Appendix K
Riparian Vegetation Analysis

Riparian vegetation is a key part of a functioning fluvial system and has both direct immediate effects on instream habitat as well as longer process-based effects on the fluvial ecosystem. It holds information about the health of the ecosystem and the geomorphic state of the river corridor. Investigating the extent and type of coverage can provide useful information when planning restoration actions. This appendix provides information on why and how the vegetation analysis was conducted. The concept of riparian vegetation in fluvial systems, and its roles in the Tucannon River specifically, is explained in more detail in Section 10.4 of the main report.

Analysis Overview

The purpose of the riparian vegetation analysis is to identify the following:

1. What is the overall status of riparian vegetation for each project area?
2. Where has that riparian vegetation increased or decreased between 2010 and 2017?

The riparian vegetation analysis for this report uses a Canopy Height Model (CHM) to quantify the extent of riparian vegetation in each project area, and classifies the vegetation based on height as shown in Table K-1. The CHMs were calculated as the difference between the first returns and the bare earth results from Light Detection and Ranging (LiDAR) datasets and sorted into vegetation size classes. Additionally, two CHMs were created using LiDAR data collected in 2010 and 2017 (Watershed Sciences 2010; QSI 2018). Comparing CHMs from different years allows for the quantification of change in the riparian vegetation. Interpretation of these results provides a way to assess the condition of riparian vegetation in each project area and to understand the trends of coverage and vegetation type over time. It also provides a baseline for future riparian vegetation analyses, which will help inform restoration efforts.

These results were trimmed to only include the "riparian area" of each project, so as to exclude results from areas captured by LiDAR but not directly relevant to the Tucannon River. The boundaries of this riparian corridor were defined as the combination of the following:

1. The channel centerline from the corresponding year (2010 or 2017), with a 150-foot buffer
2. Historical channel traces from digitized from aerial imagery
3. The 5-year available floodplain (defined in Appendix F, Connectivity Analysis)
4. Areas considered to be viable riparian habitat based on experiential knowledge and added manually

Areas deemed incorrectly included were manually removed; this also included areas that were marked as "Unobtainable" as defined in the Connectivity analysis, as well as areas with infrastructure

such as in the area shown in Figure K-1. The wetted channel area for each year was removed because the 2017 LiDAR contains bathymetric data for the channel and the 2010 dataset does not, which would cause errors in comparing the two. Appendix D provides a more detailed discussion on the differences in the blue green LiDAR (2017) and the regular LiDAR (2010). Figure K-1 shows how these layers were combined for the 2017 dataset to define the boundary of the area with potential for riparian vegetation. These boundaries were chosen because they represent a reasonable delineation of the area available for riparian vegetation growth for a given year and can be determined using remote sensing techniques.

Figure K-1
Delineation of Riparian Area
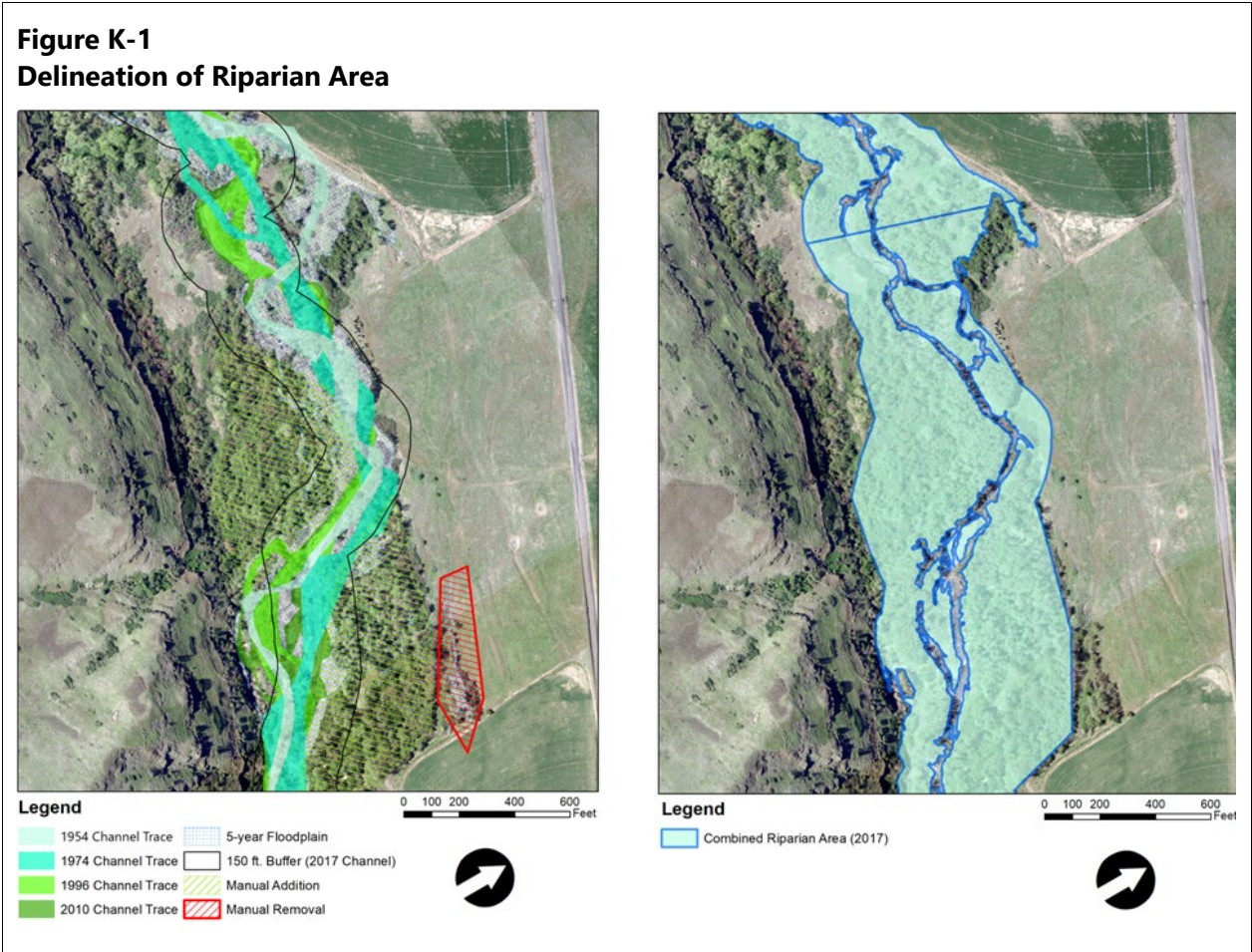
Further filtering of the data was deemed unnecessary because of the lack of man-made structures within the boundaries of the study area. Once calculated, the vegetation heights were separated into classes (listed in Table K-1) that are based on experiential knowledge of vegetation in the basin. Vegetation types are defined by ecological roles within the riparian corridor. A portion of the results are displayed in Figure K-2. The extent of coverage, the distributions of vegetation type, and the change in each vegetation type between the 2 years were investigated for each project area.

The tabulated results of this analysis can be found in Tables K-5 and K-6 at the end of this appendix. Table K-5 presents the data as acres of each vegetation size class per project area for each year, along with the total area change. Table K-6 presents each vegetation size class as a percent of the total riparian area.

Table K-1
Breakdown of Vegetation Classes

Size Range (feet)	Designed to Capture
0-3	Crops; grasses; wildflowers
3-5	Emergent or establishing woody vegetation like willows
5-15	Small deciduous trees like alders or elms
15-40	Intermediate range of large alders or smaller cottonwoods
40-80	Large, deciduous trees like cottonwoods
80+	Very old cottonwoods and large conifers in upper basin

Figure K-2
Results from Vegetation Analysis
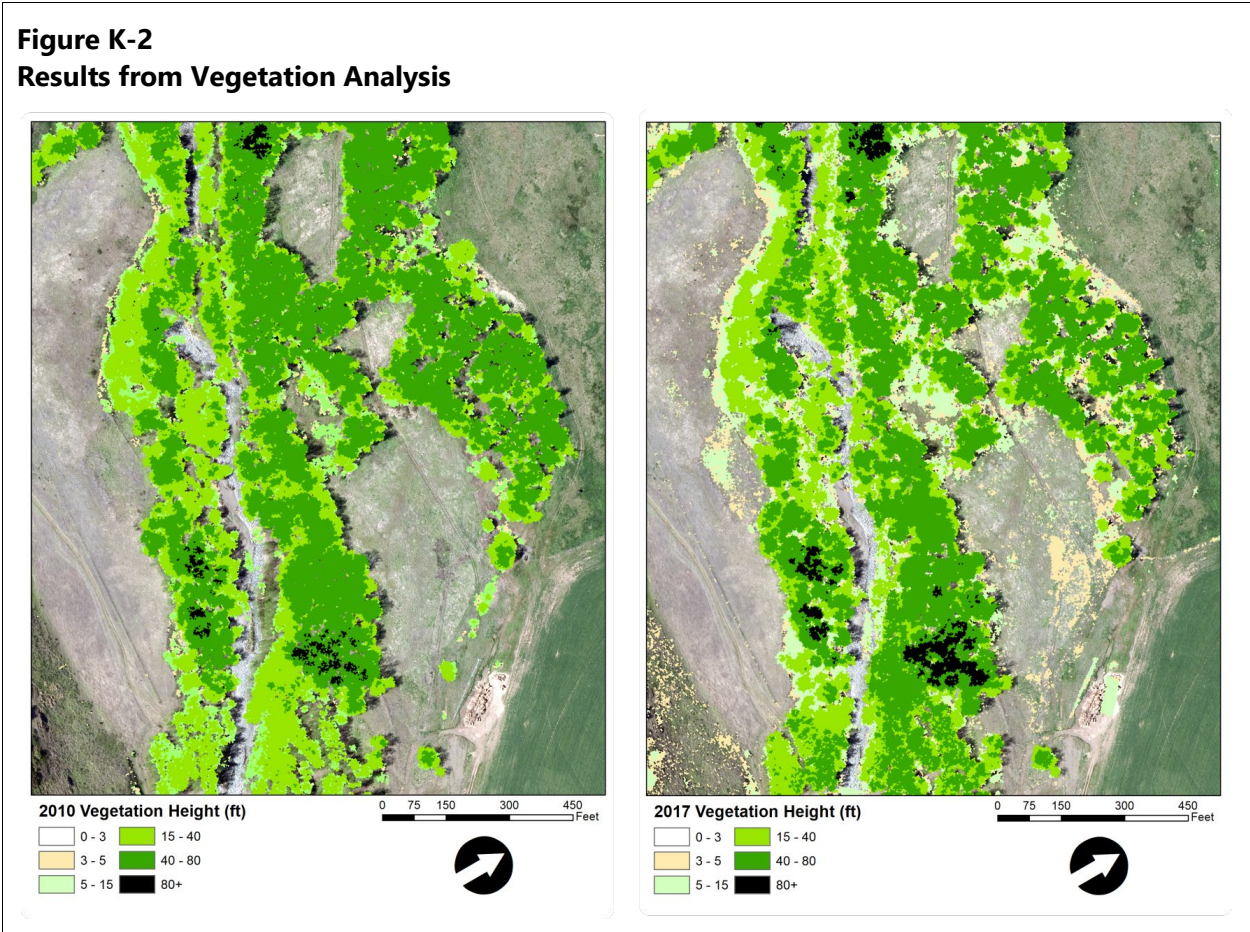
Vegetation Analysis Results, Trends, and Patterns

Target values of 25% and 40% were set for the percentage of riparian area in each project area covered by the 15- to 40-foot and 40- to 80-foot vegetation classes, respectively, as summarized in Table K-2. These two vegetation classes are especially important for the health of the riparian corridor because they provide the most shade and shelter to the river and are the most commonly recruited as large woody material. The target values were chosen based on experiential knowledge of healthy riparian corridors and the Tucannon Basin. Secondary, 5% lower targets and a 7-year trend of riparian coverage were also evaluated to highlight project areas that are close to the target values or trending towards target value.

Table K-2
2017 Riparian Vegetation Targets

Size Class (feet)	Target	Near Target Level
15–40	25%	20%
40–80	40%	35%

Table K-7 lays out whether or not each project area meets any of the targets laid out in Table K-2, as well as if the project area nearly meets either of the two targets (within 5%). Table K-5 also provides how far each project area is from meeting either of the two targets. Finally, Table K-5 shows the 7-year trend for the two target size classes (15 to 40 feet and 40 to 80 feet) calculated as the percent difference between the 2010 vegetated area and the 2017 vegetated area in the size class. This trend can be used to infer whether or not the project area is moving towards or away from meeting the target in the respective size class.

Plots of the distributions of vegetation classes (Figure K-3) (stacked area graphs) show similar trends in coverage between the 2 years. They show lesser total amounts of coverage in the upper basin (possibly due to narrower valley widths), with a higher percentage of trees in the 80-foot-plus class. Moving downstream (left to right), total coverage of vegetation is variable with a slightly positive trend. There is a decrease in the percentage of the largest trees, and an increase in the percentages of the smallest vegetation class. Downstream of Project Area 17.2, the 40- to 80-foot vegetation class becomes dramatically larger in total and relative to the others. Downstream of Project Area 39.1, which contains the town of Starbuck, there is a noticeable drop off in total riparian vegetation.

Figure K-3
Distributions of Coverage by Project Area and Vegetation Class
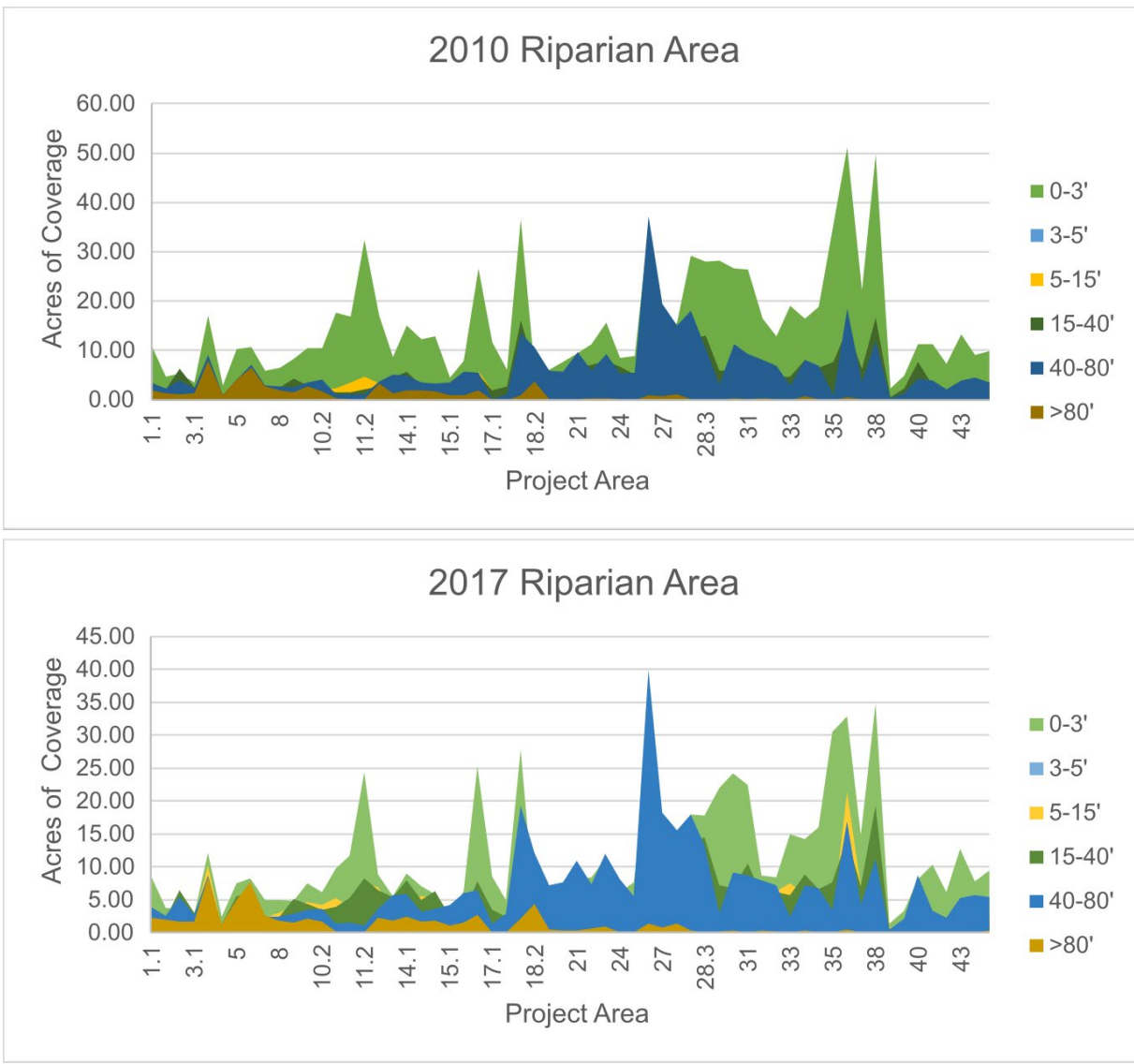
Note Stacked area graphs show the total vegetative cover at each project area as the maximum, with proportions of each vegetation class shown by color.

Table K-3 shows the distribution of vegetation height classes for the 2010 and 2017 datasets averaged across all the project areas (the full table of results can be found in Tables K-4 and K-5). For both years, it shows bimodal distributions with most of the vegetation falling in the lowest height class, and a second peak in the 40- to 80-foot class. Comparison of the two distributions shows a shift from the lowest height class to the mid-range classes from 2010 to 2017, although a Two-Factor Analysis of Variance (ANOVA) shows that differences in heights between the 2 years are not statistically significant.

Table K-3
Distributions of Average Percentages of Vegetation by Height Class and Year

Year	0–3 feet	3–5 feet	5–15 feet	15–40 feet	40–80 feet	>80 feet
2010	48%	2%	10%	17%	19%	4%
2017	34%	9%	14%	18%	20%	4%

Note:
Percentages reflect averages from all project areas.

While not statistically different, Figure K-4 visually demonstrates the shift away from the smallest height class between 2010 and 2017. This trend may capture a portion of the cycle of vegetation growth in the riparian corridor, with younger vegetation growing into the larger height classes. The 15- to 40-foot height class and the 40- to 80-foot height class are the most geomorphically important because they represent the categories of vegetation that create shade and that are recruited into the river as LWM, respectively. A target value of 25% coverage from the 15- to 40-foot height class and 40% coverage from the 40- to 80-foot height class were set to evaluate existing conditions relative to ideal conditions. This comparison shows that for the 40- to 80-foot height class, none of the project areas hit the target value, although four (8%) of them fall within 5% and 32 (53%) have shown growth over the last 7 years (Table K-3). Of the 15- to 40-foot height class, four project areas reach the target value, 15 (25%) are within 5% of the target, and 29 (48%) have shown growth between 2010 and 2017.

Figure K-4
Change in Riparian Area, 2010 to 2017
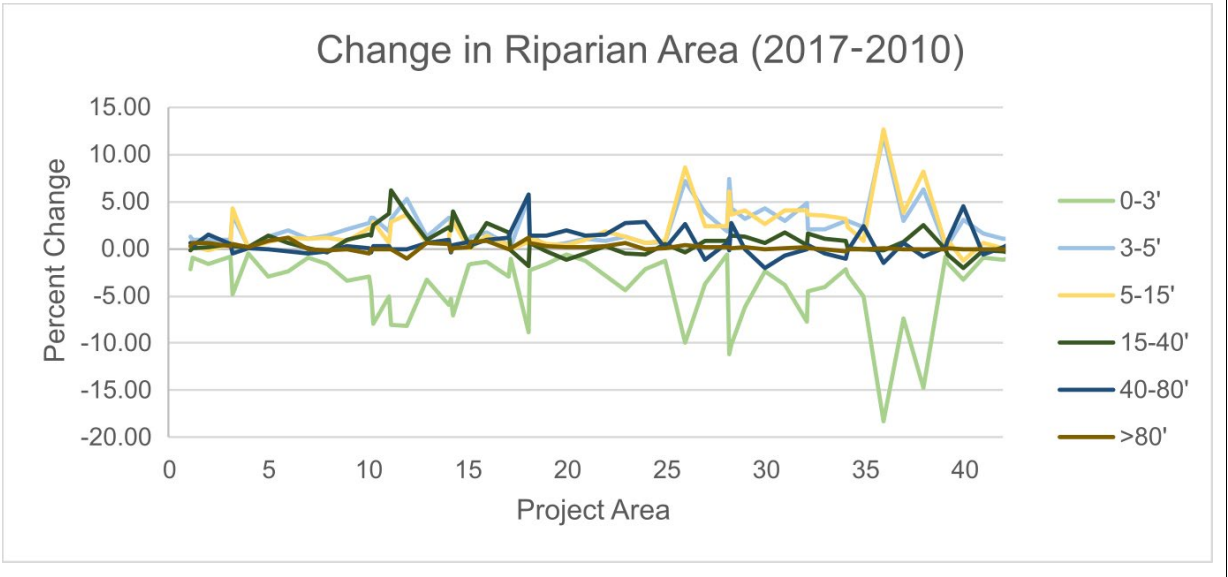
Detailed Instructions for Performing this Analysis

Part of the purpose of this assessment is to define repeatable and data-driven methods for assessing project areas and how they have progressed in relation to their goals. This section provides the detailed steps taken to perform the riparian vegetation analysis so that these analyses can be repeated in the future for additional analyses and evaluation of progress. Table K-4 provides the data that will need to be collected to reassess the riparian vegetation in each project area.

Table K-4
Raw Data Needed to Perform this Analysis

Data Needed	Used For	Source
Canopy Height Model	Analyzing vegetation heights	LiDAR (difference of first returns and bare earth)
Active channel trace (plus 150-foot buffer)	Defining riparian area	Manual tracing/hydrology data
Historic channel traces	Defining riparian area	Manual tracing/historic data
5-year available floodplain	Defining riparian area	2D hydraulic modeling results and Connectivity Analysis
Project area delineations	Calculation of all metrics per project area	Project area shapefiles from this assessment

The following steps will assume the user has adequate GIS knowledge and access to the same data sources as those produced in this report.

1. This analysis uses historical channel traces from 1954, 1974, 1996, and 2010. These data were obtained through manual digitization of aerial imagery and are available as part of the GIS package of this geomorphic assessment. Future analyses will require any more recent channel traces, and judgement to discern which historic channels are still relevant for the analysis. These data were imported into GIS as polygon shapefiles.
2. The analysis requires channel centerline data from each year in which riparian vegetation data are being investigated. Centerlines were manually digitized from aerial imagery and relative elevation maps, imported into GIS as polyline shapefiles, and a 150-foot buffer was applied to them.
3. The 5-year available floodplain data created as part of the Connectivity analysis were imported into GIS. In future analyses, these data may need to be replaced if the topography of the valley has undergone significant changes.

4. Using GIS, a polygon was created from the maximum extent of the boundaries of the historic channel traces, 150-foot buffer, and 5-year available floodplain. The boundaries of the active channel for the year of a given vegetation analysis were subtracted from this area. This subtraction is only necessary if CHMs being compared were created using different types of LiDAR that would affect the results (e.g., bathymetric vs nonbathymmetric).

5. Using GIS, CHMs were created using LiDAR data by calculating the difference in elevation between the first returns and the bare earth topography. This calculation was only performed within the riparian area boundaries created for each year.

6. The results were classified based on their elevation into six groups: 0 to 3 feet, 3 to 5 feet, 5 to 15 feet, 15 to 40 feet, 40 to 80 feet, and greater than 80 feet.

7. Using GIS, the extent of coverage in each project area for each height class were extracted. These values were converted to percentages of vegetated area.

8. Change in vegetation was calculated by subtracting the coverage extent for each height in 2017 from those in 2010. These values were converted to percent change values.

Reference

QSI (Quantum Spatial, Inc.), 2018. *Tucannon River, Washington Topobathymetric LiDAR Technical Data Report*. Prepared for GeoTerra, Inc. March 1, 2018.

Watershed Sciences, 2010. *LiDAR Remote Sensing Data Collection: Tucannon River, Tucannon Headwaters, and Cummins Creek, WA*. July 30, 2010.

Tables

Table K-5
Vegetation Size Class Per Project Area

Project Area	2010 acres						2017 acres						DELTA (2017 vs. 2010 acres)						Total Analyzed Area (ac)		
	0-3 ft	3-5 ft	5-15 ft	15-40 ft	140-80 ft	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	2010	2017	Delta (ac)
1.1	10.88	0.40	2.65	3.45	3.39	1.98	8.74	1.65	2.77	3.31	3.97	2.30	-2.14	1.25	0.13	-0.14	0.58	0.32	22.75	22.74	0.00
1.2	4.76	0.29	1.77	2.07	2.24	1.35	3.77	1.25	2.10	2.10	2.52	1.94	-0.99	0.96	0.32	0.03	0.29	0.59	12.47	13.68	1.21
2	5.29	0.44	3.42	6.28	3.92	1.04	3.66	1.38	3.31	6.48	5.48	1.64	-1.63	0.94	-0.11	0.20	1.56	0.61	20.39	21.95	1.56
3.1	3.57	0.24	1.74	2.47	2.21	1.37	2.74	1.21	2.21	2.97	2.69	1.68	-0.83	0.98	0.46	0.50	0.48	0.31	11.59	13.49	1.90
3.2	16.97	1.24	5.97	7.20	9.17	7.81	12.14	4.93	10.25	7.51	8.68	8.35	-4.83	3.68	4.29	0.31	-0.49	0.53	48.37	51.86	3.50
4	2.92	0.17	0.75	0.98	0.84	0.97	2.41	0.34	0.84	1.21	0.95	1.19	-0.51	0.18	0.09	0.22	0.11	0.23	6.63	6.94	0.31
5	10.35	0.55	3.46	4.15	4.14	4.18	7.47	1.88	4.21	5.55	4.13	5.04	-2.88	1.33	0.75	1.40	-0.01	0.86	26.83	28.27	1.44
6	10.64	0.87	5.70	5.26	7.16	6.39	8.24	2.80	6.91	5.86	6.90	7.59	-2.40	1.93	1.21	0.60	-0.26	1.19	36.03	38.31	2.28
7	5.97	0.33	1.19	1.53	2.90	2.67	5.03	1.35	2.28	1.58	2.47	2.57	-0.94	1.02	1.09	0.05	-0.44	-0.10	14.60	15.29	0.68
8	6.54	0.52	1.89	2.58	2.71	1.94	4.91	1.93	3.04	2.25	2.48	1.82	-1.63	1.42	1.15	-0.33	-0.22	-0.11	16.16	16.44	0.27
9	8.20	0.70	3.26	4.24	2.48	1.58	4.85	2.71	4.07	5.18	2.81	1.58	-3.34	2.02	0.82	0.93	0.33	0.00	20.46	21.21	0.75
10.1	10.45	0.61	2.44	2.90	3.44	2.62	7.51	3.33	4.65	4.37	3.49	2.16	-2.94	2.72	2.21	1.48	0.05	-0.45	22.45	25.51	3.06
10.2	10.54	0.70	2.14	2.04	4.02	1.76	6.12	4.01	4.17	3.48	3.69	1.69	-4.42	3.31	2.03	1.44	-0.33	-0.07	21.19	23.17	1.98
10.3	17.58	0.66	2.37	1.45	1.03	0.28	9.68	4.00	5.26	3.99	1.33	0.25	-7.90	3.34	2.88	2.55	0.30	-0.03	23.37	24.51	1.14
11.1	16.82	1.14	3.42	1.45	1.13	0.10	11.74	3.01	3.99	5.22	1.47	0.01	-5.07	1.88	0.57	3.77	0.34	-0.08	24.05	25.45	1.41
11.2	32.42	1.11	4.72	2.13	1.15	0.03	24.41	4.27	7.56	8.32	1.15	0.02	-8.01	3.15	2.84	6.19	-0.01	0.00	41.57	45.73	4.16
12	17.03	1.09	3.32	2.64	3.66	3.35	8.89	6.40	6.94	6.41	3.67	2.30	-8.13	5.31	3.62	3.77	0.01	-1.05	31.08	34.61	3.53
13	8.78	0.70	3.02	4.59	5.06	1.24	5.50	1.95	3.68	5.49	5.73	1.84	-3.28	1.25	0.66	0.90	0.67	0.60	23.38	24.19	0.80
14.1	14.97	0.56	3.85	5.62	4.83	1.99	9.07	3.82	4.85	7.94	5.84	2.47	-5.90	3.26	1.00	2.32	1.00	0.48	31.82	33.99	2.17
14.2	12.25	0.74	2.65	2.98	3.51	1.94	7.02	3.61	5.63	4.95	3.19	1.67	-5.23	2.87	2.97	1.96	-0.33	-0.27	24.09	26.07	1.98
14.3	12.92	0.86	2.50	2.46	3.34	1.81	5.88	3.87	5.34	6.38	3.70	1.84	-7.04	3.01	2.84	3.92	0.36	0.04	23.89	27.01	3.12
15.1	4.55	0.28	1.32	1.96	3.43	0.84	2.86	0.86	1.39	2.45	4.22	1.04	-1.69	0.59	0.07	0.49	0.79	0.20	12.39	12.83	0.45
15.2	7.97	0.40	2.80	2.87	5.64	0.83	6.34	1.66	2.86	3.08	6.06	1.51	-1.63	1.27	0.06	0.20	0.42	0.68	20.50	21.50	1.00
16	26.66	0.67	5.71	5.12	5.48	1.90	25.24	2.45	7.14	7.83	6.47	2.80	-1.42	1.77	1.43	2.71	1.00	0.90	45.54	51.93	6.39
17.1	11.59	0.28	1.93	1.84	0.19	0.00	8.60	0.66	2.38	3.52	1.33	0.00	-2.99	0.38	0.45	1.69	1.14	0.00	15.82	16.49	0.66
17.2	6.00	0.22	1.21	2.66	1.06	0.00	4.99	0.46	1.22	2.49	2.86	0.04	-1.01	0.24	0.01	-0.17	1.80	0.04	11.15	12.07	0.91
18.1	36.62	1.48	7.95	16.07	13.49	0.94	27.80	6.83	8.69	14.23	19.27	2.18	-8.82	5.35	0.74	-1.84	5.78	1.24	76.55	79.01	2.47
18.2	6.18	0.74	3.56	6.67	10.66	3.76	3.87	2.30	4.76	7.25	12.10	4.44	-2.31	1.57	1.20	0.57	1.44	0.67	31.58	34.72	3.14
19	6.01	0.28	1.54	4.20	5.87	0.21	4.40	0.62	2.11	3.94	7.23	0.55	-1.61	0.34	0.56	-0.26	1.36	0.34	18.13	18.85	0.73
20	7.76	0.22	0.98	4.69	5.63	0.09	7.16	0.81	1.42	3.50	7.64	0.32	-0.60	0.60	0.44	-1.19	2.01	0.23	19.37	20.86	1.49
21	9.53	0.64	2.44	6.47	9.61	0.18	8.23	1.65	3.43	5.94	11.01	0.31	-1.30	1.01	0.99	-0.53	1.39	0.13	28.88	30.57	1.70
22	11.17	0.94	3.93	7.02	5.85	0.37	8.38	1.74	5.82	7.25	7.33	0.61	-2.80	0.80	1.89	0.23	1.49	0.24	29.28	31.13	1.85
23	15.56	0.65	2.86	7.94	9.18	0.31	11.19	2.00	4.13	7.51	11.93	0.93	-4.36	1.34	1.27	-0.43	2.75	0.62	36.50	37.68	1.18
24	8.42	0.48	2.22	6.66	5.23	0.07	6.22	1.10	2.88	6.03	8.11	0.06	-2.21	0.62	0.67	-0.63	2.88	-0.01	23.08	24.41	1.33
25	8.87	0.27	1.21	5.10	5.52	0.01	7.60	1.05	2.02	5.56	5.59	0.03	-1.27	0.78	0.81	0.46	0.08	0.01	20.98	21.85	0.87
26	34.78	2.57	10.99	34.63	37.17	0.96	24.83	9.81	19.58	34.29	39.84	1.33	-9.95	7.24	8.59	-0.34	2.67	0.37	121.09	129.68	8.59
27	13.11	0.62	2.50	10.36	19.37	0.69	9.39	4.51	4.93	11.16	18.20	0.84	-3.73	3.89	2.42	0.80	-1.17	0.15	46.65	49.02	2.36
28.1	15.71	0.84	2.48	7.86	15.02	1.15	15.07	2.74	4.87	8.71	15.61	1.33	-0.65	1.89	2.39	0.84	0.59	0.18	43.07	48.32	5.25
28.2	29.13	1.02	3.97	12.16	18.05	0.20	17.98	8.43	10.01	13.32	17.92	0.32	-11.15	7.40	6.04	1.16	-0.12	0.13	64.52	67.99	3.46
28.3	27.98	0.47	3.69	13.04	10.54	0.00	17.81	4.82	7.32	14.46	13.29	0.03	-10.18	4.34	3.62	1.42	2.75	0.03	55.73	57.72	1.99
29	28.17	0.76	2.41	5.96	3.04	0.00	22.01	3.94	6.47	7.26	3.01	0.13	-6.16	3.17	4.06	1.30	-0.04	0.13	40.35	42.82	2.47
30	26.68	0.76	1.63	6.13	11.18	0.26	24.27	5.02	4.24	6.79	9.20	0.27	-2.41	4.26	2.61	0.66	-1.98	0.01	46.64	49.79	3.16
31	26.31	1.54	2.88	8.75	9.36	0.04	22.44	4.51	6.97	10.45	8.66	0.06	-3.87	2.97	4.09	1.70	-0.70	0.01	48.88	53.09	4.21
32.1	16.54	1.35	2.87	5.37	8.05	0.27	8.78	6.16	6.90	5.80	8.02	0.41	-7.77	4.81	4.03	0.43	-0.03	0.14	34.45	36.07	1.62
32.2	12.92	0.65	2.68	4.47	6.87	0.11	8.41	2.70	6.29	6.13	7.27	0.13	-4.51	2.05	3.61	1.67	0.40	0.03	27.69	30.94	3.25
33	19.04	1.91	4.03	4.77	2.88	0.00	15.01	4.00	7.57	5.79	2.38	0.00	-4.03	2.09	3.53	1.03	-0.51	0.00	32.64	34.75	2.11
34.1	16.46	0.81	2.69	8.03	8.18	0.65	14.30	3.76	5.91	8.88	7.16	0.36	-2.17	2.94	3.22	0.85	-1.02	-0.29	36.82	40.37	3.54
34.2	18.75	0.20	1.44	6.53	6.97	0.07	15.97	3.19	3.70	6.61	6.78	0.04	-2.78	3.00	2.25	0.08	-0.19	-0.04	33.96	36.28	2.32
35	35.50	0.28	1.32	7.70	0.99	0.00	30.44	2.61	2.14	7.67	3.41	0.00	-5.06	2.33	0.82	-0.04	2.41	0.00	45.80	46.27	0.47
36	51.20	1.96	8.66	14.48	18.47	0.42	32.95	13.99	21.32	14.37	16.96	0.54	-18.25	12.04	12.66	-0.11	-1.51	0.12	95.19	100.14	4.95
37	22.28	0.85	3.26	6.28	3.62	0.07	14.85	3.78	7.11	7.06	4.26	0.06	-7.43	2.94	3.84	0.78	0.64	-0.01	36.36	37.11	0.75
38	49.65	2.20	8.60	16.73	11.96	0.01	34.87	8.53	16.84	19.30	11.18	0.00	-14.78	6.33	8.24	2.57	-0.77	0.00	89.14	90.72	1.58
39.1	2.25	0.04	0.20	0.53	0.32	0.00	1.41	0.31	0.71	0.45	0.52	0.00	-0.84	0.27	0.52	-0.08	0.20	0.00	3.33	3.40	0.06
39.2	4.85	0.16	0.68	2.31	1.22	0.00	3.34	0.54	1.68	1.70	2.12	0.01	-1.51	0.39	1.01	-0.61	0.90	0.01	9.21	9.39	0.18
40	11.29	0.88	4.39	7.59	4.22	0.00	8.06	3.93	3.12	5.53	8.71	0.00	-3.23	3.05	-1.27	-2.06	4.49	0.00	28.37	29.35	0.98
41	11.31	0.22	1.53	2.98	3.93	0.00	10.33	1.82	2.15	2.85	3.39	0.00	-0.98	1.60	0.62	-0.13	-0.55	0.00	19.97	20.53	0.56

Table K-5

Vegetation Size Class Per Project Area

Project Area	2010 acres						2017 acres						DELTA (2017 vs. 2010 acres)						Total Analyzed Area (ac)		
	0-3 ft	3-5 ft	5-15 ft	15-40 ft	140-80 ft	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	2010	2017	Delta (ac)
42	7.26	0.14	1.34	1.94	2.15	0.00	6.14	1.21	1.44	1.66	2.31	0.00	-1.12	1.08	0.10	-0.29	0.16	0.00	12.83	12.76	-0.07
43	13.17	0.17	1.41	3.05	3.90	0.00	12.67	1.19	1.12	2.17	5.23	0.00	-0.50	1.02	-0.29	-0.87	1.33	0.00	21.70	22.39	0.69
44	9.07	0.12	1.88	2.45	4.58	0.00	7.84	1.37	1.47	2.10	5.74	0.00	-1.23	1.25	-0.41	-0.35	1.15	0.00	18.11	18.52	0.42
45	9.78	0.28	2.28	3.79	3.46	0.00	9.47	2.27	2.52	2.81	5.39	0.33	-0.31	1.98	0.24	-0.98	1.93	0.33	19.60	22.80	3.20

Note:

ft: feet

Table K-6

Vegetation Size Class Per Project Area as a Percent of Total Area

Project Area	2010 acres						2017 acres						DELTA (2017 vs. 2010 acres)					
	0-3 ft	3-5 ft	5-15 ft	15-40 ft	140-80 ft	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft
1.1	48%	2%	12%	15%	15%	9%	38%	7%	12%	15%	17%	10%	-9%	5%	1%	-1%	3%	1%
1.2	38%	2%	14%	17%	18%	11%	28%	9%	15%	15%	18%	14%	-11%	7%	1%	-1%	1%	3%
2	26%	2%	17%	31%	19%	5%	17%	6%	15%	30%	25%	7%	-9%	4%	-2%	-1%	6%	2%
3.1	31%	2%	15%	21%	19%	12%	20%	9%	16%	22%	20%	12%	-11%	7%	1%	1%	1%	1%
3.2	35%	3%	12%	15%	19%	16%	23%	10%	20%	14%	17%	16%	-12%	7%	7%	0%	-2%	0%
4	44%	3%	11%	15%	13%	15%	35%	5%	12%	17%	14%	17%	-9%	2%	1%	3%	1%	3%
5	39%	2%	13%	15%	15%	16%	26%	7%	15%	20%	15%	18%	-12%	5%	2%	4%	-1%	2%
6	30%	2%	16%	15%	20%	18%	22%	7%	18%	15%	18%	20%	-8%	5%	2%	1%	-2%	2%
7	41%	2%	8%	10%	20%	18%	33%	9%	15%	10%	16%	17%	-8%	7%	7%	0%	-4%	-1%
8	40%	3%	12%	16%	17%	12%	30%	12%	18%	14%	15%	11%	-11%	9%	7%	-2%	-2%	-1%
9	40%	3%	16%	21%	12%	8%	23%	13%	19%	24%	13%	7%	-17%	9%	3%	4%	1%	0%
10.1	47%	3%	11%	13%	15%	12%	29%	13%	18%	17%	14%	8%	-17%	10%	7%	4%	-2%	-3%
10.2	50%	3%	10%	10%	19%	8%	26%	17%	18%	15%	16%	7%	-23%	14%	8%	5%	-3%	-1%
10.3	75%	3%	10%	6%	4%	1%	39%	16%	21%	16%	5%	1%	-36%	14%	11%	10%	1%	0%
11.1	70%	5%	14%	6%	5%	0%	46%	12%	16%	21%	6%	0%	-24%	7%	1%	14%	1%	0%
11.2	78%	3%	11%	5%	3%	0%	53%	9%	17%	18%	3%	0%	-25%	7%	5%	13%	0%	0%
12	55%	4%	11%	8%	12%	11%	26%	18%	20%	19%	11%	7%	-29%	15%	9%	10%	-1%	-4%
13	38%	3%	13%	20%	22%	5%	23%	8%	15%	23%	24%	8%	-15%	5%	2%	3%	2%	2%
14.1	47%	2%	12%	18%	15%	6%	27%	11%	14%	23%	17%	7%	-20%	9%	2%	6%	2%	1%
14.2	51%	3%	11%	12%	15%	8%	27%	14%	22%	19%	12%	6%	-24%	11%	11%	7%	-2%	-2%
14.3	54%	4%	10%	10%	14%	8%	22%	14%	20%	24%	14%	7%	-32%	11%	9%	13%	0%	-1%
15.1	37%	2%	11%	16%	28%	7%	22%	7%	11%	19%	33%	8%	-14%	4%	0%	3%	5%	1%
15.2	39%	2%	14%	14%	28%	4%	29%	8%	13%	14%	28%	7%	-9%	6%	0%	0%	1%	3%
16	59%	1%	13%	11%	12%	4%	49%	5%	14%	15%	12%	5%	-10%	3%	1%	4%	0%	1%
17.1	73%	2%	12%	12%	1%	0%	52%	4%	14%	21%	8%	0%	-21%	2%	2%	10%	7%	0%
17.2	54%	2%	11%	24%	10%	0%	41%	4%	10%	21%	24%	0%	-12%	2%	-1%	-3%	14%	0%
18.1	48%	2%	10%	21%	18%	1%	35%	9%	11%	18%	24%	3%	-13%	7%	1%	-3%	7%	2%
18.2	20%	2%	11%	21%	34%	12%	11%	7%	14%	21%	35%	13%	-8%	4%	2%	0%	1%	1%
19	33%	2%	9%	23%	32%	1%	23%	3%	11%	21%	38%	3%	-10%	2%	3%	-2%	6%	2%
20	40%	1%	5%	24%	29%	0%	34%	4%	7%	17%	37%	2%	-6%	3%	2%	-7%	8%	1%
21	33%	2%	8%	22%	33%	1%	27%	5%	11%	19%	36%	1%	-6%	3%	3%	-3%	3%	0%
22	38%	3%	13%	24%	20%	1%	27%	6%	19%	23%	24%	2%	-11%	2%	5%	-1%	4%	1%
23	43%	2%	8%	22%	25%	1%	30%	5%	11%	20%	32%	2%	-13%	4%	3%	-2%	7%	2%
24	36%	2%	10%	29%	23%	0%	25%	5%	12%	25%	33%	0%	-11%	2%	2%	-4%	11%	0%
25	42%	1%	6%	24%	26%	0%	35%	5%	9%	25%	26%	0%	-8%	4%	3%	1%	-1%	0%
26	29%	2%	9%	29%	31%	1%	19%	8%	15%	26%	31%	1%	-10%	5%	6%	-2%	0%	0%
27	28%	1%	5%	22%	42%	1%	19%	9%	10%	23%	37%	2%	-9%	8%	5%	1%	-4%	0%
28.1	36%	2%	6%	18%	35%	3%	31%	6%	10%	18%	32%	3%	-5%	4%	4%	0%	-3%	0%
28.2	45%	2%	6%	19%	28%	0%	26%	12%	15%	20%	26%	0%	-19%	11%	9%	1%	-2%	0%
28.3	50%	1%	7%	23%	19%	0%	31%	8%	13%	25%	23%	0%	-19%	7%	6%	2%	4%	0%
29	70%	2%	6%	15%	8%	0%	51%	9%	15%	17%	7%	0%	-18%	7%	9%	2%	-1%	0%
30	57%	2%	3%	13%	24%	1%	49%	10%	9%	14%	18%	1%	-8%	8%	5%	0%	-6%	0%
31	54%	3%	6%	18%	19%	0%	42%	8%	13%	20%	16%	0%	-12%	5%	7%	2%	-3%	0%
32.1	48%	4%	8%	16%	23%	1%	24%	17%	19%	16%	22%	1%	-24%	13%	11%	0%	-1%	0%
32.2	47%	2%	10%	16%	25%	0%	27%	9%	20%	20%	23%	0%	-19%	6%	11%	4%	-1%	0%
33	58%	6%	12%	15%	9%	0%	43%	12%	22%	17%	7%	0%	-15%	6%	9%	2%	-2%	0%
34.1	45%	2%	7%	22%	22%	2%	35%	9%	15%	22%	18%	1%	-9%	7%	7%	0%	-4%	-1%
34.2	55%	1%	4%	19%	21%	0%	44%	9%	10%	18%	19%	0%	-11%	8%	6%	-1%	-2%	0%
35	78%	1%	3%	17%	2%	0%	66%	6%	5%	17%	7%	0%	-12%	5%	2%	0%	5%	0%
36	54%	2%	9%	15%	19%	0%	33%	14%	21%	14%	17%	1%	-21%	12%	12%	-1%	-2%	0%
37	61%	2%	9%	17%	10%	0%	40%	10%	19%	19%	11%	0%	-21%	8%	10%	2%	2%	0%
38	56%	2%	10%	19%	13%	0%	38%	9%	19%	21%	12%	0%	-17%	7%	9%	3%	-1%	0%
39.1	67%	1%	6%	16%	10%	0%	41%	9%	21%	13%	15%	0%	-26%	8%	15%	-3%	6%	0%

Table K-6

Vegetation Size Class Per Project Area as a Percent of Total Area

Project Area	2010 acres						2017 acres						DELTA (2017 vs. 2010 acres)					
	0-3 ft	3-5 ft	5-15 ft	15-40 ft	140-80 ft	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft	0-3 ft	3-5 ft	5-15 ft	15-40 ft	40-80	>80 ft
39.2	53%	2%	7%	25%	13%	0%	36%	6%	18%	18%	23%	0%	-17%	4%	11%	-7%	9%	0%
40	40%	3%	15%	27%	15%	0%	27%	13%	11%	19%	30%	0%	-12%	10%	-5%	-8%	15%	0%
41	57%	1%	8%	15%	20%	0%	50%	9%	10%	14%	16%	0%	-6%	8%	3%	-1%	-3%	0%
42	57%	1%	10%	15%	17%	0%	48%	10%	11%	13%	18%	0%	-8%	8%	1%	-2%	1%	0%
43	61%	1%	7%	14%	18%	0%	57%	5%	5%	10%	23%	0%	-4%	5%	-1%	-4%	5%	0%
44	50%	1%	10%	14%	25%	0%	42%	7%	8%	11%	31%	0%	-8%	7%	-2%	-2%	6%	0%
45	50%	1%	12%	19%	18%	0%	42%	10%	11%	12%	24%	1%	-8%	8%	-1%	-7%	6%	1%

Note:

ft: feet

Table K-7
Riparian Vegetation Targets and Trends

Project Area	Total 2017 Riparian Area (ac)	2017 Riparian Area Per VM (ac/mi)	15-40'			40'-80'		
			Meets Target?	Off By	7-year Trend	Meets Target?	Off By	7-yearTrend
1.1	22.74	41.36	No	10%	-1%	No	23%	3%
1.2	13.68	34.87	No	10%	-1%	No	22%	1%
2	21.95	34.13	Yes	-5%	-1%	No	15%	6%
3.1	13.49	36.23	Nearly	3%	1%	No	20%	1%
3.2	51.86	36.01	No	11%	0%	No	23%	-2%
4	6.94	29.13	No	8%	3%	No	26%	1%
5	28.27	62.31	No	5%	4%	No	25%	-1%
6	38.31	51.55	No	10%	1%	No	22%	-2%
7	15.29	33.93	No	15%	0%	No	24%	-4%
8	16.44	36.48	No	11%	-2%	No	25%	-2%
9	21.21	52.95	Nearly	1%	4%	No	27%	1%
10.1	25.51	54.54	No	8%	4%	No	26%	-2%
10.2	23.17	32.16	No	10%	5%	No	24%	-3%
10.3	24.51	59.09	No	9%	10%	No	35%	1%
11.1	25.45	33.92	Nearly	4%	14%	No	34%	1%
11.2	45.73	47.55	No	7%	13%	No	37%	0%
12	34.61	53.13	No	6%	10%	No	29%	-1%
13	24.19	31.61	Nearly	2%	3%	No	16%	2%
14.1	33.99	55.68	Nearly	2%	6%	No	23%	2%
14.2	26.07	31.70	No	6%	7%	No	28%	-2%
14.3	27.01	37.51	Nearly	1%	13%	No	26%	0%
15.1	12.83	33.68	No	6%	3%	No	7%	5%
15.2	21.50	50.80	No	11%	0%	No	12%	1%
16	51.93	37.31	No	10%	4%	No	28%	0%
17.1	16.49	47.93	Nearly	4%	10%	No	32%	7%
17.2	12.07	39.37	Nearly	4%	-3%	No	16%	14%
18.1	79.01	73.09	No	7%	-3%	No	16%	7%
18.2	34.72	44.79	Nearly	4%	0%	No	5%	1%
19	18.85	33.59	Nearly	4%	-2%	Nearly	2%	6%
20	20.86	47.83	No	8%	-7%	Nearly	3%	8%
21	30.57	29.05	No	6%	-3%	Nearly	4%	3%
22	31.13	28.74	Nearly	2%	-1%	No	16%	4%
23	37.68	35.82	No	5%	-2%	No	8%	7%
24	24.41	32.24	Nearly	0%	-4%	No	7%	11%
25	21.85	40.50	Yes	0%	1%	No	14%	-1%
26	129.68	43.43	Yes	-1%	-2%	No	9%	0%
27	49.02	46.80	Nearly	2%	1%	Nearly	3%	-4%
28.1	48.32	55.67	No	7%	0%	No	8%	-3%
28.2	67.99	58.22	No	5%	1%	No	14%	-2%
28.3	57.72	49.57	Yes	0%	2%	No	17%	4%
29	42.82	38.31	No	8%	2%	No	33%	-1%
30	49.79	49.42	No	11%	0%	No	22%	-6%
31	53.09	35.57	No	5%	2%	No	24%	-3%
32.1	36.07	45.93	No	9%	0%	No	18%	-1%
32.2	30.94	44.55	No	5%	4%	No	17%	-1%
33	34.75	28.45	No	8%	2%	No	33%	-2%
34.1	40.37	35.30	Nearly	3%	0%	No	22%	-4%
34.2	36.28	46.43	No	7%	-1%	No	21%	-2%
35	46.27	67.08	No	8%	0%	No	33%	5%
36	100.14	58.89	No	11%	-1%	No	23%	-2%
37	37.11	33.78	No	6%	2%	No	29%	2%
38	90.72	30.52	Nearly	4%	3%	No	28%	-1%
39.1	3.40	32.73	No	12%	-3%	No	25%	6%
39.2	9.39	28.49	No	7%	-7%	No	17%	9%
40	29.35	51.07	No	6%	-8%	No	10%	15%
41	20.53	58.25	No	11%	-1%	No	24%	-3%
42	12.76	38.24	No	12%	-2%	No	22%	1%
43	22.39	52.21	No	15%	-4%	No	17%	5%
44	18.52	42.92	No	14%	-2%	No	9%	6%
45	22.80	43.53	No	13%	-7%	No	16%	6%

Notes:

ac: acre

mi: mile

VM: valley mile