

APPENDIX E
ROAD NETWORK AERIAL ASSESSMENT UPPER CLARK FORK TMDL
PLANNING AREA

Prepared for:

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SECTION 1.0

INTRODUCTION

This report presents draft results of the Upper Clark Fork Road Aerial Assessment for the Antelope Creek, Brock Creek, Cable Creek, Dempsey Creek, Dunkleberg Creek, Gold Creek, Hoover Creek, Modesty Creek, Peterson Creek, Racetrack Creek, Storm Lake Creek, Tin Cup Joe Creek, Warm Springs Creek, and Willow Creek Watersheds.

SECTION 2.0

METHODS

PBS&J collected GIS roads data from various sources, including:

- Beaverhead Deerlodge National Forest (roads/travel route data);
- Helena National Forest (roads/trails data);
- Montana Department of Transportation (Transportation Framework);
- USGS (Digital Line Graph data);
- US Census Bureau (Tiger files),

These GIS datasets varied in terms of scale, spatial and attribute accuracy, completeness and currency. Therefore, we compared each roads layer with the 2005/2006 NAIP aerial photography and determined that for the Upper Clark Fork study area, the Beaverhead Deerlodge National Forest (BDNF) dataset provided the best overall representation of the spatial distribution of roads in the area. Additionally, the road classification scheme used by the BDNF was most relevant for the project needs. However, the BDNF roads layers did not provide complete coverage for the project area. Therefore, PBS&J used the other datasets to guide the creation of a complete roads dataset.

The resolutions of the MDT and Census data were much coarser and therefore, used primarily for locating roads omitted from the BDNF datasets or guiding the classification of newly digitized roads. However, neither of these two datasets provided a detailed, consistent or complete road classification scheme. Although spatially accurate in many areas, the DLGs were outdated and not available for most of our study area. Therefore, the DLGs were used to help classify roads and identify areas that needed digitizing. The HNF roads data lay primarily outside our project area or in a few instances, overlapped the BDNF data, thus providing little or no extra information. For the most part, the BDNF roads data appeared to be spatially accurate as they aligned well with the NAIP photography. The main issue was that the BDNF layer had many gaps throughout our project watersheds and therefore, PBS&J used the BDNF data as a starting point to create a comprehensive roads database.

PBS&J overlaid the BDNF roads on top of the NAIP photography and proceeded to digitize all roads that were visible on the photos, yet were absent from the BDNF road layer. As mentioned above, we used the other four datasets to assist in identifying roads in areas that were hard to interpret. Additionally, whenever possible, we used the other datasets as a potential source for attribute data. In most cases, none of the datasets had accurate road descriptions, so we deduced the classifications from nearby roads or photo interpretation.

PBS&J grouped the BDNF road classes into categories which were used to attribute the digitized lines: ATV, Landing Strip, Paved, Improved, Unimproved, Trail and Undetermined (Unknown). Discussions with the BDNF lead to the understanding that these classes were largely subjective, but in general, definitions for Improved and Unimproved were equivalent to the definitions in “Standards for USGS and USDA Forest Service Single Edition Quadrangle Maps”:

Improved Roads are on a light foundation and included gravel or stone surface, or other stable material . . . The roads are generally drained and graded, but the surface is not waterproof. Periodic maintenance is required . . . Included are gravel-surface streets, secondary county roads, service roads, Forest Highways, and Forest development roads. Unimproved roads . . . are generally passable only in fair weather and [are] used mostly for local traffic. In National Forests, these roads are considered to be forest development roads...

After digitizing was complete, PBS&J intersected the draft roads layer with the National Hydrography Dataset stream reach layer to identify all potential crossings. The results of this analysis were plotted and checked through further aerial interpretation and ground truthing. PBS&J made edits accordingly by deleting non-existent crossings and in some cases, correcting road distribution and classification. Road mileage and crossing summary statistics were then conducted using the GIS system.

SECTION 3.0 RESULTS

Results for the Upper Clark Fork TMDL Planning Area are presented in the tables below and in the accompanying maps.

3.1 Antelope Creek

Table 1. Road Network Summary for Antelope Creek

Road Type	Miles	Ownership	Miles
Paved	1.0	Private	13.7
Improved	5.0	USFS	0.01
Unimproved	4.0	State of MT	0.4
Trail	4.3	Local Govt.	0
Unknown	0	Unknown	0.2
Total	14.3		14.3
Number of crossings		16	
Watershed Area		4.9 square miles	
Road Density		2.9 miles/square mile	
Road Miles within 100 ft of stream		2.83 (19.5%)	

Table 2. Summary of roads within 100 feet of a stream channel in Antelope Creek

Road Type	Miles	Ownership	Miles
Paved	0.05	Private	2.83
Improved	1.36	USFS	0
Unimproved	0.50	State of MT	0
Trail	0.92	Local Govt.	0
Unknown	0	Unknown	0
Total	2.83		2.83

3.2 Brock Creek

Table 3. Road Network Summary for Brock Creek

Road Type	Miles	Ownership	Miles
Paved	1.1	Private	88.8
Improved	6.2	USFS	0
Unimproved	102.4	State of MT	2.6
Trail	0	Local Govt.	0
Unknown	0	Unknown	0.4
		BLM	17.9
Total	109.8		109.8
Number of crossings		39	
Watershed Area		24.8 square miles	
Road Density		4.4 miles/square mile	
Road Miles within 100 ft of stream		7.58 (6.9%)	

Table 4. Summary of roads within 100 feet of a stream channel in Brock Creek

Road Type	Miles	Ownership	Miles
Paved	0.29	Private	6.05
Improved	0.47	USFS	0
Unimproved	6.81	State of MT	0
Trail	0	Local Govt.	0
Unknown	0	Unknown	0.01
		BLM	1.52
Total	7.58		7.58

3.3 Cable Creek

Table 5. Road Network Summary for Cable Creek

Road Type	Miles	Ownership	Miles
Paved	2.2	Private	9.5
Improved	4.7	USFS	32.3
Unimproved	33.6	State of MT	0
Trail	2.5	Local Govt.	0
Unknown	0	Unknown	1.4
Total	42.9		42.9
Number of crossings		13	
Watershed Area		7.6 square miles	
Road Density		5.6 miles/square mile	
Road Miles within 100 ft of stream		3.08 (7.2%)	

Table 6. Summary of roads within 100 feet of a stream channel in Cable Creek

Road Type	Miles	Ownership	Miles
Paved	0.14	Private	1.14
Improved	0.29	USFS	1.78
Unimproved	2.50	State of MT	0
Trail	0.15	Local Govt.	0
Unknown	0	Unknown	0.17
Total	3.08		3.08

3.4 Dempsey Creek

Table 7. Road Network Summary for Dempsey Creek

Road Type	Miles	Ownership	Miles
Paved	1.3	Private	35.1
Improved	5.9	USFS	15.2
Unimproved	44.7	State of MT	5.7
Trail	6.3	Local Govt.	0
Unknown	0	Unknown	2.0
Total	58.1		58.1
Number of crossings		34	
Watershed Area		28.4 square miles	
Road Density		2.0 miles/square mile	
Road Miles within 100 ft of stream		2.65 (4.5%)	

Table 8. Summary of roads within 100 feet of a stream channel in Dempsey Creek

Road Type	Miles	Ownership	Miles
Paved	0.18	Private	1.05
Improved	0.22	USFS	0.67
Unimproved	2.00	State of MT	0.65
Trail	0.24	Local Govt.	0
Unknown	0	Unknown	0.28
Total	2.65		2.65

3.5 Dunkleberg Creek

Table 9. Road Network Summary for Dunkleberg Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	27.9
Improved	6.9	USFS	19.7
Unimproved	34.8	State of MT	1.6
Trail	7.5	Local Govt.	0
Unknown	0	Unknown	0
Total	49.2		49.2
Number of crossings		28	
Watershed Area		15.3 square miles	
Road Density		3.2 miles/square mile	
Road Miles within 100 ft of stream		2.85 (5.8%)	

Table 10. Summary of roads within 100 feet of a stream channel in Dunkleberg Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	1.85
Improved	0.44	USFS	0.90
Unimproved	2.20	State of MT	0.10
Trail	0.21	Local Govt.	0
Unknown	0	Unknown	0
Total	2.85		2.85

3.6 Gold Creek

Table 11. Road Network Summary for Gold Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	79.1
Improved	48.5	USFS	117.1
Unimproved	117.4	State of MT	3.1
Trail	36.6	Local Govt.	0
Unknown	0	Unknown	0.65
		BLM	2.54
Total	202.5		202.5
Number of crossings		92	
Watershed Area		66.6 square miles	
Road Density		3.0 miles/square mile	
Road Miles within 100 ft of stream		12.57 (6.2%)	

Table 12. Summary of roads within 100 feet of a stream channel in Gold Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	7.17
Improved	2.13	USFS	4.83
Unimproved	7.78	State of MT	0.12
Trail	2.66	Local Govt.	0
Unknown	0	Unknown	0.11
		BLM	0.34
Total	12.57		12.57

3.7 Hoover Creek

Table 13. Road Network Summary for Hoover Creek

Road Type	Miles	Ownership	Miles
Paved	0.9	Private	157.0
Improved	0.2	USFS	0
Unimproved	163.3	State of MT	6.3
Trail	0.1	Local Govt.	0.01
Unknown	0	Unknown	0.8
Total	164.5		164.5
Number of crossings		71	
Watershed Area		30.9 square miles	
Road Density		5.3 miles/square mile	
Road Miles within 100 ft of stream		12.79 (7.8%)	

Table 14. Summary of roads within 100 feet of a stream channel in Hoover Creek

Road Type	Miles	Ownership	Miles
Paved	0.20	Private	11.67
Improved	0.06	USFS	0
Unimproved	12.50	State of MT	0.88
Trail	0.04	Local Govt.	0
Unknown	0	Unknown	0.24
Total	12.79		12.79

3.8 Modesty Creek

Table 15. Road Network Summary for Modesty Creek

Road Type	Miles	Ownership	Miles
Paved	10.0	Private	79.0
Improved	9.3	USFS	0
Unimproved	57.3	State of MT	2.8
Trail	5.8	Local Govt.	0
Unknown	0	Unknown	0.5
Total	82.3		82.3
Number of crossings		46	
Watershed Area		21.1 square miles	
Road Density		3.9 miles/square mile	
Road Miles within 100 ft of stream		8.35 (10.1%)	

Table 16. Summary of roads within 100 feet of a stream channel in Modesty Creek

Road Type	Miles	Ownership	Miles
Paved	1.09	Private	8.25
Improved	0.28	USFS	0
Unimproved	6.94	State of MT	0.09
Trail	0.04	Local Govt.	0
Unknown	0	Unknown	0
Total	8.35		8.35

3.9 Peterson Creek

Table 17. Road Network Summary for Peterson Creek

Road Type	Miles	Ownership	Miles
Paved	1.0	Private	61.7
Improved	21.1	USFS	31.6
Unimproved	64.4	State of MT	5.2
Trail	14.2	Local Govt.	0
Unknown	0.2	Unknown	2.5
Total	100.9		100.9
Number of crossings		41	
Watershed Area		31.1 square miles	
Road Density		3.2 miles/square mile	
Road Miles within 100 ft of stream		3.63 (3.6%)	

Table 18. Summary of roads within 100 feet of a stream channel in Peterson Creek

Road Type	Miles	Ownership	Miles
Paved	0.12	Private	2.52
Improved	0.46	USFS	0.76
Unimproved	1.91	State of MT	0.12
Trail	1.14	Local Govt.	0
Unknown	0	Unknown	0.22
Total	3.63		3.63

3.10 Racetrack Creek

Table 19. Road Network Summary for Racetrack Creek

Road Type	Miles	Ownership	Miles
Paved	5.4	Private	38.4
Improved	9.7	USFS	56.6
Unimproved	50.0	State of MT	1.3
Trail	31.2	Local Govt.	0
Unknown	0	Unknown	0
Total	96.3		96.3
Number of crossings		43	
Watershed Area		51.5 square miles	
Road Density		1.9 miles/square mile	
Road Miles within 100 ft of stream		3.79 (3.9%)	

Table 20. Summary of roads within 100 feet of a stream channel in Racetrack Creek

Road Type	Miles	Ownership	Miles
Paved	0.13	Private	1.30
Improved	0.74	USFS	2.47
Unimproved	1.40	State of MT	0.02
Trail	1.52	Local Govt.	0
Unknown	0	Unknown	0
Total	3.79		3.79

3.11 Storm Lake Creek

Table 21. Road Network Summary for Storm Lake Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	22.1
Improved	6.1	USFS	18.5
Unimproved	27.8	State of MT	0
Trail	8.4	Local Govt.	0
Unknown	0	Unknown	0
		US Gov	1.7
Total	42.3		42.3
Number of crossings		14	
Watershed Area		9.2 square miles	
Road Density		4.6 miles/square mile	
Road Miles within 100 ft of stream		2.02 (4.7%)	

Table 22. Summary of roads within 100 feet of a stream channel in Storm Lake Creek

Road Type	Miles	Ownership	Miles
Paved	0	Private	0.93
Improved	0.69	USFS	0.96
Unimproved	0.71	State of MT	0
Trail	0.62	Local Govt.	0
Unknown	0	Unknown	0
		US Gov	0.14
Total	2.02		2.02

3.12 Tin Cup Joe Creek

Table 23. Road Network Summary for Tin Cup Joe Creek

Road Type	Miles	Ownership	Miles
Paved	1.1	Private	4.3
Improved	15.3	USFS	10.2
Unimproved	42.5	State of MT	48.7
Trail	12.6	Local Govt.	5.8
Unknown	0.1	Unknown	2.6
Total	71.5		71.5
Number of crossings		36	
Watershed Area		23.0 square miles	
Road Density		3.1 miles/square mile	
Road Miles within 100 ft of stream		4.13 (5.7%)	

Table 24. Summary of roads within 100 feet of a stream channel in Tin Cup Joe Creek

Road Type	Miles	Ownership	Miles
Paved	0.04	Private	0.22
Improved	0.71	USFS	0.54
Unimproved	2.59	State of MT	3.01
Trail	0.79	Local Govt.	0.33
Unknown	0	Unknown	0.03
Total	4.13		4.13

3.13 Warm Springs Creek

Table 25. Road Network Summary for Warm Springs Creek

Road Type	Miles	Ownership	Miles
Paved	0.5	Private	172.1
Improved	17.4	USFS	0
Unimproved	172.8	State of MT	4.0
Trail	2.0	Local Govt.	0
Unknown	0	Unknown	0.8
		BLM	15.8
Total	192.6		192.6
Number of crossings		85	
Watershed Area		37.4 square miles	
Road Density		5.1 miles/square mile	
Road Miles within 100 ft of stream		13.77 (7.0%)	

Table 26. Summary of roads within 100 feet of a stream channel in Warm Springs Creek

Road Type	Miles	Ownership	Miles
Paved	0.09	Private	12.67
Improved	0.73	USFS	0
Unimproved	12.92	State of MT	0.19
Trail	0.04	Local Govt.	0
Unknown	0	Unknown	0.11
		BLM	0.79
Total	13.77		13.77

3.14 Willow Creek

Table 27. Road Network Summary for Willow Creek

Road Type	Miles	Ownership	Miles
Paved	6.9	Private	28.1
Improved	6.9	USFS	0
Unimproved	43.6	State of MT	23.0
Trail	2.4	Local Govt.	0
Unknown	0.2	Unknown	9.0
Total	60.0		60.0
Number of crossings		53	
Watershed Area		14.9 square miles	
Road Density		4.0 miles/square mile	
Road Miles within 100 ft of stream		7.07 (11.8%)	

Table 28. Summary of roads within 100 feet of a stream channel in Willow Creek

Road Type	Miles	Ownership	Miles
Paved	0.53	Private	4.24
Improved	0.16	USFS	0
Unimproved	6.32	State of MT	1.77
Trail	0.05	Local Govt.	0
Unknown	0	Unknown	1.05
Total	7.07		7.07