1. Cottonwood Creek Watershed Summary

Description and Land Use

Table xxx: Cottonwood Creek Watershed Overview

Watershed Size	26,442 acres/42 sq miles/108.78 sq km
Elevation Range	3900 Feet [4500-8400 ft. above sea level]
Stream Miles	57.86
Land Ownership	30% Private /1% State, Local / 69% Federal
Road Miles	Local Road/City Street = 23.3 Four Wheel Drive Trail = 22.5 Service Road/Driveway = 5.1 Total = 50.9

Source: Montana GIS Portal Data Layers

Cottonwood Creek descends from the Boulder Mountains and flows westward through the East Deer Lodge Valley, draining about 42 square miles (Table xxx). The creek enters the Clark Fork on the Grant-Kohrs Ranch, near the city of Deer Lodge, after flowing over six miles through predominantly private agricultural lands.

Cattle grazing and pasturing, hay production, urbanization, timber harvest, and historic mining are the dominant land uses in the watershed (MFWP, 2009). Private ownership comprises 30% of the watershed while 69% of the watershed is under federal ownership. State government manages the remaining 1%. The Beaverhead Deer Lodge National Forest manages a portion of the upper watershed containing the creek's four headwater tributaries: North, Middle and South Cottonwood, and Baggs Creek (Kirk 2008).

2. Impairments

Although no sections of Cottonwood Creek are on the Montana DEQ's 303(d) list, suspected impairments are reported throughout the watershed (Kirk 2008) and include:

Mining/Metals

Priority abandoned mines within the Emery Mining District have been targeted as potential sources of acid mine drainage in the middle reach of Cottonwood Creek (KirK, 2008).

Data from the Montana Bureau of Mines and Geology shows 37 abandoned mines within the watershed area, five of which (Ding Bat [Blue-Eyed Maggie]Mine, Lower Hidden Hand Mine, Rocker Gulch Mine, St. Mary Mine and Sterrit Mine) exceed Montana water quality standards for arsenic and metals contamination. (KirK, 2008). Due to soil composition and pH levels, metals contaminants disseminate mainly through wind and water erosion (KirK, 2008) instead of leaching through soil.

Irrigation and Dewatering

Chronic dewatering results from the variety of land uses within the basin and has many implications for both water quantity and quality. In particular, irrigation water rights are over-allocated on Cottonwood Creek, which often causes complete dewatering in parts of the lower reaches (KirK, 2008). Peak flows for the creek (measured in 1964 and the annually during 1975-1991) were often in the 100-500 cfs range, with bankfull flow estimated at 250 cfs (Reiland, pers. comm.. 2011). But for much of the late summer, fall, winter and early spring flows range from one to ten cfs (KirK, 2008).

In addition to reduced stream flow, irrigation creates physical barriers to fish passage. Of the 15 irrigation ditch diversions within the drainage, nine were found to be partial barriers to fish movement (Kirk, 2010; TU, WRC, MFWP, 2010). Perched culverts exist on the downstream side of Interstate 90, which can substantially reduce fish migration (MFWP, 2009).

Temperature

Thermal impairments have also been attributed to dewatering, and are documented in the lower portion of the basin, especially in and downstream of the town of Deer Lodge. Temperatures below 16°C are optimum for westslope cutthroat trout growth, while temperatures below 20 °C are critical for their survival (Kirk, 2010). High temperatures also encourage algae growth and reduce dissolved oxygen content, which can be detrimental to fish health. Temperature has been regularly monitored on reaches of Cottonwood Creek in the last five years (2007-2011), but its tributaries have not been monitored in recent years (MFWP, 2009).

Table XXX: Temperature Measurements for Cottonwood Creek

Year	RM	Period	Days >15°C	Days >20°C	Max Temp (°C)
2007	0.5	7/15-10/15	65	20	24.1
	7.0	7/17-10/17	25	0	17.8
2008	0.3	7/11-10/13	62	26	22.2
	7.0	7/16-10/23	19	0	16.6

Source: MFWP 2009

Nutrients

Nutrient levels of nitrogen and phosphorous in Cottonwood Creek were compared to documented streams unaffected by human-caused eutrophication, and are considered elevated by those standards (KirK, 2008). Quantities of these two nutrients increase downstream and have their highest concentrations near the city of Deer Lodge (KirK, 2008). The most likely sources are livestock and urban drainage (KirK, 2008). According to KirK (2008), excessive nutrient levels can lead to undesirable algae growth which in turn can cause:

- Unpleasant tastes and odors in drinking water
- Corrosion and blockages of irrigation equipment
- Reduced dissolved oxygen
- Altered ecological communities, especially macroinvertebrates
- Degradation of aesthetic value

Riparian Habitat/Stream Channel

When Montana FWP performed a stream assessment on Cottonwood Creek in 2007, the creek received reduced scores in all assessed categories (MFWP, 2009). The channel has been manipulated in several places, beneficial riparian vegetation is often sparse due to human activities and livestock grazing, and noxious weeds are present throughout the area. The lack of

woody vegetation has led to bank erosion and increased sedimentation, as well as reduced debris for fish habitat (MFWP, 2009). The four tributaries included in the assessment (Baggs Creek and the North, Middle and South Forks of Cottonwood Creek) suffer from many of the same issues, although the riparian conditions are better for the North and Middle Forks (MFWP, 2009).

The WRC performed a riparian health assessment in 2010, and found that several stream reaches were classified as "at-risk" or "not sustainable" due to many of the same impairments noted by Montana FWP. Grazing, lack of woody vegetation and historic mining effects have depleted riparian habitat and resulted in accelerated bank erosion (WRC, 2010).

3. Native/Sport Fishery Status

Table xxx: Table xxx: Fish Distribution in the Cottonwood Creek Basin

Stream	Begin*	End*	Species	Abundance	Origin
Cottonwood Creek	0.0	10.0	Brook Trout	Common	Introduced
	0.0	10.0	Brown Trout	Common	Introduced
	0.0	1.0	Common Carp	Unknown	Introduced
	0.0	1.0	Largescale Sucker	Unknown	Native
	0.0	1.0	Longnose Sucker	Unknown	Native
	0.0	1.0	Mottled Sculpin	Unknown	Native
	0.0	1.0	Redside Shiner	Unknown	Native
	0.0	10.0	Slimy Sculpin	Common	Native
	0.0	4.0	Westslope Cutthroat Trout	Rare	Native
	4.0	10.0	Westslope Cutthroat Trout	Common	Native
Rocker Gulch	0.0	2.0	Westslope Cutthroat Trout	Common	Native
South Fork Dry Cottonwood Creek	0.0	5.0	Westslope Cutthroat Trout	Rare	Native
Middle Fork Cottonwood Creek	0.0	3.0	Brook Trout	Rare	Introduced
	0.0	3.0	Westslope Cutthroat Trout	Common	Native
North Fork Cottonwood Creek	0.0	3.0	Brook Trout	Unknown	Introduced
	0.0	3.0	Westslope Cutthroat Trout	Common	Native

*River Mile

Source: KirK, 2008

Current Condition

Cottonwood Creek is one of the more significant tributaries in the upper Clark Fork and provides some habitat for genetically pure westslope cutthroat trout--mainly in the upper reaches of the drainage. A 2007 survey found no westslope cutthroat trout in the lower reaches, but brook and brown trout are present throughout (MFWP, 2010). The drainage suffers from barriers to fish passage in the form of culverts, irrigation diversions, high temperatures and low flows. Riparian habitat quality along Cottonwood Creek is considered "fair at best" (MFWP, 2010), and impacts from mining, logging, riparian grazing and development continue to affect the fishery (MFWP, 2010; BDNF, 2007).

Fishery Conditions in Cottonwood Creek Tributaries

- **Baggs Creek**: contains higher levels of westslope cutthroat trout, but still is rated only "fair" overall fish habitat because riparian vegetation (especially woody varieties) is sparse, and impacts from livestock are apparent (MFWP, 2009).

- **North Fork**: contains several private mining claims and is also impacted by agriculture, logging and recreation. The creek contains a substantial population of westslope cutthroat trout and some brook trout. Fish habitat in the assessed reach was scored as "excellent" (MFWP, 2009).

- **Middle Fork**: supports the same land uses as the North Fork and also contains primarily westslope cutthroat trout. Fish habitat in the assessed reach was rated "good" (MFWP, 2009)

- **South Fork**: supports agriculture, timber harvest and recreation, but mining is not listed as a major land use. The 2007 survey sample was comprised solely of westslope cutthroat trout. Fish habitat in the reach was rated "fair (MFWP, 2009).

Fishery Potential

Table xxx: Tributary Rating Summary for Cottonwood Creek (Priority 2)

Stream	Reach(RM)	Trout Species	Impairments

Cottonwood Creek	Lower: 0.0-5.8	Brook and Brown	Low summer flows due to irrigation, diversions, culverts; mining; live-stock grazing in riparian areas; high temperatures; development; compe-tition to westslope cutthroat from brook/brown trout
Current Recruitment/Restoration Fishery Value			Protection/Enhancement Value
Medium			**High**
Current Tributary/Replacement Fishery Value			Protection/Enhancement Value
Medium			**High**
Current Native Fishery Value (westslope cutthroat)			Protection/Enhancement Value
Low			**Medium**

Source: MFWP, 2010; KirK, 2008

While Cottonwood Creek experiences the above impairments (Table xxx), protection and enhancement possibilities for a viable trout fishery exist on several levels. FWP has shown an interest in managing (in collaboration with state agencies and other organizations) Cottonwood Creek as a recreational fishery, declaring lower Cottonwood Creek a "Priority 2" stream reach in the Final Tributary Rating Summary (2010). Improved management practices can increase the fishery viability by addressing documented impairments (Table xxx) with appropriate restoration projects.

4. Monitoring/Assessments

Cottonwood Creek and its riparian areas have been monitored by several different agencies in recent years (Table xxx). Assessments have included fish habitat and fishery potential, stream flow, temperature, noxious weeds, and stream channel and riparian habitat status.

Table xxx: Cottonwood Creek Assessments

Type	Agency	Year	Area
Riparian/Geomorphology/Flow Assessment	WRC	2011/2012	Lower Cottonwood Creek
Tributary Prioritization /Rating Summary	MFWP	2010	Lower Cottonwood Creek
Fish Population/Riparian Habitat	MFWP	2009	Cottonwood Creek and tributaries

Flow Report	KirK	2010	Cottonwood/Baggs Creek
Riparian/Geomorphology/Flow Assessment	WRC	2010	Cottonwood Creek
EDLV Landscape Assessment	KirK	2008	Cottonwood/tributaries
KirK Assessment Title?	KirK	2003	?????
Youth Forest Monitoring Program	BDNF	2007	Tributaries
Irrigation Structure Inventory	WRC/TU/ MFWP	2010	Throughout Cottonwood Creek

WRC Riparian Assessment

The WRC conducted NRCS riparian assessments on 8.1 miles of Cottonwood Creek in 2010. Out of 17 assessed reaches, the WRC classified three as "not sustainable", twelve as "at-risk" and two as "sustainable (WRC, 2011).

5. Restoration

Needs

- Address high stream temperatures in Cottonwood Creek and monitor those of the tributaries
- Address dewatering issues caused by over-irrigation and over-allocation of water rights
- Facilitate fish passage in areas with barriers such as diversions and culverts
- Promote methods of keeping livestock out of creeks and away from sensitive riparian areas to help with nutrient loading, metals contamination, sedimentation, and destruction of fish and riparian habitat
- Continued monitoring of abandoned mines

Activities: Projects being undertaken by the WRC

- Cottonwood Creek Habitat Enhancement- 2011 (install Applegate pivots)
- Cottonwood Creek Habitat Enhancement-2011 (install Applegate pipeline)
- Cottonwood Creek -2011 (design and install new Applegate irrigation diversions)
- Cottonwood Creek Habitat Enhancement-2011-2012 (install stockwater wells and tanks-McQueary Ranches)
- Cottonwood Creek Fish Passage 2011-2013 (design, install new diversions, fish passage structures)
- Cottonwood Creek-D.Johnson Channel Design, 2011-2012

6. Watershed Map

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