

**DRAFT 20Nov22 AM**

**Supporting Document 2-1**

**Stream Morphology and Treatment**

**Ramifications for the North Fork Colorado River**

**and Tributaries in the ETF Project Area**

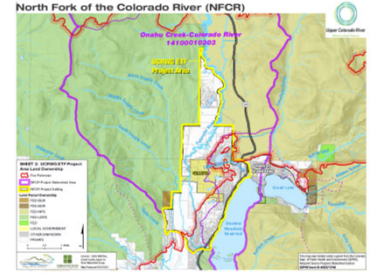
**CDPHE#2022-3746**

Brief prepared for the Upper Colorado River Watershed Group  
November, 2022

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**Part A Focus on the North Fork Colorado River (NFCR) and Tributaries in the UCRWG ETF Project Area**

- The NFCR, including tributary Supply Creek, is the primary contributors of water, sediment, detritus, and various chemical constituents to 303(d) listed Shadow Mountain Reservoir (SMR) and thus primary influences on SMR water quality
- Stream bank, channel stability, and sediment transport are thus important to better understanding ETF impacts upon the streams and SMR and likely restoration treatments
- This supporting document is funded by:
  - CDPHE Nonpoint Source Program, Watershed Section Grant ID#2022\*3746
  - Fire on the Mountain Foundation 2022

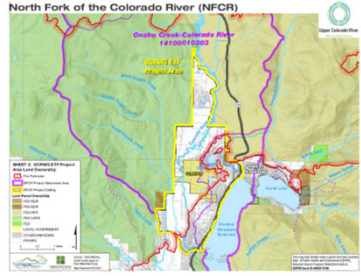


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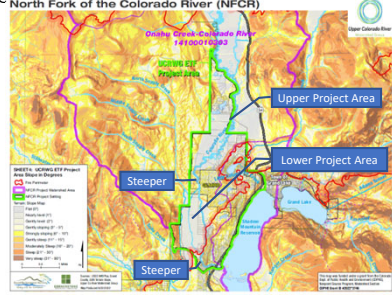


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**Valley Gradient In the UCRWG ETF Project Area (SLOPE COLORS TOO HOT)**

- Most of the UCRWG ETF project area is relatively flat and flanked by steeper slopes to the east and west, typical of U-shaped morphology in Rocky Mtn glacial valleys
- The characteristically wide valley floor necks down with two steeper reaches at the Grand Lake Metro Rec District (GLMRD) and below the ETF fire zone just before entering Shadow Mtn Reservoir

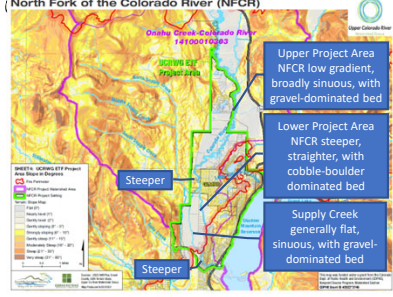


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**Plan-View Stream Morphology In the UCRWG ETF Project Area (SLOPE)**

- The NFCR meanders broadly across the upper project area then steepens and becomes straighter downstream at GLMRD
- NFCR characteristics are markedly different in the Upper and Lower Project Areas in terms of gradient, sinuosity, width/depth ratio, bank stability, and bed load



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**DRAFT Stream Reach Characteristics in the ETF Project Area**

	Upper COR Project Reach	Lower COR Project Reach	Lower Supply Creek Project Reach
Gradient	Low	Moderate	Mostly low, some moderate
Sinuosity	Moderate to high	Low to moderate	Moderate to high
Bed materials	Gravel dominated	Boulder + cobble dominated	Cobble + silt dominated <sup>1</sup>
Bank vegetation, stability	Some instability, eroding banks common with perched vegetation	Banks generally well vegetated with recovering willow, alder, and mesic grass-forb	Banks generally well vegetated with willow, alder, and hydric grass-forb <sup>1</sup>
Channel morphology	Generally good but entrenched <sup>2</sup> + notable cutoff chutes	Entrenched with high Width/Depth ratio, well armored banks but monotonous	Generally good <sup>1</sup>
Beneficial log jams	Significant natural structures capturing sediment, supporting riparian processes	Areas with burned logs in channel but not yet pioneering riparian	NA?

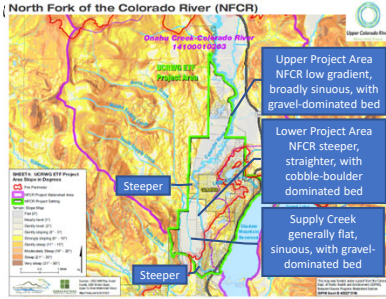
<sup>1</sup>Based upon limited observations  
<sup>2</sup>Low and high flows in "same channel width"

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### Plan-View Stream Morphology In the UCRWG ETF Project Area (SLOPE)

- The NFCR meanders broadly across the upper project area then steepens and becomes straighter downstream at GLMRD
- NFCR characteristics are markedly different in the Upper and Lower Project Areas in terms of gradient, sinuosity, width/depth ratio, bank stability, and bed load



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### Part B Characteristic Project Reaches and Restoration Strategies

- Overview with reaches called out per Part A Above

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### Characteristic Upper Meandering Reach Rector Property (Kawuneeche Ranch) with Abundant Gravel but Sparse Coarse Woody Material (CWM)

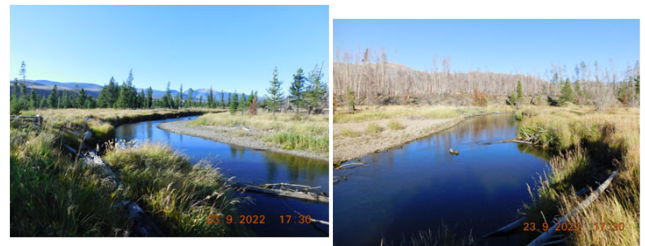


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### Characteristic Upper Meandering Reach Kaback Property Near Sun Valley Lake with Abundant Gravel and CWM



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### Characteristic Upper Meandering Reach Kaback Property Near Sun Valley Lake at Peak Runoff 800+CFS at USGS Baker Gage



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### Characteristic Upper Meandering Reach NFCR at Sun Valley Trailhead, RMNP, with Abundant Gravel + CWM



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Characteristic Steeper Reach at GLMRD  
RMNP-Randal Property Below Hanscome Ditch  
With Abundant Gravel + CWM + Cottonwood!



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Characteristic Steeper Reach at GLMRD  
Randal Property Below \_\_\_\_\_ Ditch  
Abundant CWM Driving High HGM Processes



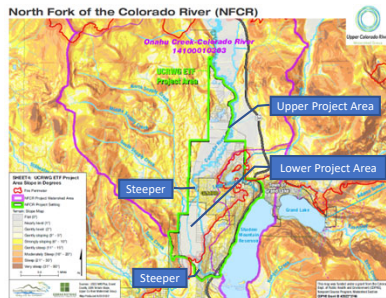
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Valley Gradient In the UCRWG ETF Project Area  
(SLOPE COLORS?)

- Focus on GLMRD reach
- The characteristically wide valley floor necks down with two steeper reaches at the Grand Lake Metro Rec District (GLMRD) and just before entering Shadow Mtn Reservoir



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Steeper Gradient at GLMRD, Sediment Starved and Sparse CWM



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More Moderate Gradient Below GLMRD  
Boulder-Dominated, ETF CWM



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More Moderate Gradient  
COR on Best Property – Boulders + Cobble, sparse CWM



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NEED LORENS (Not in ETF zone but..)

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Low- Moderate Gradient  
Supply Creek on Rounds Property  
Cobble + gravel, Sparse CWM



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### DRAFT Generally Applicable Recommendations for Restoration of Natural Areas in the ETF Zone

- Protect recovering vegetation – willow, aspen, conifer seedlings, grass/forb
- Treat burned wood as a resource, utilizing organic material on site:
  - Logs laid on contour to reduce runoff, capture sediment on slopes and in riparian areas
  - Logs with root wads for structure – retaining walls, stream banks where practicable
  - Logs for habitat projects – leaky check dams, “Zeedyk baffles”, log and scatter
  - Chip for mulch, sediment control, weed barrier
  - Burn only as last resort ☹️
- Treat heavily burned (high SBS) patches with mycorrhizae, seeds, wood chip mulch

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### DRAFT Treatment Suitability for Stream Reaches

	Upper COR Project Reach	Lower COR Project Reach	Lower Supply Creek Project Reach
Protect and plant willows, cottonwood (cages and enclosures)	Yes, will stabilize stream banks over time	Not necessary	Not necessary?
Fish-friendly diversions and return-flow treatment wetlands	Yes	Yes	Yes
Zeedyk baffles	Yes to stabilize banks and expand log-jams	Yes to collect sediment, develop riparian processes in channel	
(Beaver friendly) leaky check dams	Yes in tributaries, sloughs and highwater channels, ditch return flows	NA?	Yes in channel and lateral waters
Traditional vegetated boulder-log structures	Yes to raise channel bed and increase hydrogeomorphic processes	Yes to raise channel bed and increase hydrogeomorphic processes	Probably not?

\*Based upon limited observations

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### DRAFT Treatment Scheduling for Stream Reaches

	Pilot Projects Summer 2022	More Pilot Projects Fall 2022	2023 and Beyond
Protect and plant willows, cottonwood (cages and enclosures)	Yes, done	Yes 3+ properties scheduled	Yes continue
Fish-friendly diversions and return-flow treatment wetlands	No, will be long process with surveys, designs, and negotiations with ditch owners and multiple agencies	No, will be long process with surveys, designs, and negotiations with ditch owners and multiple agencies	Yes
Zeedyk baffles	Not yet	Yes two possible target areas identified	Yes
(Beaver friendly) leaky check dams	Not yet	Yes two possible target areas identified	Yes
Traditional vegetated boulder-log structures	No, will be long process with surveys, designs, and negotiations with landowners and multiple agencies	No, will be long process with surveys, designs, and negotiations with landowners and multiple agencies	Yes

\*Based upon limited observations

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### Recovering Willows – Green Armor on Banks

- Kaback
- Willows and aspen recovering but munched
- Especially important along stream banks – Kaback
- Rector?



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## Recovering Willows – Green Armor on Banks

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## South Supply Slope Wildflowers

- Promote natural processes by reducing erosion and sedimentation...
- Credit NO woodchip mulch
- Chopper ??
- Photo 2July22 on Arapaho National Forest



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## Initiative 4 Detail: Direct Plantings, Container Stock

- ❑ Dormant plantings of willow whips and cottonwood poles can be a cost-effective approach to increasing...
- ❑ Plantings can be combined in clusters with multiple species
- ❑ Use "rainwater harvesting"<sup>1</sup> techniques to increase planting success, reduce maintenance

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## Thank You, Happy to Answer Questions or Schedule Field Trip

- ❑ Project Scientist Geoffrey Elliott, MSc.
  - [geoff@grandenvironmental.com](mailto:geoff@grandenvironmental.com)
  - 970-509-0199
- ❑ UCRWG Board President Andy Miller
  - [lonesomehut@lonesomehut.com](mailto:lonesomehut@lonesomehut.com)
  - 970-531-0674



NEED PHOTO

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## Links and References

- Should we have references cited section here?

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