

REVISED RESTORATION PLAN FOR THE CLARK FORK RIVER AQUATIC AND RIPARIAN RESOURCES

Presentation to the Public
October, 2020



With support from:

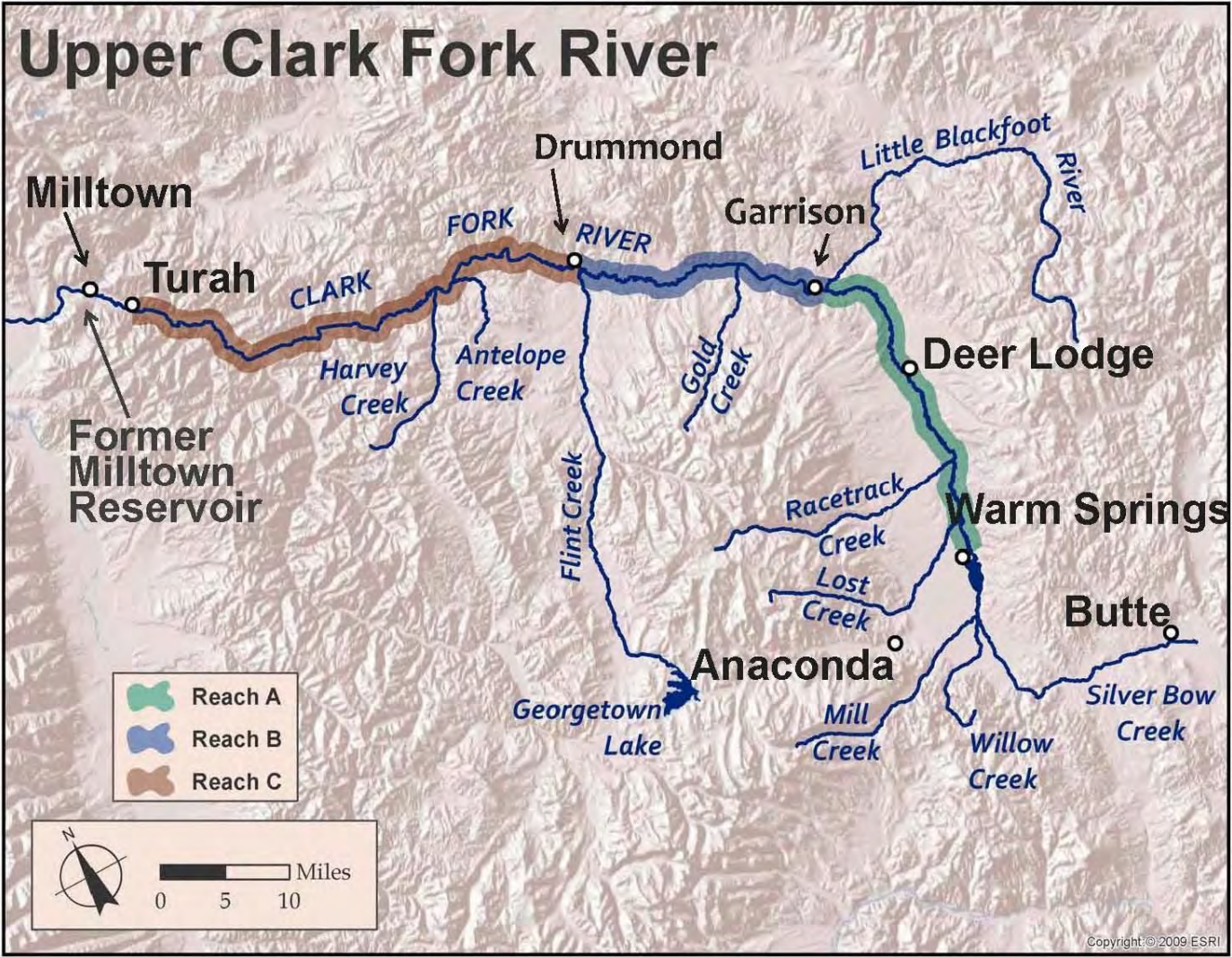


OVERVIEW

- Background
- Restoration & Remediation Work Completed
- Restoration Plan Goals and Objectives
- Updated Restoration Actions
- Alternatives Analysis and Costs
- Restoration Fund: Current Bureau of Investments Report: Market Value of \$30.9M



UPPER CLARK FORK RIVER REACHES



CLARK FORK RIVER REMEDIATION & RESTORATION ACTIVITIES

- **Remediation** – Protect Public Health & Welfare & the Environment through implementation of the cleanup
- **Restoration** – Restore, Replace, or Acquire the equivalent of injured natural resources covered under the lawsuit
 - **Aquatic Resources**
 - **Terrestrial (Including Riparian) Resources**



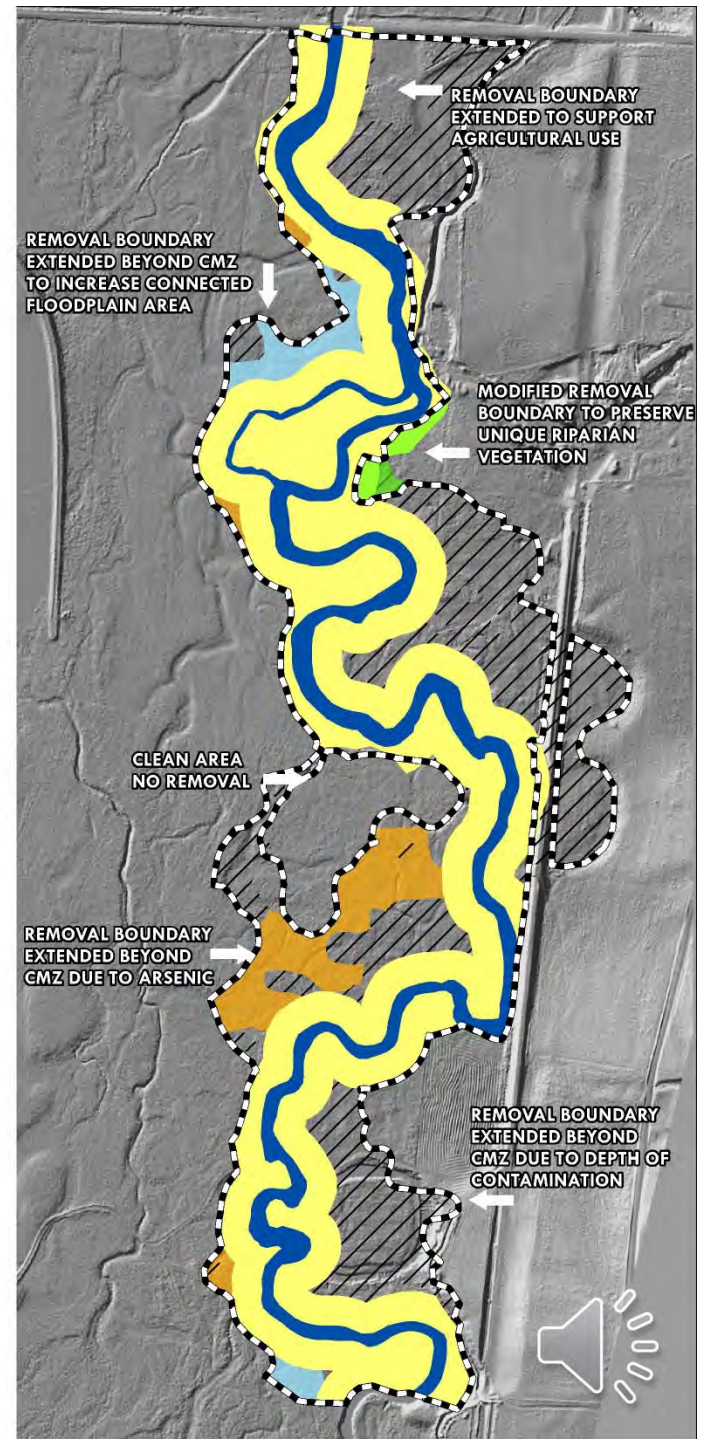
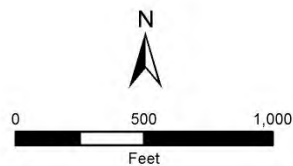
REMEDIAL ACTION PROCESS (REMOVAL CRITERIA)

- Identify all areas where the sum of COCs exceed: 1400ppm (Contaminated Soil)
- Remove contaminated soil from:
 - Channel Migration Zone (CMZ)
 - Depths exceeds 2 feet outside the CMZ
 - Arsenic exceeds 620 mg/kg (farmer rancher risk scenario)
- Preservation areas:
 - Cultural Resources
 - Cottonwoods
 - Wetlands outside the CMZ
- Additional Remedy removals for floodplain reconnection



DESCRIPTION OF REMEDY

-  REMOVAL EXTENTS
-  CHANNEL MIGRATION ZONE (CMZ); ALL CONTAMINATION REMOVED
-  CONTAMINATION EXCEEDS THRESHOLD AND IS DEEPER THAN 2FT
-  ARSENIC LEVELS EXCEED HUMAN HEALTH STANDARD IN THE SURFACE INTERVAL
-  REMOVAL OF CONTAMINATION LESS THAN 2FT DEEP OUTSIDE CMZ RESULTS IN A CONNECTED FLOODPLAIN
-  UNIQUE RIPARIAN VEGETATION



Example Completed Restoration Actions

- 1) ADDITIONAL TAILINGS REMOVAL THAT IS OUTSIDE OF AREAS EXPECTED TO BE ADDRESSED BY REMEDY;
- 2) CONSERVATION EASEMENTS COVERING THE AREAS OF EXPECTED REMEDY AND RESTORATION ACTIONS;
- 3) RECONSTRUCTION OF TWO TRIBUTARY CHANNELS AT THEIR CONFLUENCE WITH THE CLARK FORK RIVER (CFR); AND
- 4) COST SHARING FOR COMBINED REMEDIATION/RESTORATION ACTIONS.



FLOODPLAIN TREATMENTS



Microtopography & Wood



Planting



Floodplain Swales

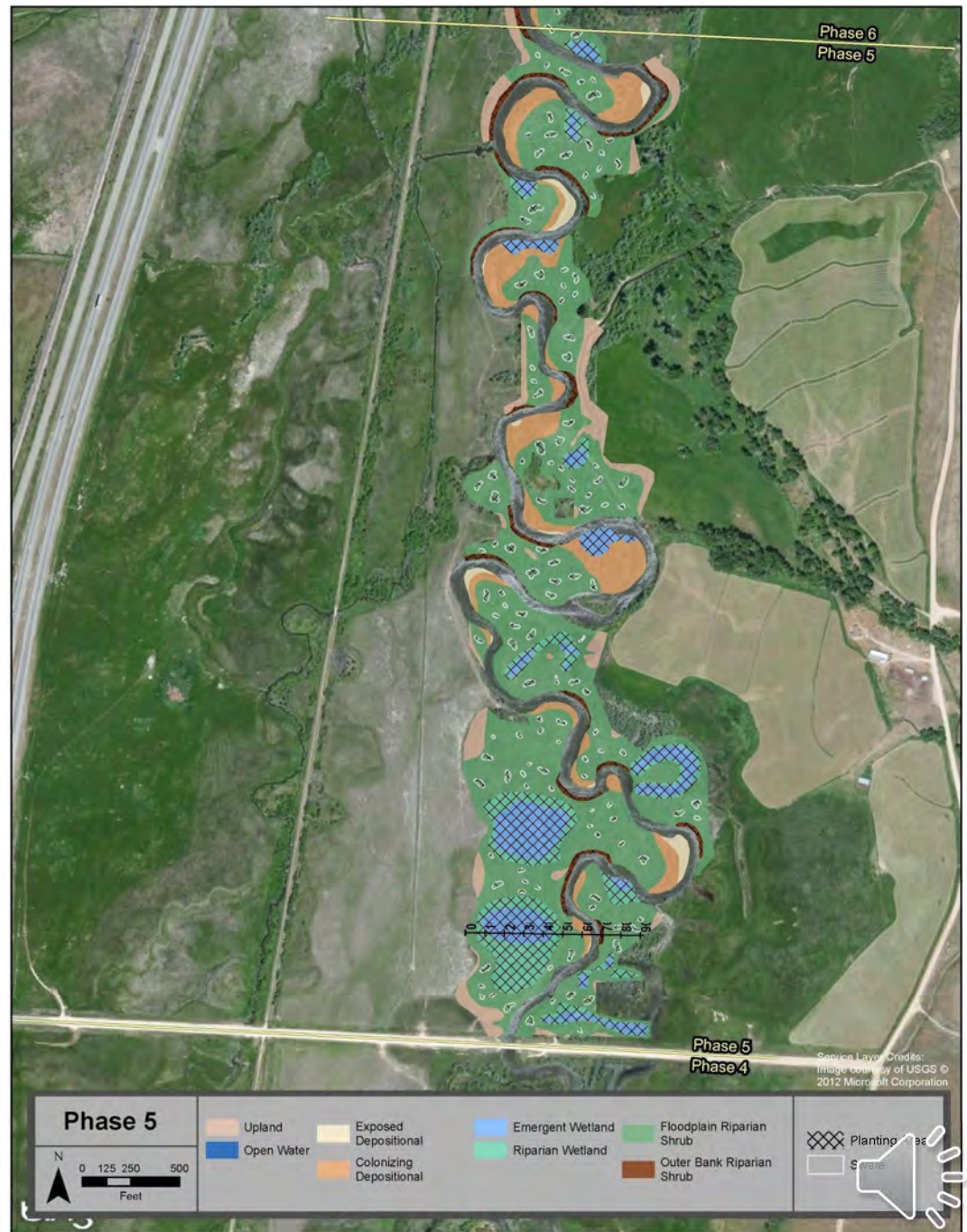


Browse Protection



REVEGETATION PLAN

- Matches geomorphic position, hydrology and substrate with target plant communities
- Anticipates plant communities that will develop in different parts of the floodplain



STREAMBANK TREATMENTS



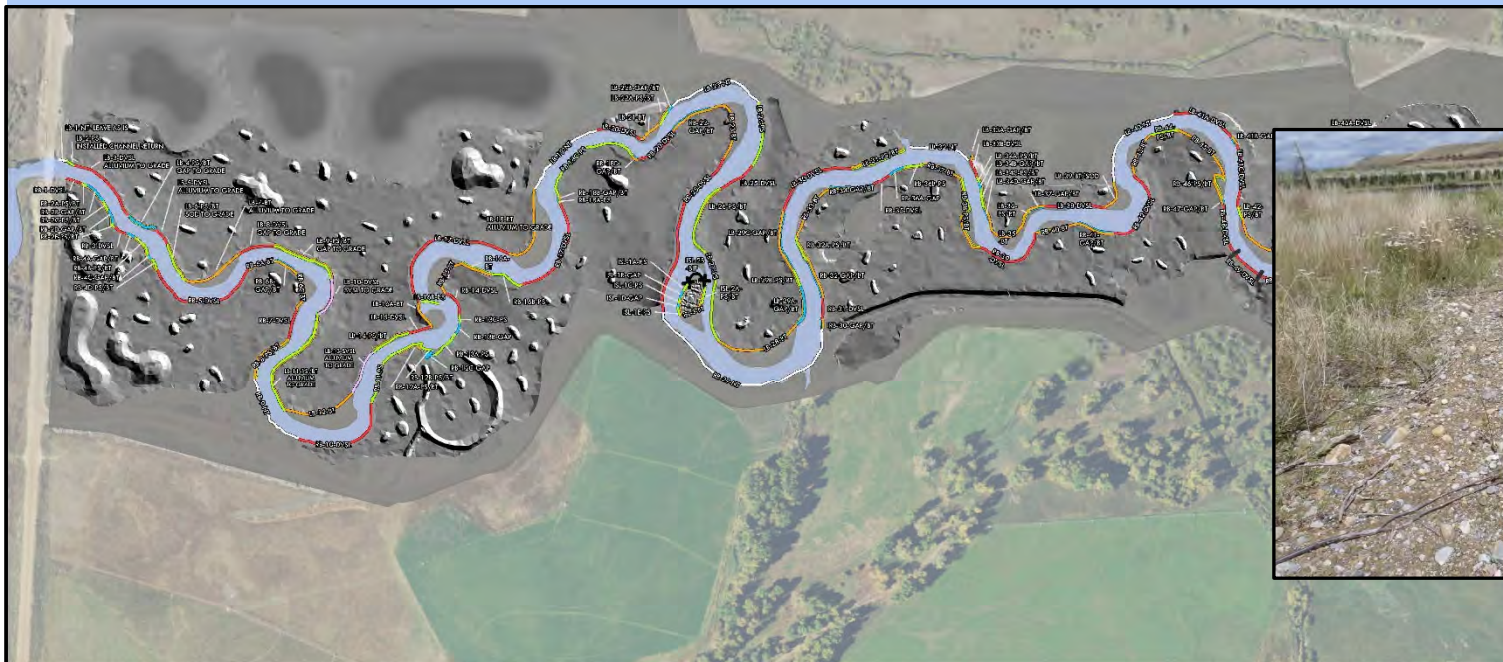
Vegetated Soil Lift



Brush Matrix











Preserve Existing Vegetation

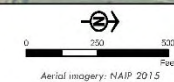


Point Bar & Brush Trench

PHASE 5

AS BUILT STREAMBANK TREATMENTS

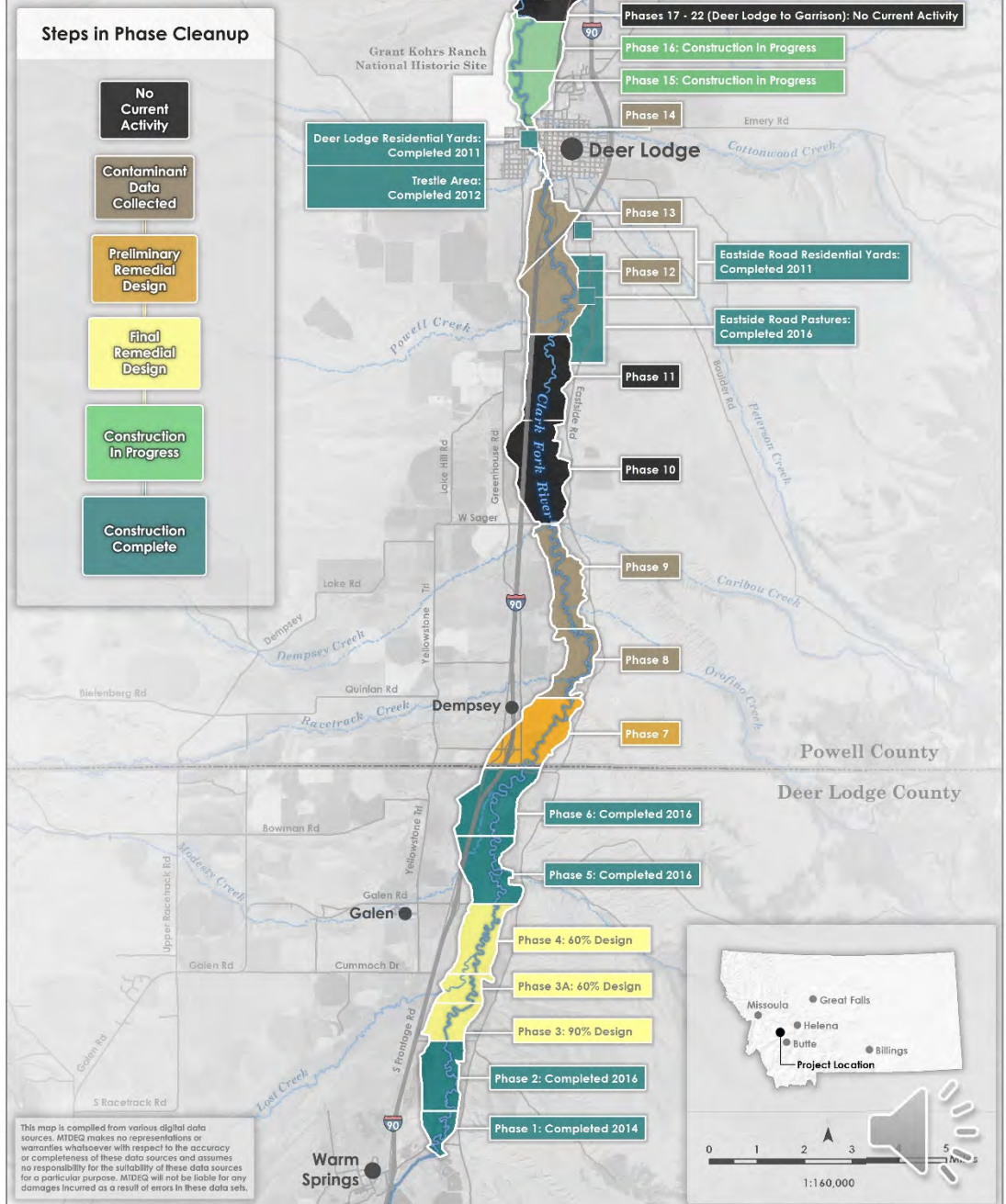
-  Bifurcation (BIF)
-  Double VSL (DVSL)
-  Preserve (PS)
-  Single VSL (SVSL)
-  Brush trench (BT)
-  No treatment (NT)
-  Rip Rap (RIPRAP)
-  Gap (GAP)



CFR REACH A PHASE STATUS

<https://deq.mt.gov/Land/fedsuperfund/cfr>

Clark Fork River Cleanup Phase Status as of August 2018, Clark Fork River Reach A



RESTORATION GOALS AND OBJECTIVES

1. Restore aquatic resources in the Clark Fork River to baseline conditions.

Objectives include:

- Improve water quality and reduce the rate of accumulation of metals and arsenic in bed sediments.
- Restore in-stream habitat within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other native fishes.
- Improve floodplain stability to reduce sediment erosion into the Clark Fork River and reduce migration of metals and arsenic to the stream.



RESTORATION GOALS AND OBJECTIVES CONT.

2. Restore terrestrial habitat to baseline conditions along the riparian zones and floodplains of the Clark Fork River.

Objectives include:

- Restore cover and diversity of vegetation within the floodplain and riparian zone to baseline conditions.
- Restore habitat complexity of the floodplain to approximate baseline conditions, as estimated by reference stream assessments.
- Improve floodplain stability through planting of dense stands of willows and shrubs.



RESTORATION GOALS AND OBJECTIVES CONT.

3. Offset the residual effects from hazardous substances that are not eliminated from the aquatic system to flora and fauna.

Objectives include:

- Restore in-stream habitat within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.
- Improve water quality within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.
- Improve water quantity within the Clark Fork River and its tributaries to support the complete life history strategy of salmonids and other fishes.



RESTORATION GOALS AND OBJECTIVES CONT.

4. Maximize the long-term beneficial effects and cost-effectiveness of restoration activities.

Objective include:

- Coordinate restoration activities with remediation to generate cost savings.
- Develop and implement a plan to preserve, protect, and manage the restored riparian floodplain corridor.

5. Improve natural aesthetic values of the Clark Fork River.

Objective includes:

- Develop a productive, restored river and floodplain ecosystem to improve natural aesthetics, similar to baseline conditions, and based on reference sites.



RESTORATION ACTION PRIORITIZATION

- In 2019, NRDP and Montana Fish, Wildlife and Parks identified potential restoration actions
- Priority tiers
- Ranking criteria
- Resulted in list of restoration actions to include in the revised restoration plan

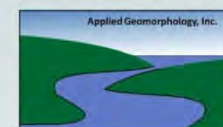
CLARK FORK RIVER AQUATIC AND RIPARIAN RESTORATION ACTIONS AND PRIORITIZATION ANALYSIS

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July, 2019



MAINSTEM UPPER CLARK FORK RIVER – RESTORATION LIMITING FACTORS

- Metals contaminated floodplain, streambanks, and channel bed
- Regulated flows at Warm Springs Ponds
- Water temperature (elevated summer temps)
- Stream flow (low base flows)
- Nutrients/algae
- Lack of floodplain connectivity
- Streambank erosion/lack of woody vegetation cover on streambanks
- Agriculture/irrigation practices
- Passage (diversion structures)
- Lack of aquatic habitat (pools, wood, woody vegetation)
- Lack of terrestrial/riparian habitat



RESTORATION PLAN METHODS: TIERS

Restoration actions fall into three priority tiers:

Tier I: Actions directly integrated with remediation actions in the CFROU (i.e. remediation/restoration actions).

Tier II: Actions occur within the CFROU, but do not directly contribute to remediation of contamination in the CFROU. Actions may benefit or enhance the remedial actions.

Tier III: Actions do not occur in the CFROU, but have been previously determined as high priorities for restoration.



RESTORATION ACTION	PRIORITY TIER		
	I	II	III
Floodplain Diversity Enhancement (within Remedy or Contamination Removal Areas)	Green		
Additional Revegetation (within Remedy or Contamination Removal Areas)	Green		
Additional Contamination Removal	Green		
Conservation Easements	Green		
Short and Long Term Management/Stewardship	Green		
Restore Streambanks Ahead of Remediation	Green		
Land Acquisition	Green		
Channel Relocation		Yellow	
Floodplain Diversity Enhancement (outside of Remedy or Contamination Removal Areas)		Yellow	
Clark Fork River Reaches B and C Aquatic Habitat Restoration		Yellow	
Remove High-risk Contaminated Sediments Ahead of Remediation	Green		
Riparian Vegetation Expansion (outside of Remedy or Contamination Removal Areas)		Yellow	
Reach A Aquatic Habitat Enhancement		Yellow	
Modification of Mainstem Clark Fork River Diversion Structures		Yellow	
Upper Blackfoot Mining Complex Restoration			
Upper Blackfoot River Native Trout Restoration			

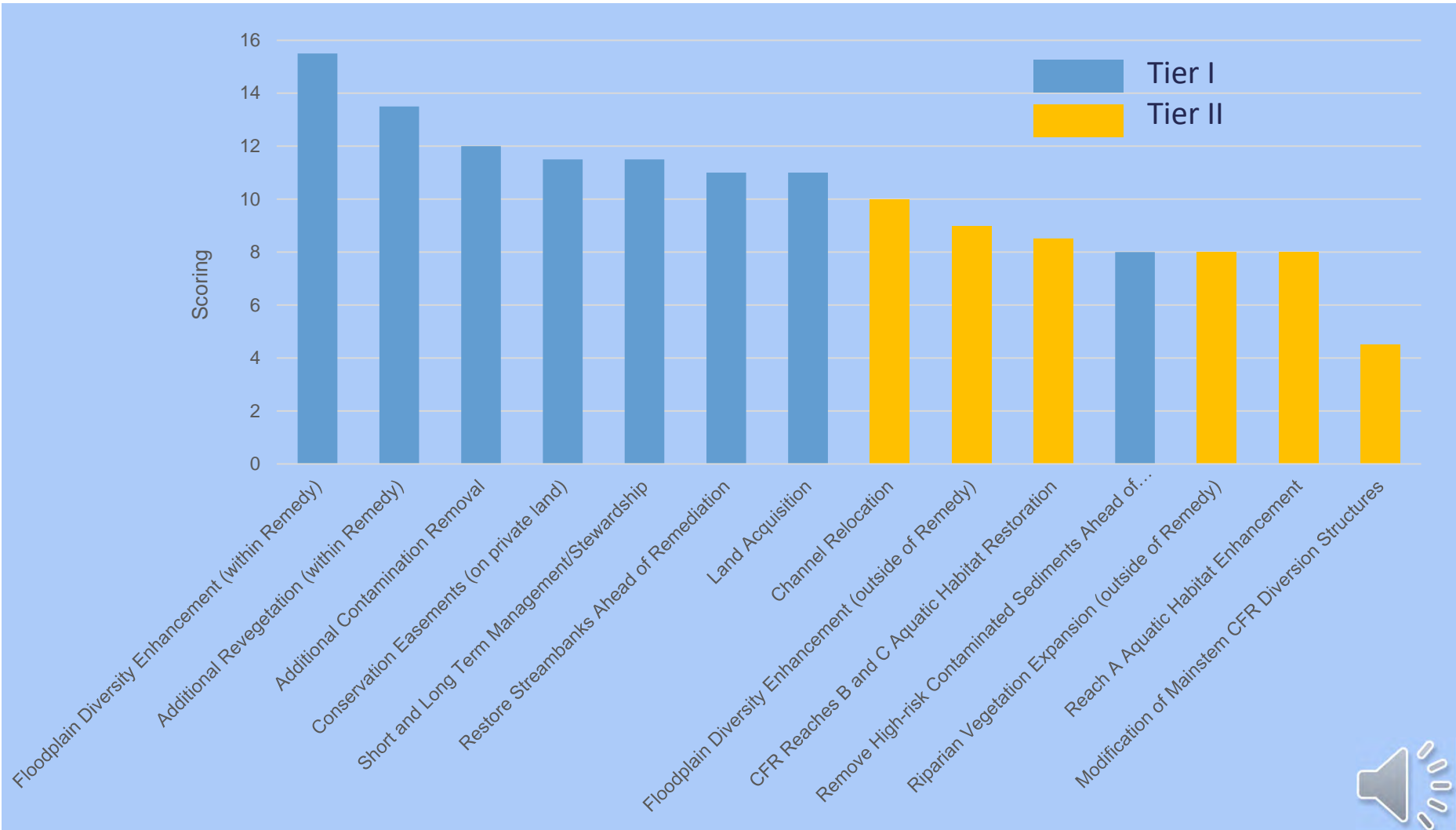


RESTORATION PLAN METHODS: RANKING AND SCORING

- Technical Feasibility
- Ecological Benefit
- Biological Benefit (Aquatic)
- Biological Benefit (Terrestrial)
- Adverse Environmental Impacts
- Recovery Period
- Federal, State, Tribal Policies, Rules, and Laws
- Adverse Socioeconomic Impacts
- Data Gaps
- Proximity to Other Restoration or Remediation Actions
- Benefit to Completed Restoration or Remediation Actions
- Risks to Completed Restoration or Remediation Actions
- Benefits Multiple Resources
- Cost
- Benefit:Cost



RANKING AND SCORING RESULTS



FLOODPLAIN DIVERSITY ENHANCEMENT (WITHIN REMEDY)

Tier I

- Restore, enhance, or protect existing floodplain features such as wetlands, side channels, or oxbows.
- Create additional floodplain features such as wetlands, side channels, distributary flow channels, or oxbows.
- Diversify floodplain topography.
- Lower floodplain surfaces to increase connectivity.



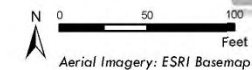
EXAMPLE TREATMENTS

- CONSTRUCT SIDE CHANNEL
- INCORPORATE FLOODPLAIN ROUGHNESS & WOOD THROUGHOUT ENHANCEMENT AREA
- INSTALL WILDLIFE FENCE TO PROTECT VEGETATION

- CONSTRUCT SHALLOW BENCHES TO SUPPORT EMERGENT WETLAND
- GRADE POINT BAR FEATURES FOR HABITAT DIVERSITY
- SLOPE OXBOW BANKS TO SUPPORT WOODY WETLANDS
- CONSTRUCT DEPRESSION TO SUPPORT WOODY WETLANDS

FLOODPLAIN DIVERSITY ENHANCEMENT WITHIN REMEDY

- 100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)
- ESTIMATED REMEDIATION BOUNDARY



Aerial Imagery: ESRI Basemap (2018)

ADDITIONAL REVEGETATION (WITHIN REMEDY)

Tier I

- Planting more plants, additional species, or larger size plants;
- Adding additional species to seed mixes to increase diversity;
- Installing other vegetation enhancement treatments such as pre-vegetated wetland sod mats; and
- Establishing cottonwood and willow stands from seed.



ADDITIONAL CONTAMINATION REMOVAL

Tier I

- Removing contamination that would not be removed under Remedy.
- The most common reason for additional contamination removals is to increase floodplain connectivity by lowering the ground surface relative to the river stage.

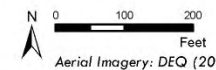


EXAMPLE TREATMENTS

-  AREAS WHERE REMOVAL OF SHALLOW CONTAMINATION WOULD SUPPORT FLOODPLAIN CONNECTIVITY

ADDITIONAL CONTAMINATION REMOVAL

-  100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)
-  ESTIMATED REMEDIATION BOUNDARY

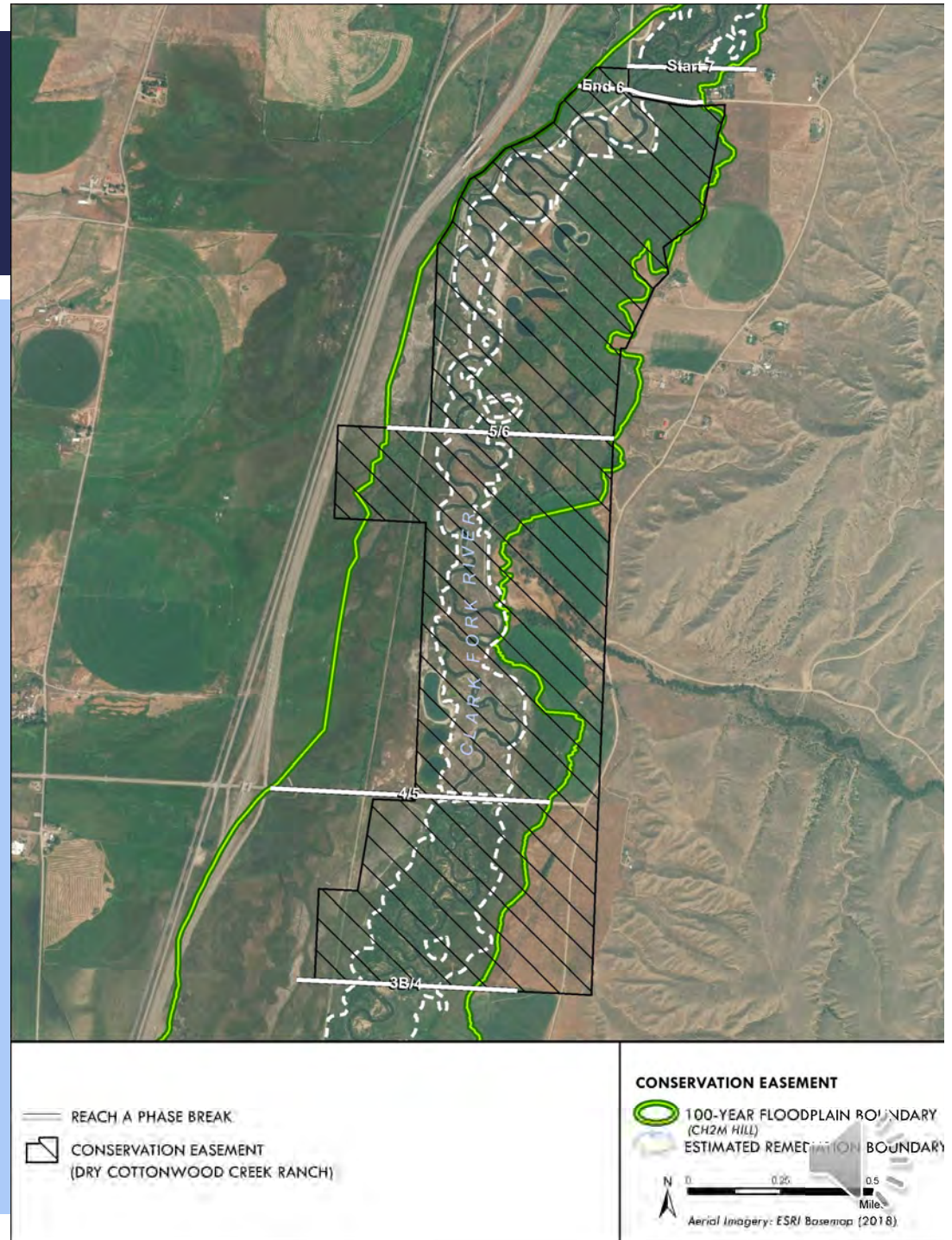


Aerial Imagery: DEQ (2011)

CONSERVATION EASEMENTS

Tier I

- Place conservation easements on lands that will remain in private ownership



SHORT AND LONG TERM MANAGEMENT/ STEWARDSHIP

Tier I

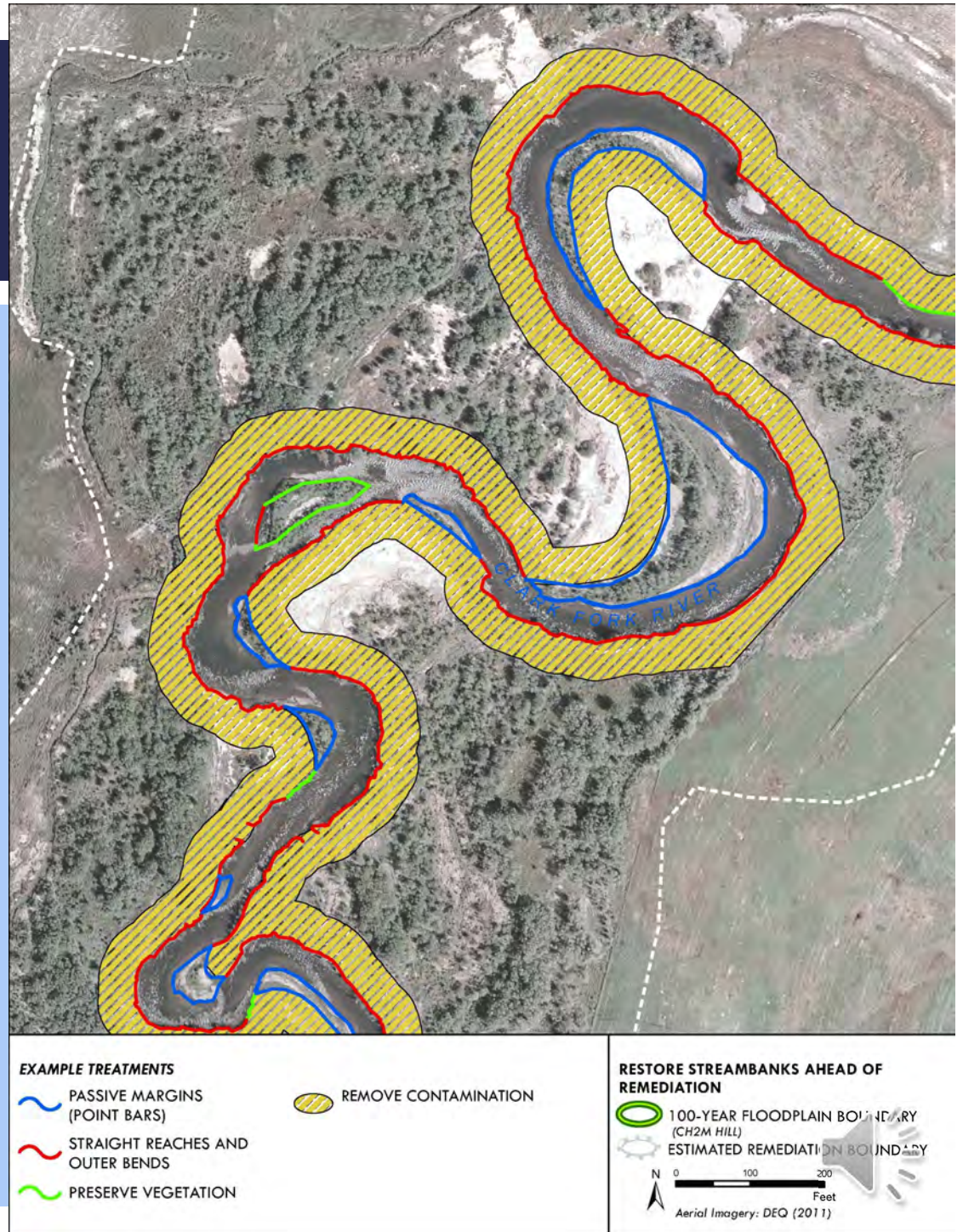
- Prepare and implement land management plans for areas outside of Remedy;
- Establish lease agreements for areas outside of Remedy where restoration actions are completed or extend remediation lease agreements to prevent undesirable land uses within restoration areas for a specified length of time, or establish other incentive programs;
- Install riparian fencing to protect a riparian buffer or CMZ in grazed areas;
- Conduct weed control beyond Remedy obligations;
- Implement grazing management (off-stream water sources, grazing strategies); and
- Develop and support partnerships with organizations that can work directly with landowners to promote stewardship of restored lands.



RESTORE STREAMBANKS AHEAD OF REMEDIATION

Tier I

- Re-build streambanks prior to DEQ remediating the adjacent floodplain.
- Reduce the amount of contaminated sediment entering the river due to bank erosion in the near term and allow bank vegetation to begin to establish and expand earlier than would happen with the remediation schedule.



LAND ACQUISITION

Tier I

- Acquire land that will remain in state ownership and be managed as conservation land in perpetuity, emphasizing natural river function and habitat objectives



— REACH A PHASE BREAK
□ NRDP ACQUIRED PROPERTY
(CLARK FORK RIVER RANCH)

LAND ACQUISITION

○ 100-YEAR FLOODPLAIN BOUNDARY
(CH2M HILL)
○ ESTIMATED REMEDIATION BOUNDARY

N 0 0.25 0.5
Miles

Aerial Imagery: ESRI Basemap (2018)

CHANNEL RELOCATION

Tier II

- Relocate the main Clark Fork River channel from its current location when current channel conditions do not support river and ecological function



EXAMPLE TREATMENTS



CHANNEL RELOCATION TO REDUCE EROSION OF A HIGH TERRACE AND INCREASE FLOODPLAIN ACREAGE

CHANNEL RELOCATION



100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)



ESTIMATED REMEDIATION BOUNDARY



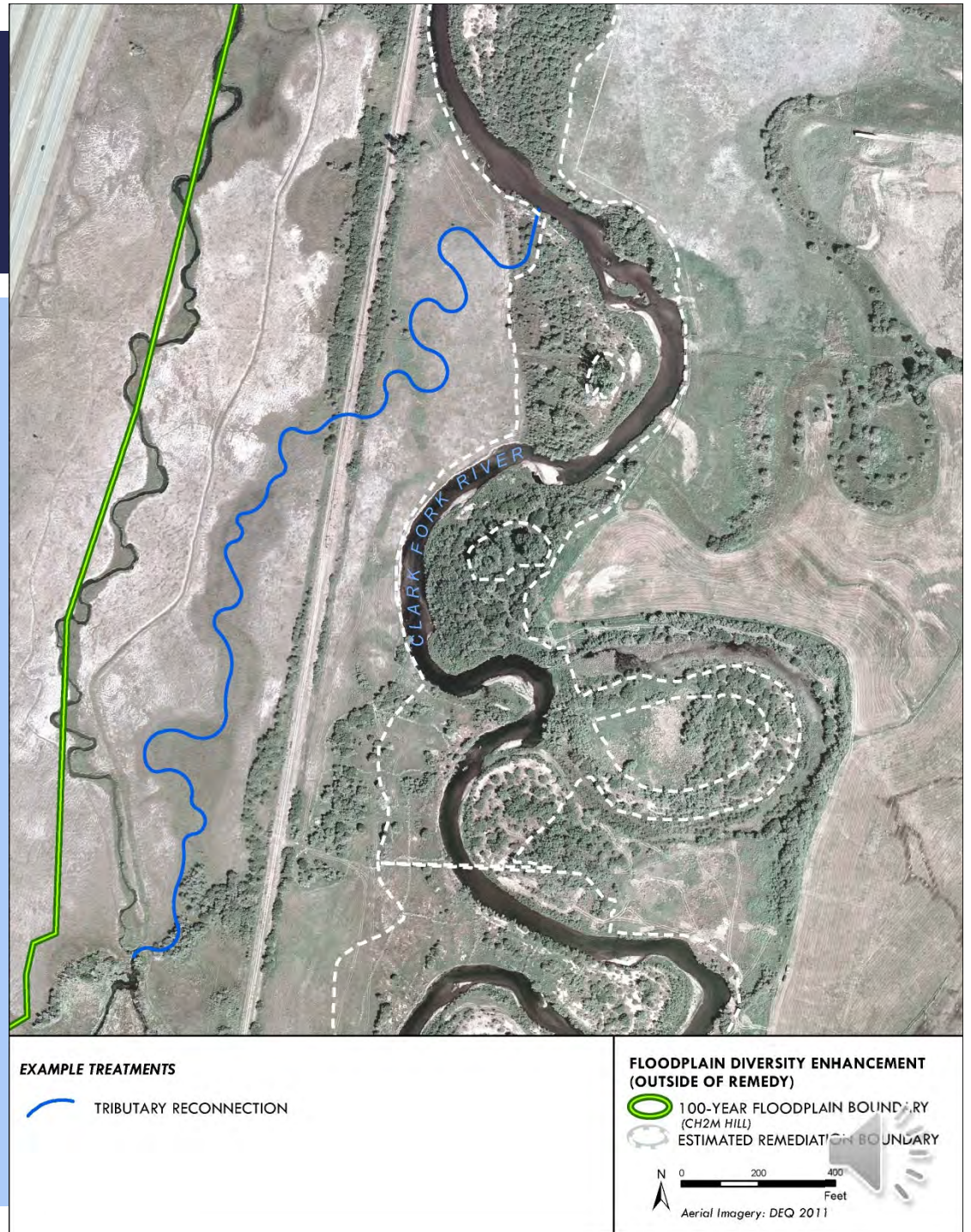
0 200 400
Feet

Aerial Imagery: DEQ (2011)

FLOODPLAIN DIVERSITY ENHANCEMENT (OUTSIDE OF REMEDY)

Tier II

- Diversify floodplain topography
- Create wetlands, side channels, distributary flow channels, oxbows, etc.
- Restore degraded or drained wetlands (i.e. in irrigated areas)
- Lower floodplain surfaces to restore connectivity and increase the potential for natural riparian vegetation expansion
- Reconnect tributary confluences






CFR REACHES B AND C AQUATIC HABITAT RESTORATION

Tier II

- Rip-rap removal/replacement/revegetation
- Riparian vegetation protection
- Riparian vegetation enhancement
- In-stream habitat enhancement (pool formation + cover)
- Channel Migration Zone (CMZ) recovery
- Remove floodplain constrictions (i.e. old railroad berms)



EXAMPLE TREATMENTS

-  CONSTRUCT STREAMBANKS ON SEVERELY ERODING BANKS
-  REMOVE RIPRAP & REVEGETATE
-  FLOODPLAIN PLANTING WITHIN CHANNEL MIGRATION ZONE

CLARK FORK RIVER REACHES B & C AQUATIC HABITAT RESTORATION

-  100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)
-  ESTIMATED REMEDIATION BOUNDARY





Aerial Imagery: NAIP 2011

REMOVE HIGH RISK CONTAMINATED SEDIMENTS AHEAD OF REMEDIATION


Tier I

- Remove high risk contaminated sediments in currently unremediated phases in Reach A prior to remedial actions.
- Removes contaminated material that would be removed by remedy



 REMOVE HIGH-RISK CONTAMINATED SEDIMENTS (SLICKENS)
 ALL EPA MAPPED SLICKENS (2006)

REMOVE HIGH-RISK CONTAMINATED SEDIMENTS AHEAD OF REMEDIATION

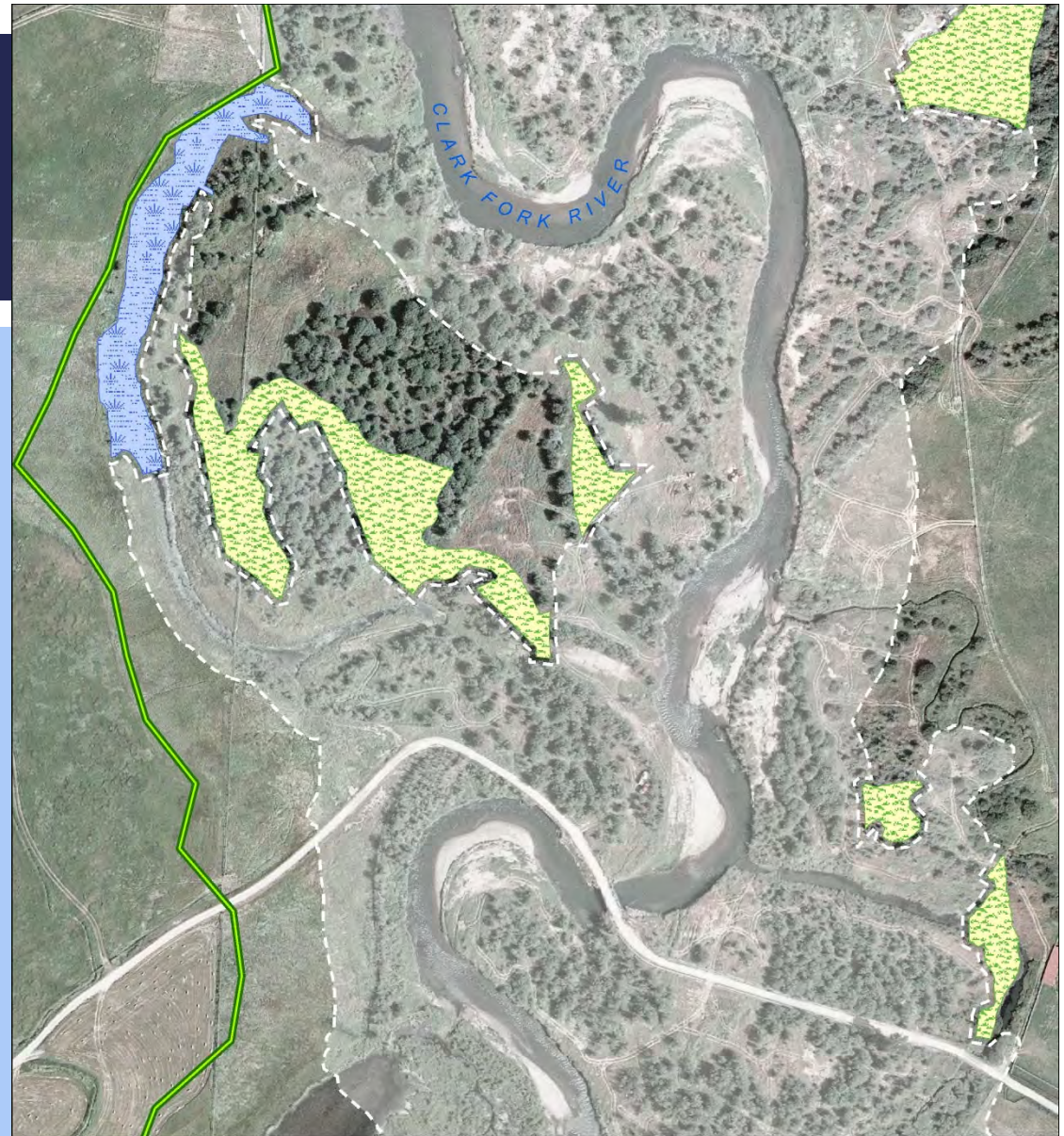
 100-YEAR FLOODPLAIN BOUNDARY
(CH2M HILL)
 ESTIMATED REMEDIATION BOUNDARY

N
0 100 200
Feet
Aerial Imagery: DEQ (2011)



RIPARIAN VEGETATION EXPANSION (OUTSIDE OF REMEDY)

Tier II



- Revegetation (planting, seeding, etc.)
- Planted riparian vegetation protection
- Restore and revegetate eroding, clean streambanks

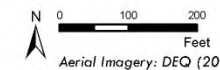


EXAMPLE TREATMENTS

-  PLANT SHRUBS
-  PLANT WETLAND HERBACEOUS PLUGS

RIPARIAN VEGETATION EXPANSION (OUTSIDE OF REMEDY)

-  100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)
-  ESTIMATED REMEDIATION BOUNDARY



REACH A AQUATIC HABITAT ENHANCEMENT

Tier II



ENHANCE SPLIT FLOW CHANNEL FEATURES
(BIFURCATION TREATMENTS)



CREATE OR ENHANCE BACKWATER HABITAT



MODIFY CHANNEL GEOMETRY



INCREASE OVERHANGING
AND MID-CHANNEL WOOD



BEFORE



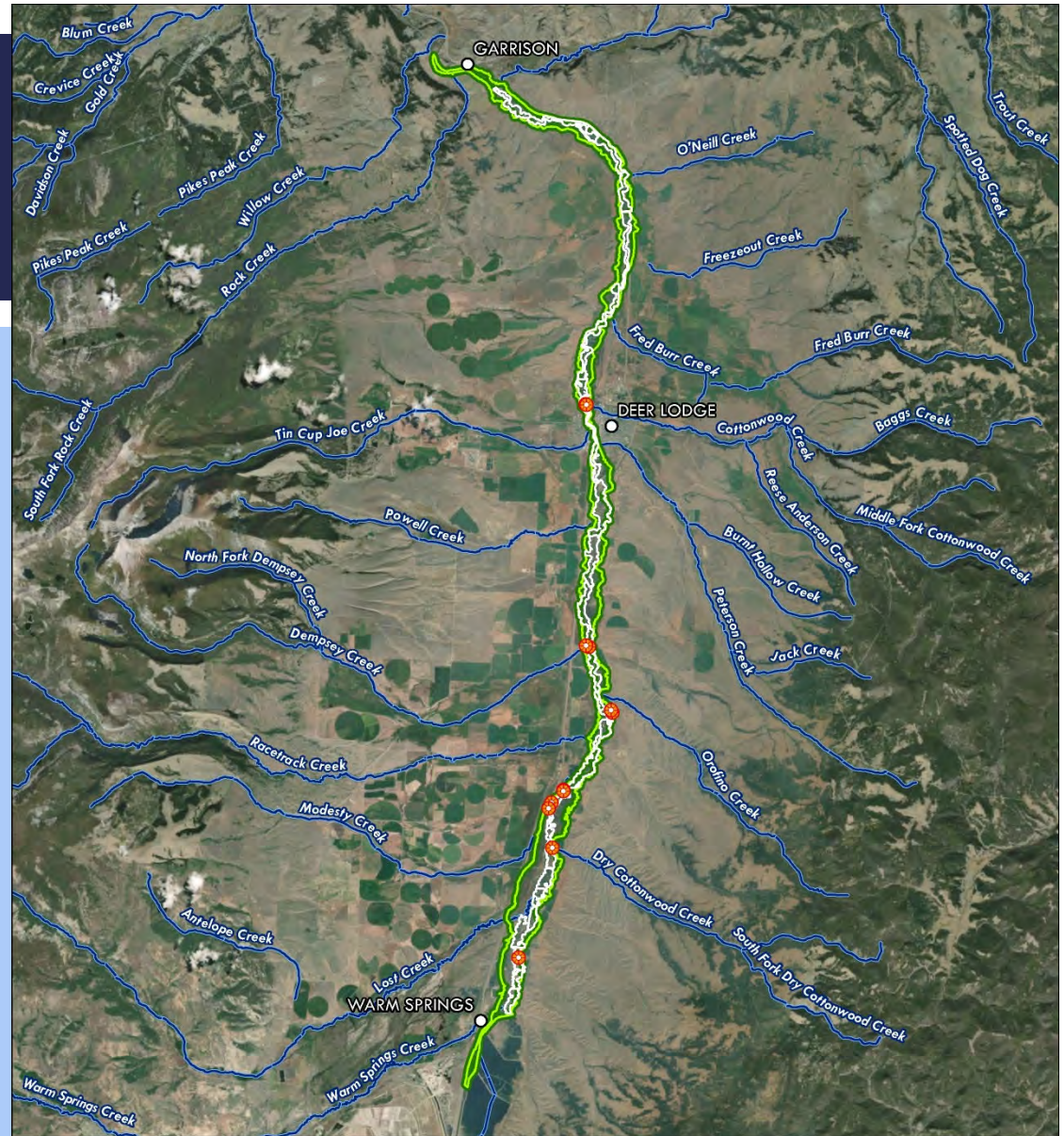
AFTER



MODIFICATION OF MAINSTEM CLARK FORK RIVER DIVERSION STRUCTURES

Tier II

- Removal and replacement of structure;
- Retro-fitting of structure to allow passage of fish and increased floater safety;
- Installation of fish screens in ditches; and
- Installation of stream gauges.



MODIFICATION OF CLARK FORK RIVER MAINSTEM DIVERSIONS

○ 100-YEAR FLOODPLAIN BOUNDARY (CH2M HILL)

○ ESTIMATED REMEDIATION BOUNDARY

0 2 4 Miles

Aerial Imagery: ESRI Basemap (2018)

ALTERNATIVES ANALYSIS

Based on Priority Tiers

- Alternative 1: No action
- Alternative 2: Tier I Actions
- Alternative 3: Tier I and Tier II Actions

Tier I: Actions directly integrated with remediation actions in the CFROU (i.e. remediation/restoration actions).

Tier II: Actions occur within the CFROU, but do not directly contribute to remediation of contamination in the CFROU. Actions may benefit or enhance the remedial actions.

Tier III: Actions do not occur in the CFROU, but have been previously determined as high priorities for restoration. (Blackfoot River actions are not included in the alternatives analysis because they were completed as part of the 2007 restoration plan revision.)



Restoration Action	Alternative 1 (No Action)	Alternative 2	Alternative 3
Floodplain Diversity Enhancement (within Remedy)			
Additional Revegetation (within Remedy)			
Additional Contamination Removal			
Conservation Easements (on private land)			
Short and Long Term Management/Stewardship			
Restore Streambanks Ahead of Remediation			
Land Acquisition			
Channel Relocation			
Floodplain Diversity Enhancement (outside of Remedy)			
CFR Reaches B and C Aquatic Habitat Restoration			
Remove High-risk Contaminated Sediments Ahead of Remediation			
Riparian Vegetation Expansion (outside of Remedy)			
Reach A Aquatic Habitat Enhancement			
Modification of Mainstem CFR Diversion Structures			



ALTERNATIVES ANALYSIS

- Used ranking and scoring categories from the prioritization analysis completed in 2019
- Cross-walked these categories with 43 CFR 11.82 evaluation criteria
- Assigned -, +, or ++ for each alternative for each category as:

- = Alternative does not address the evaluation factor.

+ = Alternative addresses the evaluation factor.

++ = Alternative best addresses the evaluation factor.



Evaluation Category	Alternative			Notes	Corresponding Criteria from 43 CFR. § 11.82
	1 (No Action)	2	3		
Technical Feasibility	++	+	+	No action is most feasible because it requires no additional effort beyond remedy.	Technical Feasibility
Ecological Benefit	-	+	++	Alternative 3 has most benefit because it has greatest area of effect.	Results of Response Actions
Biological Benefit (Aquatic)	-	+	++	Alternative 3 has greater benefits due to additional focus on actions in the river.	
Biological Benefit (Terrestrial)	-	+	++	Alternative 3 has most benefit because it has greatest area of effect.	
Proximity to Other Restoration or Remediation Actions	-	++	+	Alternative 2 would focus on areas more directly proximate to remediation actions.	
Benefit to Completed Restoration or Remediation Actions	-	+	++	Alternative 3 would have cumulative benefits beyond actions directly related to remediation, in particular contributing to a buffer around remediation.	
Benefits Multiple Resources	-	+	++	Alternative 3 has the most benefit because it has greatest area of effect.	
Natural Recovery Period	-	+	+	Both Alternatives 2 and 3 would have similar recovery periods.	
Federal, State, Tribal Policies, Rules, and Laws	-	++	+	Alternative 2 affected only by rules related to Superfund, so fewer permitting and environmental compliance needs.	Federal, State, and Tribal Policies, Rules and Laws
Adverse socioeconomic impacts	-	+	+	Alternatives 2 and 3 would each have moderate socioeconomic effects.	Human Health and Safety
Risks to Completed Restoration or Remediation Actions	++	+	+	Alternatives 2 and 3 each have moderate risks to completed actions. No action would not introduce risk to completed actions.	Potential for Additional Injury from any Proposed Action
Adverse Environmental Impacts	-	+	+	Both Alternatives 2 and 3 would have moderate adverse impacts. No action would impose the greatest limits on returning to baseline.	
Cost-effectiveness	++	+	+	Both Alternatives 2 and 3 would require expenditures sufficient to exhaust a finite restoration fund. No action would keep funds available to support remediation if needed.	Cost-effectiveness
Data gaps	++	++	+	Alternative 2 would require less investigation and data collection because it would affect a smaller area than Alternative 3. No action would require no additional data collection	Relationship of Expected Costs to Expected Benefits
Benefit: Cost	-	+	++	Alternative 3 has greatest area of restoration effect relative to a finite total budget. No action would add no benefit beyond remedial action.	



SELECTED ALTERNATIVE

Based on Priority Tiers

- Alternative 1: No action
- Alternative 2: Tier I Actions
- Alternative 3: Tier I and Tier II Actions

Tier I: Actions directly integrated with remediation actions in the CFROU (i.e. remediation/restoration actions).

Tier II: Actions occur within the CFROU, but do not directly contribute to remediation of contamination in the CFROU. Actions may benefit or enhance the remedial actions.

Tier III: Actions do not occur in the CFROU but have been previously determined as high priorities for restoration. (Blackfoot River actions are not included in the alternatives analysis because they were completed as part of the 2007 restoration plan revision.)



ESTIMATED COSTS (APPROXIMATELY \$30 MILLION REMAINS IN RESTORATION FUND)

Restoration Action	Alternative 1 (No Action)	Alternative 2	Alternative 3
Floodplain Diversity Enhancement (within Remedy)		< \$1 Million	< \$1 Million
Additional Revegetation (within Remedy)		\$1-5 Million	\$1-5 Million
Additional Contamination Removal		>\$5,000,000	>\$5,000,000
Conservation Easements (on private land)		< \$1 Million	< \$1 Million
Short and Long Term Management/Stewardship		\$1-5 Million	\$1-5 Million
Restore Streambanks Ahead of Remediation		>\$5,000,000	>\$5,000,000
Land Acquisition		\$1-5 Million	\$1-5 Million
Channel Relocation			\$1-5 Million
Floodplain Diversity Enhancement (outside of Remedy)			\$1-5 Million
CFR Reaches B and C Aquatic Habitat Restoration			>\$5,000,000
Remove High-risk Contaminated Sediments Ahead of Remediation		< \$1 Million	< \$1 Million
Riparian Vegetation Expansion (outside of Remedy)			>\$5,000,000
Reach A Aquatic Habitat Enhancement			\$1-5 Million
Modification of Mainstem CFR Diversion Structures			\$1-5 Million
TOTAL	\$2.5 million	~\$10 million to > \$25 million	~\$25 million to > \$50 million



PROCESS FOR IMPLEMENTING THE RESTORATION PLAN

- Investigate data gaps
- Identify specific restoration projects
- Evaluate restoration opportunities
- Develop restoration designs and bid packages
- Complete environmental compliance
- Implement restoration projects
- Complete monitoring and adaptive management



QUESTIONS?

Thank you.

NRDP will answer questions but will not be accepting verbal comments during this meeting.

Written comments must be submitted to NRDP at nrdp@mt.gov or sent by mail (postmarked on or before October 30, 2020) to NRDP, 1720 9th Avenue, Helena, MT 59620-1425. Subject line must read “Public Comment: CFR Aquatic and Riparian Resources Restoration Plan 2020 Revision.”

