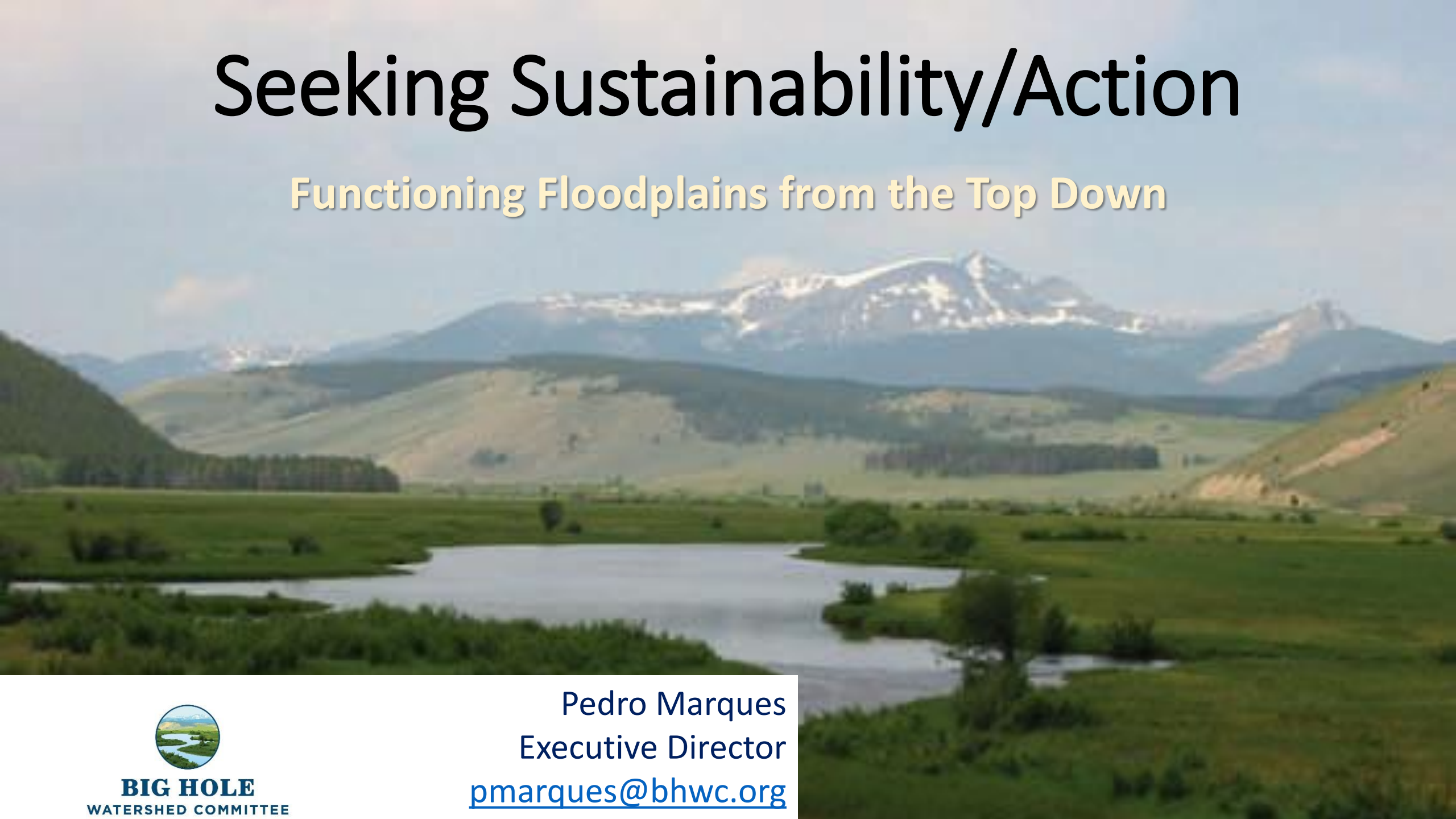


Seeking Sustainability/Action

Functioning Floodplains from the Top Down



BIG HOLE
WATERSHED COMMITTEE

Pedro Marques
Executive Director
pmarques@bhwc.org

Functioning Floodplains from the Top Down





Functioning Floodplains from the Top Down

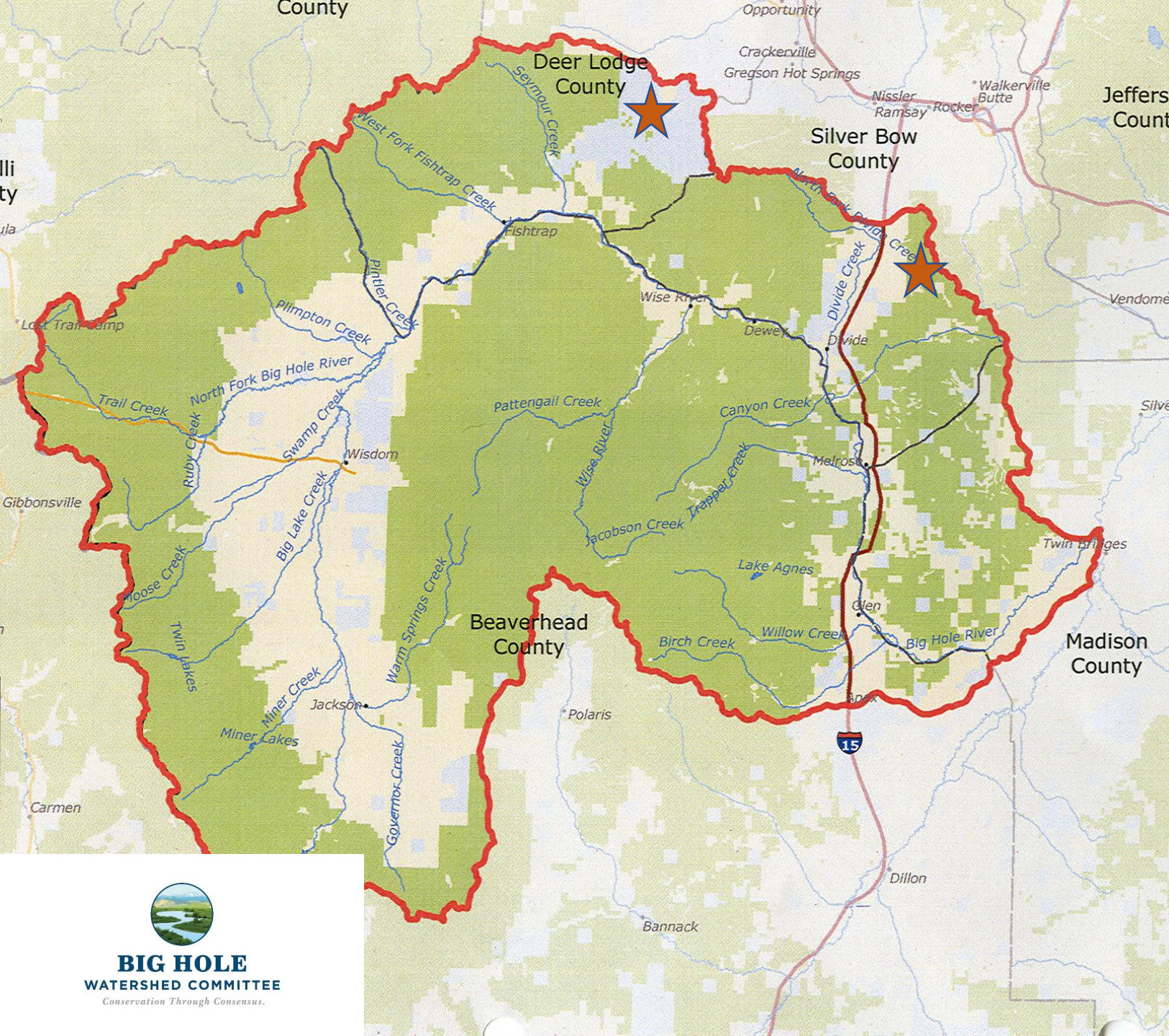
Scaling treatments to address source of degradation

Low-intensity degradation
Slow decline of ecological trends



Severely degraded sites

And the tools to quantify restoration outcomes



24 years of
collaborative
conservation

162 mile river system

2 million acres

Arctic Grayling

Flood irrigation

Slow the water, connect floodplain, soak the soil



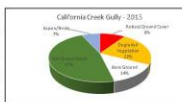
May 2016



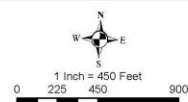
June 2018



Table 1. California Creek Gully - 2015		
Label	Average	Percent (Ac.)
Robust Ground Cover	23.7	10%
Degraded Vegetation	52.3	23%
Bare Ground	31.2	14%
Coniferous Forest	106.6	47%
Aspen/Shrub	15.8	7%
Total	222.7	100%



Legend	
California Creek Gully Photo Boundary 2015	Aspen/Shrub
Bare Ground	Coniferous Forest
Degraded Vegetation	Robust Ground Cover



Mount Haggitt - Aerial - California Creek Gully - Oct. 15, 2015	
California Creek Gully Vegetation Classification - 2015	
DATE REVISIONS	SHEET C4
Drawn: 3/1/2020	
By: [Name]	



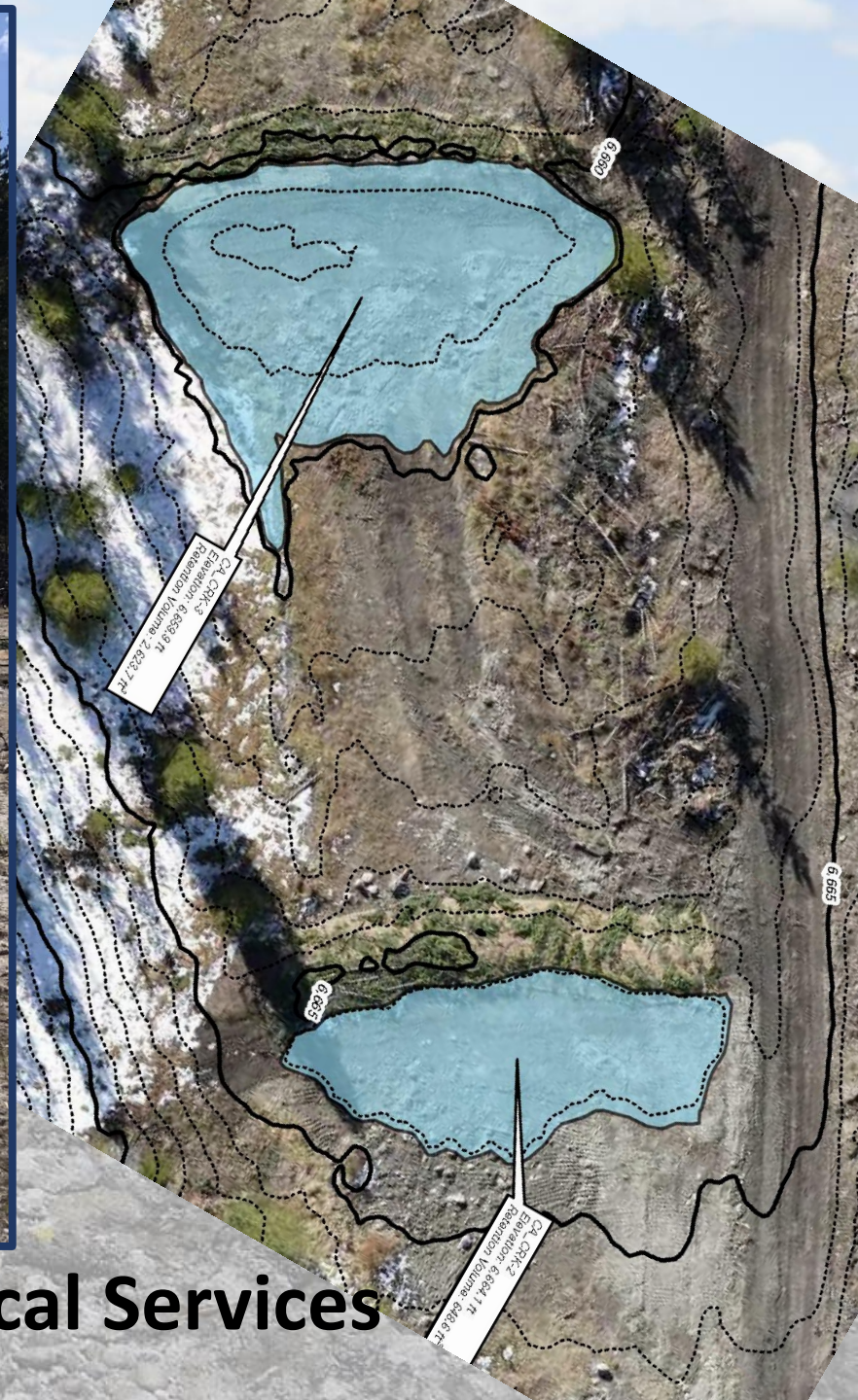
Legend

California Creek Gully Photo Boundary 2015	Aspen/Shrub
Bare Ground	Coniferous Forest
Degraded Vegetation	Robust Ground Cover





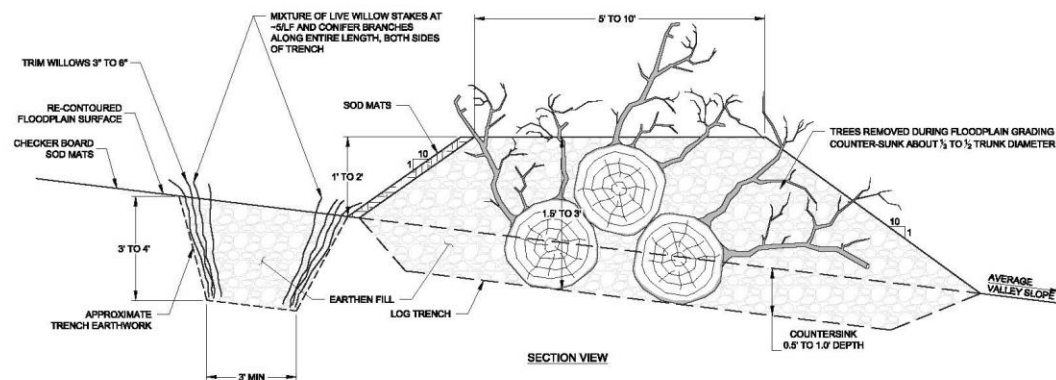
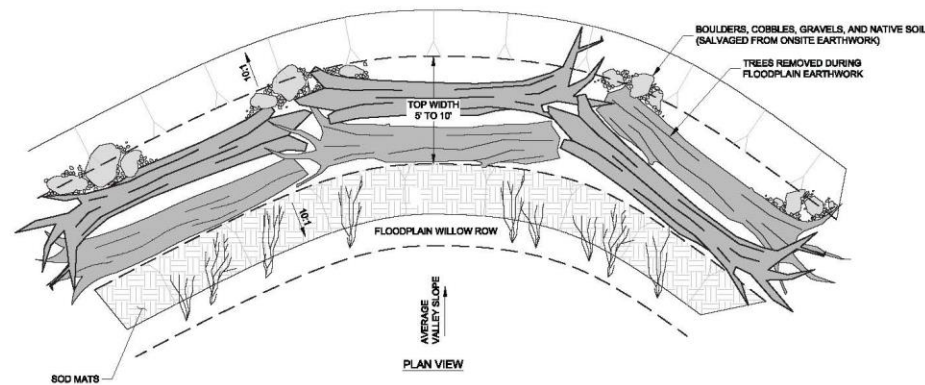
Spreader Dikes- Pioneer Technical Services



Spreader Dikes- Pioneer Technical Services

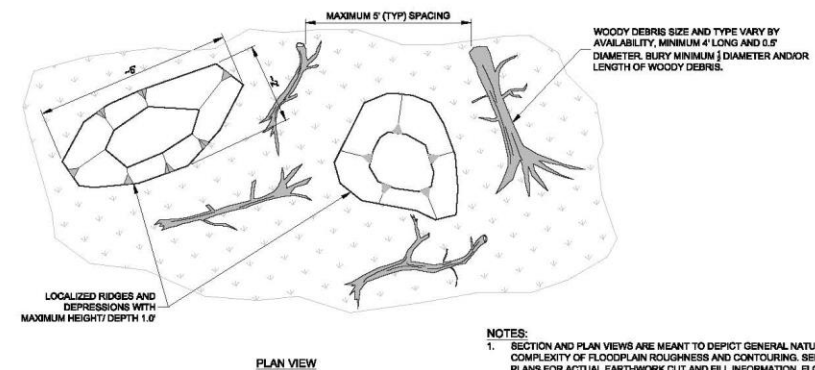
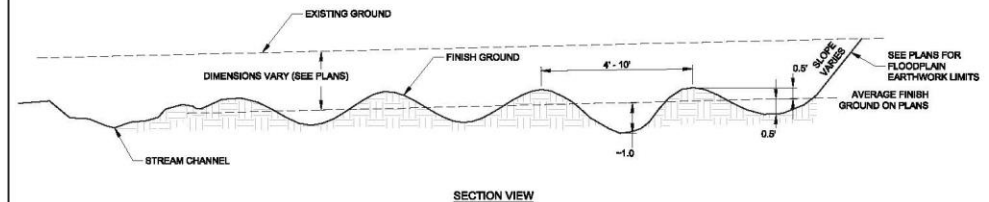
- Video- BDAs and Spreader Dikes





DETENTION RIDGE DETAIL
SCALE: NONE
1
C-2

- NOTES:
1. FINAL LOCATIONS AND LENGTH WILL BE DIRECTED IN FIELD BY ENGINEER. GENERALLY WILL BE PERPENDICULAR TO STREAM AND OR VALLEY SLOPE AND ALONG CONTOUR TO MIMIC NATURAL FEATURES & TOPOGRAPHY.
 2. DESIGN PORTION OF LOG TO PROVIDE CONTINUOUS CONTACT FROM TRUNK TO LOG TRENCH, AS NEEDED.
 3. PLACE 2-8 LOGS AT EACH DETENTION RIDGE SO THAT MINIMUM TOP WIDTH OF 8' IS ACHIEVED.
 4. FILL DETENTION RIDGE WITH NATIVE MATERIAL THAT WAS EXCAVATED FROM FLOODPLAIN EARTHWORK OR LOG TRENCH.
 5. PLACE SALVAGED SOD MATS ON STREAM BANKS IN NEW FLOODPLAIN, ALL UPSTREAM SIDES OF DETENTION RIDGES AND REMAINING SOD MATS IN CHECKER BOARD EVENLY IN NEW FLOODPLAIN.



FLOODPLAIN CONTOURING DETAIL
SCALE: NONE
2
C-2

- NOTES:
1. SECTION AND PLAN VIEWS ARE MEANT TO DEPICT GENERAL NATURE AND COMPLEXITY OF FLOODPLAIN ROUGHNESS AND CONTOURING. SEE DESIGN PLANS FOR ACTUAL EARTHWORK CUT AND FILL INFORMATION. FLOODPLAIN FINISHED SURFACE IS MEANT TO PREVENT CONCENTRATED FLOWS AND ENCOURAGE COMPLEX, DISPERSED FLOW AND FLOOD DETENTION.
 2. MICRO TOPOGRAPHY SHALL BE IRREGULAR IN DIRECTION, SPACING AND MAGNITUDE TO PRODUCE NATURAL APPEARING LAND FEATURES AND TOPOGRAPHY. FINISH GROUND SHALL BE DE-COMPRESSED BEFORE SEEDING AND WOODY DEBRIS PLACEMENT.
 3. DEPTH TO MATCH ADJACENT BASE FLOW ELEVATION. COORDINATE WITH ENGINEER PRIOR TO EXCAVATION OF DEPRESSION.

Detention Ridge- Morrion-Maierle

NO.	DESCRIPTION	BY	DATE
1	REVISIONS		
2			
3			
4			
5			

**Morrison
Maierle**
engineers - surveyors - planners - scientists

1 Engineering Place
Helena, MT 59602
406.442.3050
www.m-m.net



DRAWN BY: DAH
DSGN. BY: ZMC
APPR. BY: MDS
DATE: 04/20/19
Q.C. REVIEW
BY: MTB
DATE: 04/20/19

DEER LODGE COUNTY

OREGON CREEK RESTORATION

MONTANA

TYPICAL SECTIONS AND DETAILS

PROJECT NUMBER
5406.004.02

SHEET NUMBER

DRAWING NUMBER

D-2

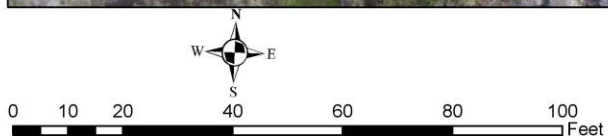
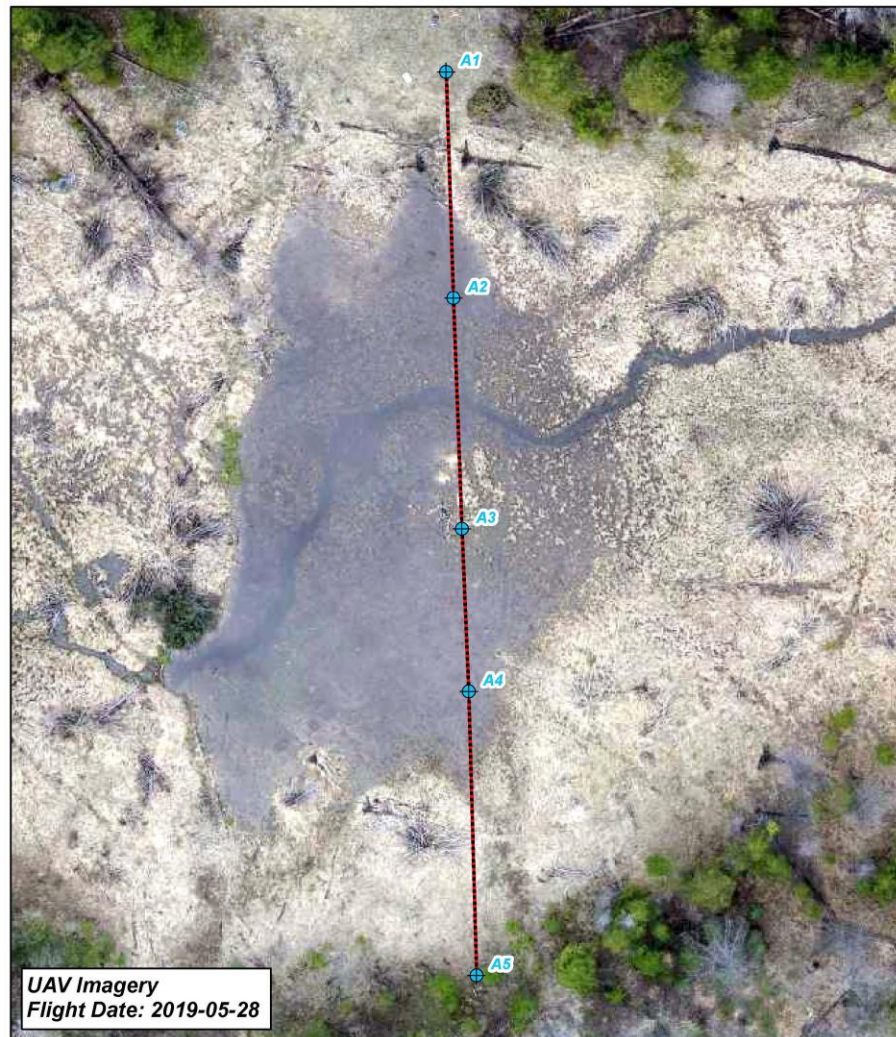



Detention Ridges- Morrison-Maierle

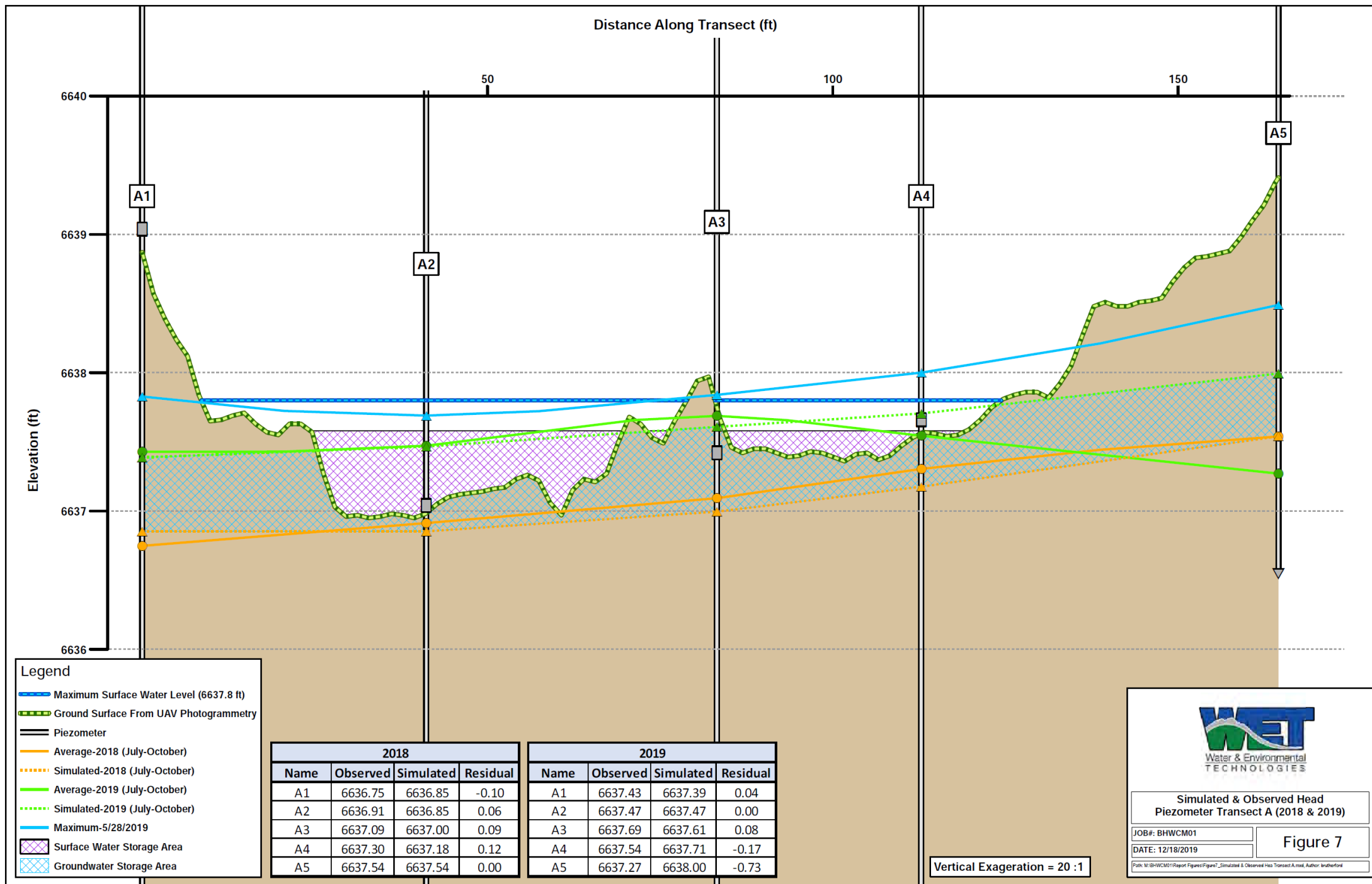
East Fork Divide Creek: Natural Water Storage



East Fork Divide Creek: Natural Water Storage



	Orthomosaic Comparison	
	JOB#: BHWCM01	SHEET 1
	DATE: 10/16/2019	
	Path: M:\BHWCM01\Gis\GisComp\comp.mxd Author: joshford	

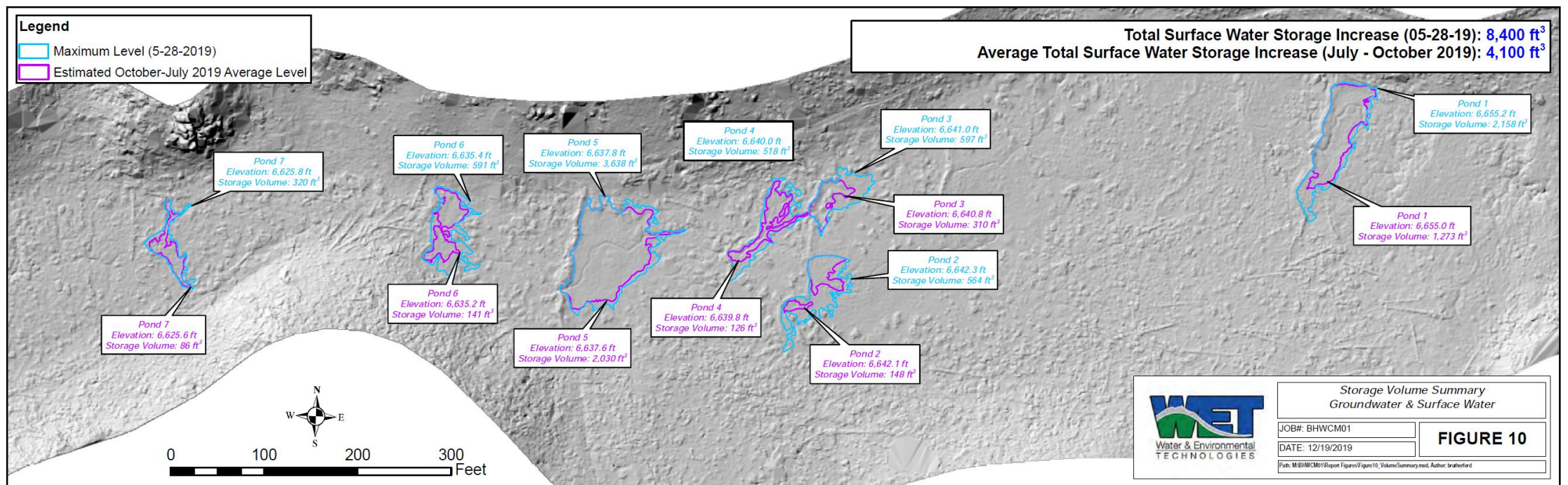
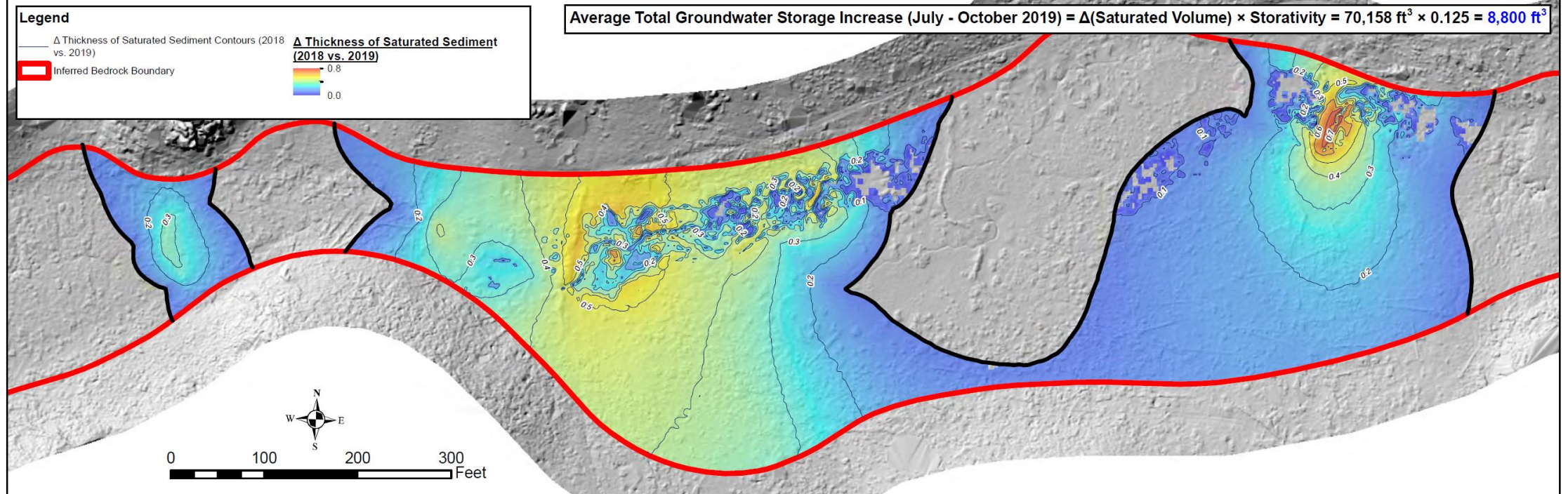


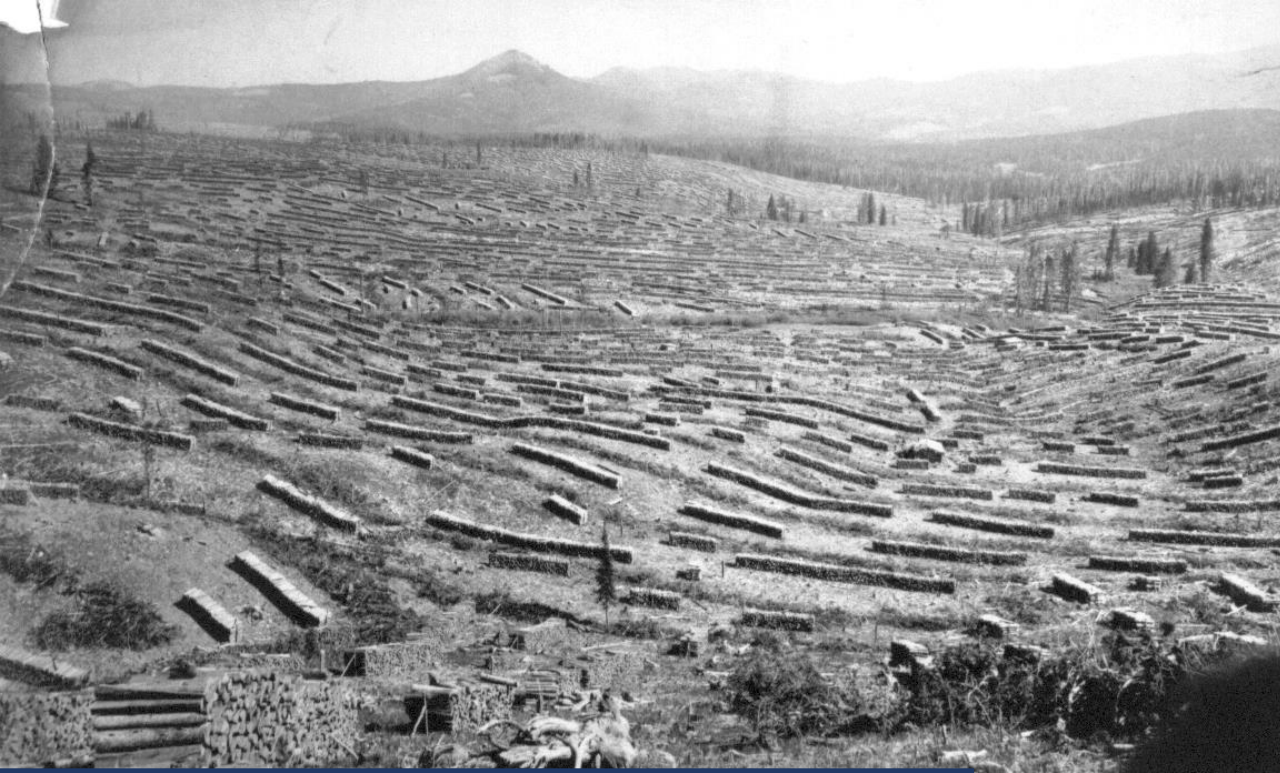
Simulated & Observed Head
Piezometer Transect A (2018 & 2019)

JOB#: BHWCM01
DATE: 12/18/2019

Figure 7

Path: M:\BHWCM01\Report\Figures\Figure7_Simulated & Observed Head Transect A.mxd, Author: brotherford





The Allen Flume, 2007. John Losensky Ecological Services

Past the Ecologic Tipping Point

- Loss of 6"-18" of forest soil= most organics and water holding capacity gone
- Friable mineral "soil" of volcanic welded tuff (C-horizon)



Past the Ecologic Tipping Point

- Seed sources few and far between= high predation rates
- Extreme summer, winter climate + wind erosion= low decomposition
- Loss of most natural grade controls and riparian buffer = Sediment Superhighways
- Incised stream channels and aggraded floodplains



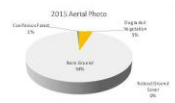


Downstream Landowners say the Big Hole “ran white” after heavy rains

2015



Table 1. 2015 Aerial Photo		
Label	Acres	Percent (Ac.)
Robust Ground Cover	0.000	0.0%
Degraded Vegetation	0.292	5.1%
Bare Ground	5.381	94.3%
Coniferous Forest	0.035	0.6%
Total	5.71	100.0%



Legend

Fertilizer Boundary



Mount Haggis - Aerial

2015 Aerial Photo - Joyner Gulch

Vegetation Classification - Area 4 Fertilizer Boundary

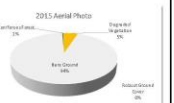
DATE: 10/20/2015

DATE: 10/20/2015

SHEET C9a



Table 1. 2015 Aerial Photo		
Label	Acres	Percent (Ac.)
Robust Ground Cover	0.000	0.0%
Degraded Vegetation	0.292	5.1%
Bare Ground	5.381	94.3%
Coniferous Forest	0.035	0.6%
Total	5.71	100.0%



Legend

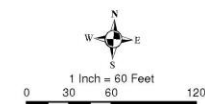
Fertilizer Boundary

Robust Ground Cover

Bare Ground

Degraded Vegetation

Coniferous Forest



Mount Haggis - Aerial

2015 Aerial Photo - Joyner Gulch

Vegetation Classification - Area 4 Fertilizer Boundary

DATE: 10/20/2015

DATE: 10/20/2015

SHEET C9

2018

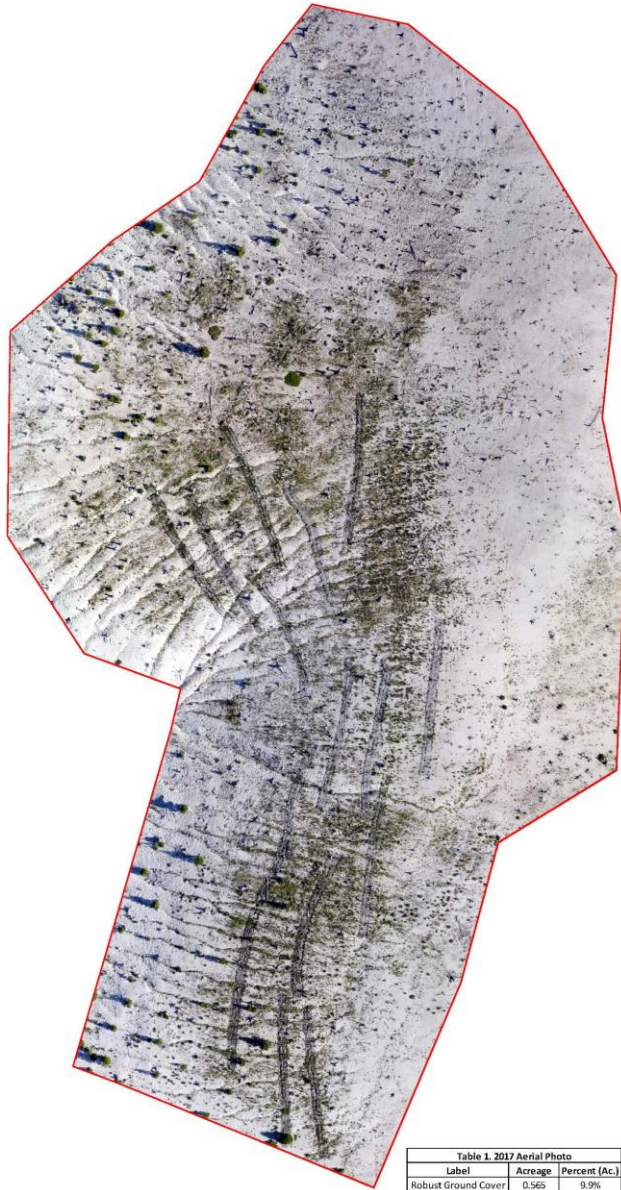
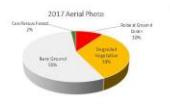


Table 1. 2017 Aerial Photo		
Label	Acres	Percent (Ac.)
Robust Ground Cover	0.565	9.9%
Degraded Vegetation	1.870	32.8%
Bare Ground	3.163	55.5%
Coniferous Forest	0.106	1.9%
Total	5.70	100.0%



Legend
Fertilizer Boundary



Mount Haggin - Aerial
2017 Aerial Photo - Joyner Gulch
Vegetation Classification - Area 4 Fertilizer Boundary
Date: 10/20/2019
SHEET C8a

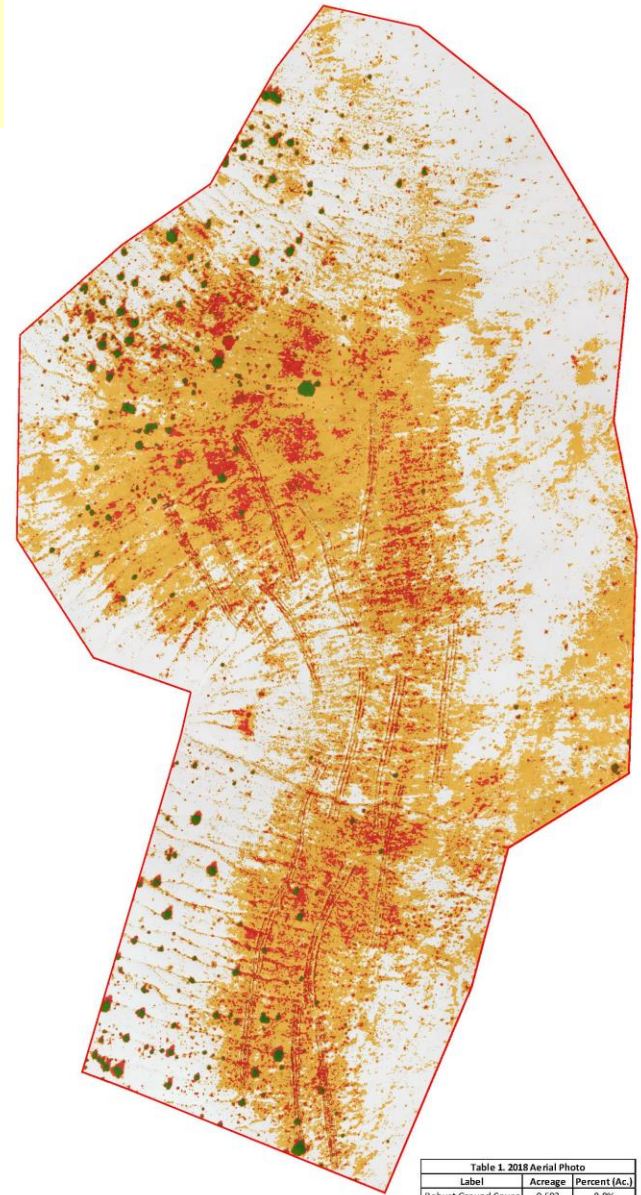
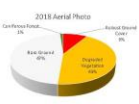
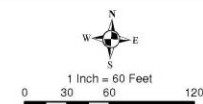


Table 1. 2018 Aerial Photo		
Label	Acres	Percent (Ac.)
Robust Ground Cover	0.502	8.8%
Degraded Vegetation	2.427	42.6%
Bare Ground	2.711	47.5%
Coniferous Forest	0.063	1.1%
Total	5.70	100.0%



Legend
Fertilizer Boundary
Bare Ground
Robust Ground Cover
Degraded Vegetation
Coniferous Forest



Mount Haggin - Aerial
2018 Aerial Photo - Joyner Gulch
Vegetation Classification - Area 4 Fertilizer Boundary
Date: 10/20/2019
SHEET C7



August 2014



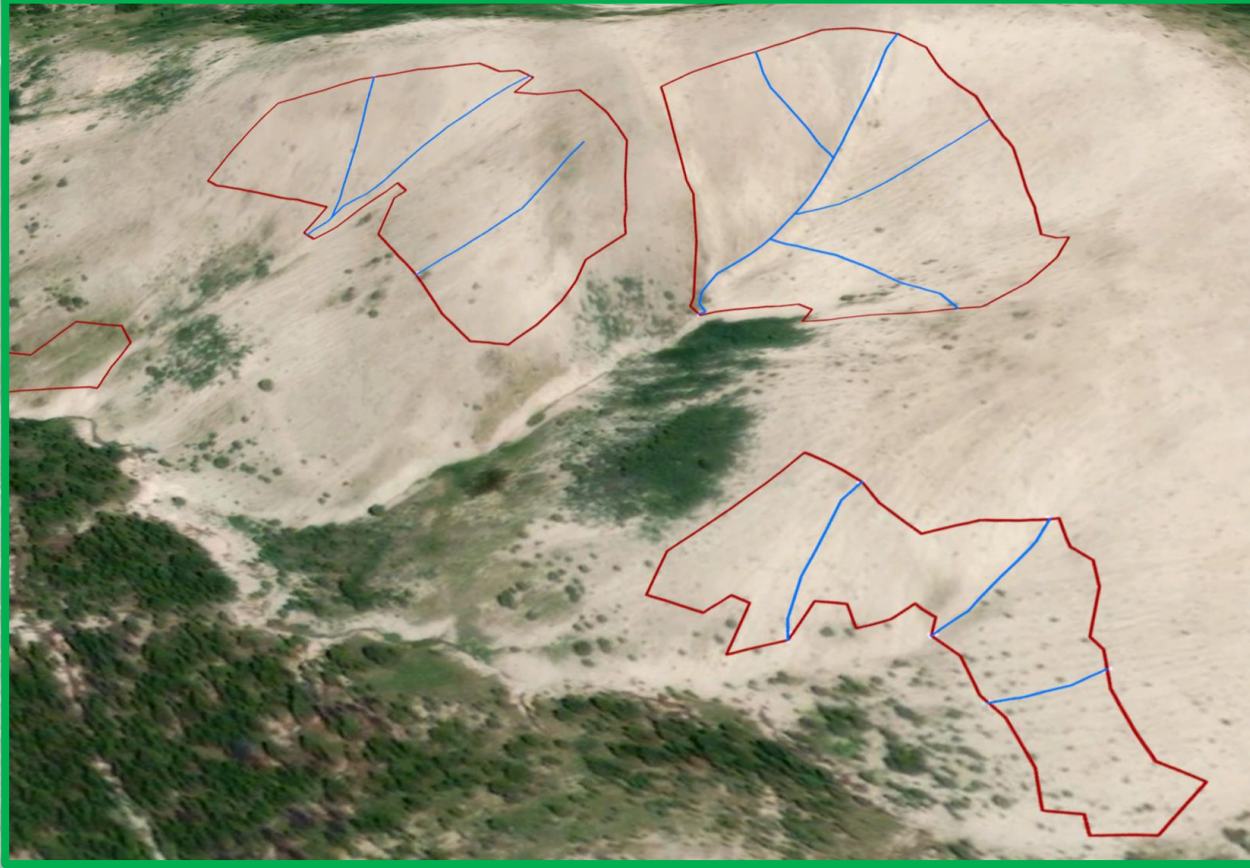
July 2017



September 2019

Dozer Basin Hydraulic Analysis- Pioneer Technical Services

PRE-CONSTRUCTION CONDITIONS



CHANGES TO DRAINAGE BASIN CHARACTERISTICS:

- Increase Flow Length
- Decrease Watershed Slope
- Increase Retention
- Increase Time of Concentration

POST-CONSTRUCTION CONDITIONS



RESULTS:

- Reduce Runoff Velocity
- Decrease Peak Runoff Flow Rate
- Decrease Volume of Runoff– 75% at 25-yr event with 70% vegetation cover

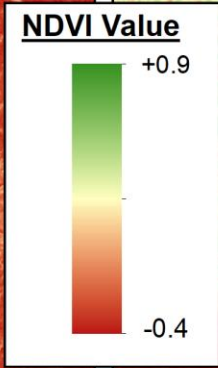
Video- Uplands treatment



Video- Gully Fill



UAV NDVI
Flight Date: 2018-08-03



UAV NDVI
Flight Date: 2019-07-17

