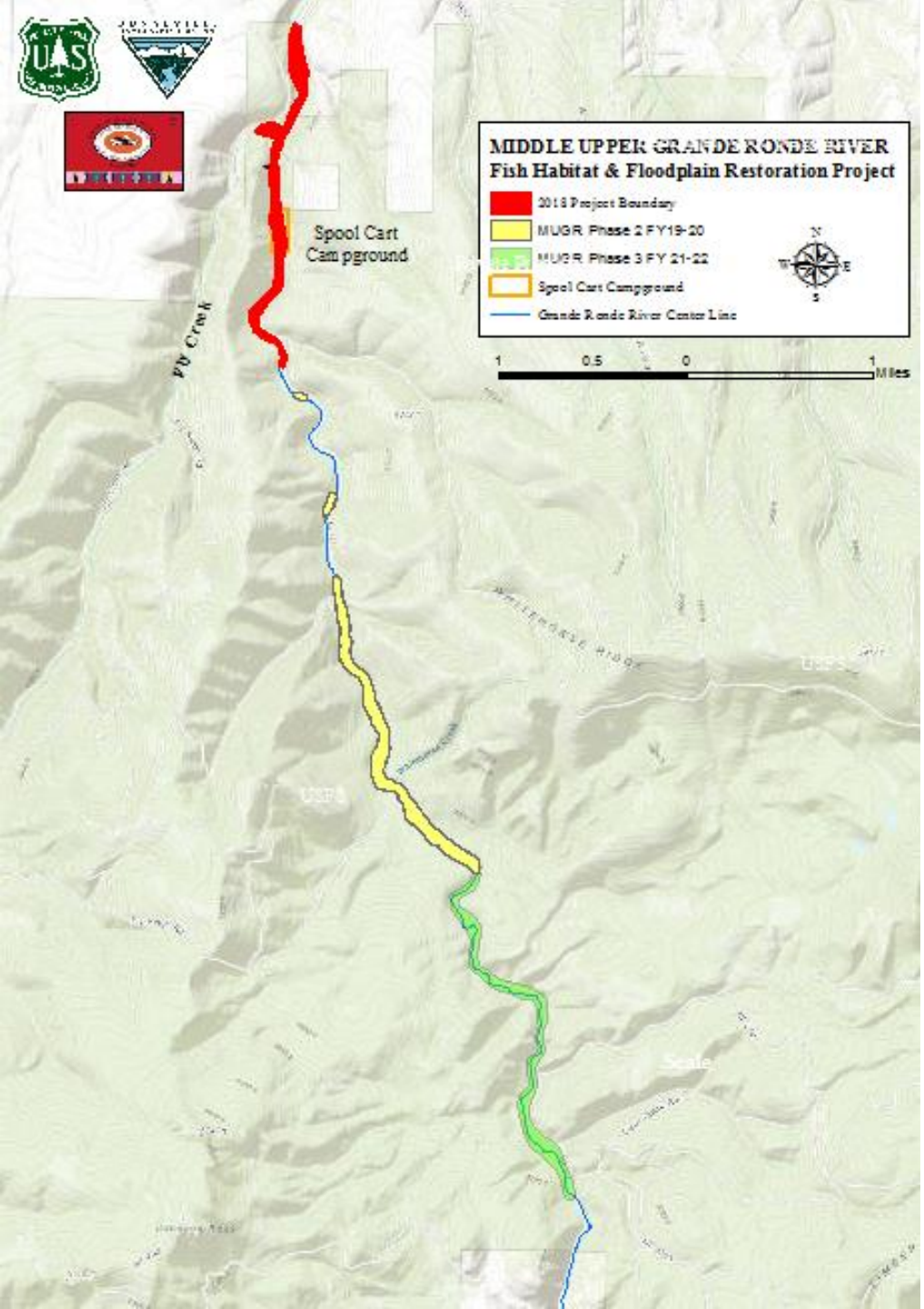
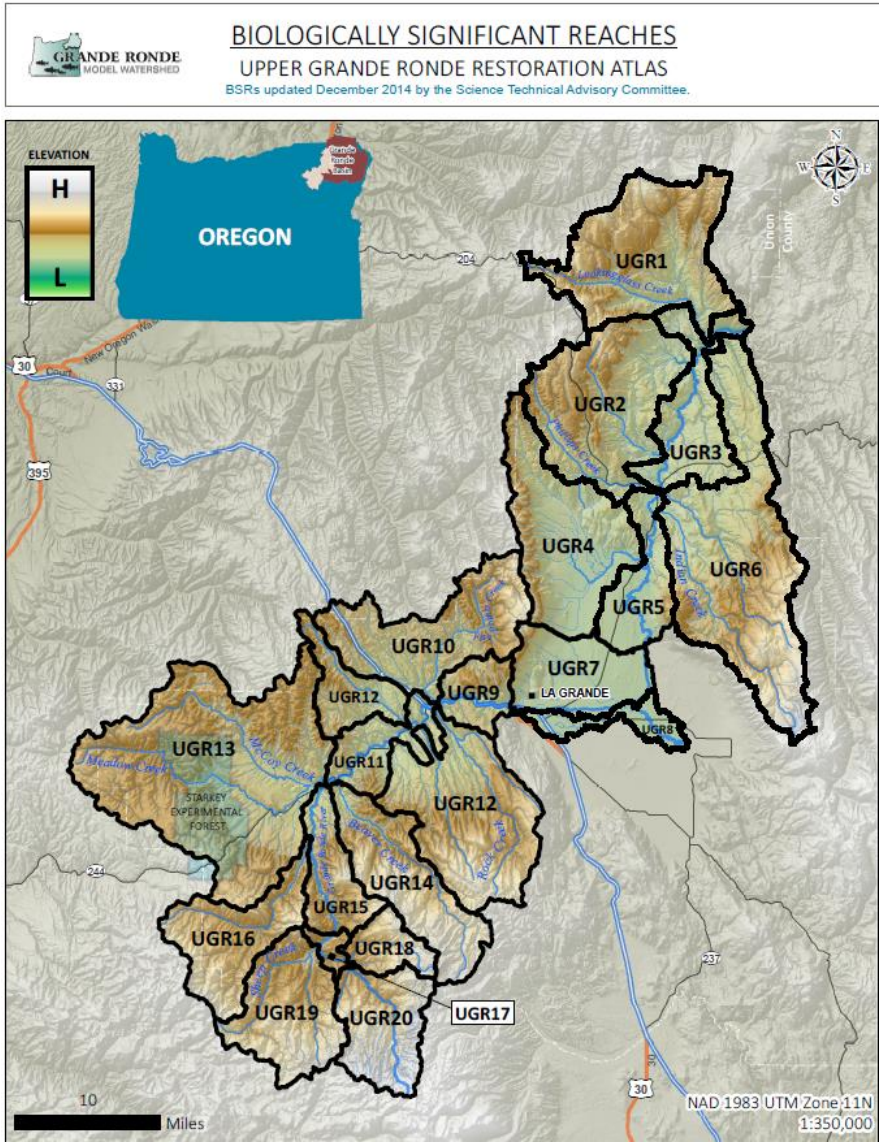
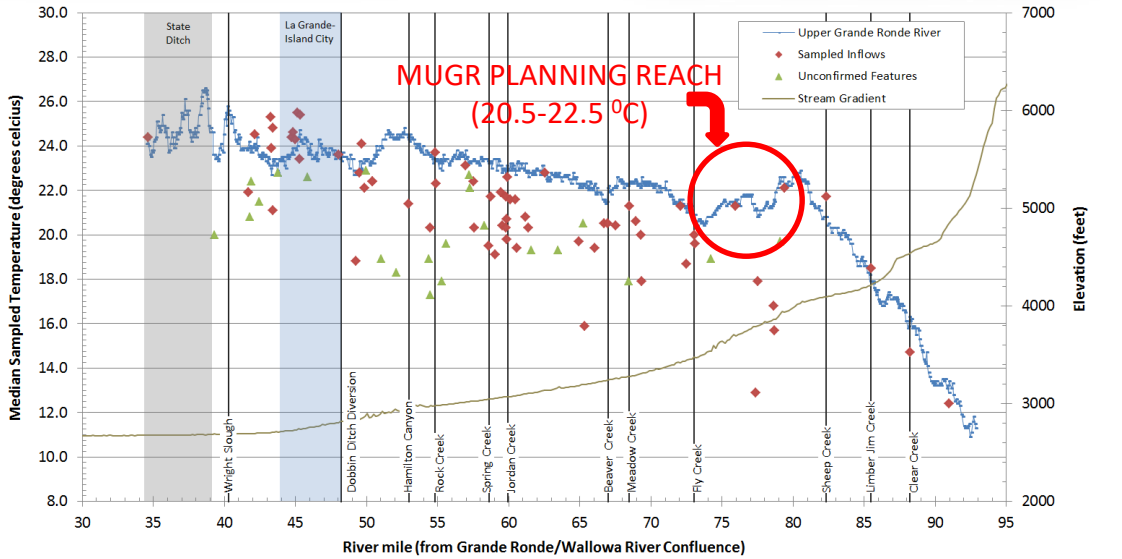
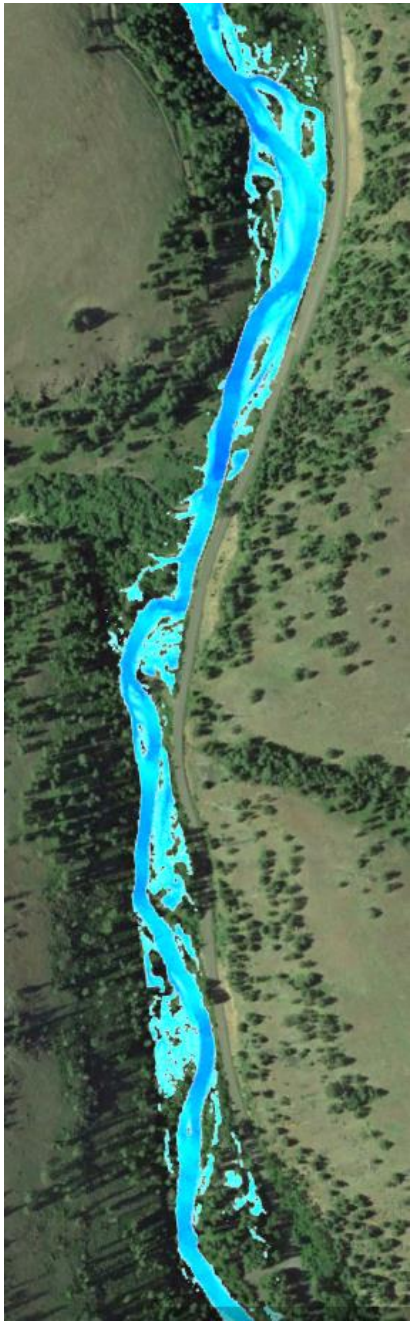

MIDDLE UPPER GRANDE RONDE RIVER
Fish Habitat & Floodplain Restoration Project
2018 Project Boundary
MUGR Phase 2 FY19-20
MUGR Phase 3 FY 21-22
Spool Cart Campground
Grande Ronde River Center Line
1 0.5 0 1 Miles
Spool Cart Campground
Fly Creek


GRANDE RONDE MODEL WATERSHED
BIOLOGICALLY SIGNIFICANT REACHES
UPPER GRANDE RONDE RESTORATION ATLAS
BSRs updated December 2014 by the Science Technical Advisory Committee.
ELEVATION
H
L
OREGON
UGR1
UGR2
UGR3
UGR4
UGR5
UGR6
UGR7
UGR8
UGR9
UGR10
UGR11
UGR12
UGR13
UGR14
UGR15
UGR16
UGR17
UGR18
UGR19
UGR20
LA GRANDE
STARKEY EXPERIMENTAL FOREST
Union County
10 Miles
NAD 1983 UTM Zone 11N
1:350,000

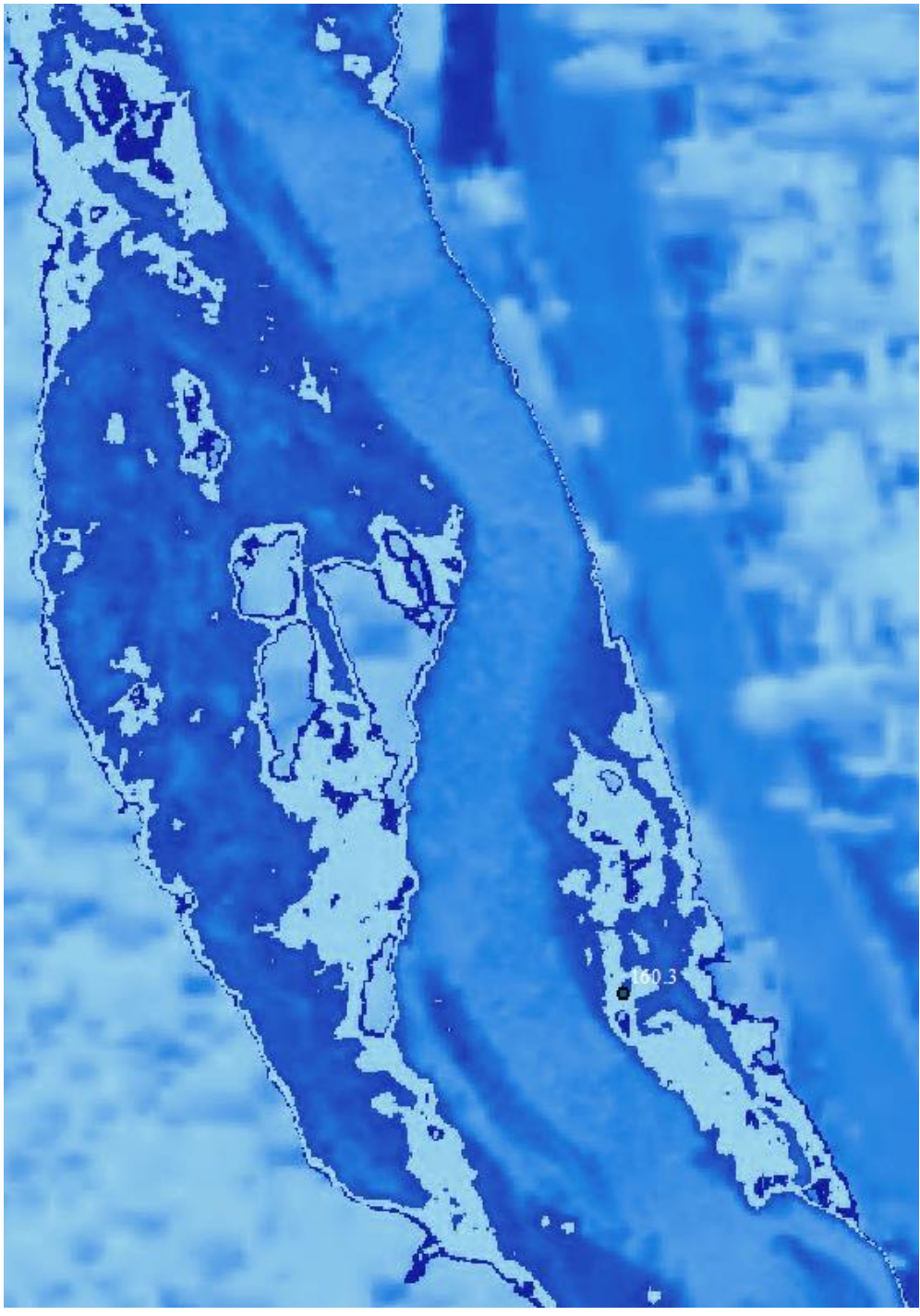
| | | | | | |
|---|---|---|---|---|---|
| UGR15 | UGS17 | UGC5 | 1.1 Habitat Quantity: Anthropogenic Barrier | 5% | 10% |
| | | | 4.1 Riparian Condition: Riparian Condition | 10% | 10% |
| | | | 4.2 Riparian Condition: LWD Recruitment | 10% | 10% |
| | | | 6.2 Channel Structure and Form: Instream Structural Complexity | 20% | 20% |
| | | | 7.2 Sediment Condition: Increased Sediment Quantity | 15% | 10% |
| | | | 8.1 Water Quality: Temperature | 25% | 25% |
| | | | 9.2 Water Quantity: Decreased Water Quantity | 15% | 15% |



# HYDRAULIC MODELING AND EXISTING CONDITION ASSESSMENT



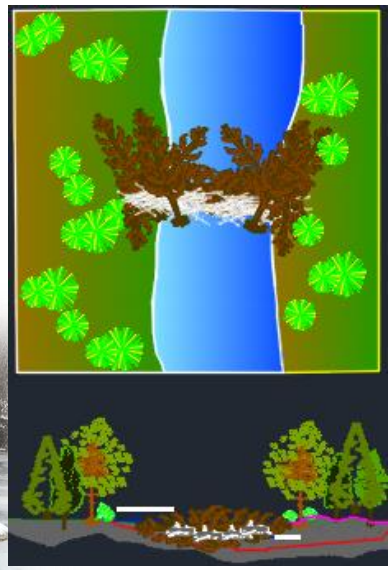

160.3

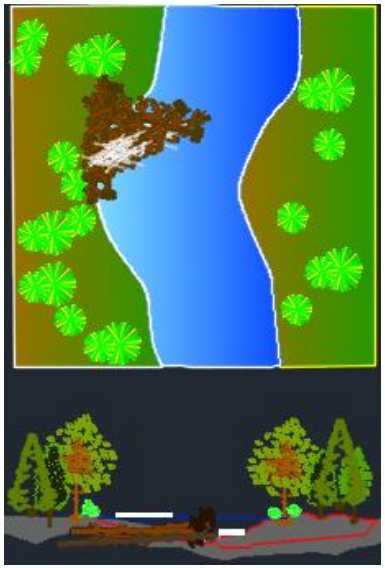

160.3

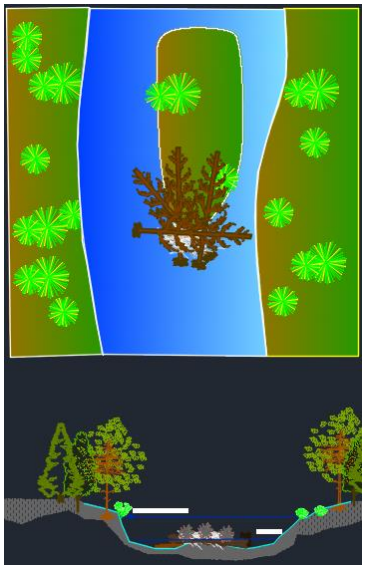
# LARGE WOOD REFERENCE SITE TIMELAPSE

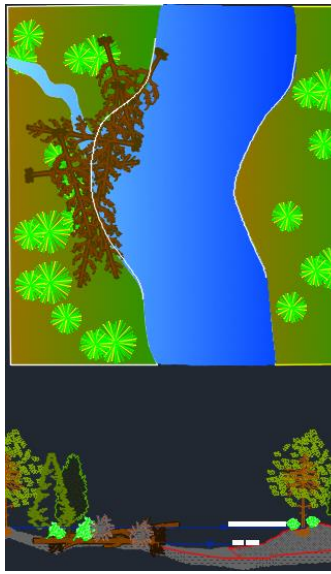


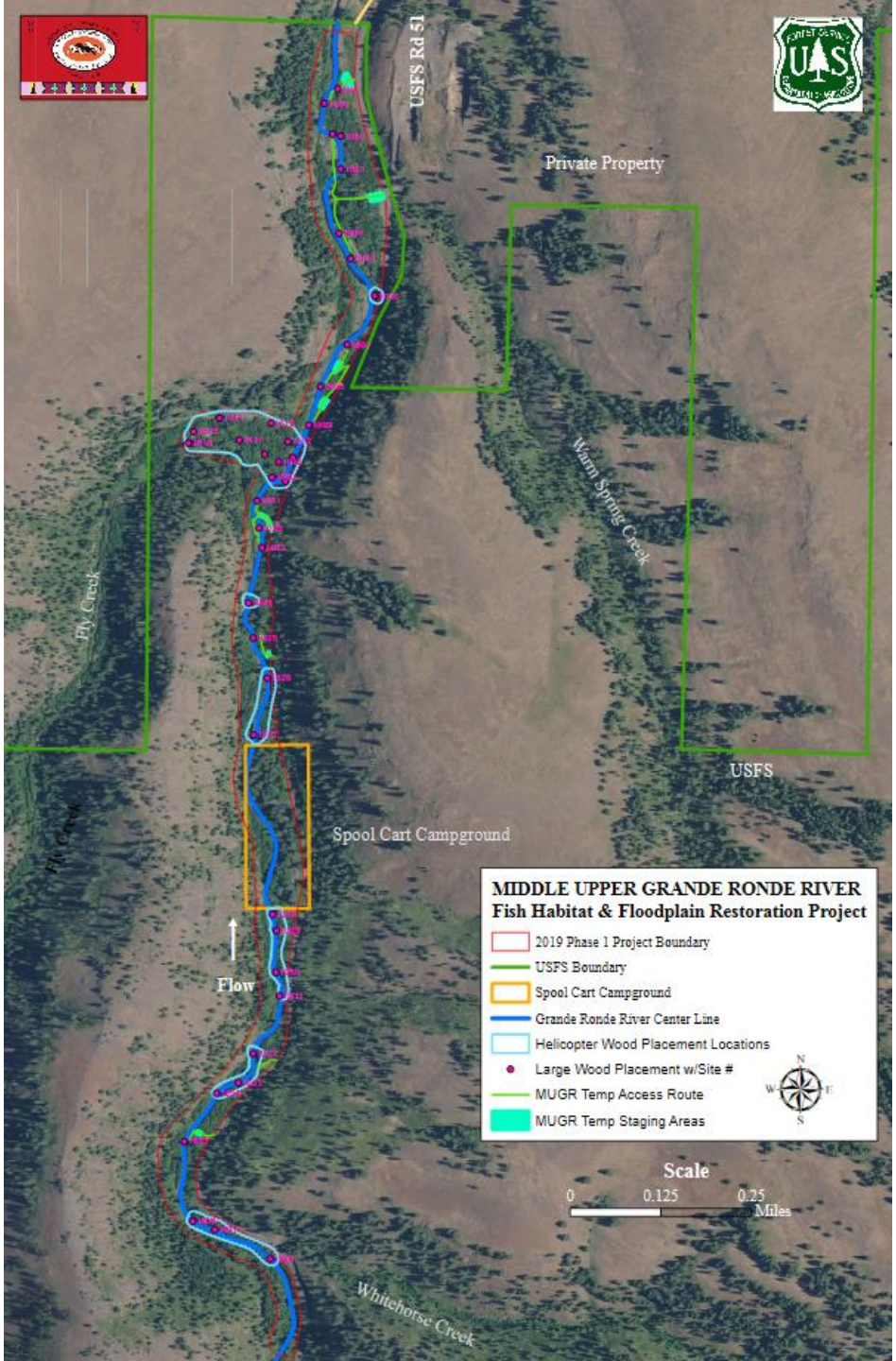

# LARGE WOOD STRUCTURE DESIGN APPROACH/REFERENCES







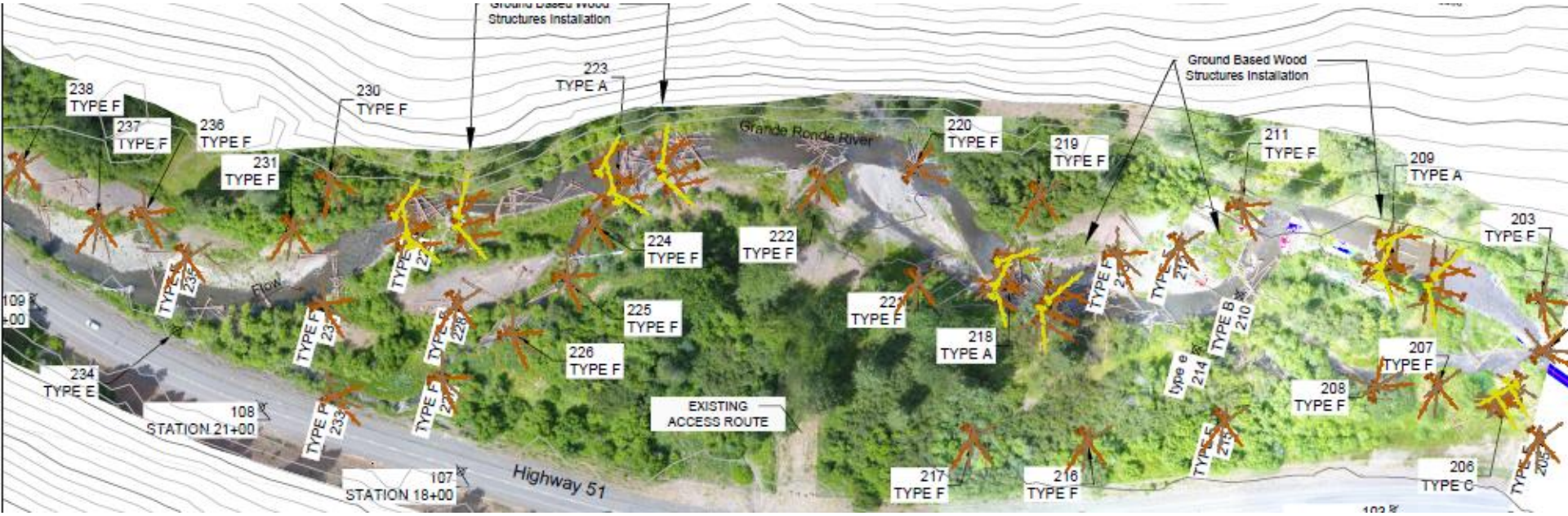

USFS Rd 51
Private Property
Warm Spring Creek
Fly Creek
Fly Creek
USFS
Spool Cart Campground
Flow
Whitehorse Creek
MIDDLE UPPER GRANDE RONDE RIVER
Fish Habitat & Floodplain Restoration Project
2019 Phase 1 Project Boundary
USFS Boundary
Spool Cart Campground
Grande Ronde River Center Line
Helicopter Wood Placement Locations
Large Wood Placement w/Site #
MUGR Temp Access Route
MUGR Temp Staging Areas
N
W
E
S
Scale
0
0.125
0.25
Miles

# *PROJECT MATERIALS SUMMARY*

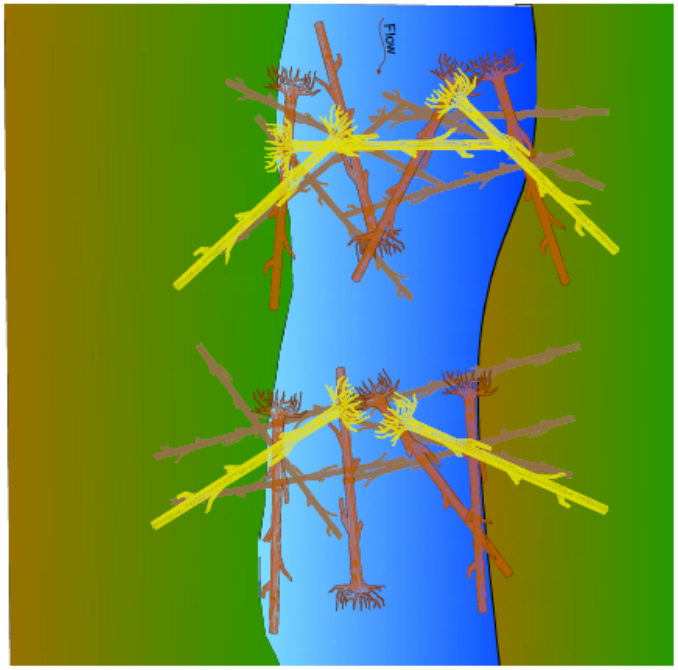
| STRUCTURE TYPES AND WOOD SPEC/STRUCTURE | # Structures | Logs w/RW 16" DBH+, 45' L | Tree Tops/Med Wood/Racking (8-14" DBH, 20-30' L |
|---|---|---|---|
| TYPE A - Habitat Structure | 22 | 13 | 18 |
| TYPE B - Existing Structure Augmentation) | 2 | 10 | 16 |
| TYPE C - Deflector Structure | 10 | 6 | 10 |
| TYPE D - APEX Structure | 3 | 4 | 6 |
| TYPE E - Bleeder Structure | 2 | 7 | 10 |
| Type F - Floodplain & Misc Channel Wood | 82 | 0 | 7 |

| Project Materials Summary by Structure Type | | |
|---|---|---|
| TYPE A - Habitat Structure | 286 | 396 |
| TYPE B - Existing Structure Augmentation) | 20 | 32 |
| TYPE C - Deflector Structure | 60 | 100 |
| TYPE D - APEX Structure | 12 | 18 |
| TYPE E - Bleeder Structure | 14 | 20 |
| Type F - Floodplain & Misc Channel Wood | 0 | 574 |
| **MATERIALS SUMMARY** | **392** | **1140** |

| WOOD MATERIAL SPECIFICATIONS | |
|---|---|
| Wood Material | Material Size |
|  | 16"+ DBH, 45' L (Top layer of structure) |
|  | 16"+ DBH, 45' L (Base Layer of Structure) |
|  | 8-15" DBH< 30'+ L (Racking Logs) |

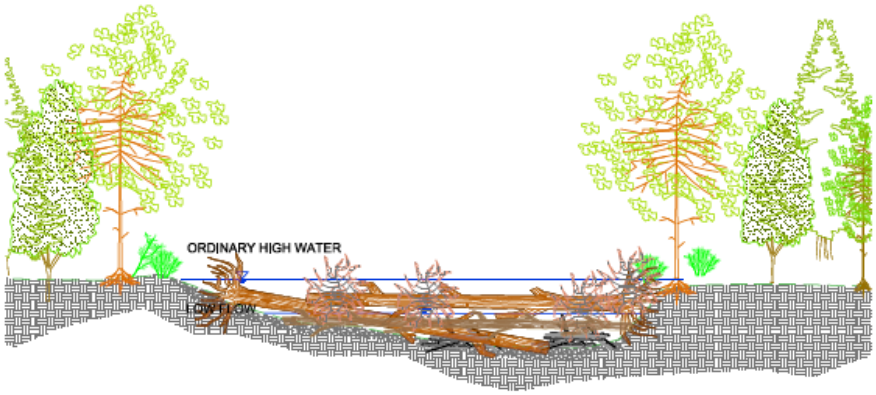

Ground Based Wood Structures Installation
238 TYPE F
237 TYPE F
236 TYPE F
230 TYPE F
223 TYPE A
231 TYPE F
Grande Ronde River
220 TYPE F
219 TYPE F
211 TYPE F
209 TYPE A
203 TYPE F
Ground Based Wood Structures Installation
224 TYPE F
222 TYPE F
225 TYPE F
221 TYPE F
218 TYPE A
226 TYPE F
234 TYPE E
108 STATION 21+00
EXISTING ACCESS ROUTE
207 TYPE F
208 TYPE F
206 TYPE C
217 TYPE F
216 TYPE F
107 STATION 18+00
Highway 51


Highway 51
276
TYPE F
TYPE A
273
TYPE D
271
TYPE F
268
TYPE F
267
TYPE A
269
TYPE F
265
TYPE C
263
TYPE C
264
TYPE C
249
TYPE C
247
TYPE A
246
TYPE F
245
TYPE F
244
TYPE A
243
240
TYPE F
242
237
TYPE F
262
TYPE F
261
TYPE C
259
TYPE F
258
TYPE F
252
TYPE F
FLY
251
TYPE F
250
TYPE C
Flow




**1 PLAN VIEW**

HORIZ 1" = 30'




**2 SECTION VIEW**

HORIZ 1" = 20'

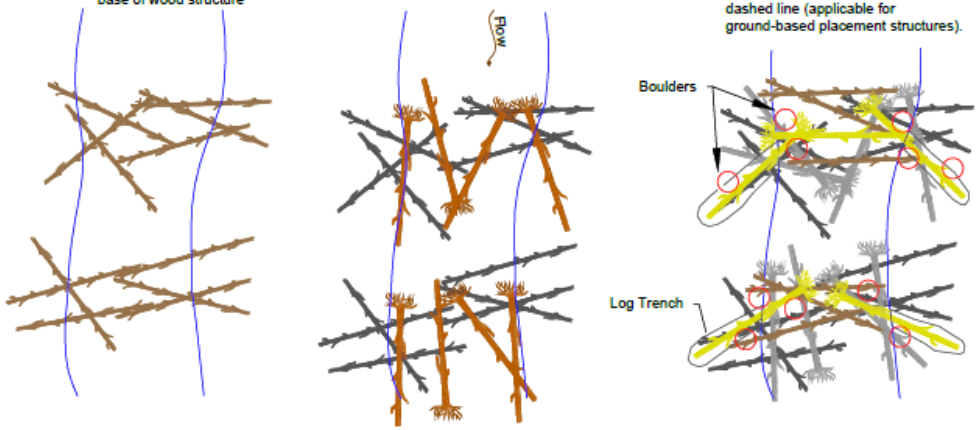
## TYPE A LARGE WOOD STRUCTURE
## BIOLOGICAL OBJECTIVES - DESIGN INTENT

- PURPOSE OF TYPE A LARGE WOOD STRUCTURE IS TO CREATE A STRUCTURE THAT INCREASES WATER SURFACE ELEVATION AND DEPTH, DECREASES WATER VELOCITY, PROMOTES SEDIMENT DEPOSITION AND STORAGE,PROVIDES HABITAT COVER AND COMPLEXITY, AND PROMOTES FLOODPLAIN CONNECTIVITY AND INCREASED GROUNDWATER AND HYPORHEIC FUNCTIONS TO IMPROVE WATER TEMPERATURE DIVERSITY AND COLD WATER REFUGE.
- PROMOTES DEVELOPMENT AND MAINTENANCE OF LARGE POOL HABITAT, PROVIDES OVERHEAD COVER, VELOCITY REFUGE, AND ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES.

STEP 1 - Install small logs/racking materail on streambed as shown to form base of wood structure

STEP 2 - Place large logs on top of small logs as shown

STEP 3 - Place additional racking logs followed by large logs as shown. Key member log trenching illustrated in dashed line (applicable for ground-based placement structures).




**3 ASSEMBLY DETAIL & INSTALLATION SEQUENCE**

HORIZ 1" = 50'

## PROJECT ELEMENT NOTES

1. WOOD MATERIAL SHALL COME FROM FIR, SPRUCE, LODGEPOLE PINE, OR PINE TREES.
2. LOCATION OF WOOD STRUCTURE SHALL BE STAKED AT EACH LOCATION BY CO.
3. WOOD STRUCTURE SHALL BE CONSTRUCTED EITHER BY TRACK MOUNTED EXCAVATOR, HELICOPTER, AND/OR A COMBINATION OF THE TWO BASED ON GROUND-BASED ACCESS FEASIBILITY.
4. STRUCTURE WILL BE CONSTRUCTED IN LAYERS FOLLOWING THE ASSEMBLY DETAIL ILLUSTRATED ABOVE.
5. STRUCTURE WILL BE INITIATED BY PLACING BASE WOOD MATERIAL, FOLLOWED BY LARGE KEY MEMBER LOGS AND INTERWOVEN WITH ADDITIONAL RACKING MEMBERS.
6. TOP KEY MEMBER LOGS WILL BE PLACED LAST, OVER-TOPPING BASE MEMBERS TO PROVIDE BALLAST AND ANCHORING OF UNDERLYING WOOD MATERIAL AS DIRECTED BY CO.
7. TYPE A STRUCTURES ACCESSIBLE BY GROUND-BASED EQUIPMENT (DELINEATED IN PLANVIEW SHEETS) WILL INCLUDE TRENCHING AND BURYING 3-4 KEY MEMBER LOGS AND BACK-FILLED WITH COMPACTED BACKFILL TO PROVIDE STRUCTURAL STABILITY AND BALLAST. TRENCHES WILL TYPICALLY BE 35-40 FEET IN LENGTH, 3 FEET WIDE AND 4 FEET DEEP.
8. BOULDERS WILL BE PLACED IN WOOD STRUCTURES ACCESSIBLE BY GROUND-BASED EQUIPMENT TO WEDGE KEY MEMBERS AND PROVIDE ADDITIONAL BALLAST FOR STRUCTURAL STABILITY.

MATERIAL SCHEDULE

| ITEM | QUANTITY | DIA. (IN) | LENGTH (FT) | ROOTWAD (Y/N) |
|---|---|---|---|---|
| LARGE LOG W/RW | 13 | 16" Plus | ~ 45' plus | YES - 5" DIA. MIN. |
| RACKING LOGS/TOPS | 18 | 8-16" | ~ 20-30' | NO |

| SUMMARY OF QUANTITIES | | |
|---|---|---|
| **Large Wood Structures** | **Quantity** | **Unit** |
| TYPE I (Channel Spanning wood structure) | | |
| # Structures | 21 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 231 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 336 | each |
| TYPE II (Similar to Type I, constructed on existing structure) | | |
| # Structures | 4 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 24 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 64 | each |
| TYPE III (Defector) | | |
| # Structures | 10 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 50 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 100 | each |
| TYPE IV (Apex) | | |
| # Structures | 3 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 8 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 12 | each |
| TYPE V (Bleeder) | | |
| # Structures | 3 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 21 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 12 | each |
| TYPE VI (Whole Trees) | | |
| # Structures | 29 | each |
| Key member w/RW, (18" dbh+, 45'+ L | 0 | each |
| Racking Logs/tops, 8-14" dbh, 20-30' L | 0 | each |
| Floodplain/Large Wood Augmentation | 200 | each |
| Small-Medium Whole Trees/Logs 6-14" DBH, 20-30" L | | |
| SUMMARY | | |
| Total large Wood Structures | 70 | each |
| Total Key Member Pieces of Wood, 18"+ DBH, 45' L | 363 | each |
| Total Racking Material (Logs/Treetops, 8-14" DBH, 20-30' L | 533 | each |
| Total Floodplain Augmentation Logs, 8-14" DBH, 20-30' L | 200 | each |

# SUMMARY

- 40 Engineered Wood Treatment Sites
- 31 Whole Tree Placements
- 200 Pieces Wood Augmentation

# CONSTRUCTION METHOD

- 25 ELJ Sites (63%) Helicopter Placement
- 15 ELJ Sites (37%) Ground Based Placement
- 31 Whole Tree Placements
- 200 Pieces Wood Augmentation

| | | Per Each | |
|---|---|---|---|
| **STRUCTURE TYPES AND WOOD SPEC/STRUCTURE** | **COUNT** | **Log w/RW 18" DBH+, 45'** | **RACKING (8-14" DBH, 20-30' LENGTH** |
| TYPE I (Channel Spanning Structure) | 21 | 11 | 16 |
| TYPE II (Channel Spanning Structure (on Existing Structure) | 4 | 6 | 16 |
| TYPE III (Deflector Structure) | 10 | 5 | 10 |
| TYPE IV (APEX Structure) | 2 | 4 | 6 |
| TYPE V (Bleeder Structure) | 3 | 7 | 7 |
| Type VI (Large Whole Trees) | 29 | 1 | 0 |
| Floodplain/Augmentation Wood - Small-Med whole tree/logs no RW 6-14" DBH, 20-30' L | 200 | 0 | 200 |

| | | |
|---|---|---|
| TYPE I | 231 | 336 |
| TYPE II | 24 | 64 |
| TYPE III | 50 | 100 |
| TYPE IV | 8 | 12 |
| TYPE V | 21 | 21 |
| TYPE VI | 29 | 0 |
| FP/Augmentation Wood - Sm-Med WT/logs no RW 6-14" DBH, 20-30' L | 0 | 200 |
| **MATERIALS SUMMARY** | **363** | **733** |