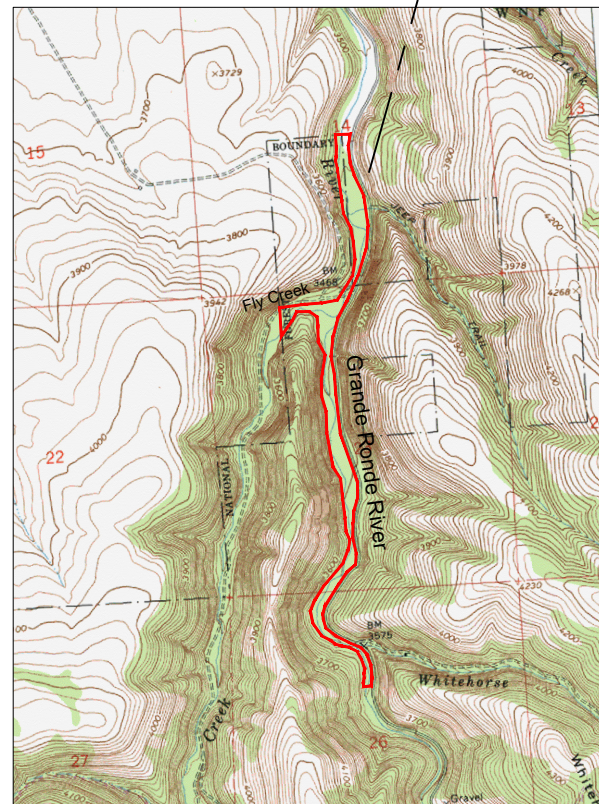
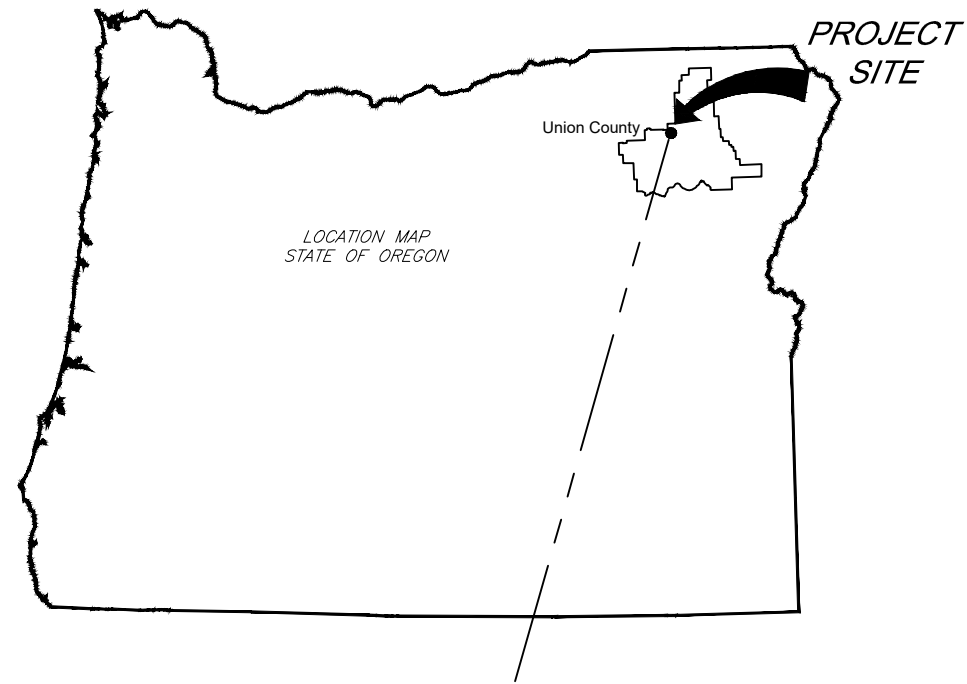


# GRANDE RONDE SUBBASIN FISH HABITAT ENHANCEMENT

## MIDDLE UPPER GRANDE RONDE RIVER, PHASE I

### Construction Drawings



#### PROJECT LOCATION MAP

Township 4 South, Range 35 ½ East  
SECTIONS: 14, 23, 26, & 35

Township 5 South, Range 35 ½ East  
Sections 1, 2, & 13

Township 5 South, Range 36 East  
Section 18

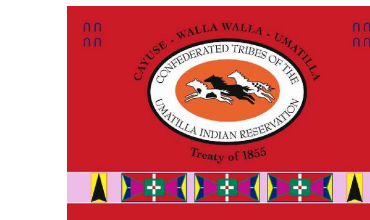
0450935 N, 1182247 W

USGS Quadrangle: Little Beaver Creek, OR 45118-83

Project Area Elevation  
3,431 to 4,022 Feet Above Mean Sea Level

UNION COUNTY, OREGON

6th Field HUC, Upper Grande Ronde River #17060104



#### PROJECT DESCRIPTION

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Grande Ronde Basin Fish Habitat Program and U.S. Forest Service, Wallowa-Whitman National Forest, LaGrande Ranger District seek to enhance and restore fish habitat and floodplain process and function to benefit fishery resources along an 8 mile reach in the Middle Upper Grande Ronde River in the Upper Grande Ronde River Basin. The Phase 1 project is located along two miles in the lower portion of the larger reach and is scheduled for construction during summer 2019. Future phases will be developed pending funding and resource availability. Targeted fish populations include ESA listed Snake River spring-summer Chinook salmon and summer steelhead. Additional species of interest include bull trout, Pacific lamprey, freshwater mussels, and resident native fish. The project area provides critical spawning and rearing habitat for targeted fish populations. Planned habitat enhancement includes installation of large wood material to increase habitat complexity, promote pool development, and activate floodplain and side channel habitats. Large wood structures will be constructed using a combination of ground-based equipment and helicopter in areas that are difficult to access. Targeted life requisites for adult spawning and juvenile summer and winter rearing include: habitat complexity and diversity, large pools, decreased channel width:depth ratio, sediment sorting, storage and decreased streambed embeddedment and sub-pavement, increased cold water refuge and hyporheic exchange. The Project was designed in accordance with ARBO II, Aquatic Restoration Activities Biological Opinion conservation measures and project design criteria.

#### INDEX OF DRAWING SHEETS

1. COVER, LOCATION, & SHEET INDEX
2. PROJECT OVERVIEW
3. PLAN SHEET OVERVIEW
4. GENERAL NOTES
5. PROJECT QUANTITIES
6. PROPOSED CONDITIONS Station 0+00 to 24+50
7. PROPOSED CONDITIONS Station 24+50 to 48+50
8. PROPOSED CONDITIONS Station 48+50 to 71+50
9. PROPOSED CONDITIONS Station 71+50 to 94+50
10. PROPOSED CONDITIONS Station 94+50 to 106+00
11. TYPICAL TYPE A Large Wood Structure
12. TYPICAL TYPE B Large Wood Structure
13. TYPICAL TYPE C Large Wood Structure
14. TYPICAL TYPE D Large Wood Structure
15. TYPICAL TYPE E Large Wood Structure
16. TYPICAL TYPE F Large Wood Structure

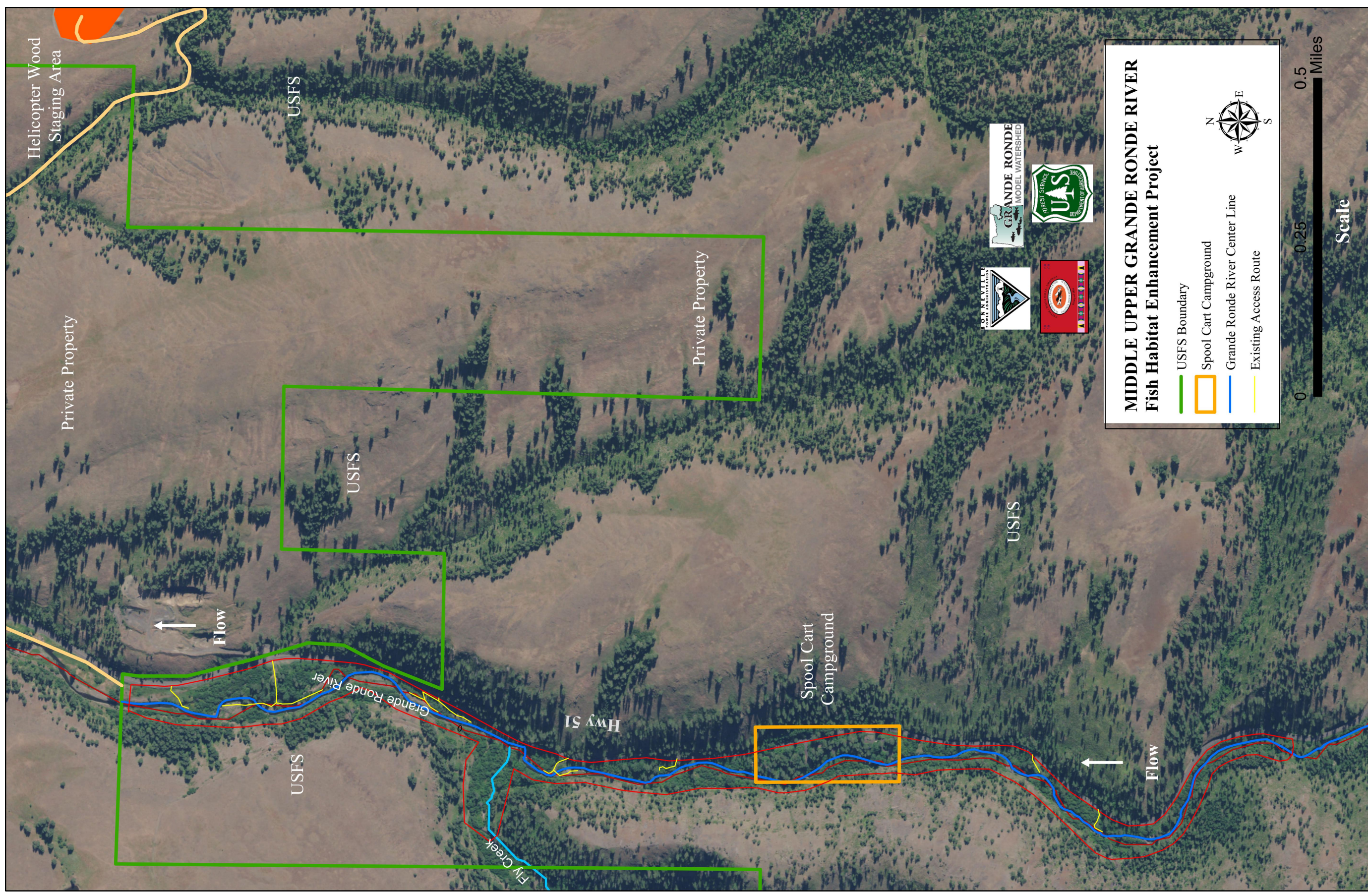
Designed	A. Childs S. Welch	Date	May 2019
Drawn	A. Childs		May 2019
Checked			
Approved			
Title			

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union County, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest



COVER





**MIDDLE UPPER GRANDE RONDE RIVER  
Fish Habitat Enhancement Project**

- USFS Boundary
- Spool Cart Campground
- Grande Ronde River Center Line
- Existing Access Route

N  
W E  
S

0 0.25 0.5 Miles

**Scale**



OVERVIEW



**MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project**  
Union County, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest

Designed	A. Childs S. Welch	Date	May 2019
Drawn	A. Childs	Checked	May 2019
Approved		Title	



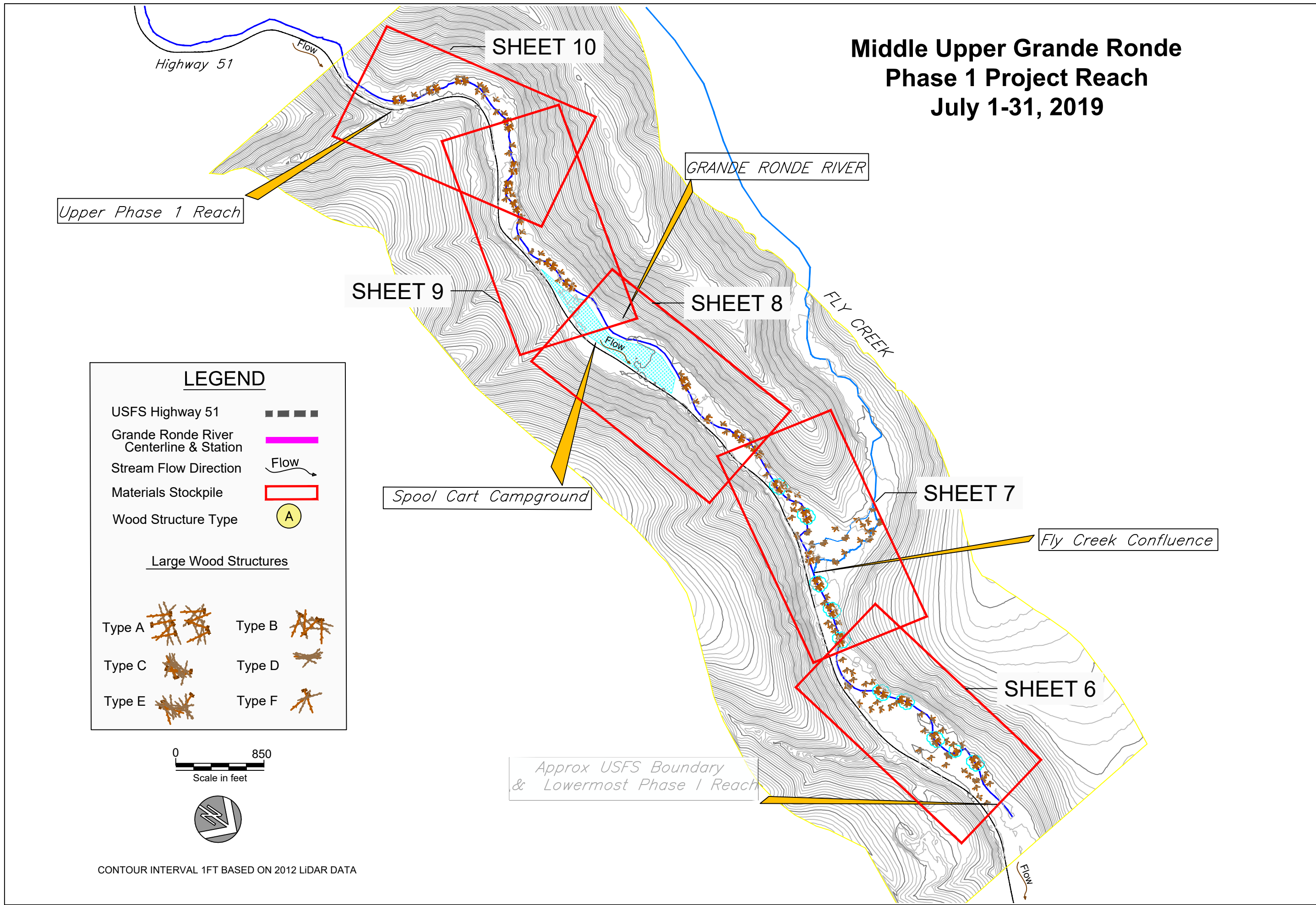
# Middle Upper Grande Ronde Phase 1 Project Reach July 1-31, 2019

Date  
 May 2019  
 May 2019  
 Designed A. Childs S. Welch  
 Drawn A. Childs  
 Checked  
 Approved  
 Title

MIDDLE UPPER GRANDE RONDE  
 Fish Habitat Enhancement Project  
 Union COUNTY, OREGON  
 Confederated Tribes of the Umatilla Indian Reservation &  
 Wallowa Whitman National Forest



PROJECT SHEET OVERVIEW



Upper Phase 1 Reach

SHEET 10

GRANDE RONDE RIVER

SHEET 9

SHEET 8

FLY CREEK

Spool Cart Campground

SHEET 7

Fly Creek Confluence

SHEET 6

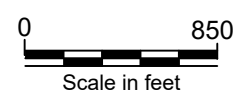
Approx USFS Boundary  
& Lowermost Phase 1 Reach

**LEGEND**

- USFS Highway 51
- Grande Ronde River Centerline & Station
- Stream Flow Direction
- Materials Stockpile
- Wood Structure Type

Large Wood Structures

Type A	Type B
Type C	Type D
Type E	Type F



CONTOUR INTERVAL 1FT BASED ON 2012 LiDAR DATA

**GENERAL CONTRACTOR REQUIREMENTS**

Work shown on these plans will be performed for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), herein referred to as "Contracting Agency." Contact information for Contracting Agency's representative is included on these construction drawings. Contracting Agency's representative (or other persons assigned by Contracting Agency to act as Contracting Agency's representative) are herein referred to as the "Contracting Officer."

The Contractor shall conduct stream enhancement construction in accordance with the plans stamped "Approved for Construction." These plans will be provided to the Contractor by the Contracting Agency prior to construction. Work shall not be done without the current set of approved construction plans.

The project designs depicted herein are approximate and are intended to express the overall design intent of the project. These designs may need to be adjusted in the field during construction in order to meet the specific site conditions and intended function. Adjustments are to be authorized by the Contracting Officer.

The Contractor shall pursue work in a continuous and diligent manner to ensure timely completion of the project per construction subcontract.

The Contractor shall be responsible for the general safety during construction, and all work shall conform to pertinent safety regulations and codes. The Contractor shall be solely and completely responsible for compliance with all applicable provisions of OSHA and OAR Chapter 437, in the construction practices for all employees directly engaged in the construction of this project.

All material and workmanship furnished on or for this project must meet the minimum requirements of project permits, approving agencies, specifications as set forth herein, or whichever is more restrictive.

Contractor shall be responsible for obtaining, at Contractor's expense, all construction permits as required by local, state and federal agencies. Contractor shall provide all material, labor, and equipment required to comply with all applicable permit conditions and requirements.

Prior to commencement of work, Contractor shall provide the Contracting Agency with a detailed construction schedule and work plan for approval. The Contractor shall not begin any construction work until the construction schedule and work plan is approved by the Contracting Officer.

Project design drawings and specifications represent the construction documents. Any deviations from these drawings and associated specifications without written approval from the Contracting Officer may result in this project not meeting specifications and may affect the terms and conditions of the construction contract.

All existing conditions are to be verified in the field prior to construction and any adjustments to the drawings shall be made as directed by the Contracting Officer.

Excavation, grading, and trenching shall be the responsibility of the contractor performing the work. The design drawings are not intended to provide means or methods of construction.

All excess materials and excavation to be placed at location identified by the Contracting Officer with coordination with the contractor.

**Existing Data & Coordinate System**

Elevations and distances shown are in feet and decimals.

Horizontal datum is US State Plane Coordinate System, Oregon North Zone, NAD 83, International Feet. The vertical datum is NAVD 88, feet.

Topographic mapping along the Grande Ronde River is based on LIDAR and CHAMPs Survey Data. The geometry of the stream at the time of construction could be different than shown on these plans due to channel evolution.

**Aquatic Restoration Activities Biological Opinion II in States of Oregon and Washington (ARBO II)**

**TERMS AND CONDITIONS AND BEST MANAGEMENT PRACTICES**

The Contractor will comply with the General Aquatic Conservation Measures and Project Design Criteria in the NOAA Fisheries ARBO II that requires the utmost care is taken when construction activity is taking place in or near the waterway.

All work within the actively flowing Grande Ronde River and Fly Creek channels shall occur only within designated in-water work window (July 1 – July 31)

Anytime work occurs within the actively flowing channel, the Contractor shall monitor in-stream turbidity once per hour at a location 100 feet downstream of the construction activity using turbidity monitoring equipment provided by the Contracting Officer.

In-stream turbidity shall be limited to levels listed in permits and specifications, and the Contractor shall modify work procedures if necessary comply with specifications. The Contracting Officer will assist the Contractor during initial measurements to ensure testing equipment is used correctly. The Contractor will be responsible for all measurements and maintain a log that documents date, time, and turbidity level of all measurements taken.

The Contractor shall install and maintain appropriate sediment control devices throughout the project site, including the construction staging area and stockpile area if there is potential for impacting waters of the State. Temporary construction and permanent erosion control measures shall be designed, constructed and maintained in accordance with all applicable local, state

and federal regulations.

Discharges entering active streams on site shall satisfy all state and federal standards and project permit requirements for contaminants and turbidity.

**Work Area Isolation, Fish Rescue and Avoidance**

In-water work will be completed during in-water work window identified above.

Work area isolation and fish rescue, if necessary, will include a combination of techniques based on individual treatment sites and presence of fish. Activities may include block netting, seining work areas to relocate fish from immediate work areas, and limited electrofishing.

Project site may include presence of freshwater mussels which will be surveyed prior to project construction. Documented mussel beds will be avoided where feasible and salvaged/transplanted as necessary to construct project.

Contractor and CO will coordinate during construction to schedule fish rescue and isolation of individual work sites.

**Site and Resource Protection**

Construction will be proceed with emphasis on minimizing damage to riparian and wetland vegetation. Contractor and CO will coordinate closely on equipment access and staging areas to minimize impacts on existing vegetation. Access, staging, and construction sites will be reviewed onsite by Contractor and CO to define access and flag vegetation that needs to be cleared .

Trees, shrubs and sod expected to be damaged by access and/or construction will be carefully cleared and stored for re-use/replanting.

**Cultural Resources Inadvertent Discovery**

- If construction work comes into contact with any of the following cultural resources:
  - Native American cultural artifacts (flakes, arrowheads, stone tools, bone tools, pottery, etc.)
  - Historic era artifacts (building foundations, homesteads, mining camps, etc)
  - Human skeletal remains and bone fragments:

Ground disturbing construction in the area must immediately discontinue. Do not touch or move the objects and maintain the confidentiality of the site. Follow procedures listed in the BPA Inadvertent Discovery Procedure and await further direction from BPA's Cultural Resource Staff.

**Utilities**

The CTUIR makes no representation as to the existence or non-existence of utilities. It is the responsibility of Contractor to comply with the provisions of ORS 757.541 to 757.571. Contractor will be liable for any damage resulting from disruption of service caused by construction activities. The telephone number for utility locates is 1-800-424-5555.

**Project Material Notes and Specifications**

Prior to commencement of work, Contractor shall provide the Contracting Agency with a detailed schedule and work plan for materials acquisition and delivery to designated material stockpile locations. Materials acquisition plan will be approved by Contracting Officer.

Contractor shall confirm the access point, route(s), and locations of temporary staging and storage areas with the Contracting Officer prior to transporting materials and equipment to the project site.

Project design drawings and specifications represent the construction documents. Any deviations from these drawings and associated specifications without written approval from the Contracting Officer may result in this project not meeting specifications and may affect the terms and conditions of the construction contract.

All existing conditions are to be verified in the field prior to construction and any adjustments to the drawings shall be made as directed by the Contracting Officer.

All excess materials and excavation to be placed at location identified by the Contracting Officer with coordination with the contractor.

Date	May 2019
Designed	A. Childs S. Welch
Drawn	A. Childs
Checked	
Approved	
Title	

MIDDLE UPPER GRANDE RONDE  
 Fish Habitat Enhancement Project  
 Union County, OREGON  
 Confederated Tribes of the Umatilla Indian Reservation &  
 Wallowa Whitman National Forest

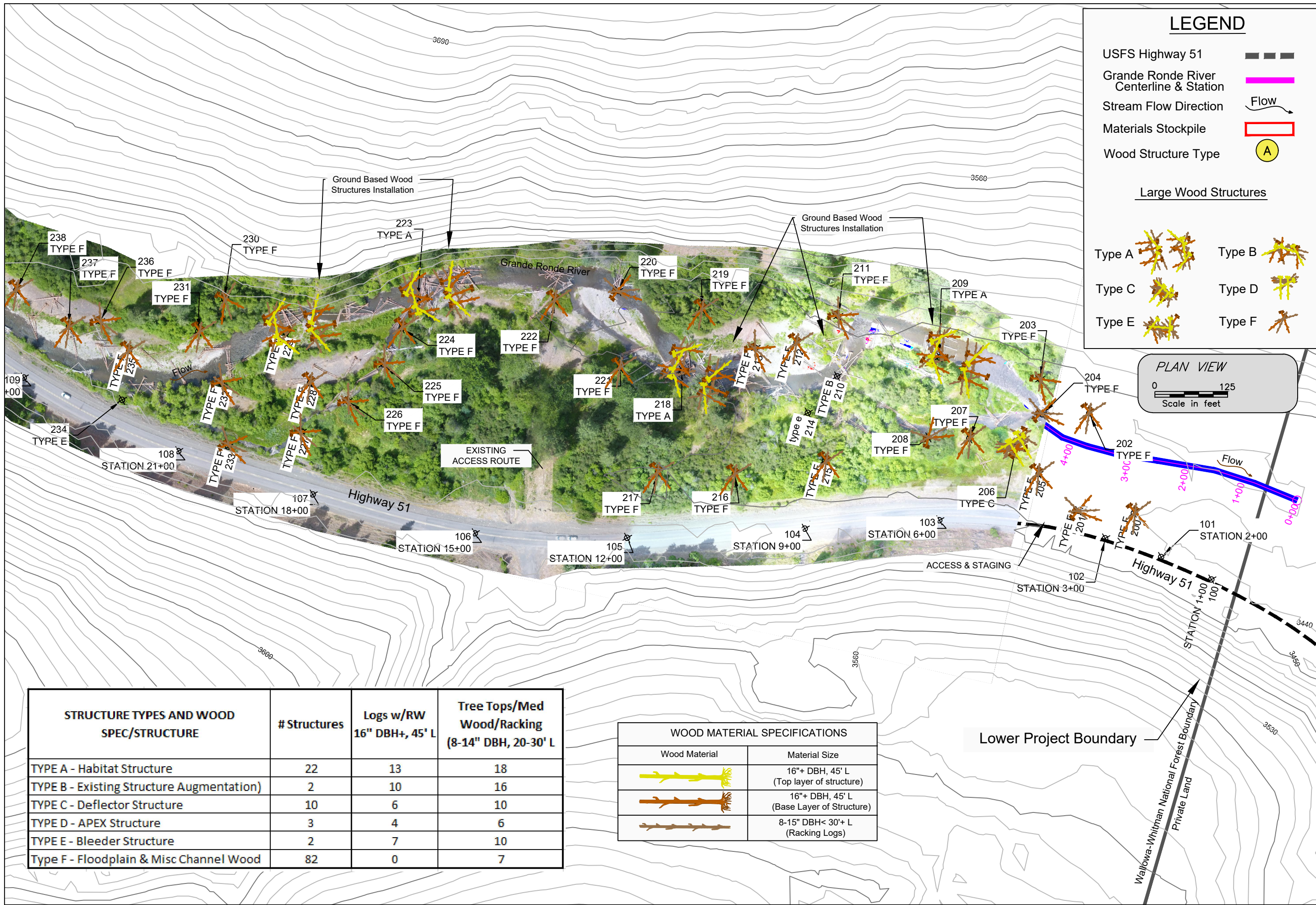


NOTES









### LEGEND

- USFS Highway 51
- Grande Ronde River Centerline & Station
- Stream Flow Direction
- Materials Stockpile
- Wood Structure Type

#### Large Wood Structures

- Type A
- Type B
- Type C
- Type D
- Type E
- Type F

**PLAN VIEW**

0 125

Scale in feet

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

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)

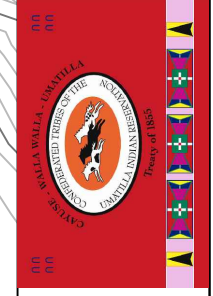
Date  
May 2019

Designed A. Childs/S. Welch  
May 2019

Drawn A. Childs  
May 2019

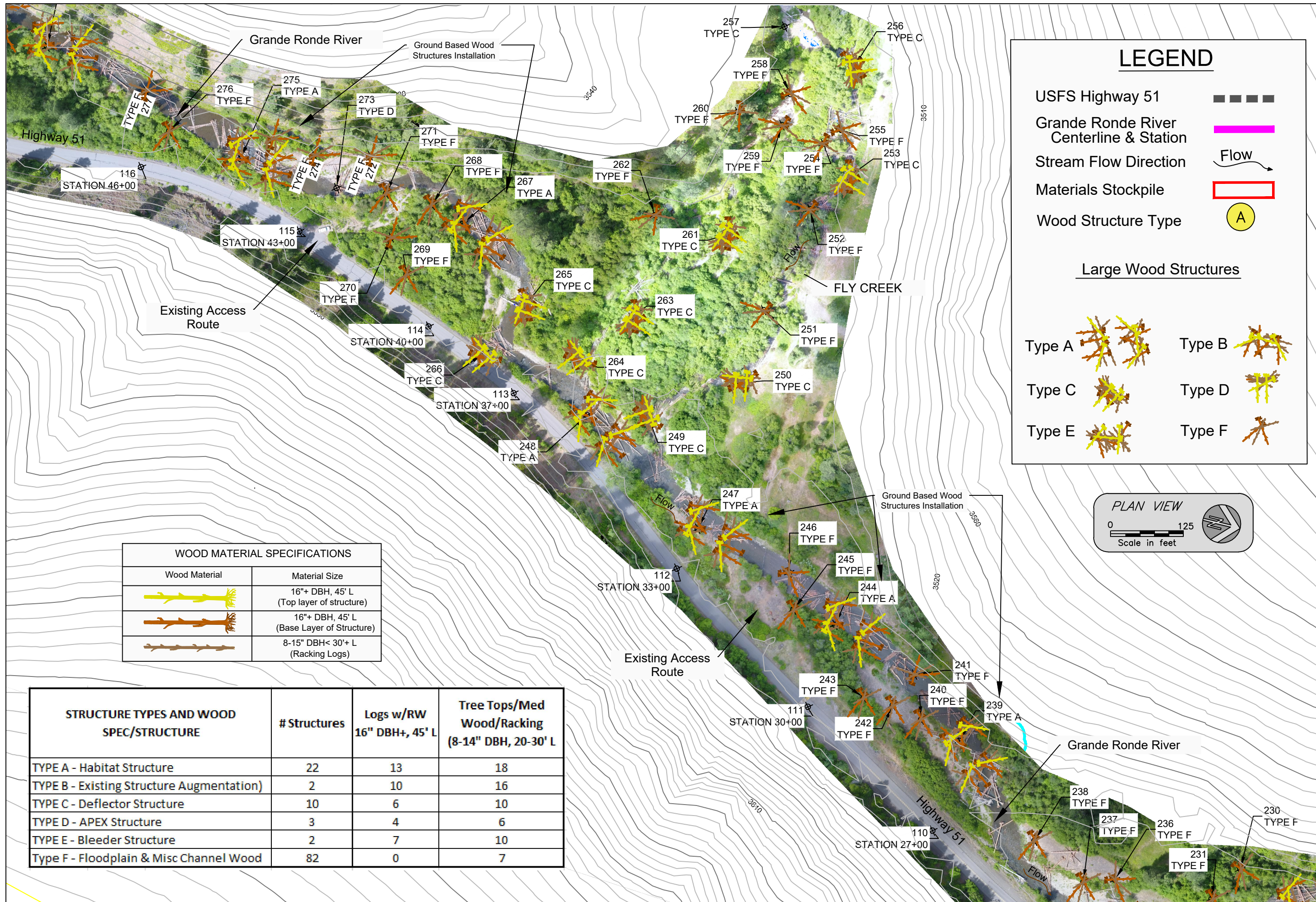
Checked  
Approved  
Title

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union COUNTY, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa-Whitman National Forest



PLANVIEW STATIONS  
0+00 - 24+50





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)

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)
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TYPE E - Bleeder Structure	2	7	10
Type F - Floodplain & Misc Channel Wood	82	0	7

### LEGEND

USFS Highway 51   
 Grande Ronde River Centerline & Station   
 Stream Flow Direction  Flow   
 Materials Stockpile   
 Wood Structure Type A

#### Large Wood Structures

Type A	Type B
Type C	Type D
Type E	Type F

PLAN VIEW

0 125

Scale in feet

Date	May 2019	Designed	A. Childs/S. Welch	Checked	Approved	Title
	May 2019		A. Childs			

MIDDLE UPPER GRANDE RONDE

Fish Habitat Enhancement Project

Union County, OREGON

Confederated Tribes of the Umatilla Indian Reservation & Wallowa-Whitman National Forest

PLANVIEW STATIONS  
24+50 - 48+50

Sheet 7 of 16





### LEGEND

- USFS Highway 51
- Grande Ronde River Centerline & Station
- Stream Flow Direction  Flow
- Materials Stockpile
- Wood Structure Type A

#### Large Wood Structures

Type A	Type B
Type C	Type D
Type E	Type F

PLAN VIEW

0  125

Scale in feet

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)
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TYPE E - Bleeder Structure	2	7	10
Type F - Floodplain & Misc Channel Wood	82	0	7

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)

Date May 2019

Designed A. Childs/S. Welch

Drawn A. Childs

Checked \_\_\_\_\_

Approved \_\_\_\_\_

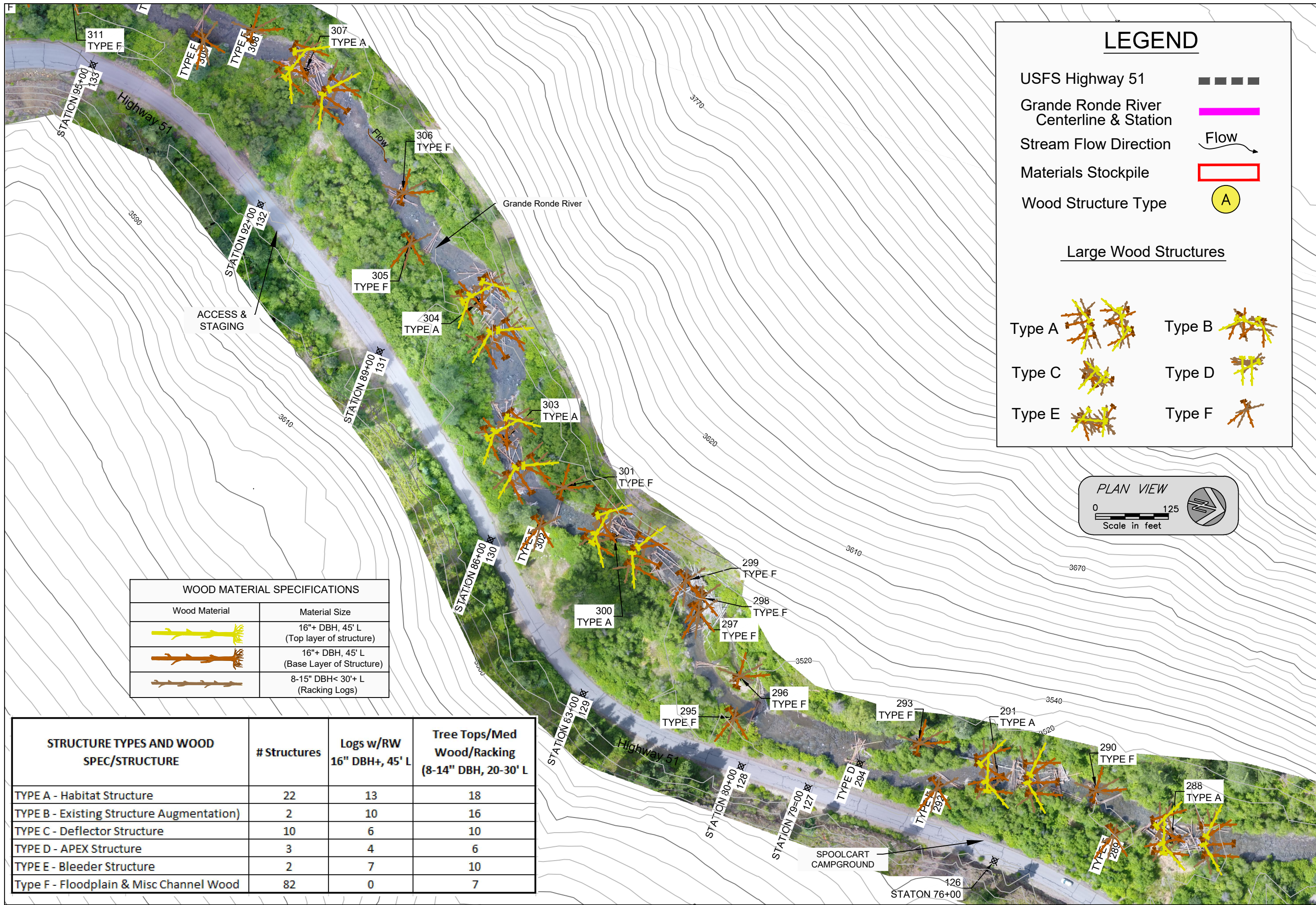
Title \_\_\_\_\_

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union County, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa-Whitman National Forest



PLANVIEW  
STATIONS  
48+50 - 71+50





### LEGEND

USFS Highway 51

Grande Ronde River Centerline & Station

Stream Flow Direction  Flow

Materials Stockpile

Wood Structure Type A

#### Large Wood Structures

Type A	Type B
Type C	Type D
Type E	Type F

WOOD MATERIAL SPECIFICATIONS	
Wood Material	Material Size
	16"+ DBH, 45' L (Top layer of structure)
	16"+ DBH, 45' L (Base Layer of Structure)
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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)
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TYPE C - Deflector Structure	10	6	10
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TYPE E - Bleeder Structure	2	7	10
Type F - Floodplain & Misc Channel Wood	82	0	7

PLAN VIEW

0  125

Scale in feet

Date	May 2019	Designed	A. Childs/S. Welch	Drawn	A. Childs
Checked		Approved		Title	

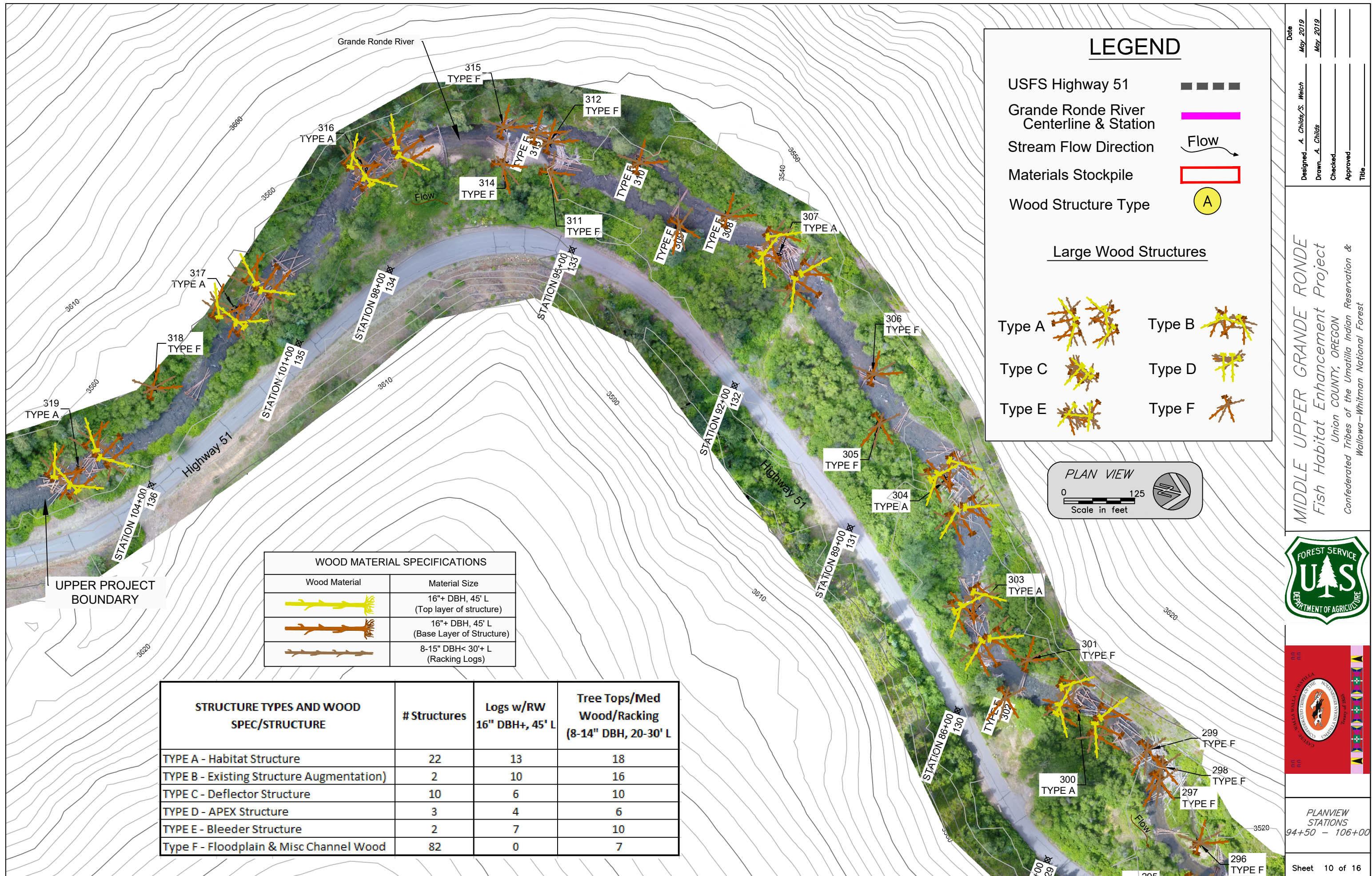
MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project

Union COUNTY, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa-Whitman National Forest

PLANVIEW STATIONS  
71+50 - 94+50

Sheet 9 of 16





### LEGEND

USFS Highway 51   
 Grande Ronde River Centerline & Station   
 Stream Flow Direction  Flow ➤  
 Materials Stockpile   
 Wood Structure Type A

#### Large Wood Structures

Type A	Type B
Type C	Type D
Type E	Type F

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)

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)
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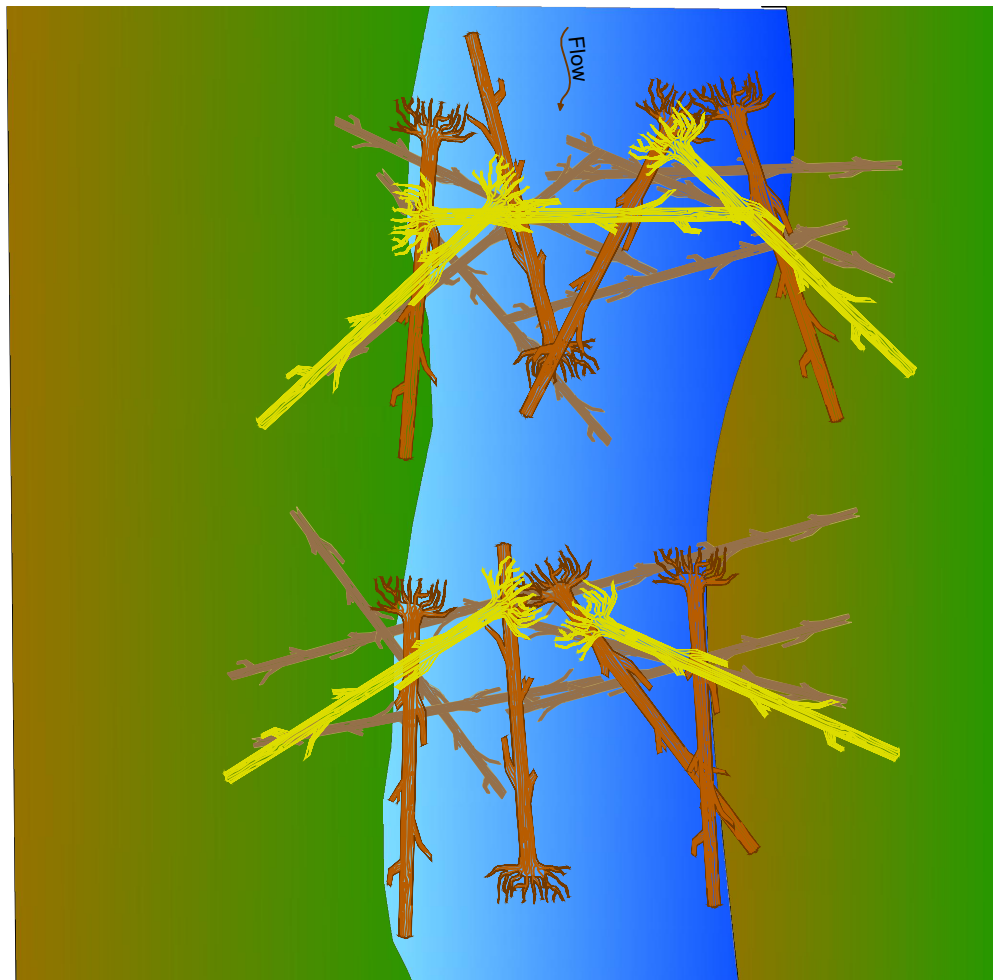
PLAN VIEW

0  125

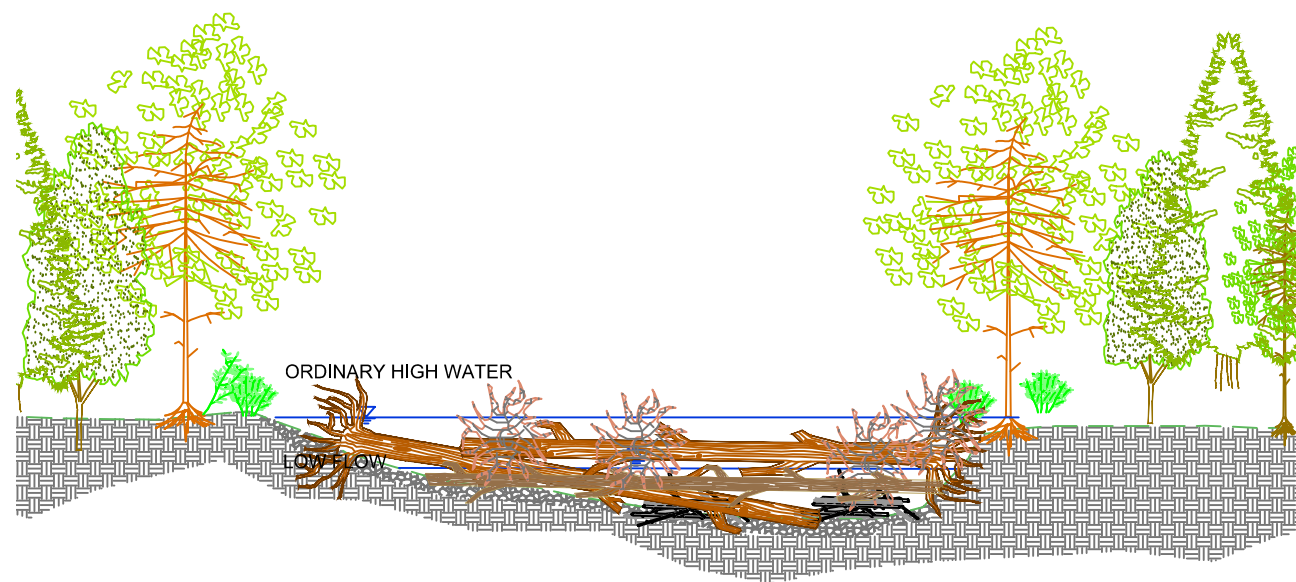
Scale in feet

Date	May 2019	Designed	A. Childs/S. Welch	Checked	A. Childs	Approved	May 2019	Title	
<p style="margin: 0;"><b>MIDDLE UPPER GRANDE RONDE</b></p> <p style="margin: 0;"><i>Fish Habitat Enhancement Project</i></p> <p style="margin: 0; font-size: 0.8em;">Union COUNTY, OREGON</p> <p style="margin: 0; font-size: 0.7em;">Confederated Tribes of the Umatilla Indian Reservation &amp; Wallowa-Whitman National Forest</p>									
<p style="margin: 0;">PLANVIEW STATIONS 94+50 - 106+00</p>									
<p style="margin: 0;">Sheet 10 of 16</p>									





**1 PLAN VIEW**  
 HORIZ 1" = 30'

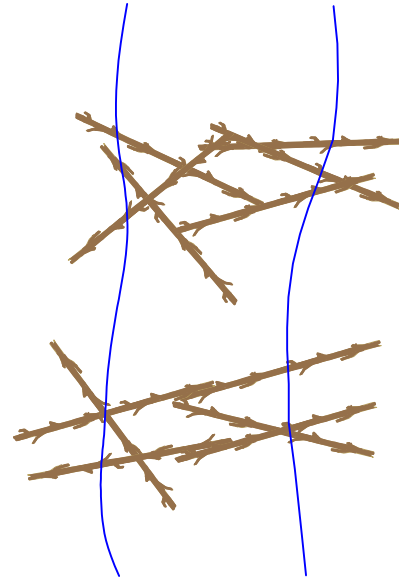


**2 SECTION VIEW**  
 HORIZ 1" = 20'

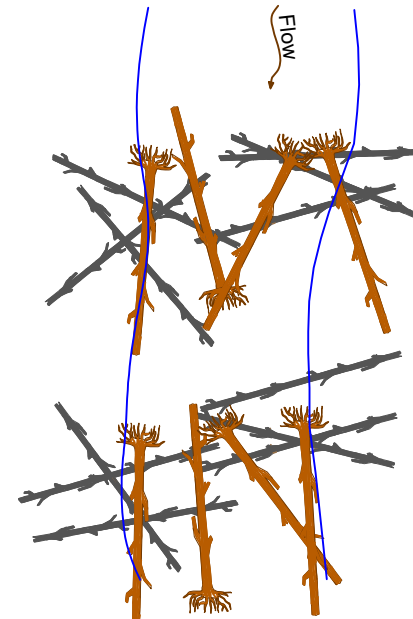
## TYPE A LARGE WOOD STRUCTURE BIOLOGICAL OBJECTIVES - DESIGN INTENT

- 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.

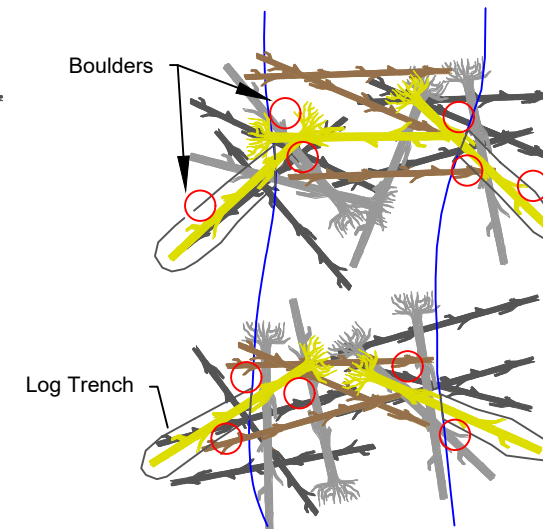
STEP 1 - Install small logs/racking material on streambed as shown to form base of wood structure



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

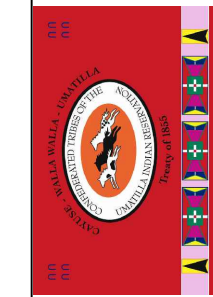
1. WOOD MATERIAL SHALL COME FROM FIR, SPRUCE, LODGEPOLE PINE, OR PINE TREES.
2. LOCATION OF WOOD STRUCTURE SHALL BE STAKED AT EACH LOCATION BY CO.
3. WOOD STRUCTURE SHALL BE CONSTRUCTED EITHER BY TRACK MOUNTED EXCAVATOR, HELICOPTER, AND/OR A COMBINATION OF THE TWO BASED ON GROUND-BASED ACCESS FEASIBILITY.
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

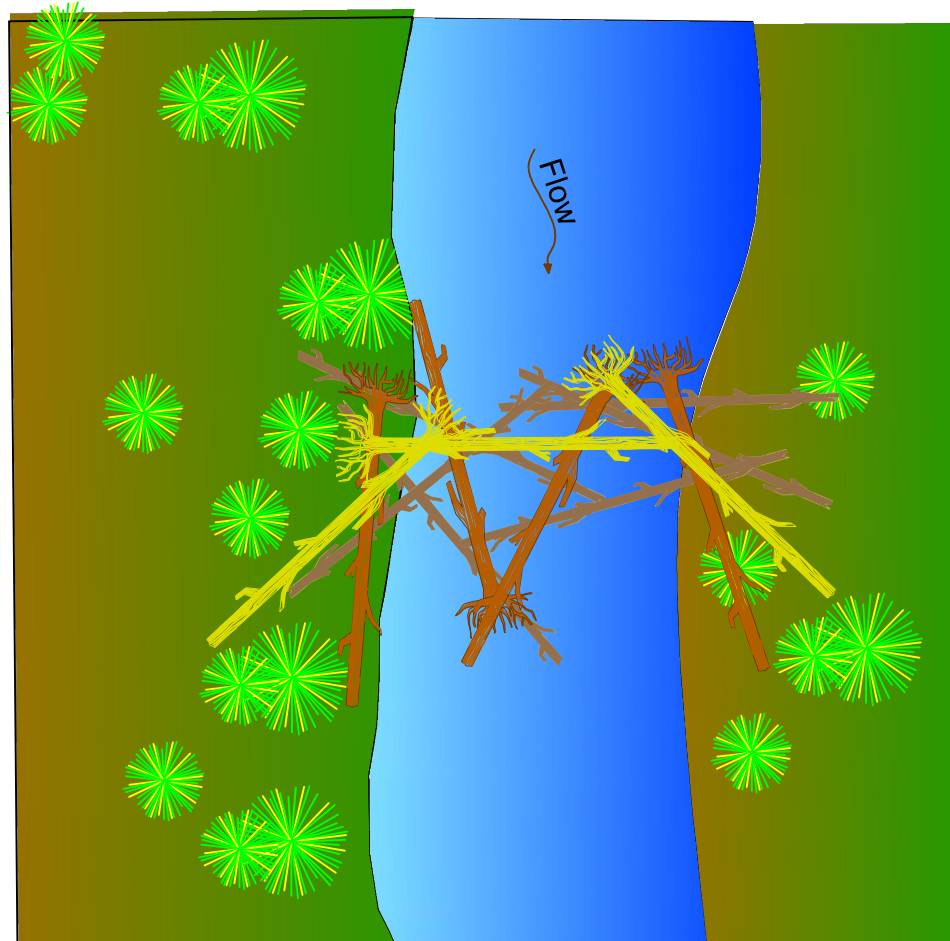
Designed	A. Childs/S. Welch	Date	May 2019
Drawn	A. Childs	Checked	May 2019
Approved		Title	

MIDDLE UPPER GRANDE RONDE  
 Fish Habitat Enhancement Project  
 Union County, OREGON  
 Confederated Tribes of the Umatilla Indian Reservation &  
 Wallowa Whitman National Forest

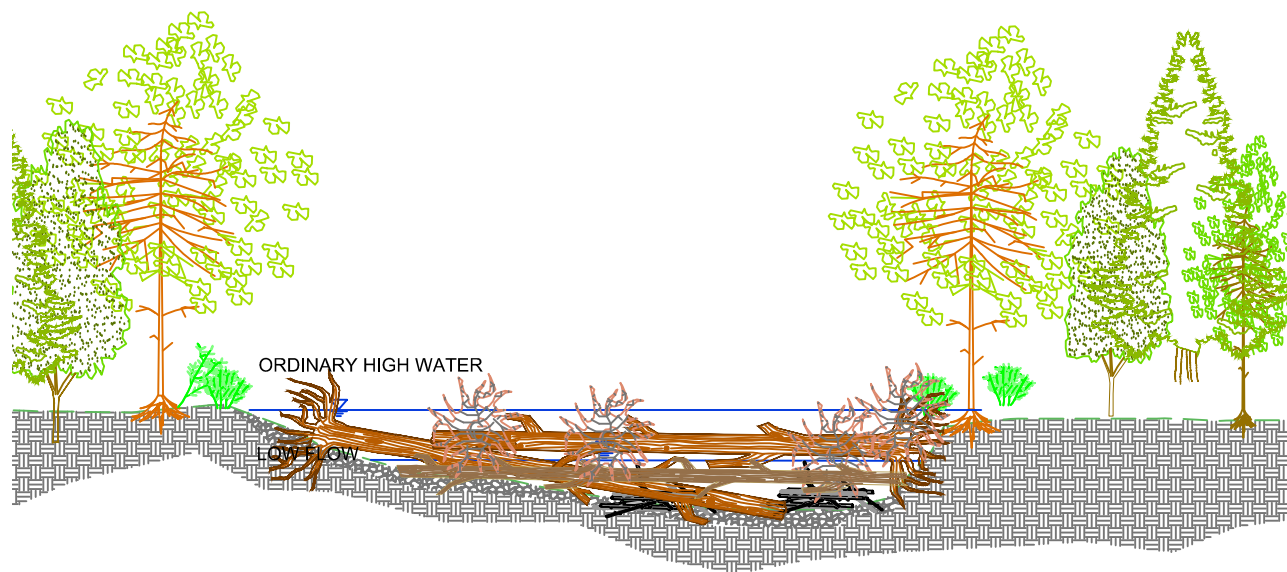


TYPE A Structure





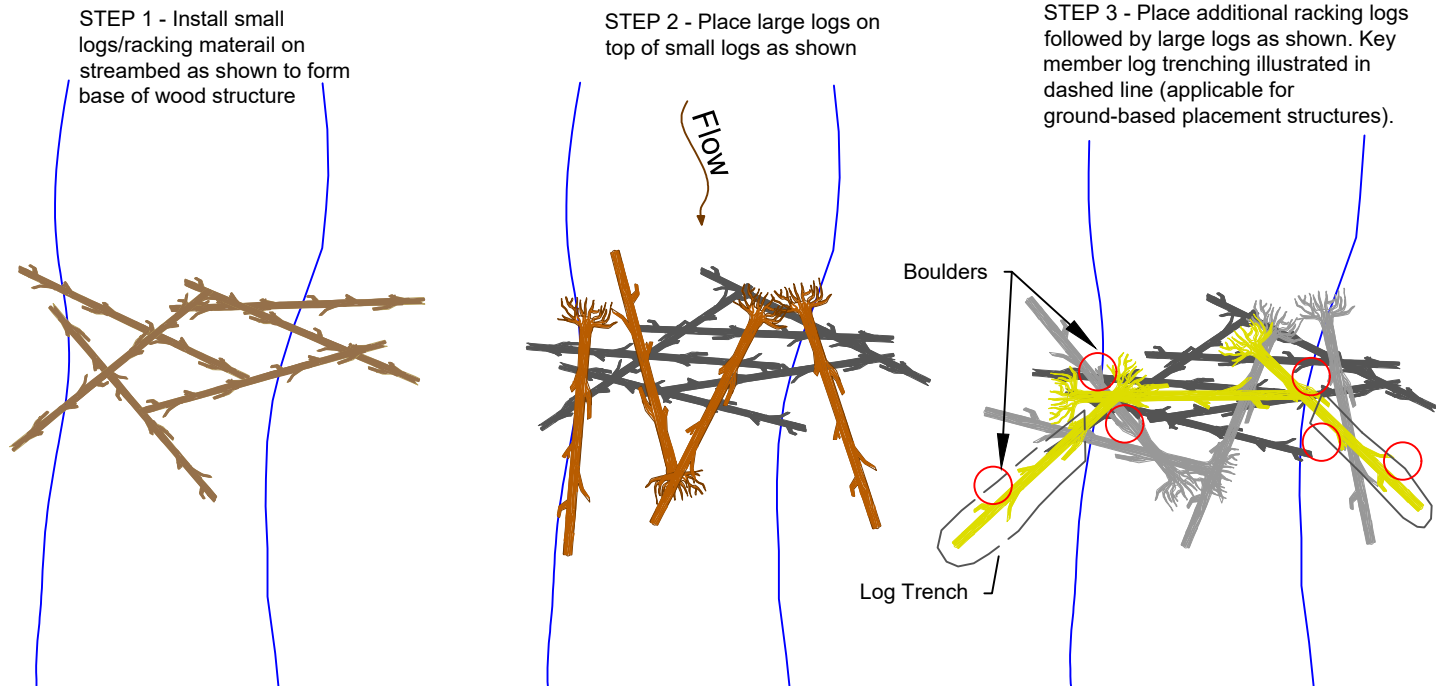
**1 PLAN VIEW**  
HORIZ 1" = 30'



**2 SECTION VIEW**  
HORIZ 1" = 20'

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

- PURPOSE OF TYPE B IS THE SAME AS A TYPE A LARGE WOOD STRUCTURE. ADD STRUCTURAL COMPLEXITY THAT INCREASES WATER SURFACE ELEVATION AND DEPTH, DECREASES WATER VELOCITY, PROMOTE SEDIMENT SORTING AND STORAGE, PROVIDES HABITAT COVER AND DIVERSITY, 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 AND PROVIDES OVERHEAD COVER, VELOCITY REFUGE, AND ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES.
- TYPE II STRUCTURE IS DESIGNED TO AUGMENT EXISTING CONSTRUCTED LOG STRUCTURES, USING THE KEY MEMBER BASE STRUCTURE AS AN ANCHOR POINT FOR CHANNEL SPANNING TYPE II STRUCTURE.



**3 ASSEMBLY DETAIL**  
HORIZ 1" = 40'

## PROJECT ELEMENT NOTES

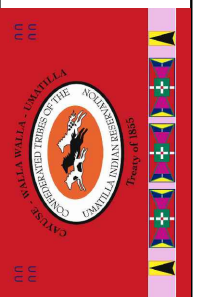
1. WOOD MATERIAL SHALL COME FROM FIR, SPRUCE, LODGEPOLE PINE, OR PINE TREES.
2. LOCATION OF WOOD STRUCTURE SHALL BE STAKED AT EACH LOCATION BY CO.
3. WOOD STRUCTURE SHALL BE CONSTRUCTED EITHER BY TRACK MOUNTED EXCAVATOR, HELICOPTER, AND/OR A COMBINATION OF THE TWO BASED ON GROUND-BASED ACCESS FEASIBILITY.
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)
KEY MEMBER	10	16"+ DBH	~ 45' plus	YES - 5" DIA. MIN.
RACKING LOGS/TOPS	16	8-14"	~ 20-30'	NO

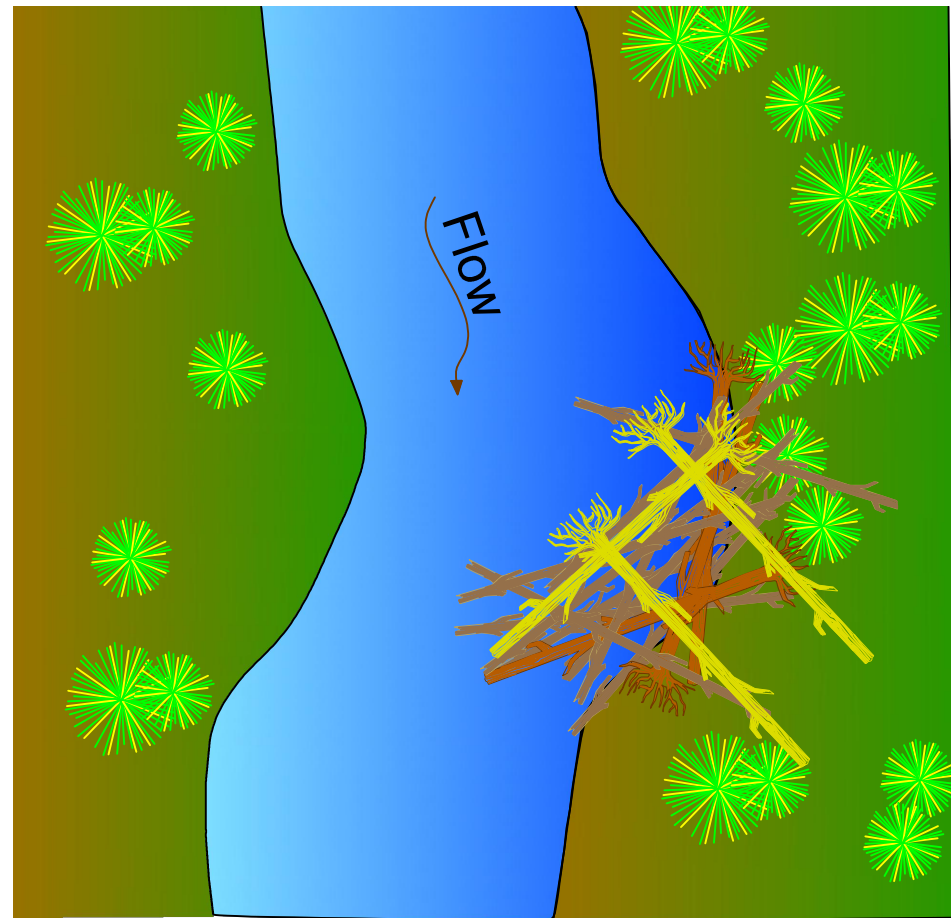
Date	Designed	Drawn	Checked	Approved	Title
May 2019	A. Childs/S. Welch	A. Childs			
May 2019					

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union COUNTY, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest

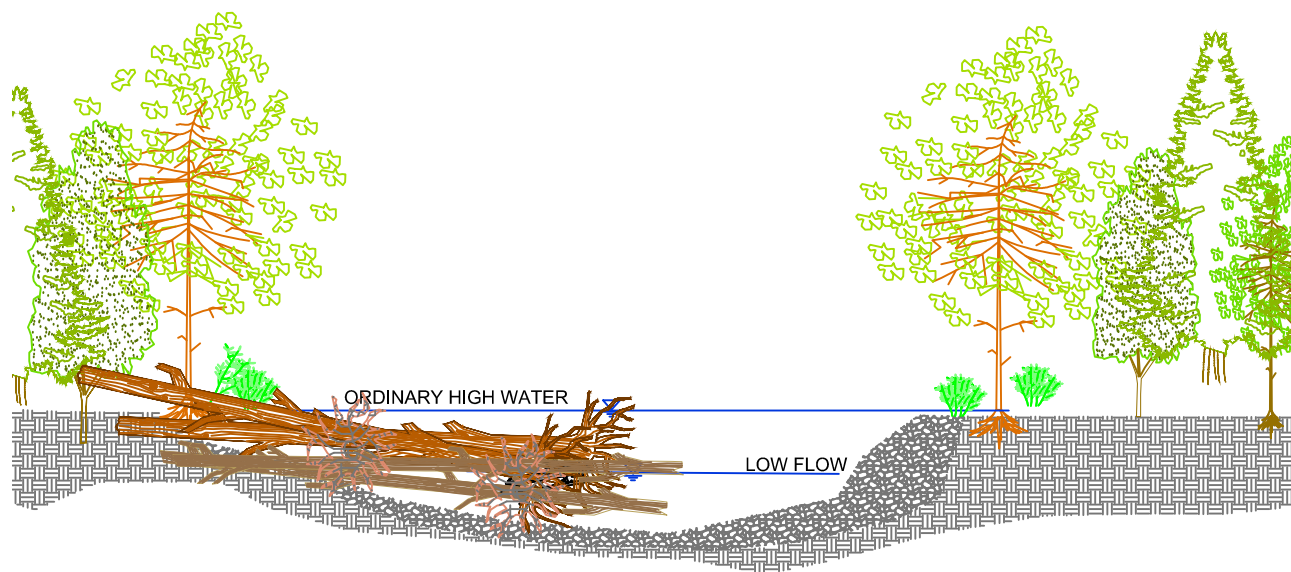


TYPE B Structure





**1 PLAN VIEW**  
HORIZ 1" = 30'



**2 SECTION VIEW**  
HORIZ 1" = 20'

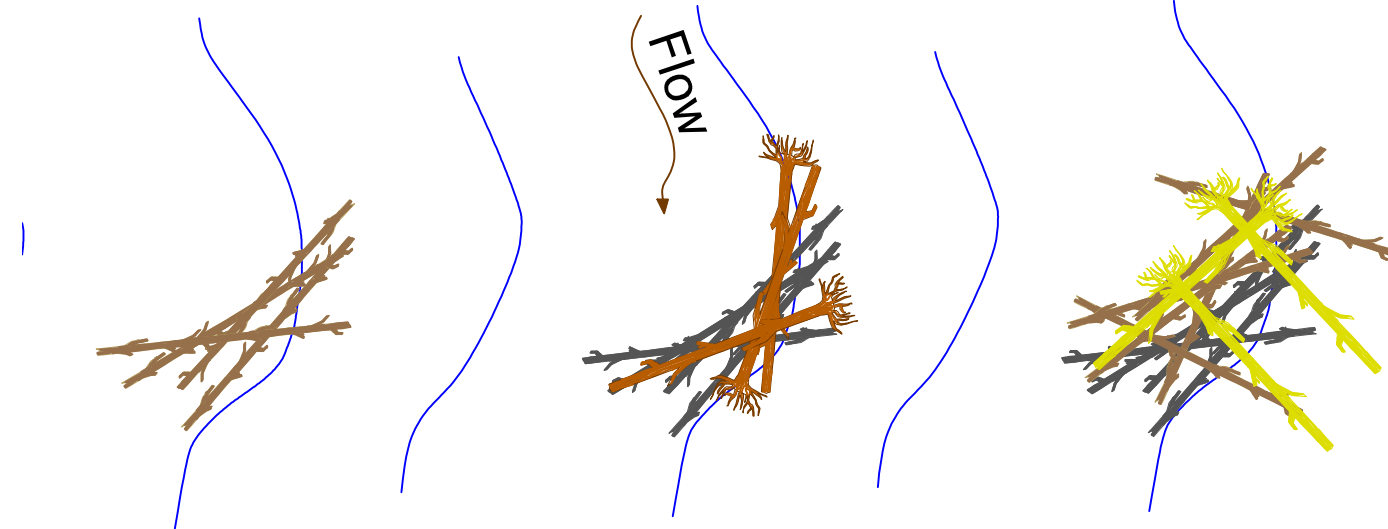
## TYPE C DEFLECTOR LARGE WOOD STRUCTURE BIOLOGICAL OBJECTIVES - DESIGN INTENT

- PURPOSE OF TYPE C DEFLECTOR LARGE WOOD STRUCTURE IS TO CREATE AND MAINTAIN POOL HABITAT AND COMPLEXITY. STRUCTURE MIMICS EXISTING STRUCTURES IN PROJECT REACH THAT HAVE GENERALLY DEVELOPED NATURALLY. DEFLECTOR STRUCTURES ARE DESIGNED TO FORCE ENERGY AWAY FROM NEAR BANK AND CREATE/MAINTAIN POOL SCOUR.
- PROMOTES DEVELOPMENT AND MAINTENANCE OF POOL HABITAT, PROVIDES OVERHEAD COVER, VELOCITY REFUGE, AND ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES.

STEP 1 - Install small logs/racking material 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.



**3 ASSEMBLY DETAIL & SEQUENCE**  
HORIZ 1" = 40'

## 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 BY TRACK MOUNTED EXCAVATOR AND/OR IN CONJUNCTION WITH HELICOPTER 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. BOULDERS WILL BE PLACED TO WEDGE KEY MEMBERS AND PROVIDE BALLAST ON WOOD STRUCTURES ACCESSIBLE BY GROUND BASED CONSTRUCTION EQUIPMENT.

### MATERIAL SCHEDULE

ITEM	QUANTITY	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)
KEY MEMBER	6	16" Plus	~ 45' plus	YES - 5" DIA. MIN.
RACKING LOGS/TOPS	10	8-14"	~ 20-30'	NO

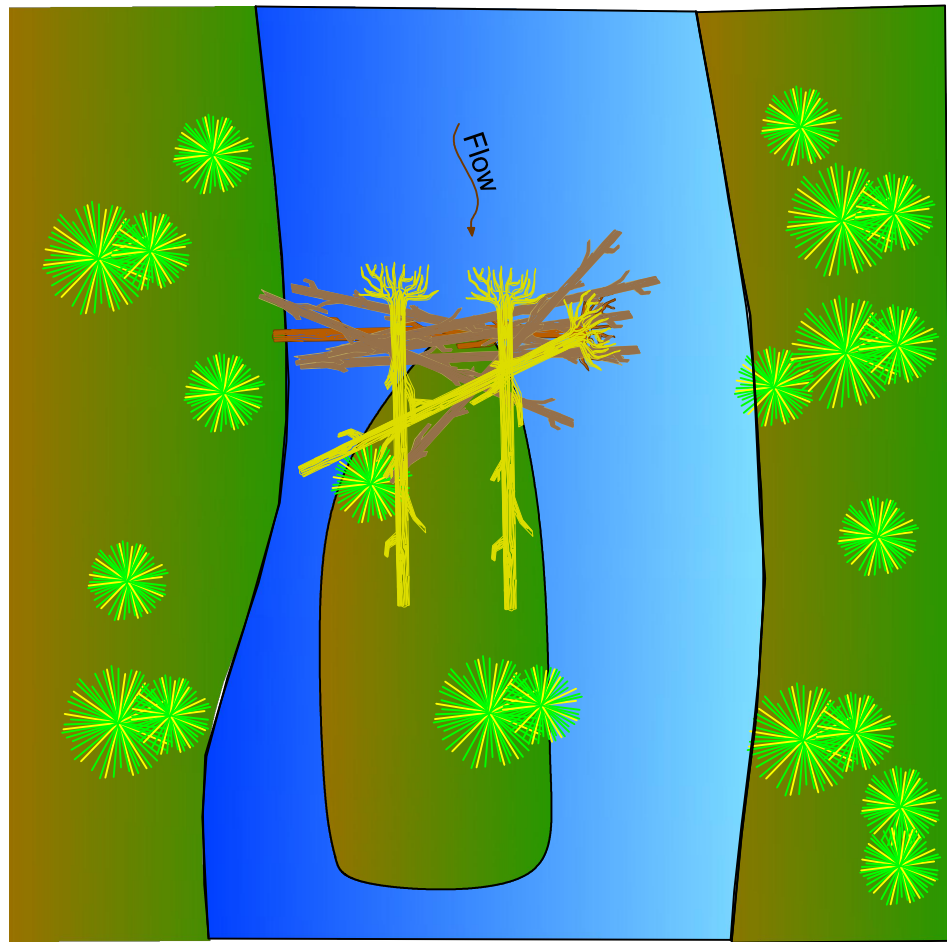
Date	May 2019
Designed	A. Childs/S. Welch
Drawn	A. Childs
Checked	
Approved	
Title	

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union County, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest

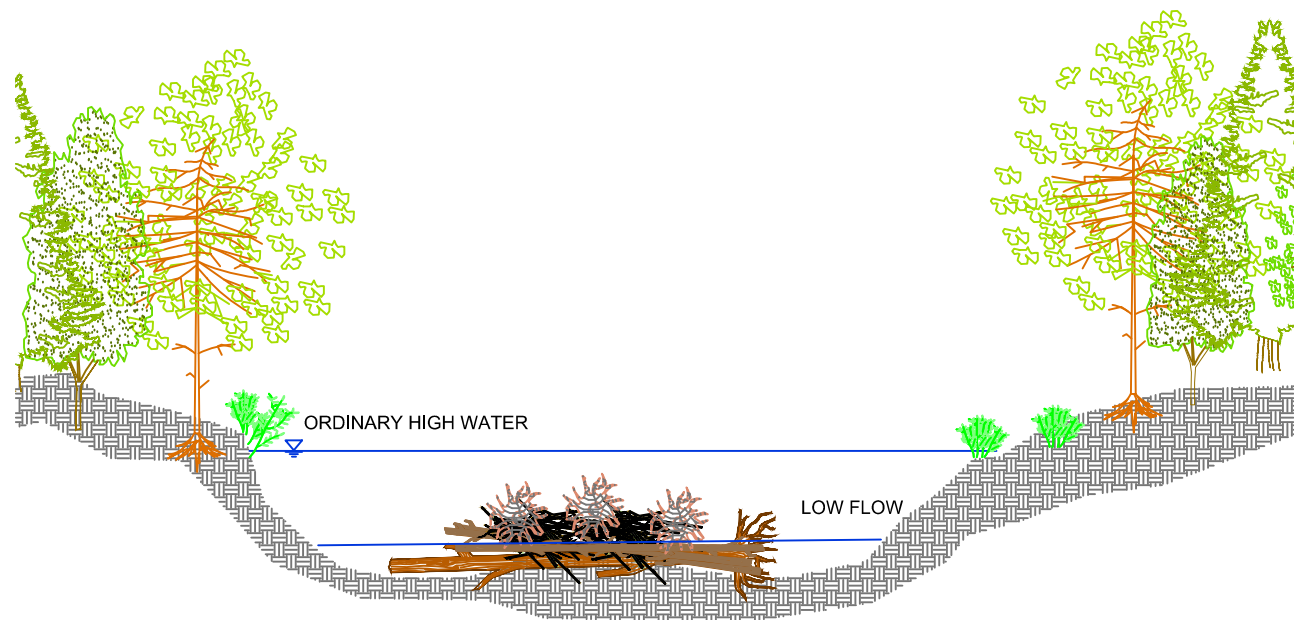


TYPE C Structure





**1 PLAN VIEW**  
HORIZ 1" = 30'



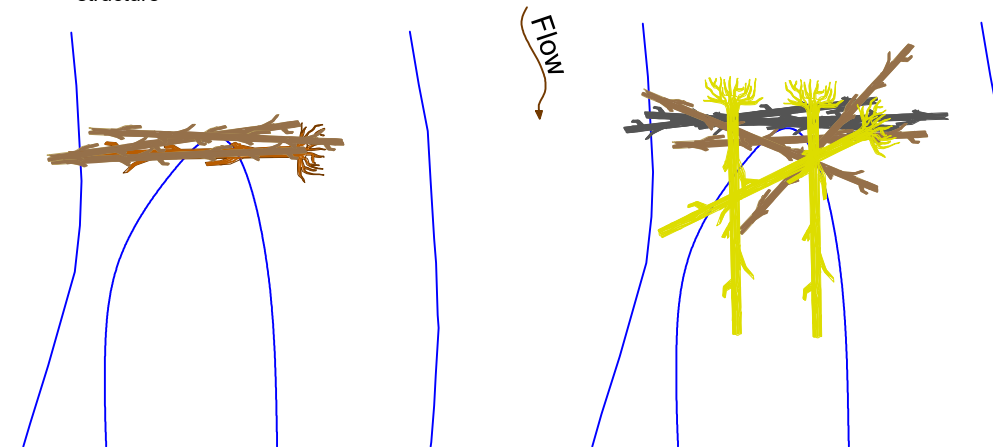
**2 SECTION VIEW**  
HORIZ 1" = 20'

### TYPE D APEX LOG STRUCTURE BIOLOGICAL OBJECTIVES - DESIGN INTENT

- PURPOSE OF TYPE D APEX STRUCTURE IS TO CREATE/MAINTAIN CHANNEL SPLIT FLOW AND SIDE CHANNEL HABITAT.
- PROVIDES HABITAT COMPLEXITY, VELOCITY REFUGE, ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES AND PROMOTES SIDE CHANNEL/PERIPHERAL HABITAT DEVELOPMENT AND MAINTENANCE.

STEP 1 - Install small base, large log and logs/racking material on streambed as shown to form base of wood structure

STEP 2 - Place additional racking logs followed by large logs as shown.



**3 ASSEMBLY DETAIL**  
HORIZ 1" = 40'

### 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 BY TRACK MOUNTED EXCAVATOR AND/OR IN CONJUNCTION WITH HELICOPTER 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.

#### MATERIAL SCHEDULE

ITEM	QUANTITY	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)
KEY MEMBER	4	20" Plus	~ 45' plus	YES - 5" DIA. MIN.
RACKING LOGS/TOPS	6	8-14"	~ 20-30'	NO

Date	May 2019
Designed	A. Childs/S. Welch
Drawn	A. Childs
Checked	
Approved	
Title	

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union County, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest

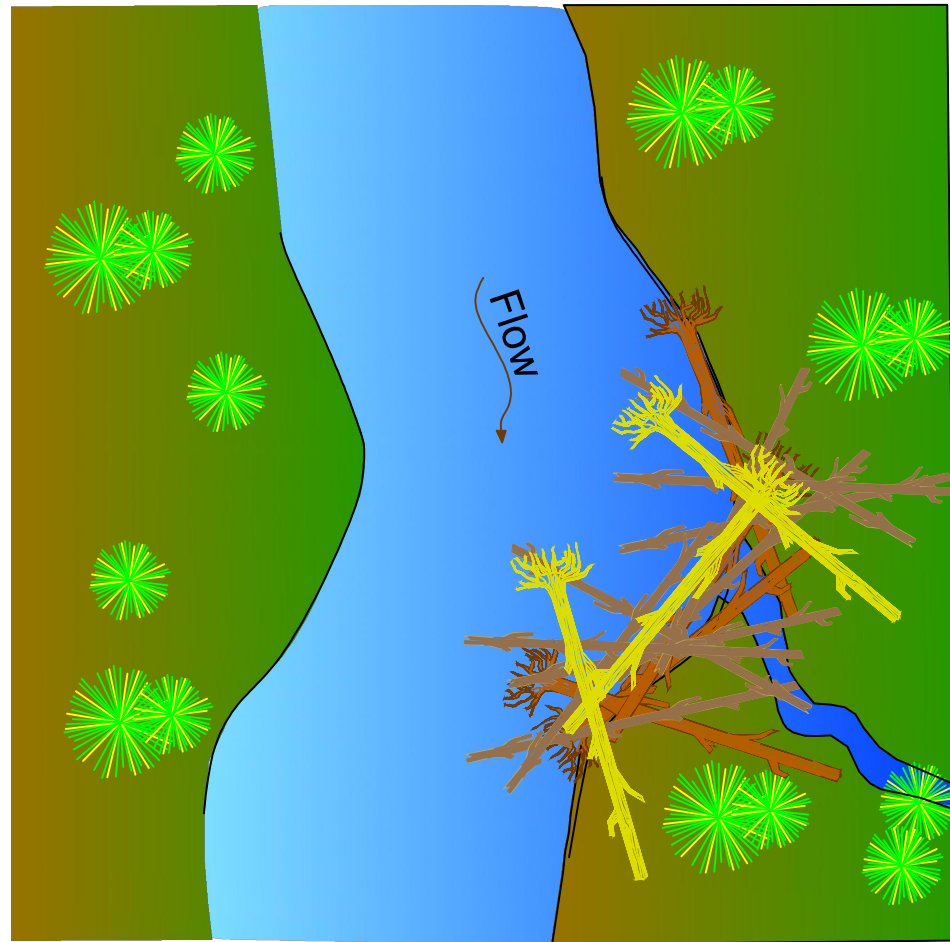


TYPE D Structure



## TYPE E BLEEDER STRUCTURE BIOLOGICAL OBJECTIVES - DESIGN INTENT

- PURPOSE OF TYPE E STRUCTURE IS TO PROVIDE CHANNEL ROUGHNESS AND COMPLEXITY, STREAM BANK STABILITY, MANAGE HIGH FLOWS ONTO FLOODPLAIN AND CREATE/MAINTAIN SIDE CHANNEL HABITAT.
- PROVIDES STREAMBANK STABILITY, OVERHEAD COVER, HABITAT COMPLEXITY, VELOCITY REFUGE, AND ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES AND HABITAT REQUIREMENTS FOR NATIVE FISH.



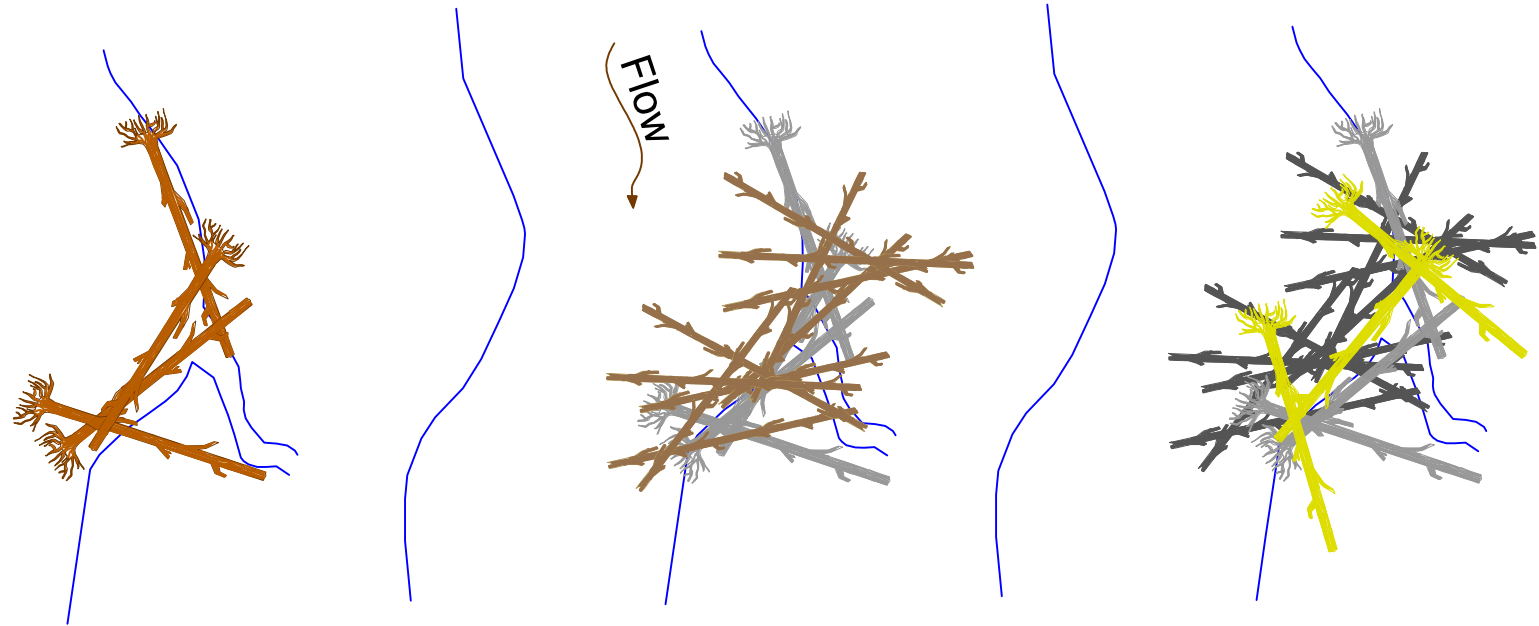
**1 PLAN VIEW**

HORIZ 1" = 30'

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

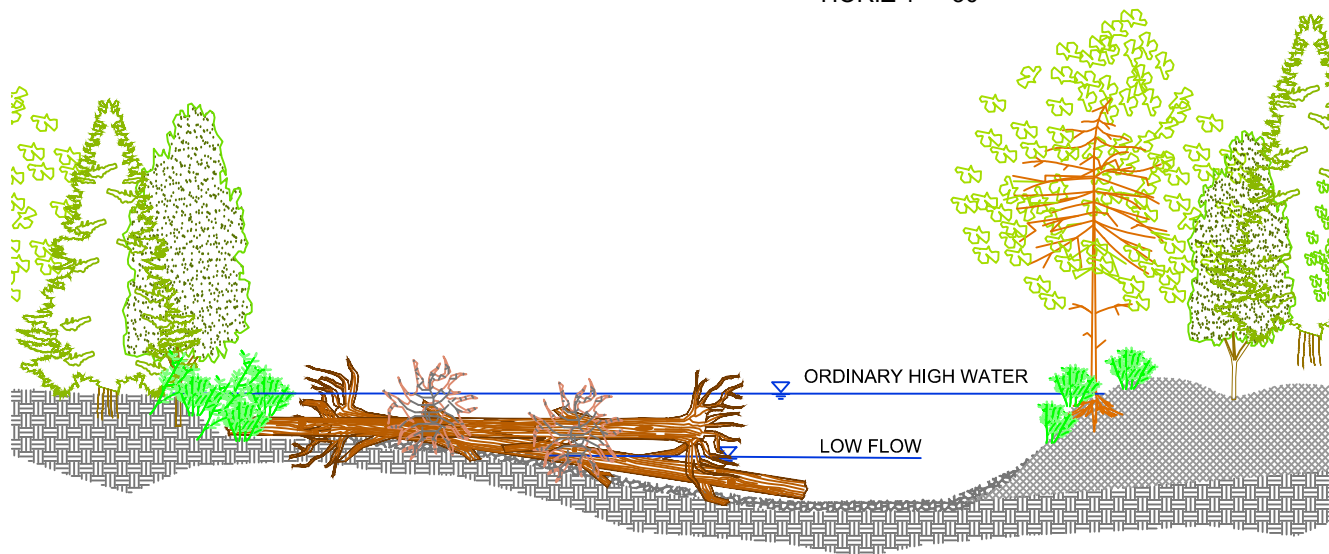
STEP 2 - Place large logs on top of small logs as shown

STEP 3 - Place additional racking logs followed by large logs as shown.



**3 ASSEMBLY DETAIL**

HORIZ 1" = 40'



**2 SECTION VIEW**

HORIZ 1" = 20'

### 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 BY TRACK MOUNTED EXCAVATOR AND/OR IN CONJUNCTION WITH HELICOPTER 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.

#### MATERIAL SCHEDULE

ITEM	QUANTITY	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)
KEY MEMBER	7	16"+	~ 45' plus	YES - 5" DIA. MIN.
RACKING LOGS/TOPS	10	8-15"	~ 20-30'	NO

Designed	A. Childs/S. Welch	Date	May 2019
Drawn	A. Childs	Checked	May 2019
Approved		Title	

**MIDDLE UPPER GRANDE RONDE**  
 Fish Habitat Enhancement Project  
 Union County, OREGON  
 Confederated Tribes of the Umatilla Indian Reservation &  
 Wallowa Whitman National Forest

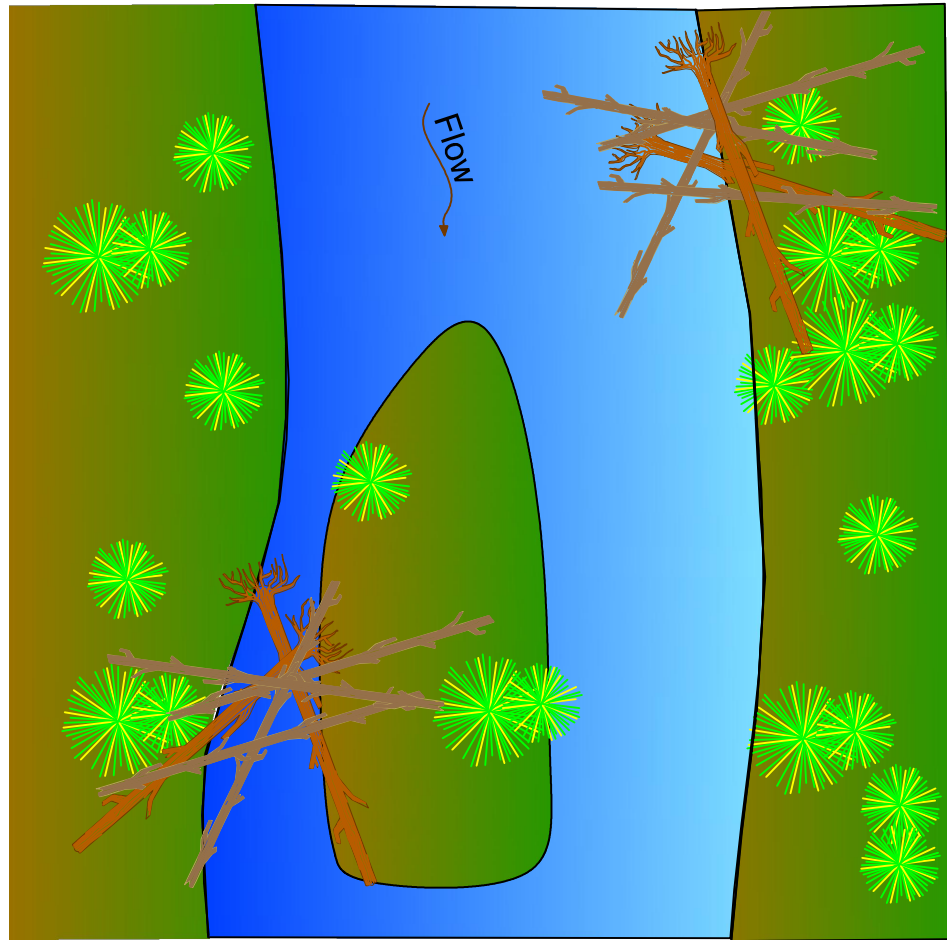


TYPE E Structure

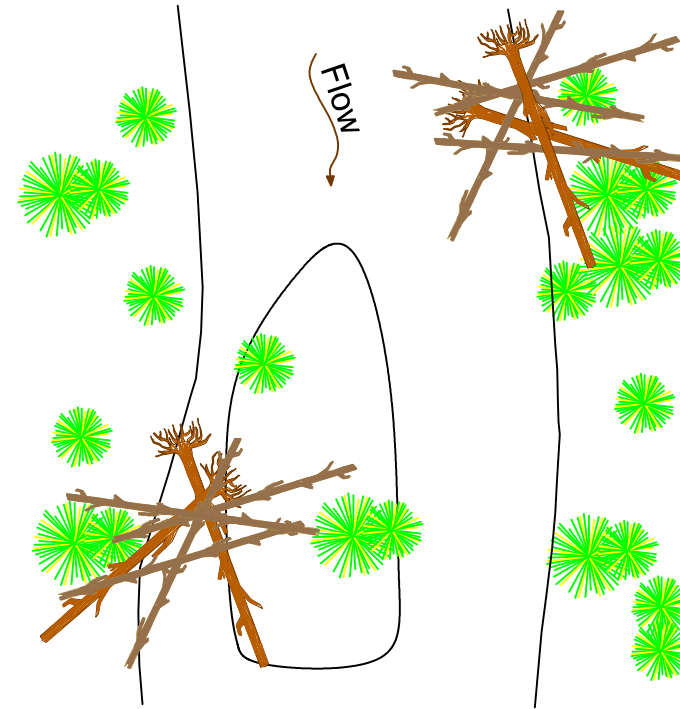


## TYPE F FLOODPLAIN & MISC CHANNEL WOOD OBJECTIVES - DESIGN INTENT

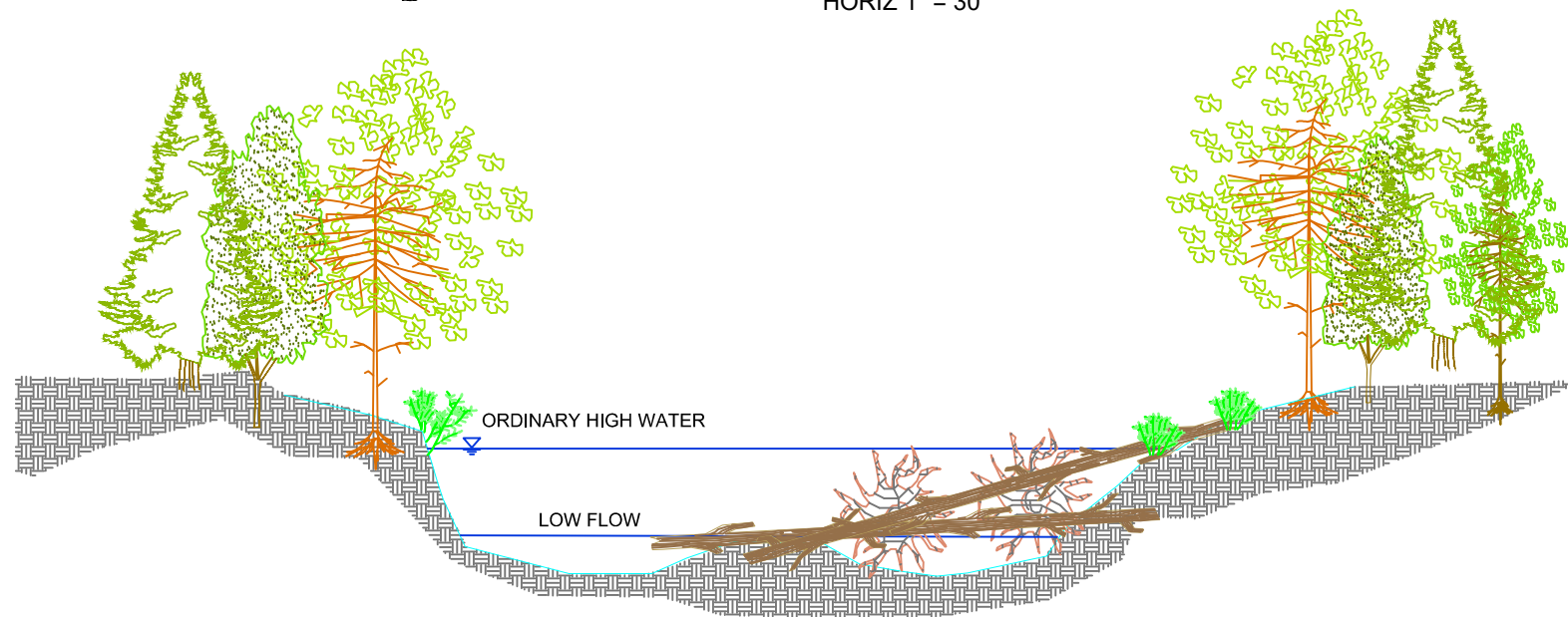
- PURPOSE OF TYPE F STRUCTURE IS TO PROVIDE SIDE CHANNEL AND FLOODPLAIN HABITAT COMPLEXITY AND DIVERSITY. PROVIDES FLOODPLAIN ROUGHNESS, AND SIDE CHANNEL OVERHEAD COVER, VELOCITY REFUGE, AND ORGANIC NUTRIENTS THAT SUPPORT FOOD WEB PROCESSES AND ALL LIFE STAGES OF JUVENILE AND ADULT SALMONID (REARING, HOLDING)



**1 PLAN VIEW**  
HORIZ 1" = 30'



**3 ASSEMBLY DETAIL**  
HORIZ 1" = 40'



**2 SECTION VIEW**  
HORIZ 1" = 20'

### PROJECT ELEMENT NOTES

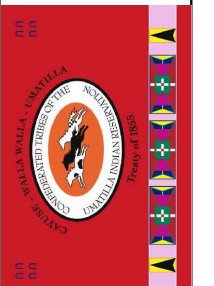
- WOOD MATERIAL SHALL COME FROM FIR, SPRUCE, LODGEPOLE PINE, OR PINE TREES.
- GENERAL LOCATIONS OF TYPE F FLOODPLAIN AND CHANNEL WOOD SHALL BE STAKED AT EACH LOCATION BY CO. WOOD MATERIAL IS INTENDED TO BE MOBILE AND RACK INTO LARGER WOOD STRUCTURES TO IMPROVE ABILITY OF TYPE A AND B STRUCTURES TO BACK UP WATER, INCREASE DEPTH, AND ACTIVATE FLOODPLAIN. WOOD MATERIAL WILL BE PLACED RANDOMLY THROUGHOUT THE PROJECT AS DIRECTED BY CO.
- WOOD STRUCTURE SHALL BE CONSTRUCTED BY TRACK MOUNTED EXCAVATOR AND/OR IN CONJUNCTION WITH HELICOPTER BASED ON GROUND-BASED ACCESS FEASIBILITY.
- STRUCTURE WILL BE CONSTRUCTED USING RACKING MATERIAL AND SMALL TO MEDIUM SIZED LOGS WITH OR WITHOUT ROOTWADS.
- SMALLER LOGS WILL BE PLACED FIRST AND OVERLAIN WITH AT LEAST TWO LARGER RACKING LOG MEMBERS (>12" DBH).
- 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.

#### MATERIAL SCHEDULE

ITEM	QUANTITY	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)
KEY MEMBER	0	16" +	~ 45' plus	YES - 5" DIA. MIN.
RACKING LOGS/TOPS	7	8-15"	~ 20-30'+	Optional

Designed	A. Childs/S. Welch	Date	May 2019
Drawn	A. Childs	Checked	May 2019
Approved		Title	

MIDDLE UPPER GRANDE RONDE  
Fish Habitat Enhancement Project  
Union COUNTY, OREGON  
Confederated Tribes of the Umatilla Indian Reservation &  
Wallowa Whitman National Forest



TYPE F Structure