Site and Reach Assessment
SR 21, South Nanamkin Creek, MP 133.6

Work Order JG6346

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April 12, 2010
Site and Reach Assessment
SR 21 MP 133.6 at South Nanamkin Creek

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Summary

Report findings:

- The problems resulting from avulsion above the road crossing are being caused by aggradation in the reach of South Nanamkin Creek approximately 2500 feet upstream from the confluence with the Sanpoil River.

- The aggradation in the lower reaches of South Nanamkin Creek is aggravated by a significant drop in stream gradient where it enters the Sanpoil River Valley.

- Grade control structures (porous weirs) and the culverts under State Route 21 limit sediment transport and head cuts from moving through the stream channel.

- The culverts at the road crossing are perched above the downstream channel within the alluvial deposits causing fish passage problems.

- The relatively young geomorphologic age of the South Nanamkin Creek watershed results in a very unstable and dynamic stream.

- The lack of large woody debris available in the stream and for recruitment limits the amount of available habitat for aquatic life.

Report recommendations:

- Replacement of the culverts at the road crossing with a fish passable arch or bridge to allow passage of all species at all life stages. Recommend using stream simulation design option for determining minimum clear span of arch or bridge. Consult with Colville Confederated Tribes’ Department of Fish and Wildlife for further design requirements.

- Remove all vertical grade control structures in the reach to allow the stream to naturally progress toward vertical stability and unimpeded sediment transport to closely mimic natural processes and limit the possibility of future avulsion.

- Ensure the new stream crossing structure is founded deep enough to accommodate anticipated scour and head cuts through the reach.
Introduction

This report presents a site and reach assessment for South Nanamkin Creek in the vicinity of its confluence with the Sanpoil River and where crossed by State Route (SR) 21 at milepost (MP) 133.6. South Nanamkin Creek is geographically located in Ferry County on the Colville Indian Reservation within the State of Washington. The crossing of SR 21 over South Nanamkin Creek is located in the Northwest quarter of the Southwest quarter of Section 1 of Township 32 North, Range 32 East of the Willamette Meridian. This site was initially identified by the Colville Confederated Tribes’ (CCT) Fish & Wildlife Department as a fish passage concern (see letter in Appendix 1). The existing culverts under SR 21 along with the large amount of alluvial material make passage through this reach difficult for fish. This site has also been classified by the Washington State Department of Transportation (WSDOT) as a Chronic Environmental Deficiency (CED) because maintenance has been conducted on the site at least 3 times in the previous 10 years and the maintenance being conducted has a negative impact on aquatic fish habitat.

This report provides the site and reach assessment necessary to identify the causal factors for the deficiencies evident and suggest alternatives for correction. The stream has been broken into three sub-reaches to make this report and discussions easier to understand. They are named the “Sediment Transport Reach”, “Upper Reach” and “Lower Reach”. The “Sediment Transport Reach” is the high gradient mountainous reach down to the edge of the valley floor. The “Upper Reach” is the moderate gradient reach across the valley floor from the edge of the valley to the SR 21 crossing. The “Lower Reach” is a very low gradient reach across the valley floor from the SR 21 crossing to the mouth at the San Poil River. To geographically identify the three sub-reaches a map titled Reach Delineation is included in Appendix 1.

The primary deficiency experienced at the site is the horizontal migration and avulsion of the stream in the upper reach. Sediment transport is also a concern in the lower reach downstream from SR 21 where aggradation caused avulsion near the mouth of the stream. This report is developed to assess the condition of the site and reach and provide recommendations to the design team. In no way should it be construed as a design level document and all conclusions and recommendations shall be verified by engineering calculations prior to such use.
Site Assessment

From the standpoint of WSDOT, the site is the culverts under SR 21. The culverts are a 66% fish passage barrier as listed in the WSDOT Fish Passage Inventory, Progress Performance Report dated July 2009. The identified problems with the culverts are water surface drop at the outlet and high velocities indicated by lack of residual substrate through the culverts. The on-site assessment was in concurrence with Washington Department of Fish and Wildlife’s (WDFW) assessment of the fish passage of the crossing utilizing their process for assessing fish passage barriers. As described earlier, the site is also a Chronic Environmental Deficiency because of the high frequency of maintenance at the site and the potential impact of maintenance to the aquatic habitat. The following photo was taken during the site visit in June 2009 of the culverts at the inlet.

Figure 2. Inlet of culverts under SR 21.

Note the angular material (non-native) placed to prevent erosion during larger events when the culverts are presumed to be under pressure flow. Historically the culvert has been a point of sediment deposition because of limited conveyance capacity and reduced velocities in the backwater condition experienced upstream during periods of pressure flow through the culvert. This information was obtained from a phone conversation with Gary Olson, WSDOT Maintenance Lead Tech who has close to 30 years of experience with this segment of SR 21. The existing steel culvert arch pipe is rusting, suggesting it is starting to deteriorate and may develop holes in the near future if it has not already.
The following photo was taken during the site visit in June 2009 of the culverts at the outlet.

Figure 3. Outlet of culverts under SR 21.

The smaller circular culvert is located behind the fence and is shown by a red arrow. The outlets of both culverts are at approximately the same elevation even though the horizontal skew of the smaller culvert moves the outlet farther to the North than the arch pipe. It is unknown why the fence and log cribbing is placed where the discharge from the small culvert is directed into them. This renders the smaller culvert practically useless in terms of fish passage during low flows and hydraulically limited in terms of high flow conveyance.
Reach Assessment

Watershed Conditions and Land Cover

South Nanamkin Creek drains 16.9 square miles of watershed. The primary land cover within the watershed is coniferous forest in varied stages of succession from seedling populated clearcut’s to large mature overstory. A minor component of rock bands, meadows and agricultural fields are present in the watershed. The only impervious surfaces in the South Nanamkin Creek watershed are less than a dozen buildings, one lane gravel driveways and forest roads and the asphalt pavement on SR 21. A watershed level change with possible impacts to the site was the construction of Grand Coulee Dam and the subsequent backwater of the Columbia and Sanpoil Rivers in early 1942. The free flowing reach of the Sanpoil River was reduced 9.2 miles, from 71 miles to 62 miles. The cumulative effect of the backwater on the mouth of the Sanpoil River is not quantifiable, but it is believed to reduce the overall stream gradient and reduce sediment transport. In the scale of geomorphologic time, the cumulative effects will eventually affect the lower parts of the San Poil watershed system including South Nanamkin Creek.

Geomorphology, Geology and Soils

South Nanamkin Creek is situated in the Okanogan Highlands region of North Central Washington. This area is primarily mountainous terrain laced with valleys. The Sanpoil River Valley is a moderately sized valley carved through the surrounding mountains from the vicinity of Curlew Lake southerly to its confluence with the Columbia River Valley south of the present location of the town of Keller. South Nanamkin Creek flows in smaller transverse side valleys from the mountains down into the Sanpoil River Valley. The primary soil classifications in this area are bedrock/rock outcrop or glacially deposited material. The majority of the landforms were created in the Pleistocene epoch by the scouring of the continental ice sheets. Since the ice age, the modern watershed has developed by natural processes of the stream. Most of the soils in the project reach are well graded gravel and cobble that has been transported from farther up in the watershed through the sediment transport reach. This is the result of higher stream gradients in the sediment transport reach and lower stream gradients in the upper and lower reaches resulting in the deposition of the material on the valley floor. Currently, aggradation is occurring primarily in the upper reach indicating the natural transport of sediment through the reach is moving material downstream until it reaches the first area of low gradient stream where most of the larger material is deposited. This result is expected and follows the standard theory of sediment transport. As the stream gradient becomes flat, the velocity slows and the hydraulic forces necessary to move larger material are not present. The Stream Gradient Map included in Appendix 1 was produced from WDFW Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP) data.

Hydrology and Flow Conditions

The stream has its headwaters in the upper elevations of the mountains where it begins its descent down to the Sanpoil River Valley. As the stream flows farther toward the valley, it has confluences with other small order tributaries, combining and adding volume to the flow. By the time the stream crosses under SR 21, it has combined with enough sub-
basin drainage channels to develop a 16.9 square mile watershed and does not gain appreciable area between SR 21 and the mouth. As with most mountainous stream systems in the semi-arid interior region of Northeast Washington, this stream experiences large events characterized by either high intensity thunderstorms or rain on snow events. Due to a lack of data from stream gages in the near vicinity, the USGS Regression Equations were used to develop flow statistics. The following flow statistics were developed using the StreamStats website published by the United States Geological Survey.

<table>
<thead>
<tr>
<th>South Nanamkin Creek @ SR 21</th>
<th>Flow (ft³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 year MRI</td>
<td>35.4</td>
</tr>
<tr>
<td>10 year MRI</td>
<td>106</td>
</tr>
<tr>
<td>25 year MRI</td>
<td>156</td>
</tr>
<tr>
<td>50 year MRI</td>
<td>199</td>
</tr>
<tr>
<td>100 year MRI</td>
<td>247</td>
</tr>
</tbody>
</table>

Additional design of structures or channel modifications may necessitate further investigation of the hydrology relating to peak flow events at that time.

**Channel Geometry and Flow Characteristics**

If left in its native condition without additional channel maintenance, South Nanamkin Creek would continue to transport sediment down from the mountains where it is carving out valleys and stream channels. The sediment transported down into the valley would continue to form an alluvial fan on the valley floor. As the alluvial fan developed, the stream would avulse and ultimately form a braided channel within the alluvial fan across the valley floor. Because of the location of the SR 21 crossing and private property, allowing the stream to return to a 100% natural condition is not currently feasible. The current channel geometry and flow characteristics are hard to assess because of the nearly continuous restoration and maintenance work on this stream reach in the past 15 years.

The planar geometry of the channel is meandering, although many of the meanders appear to be directionally influenced by the use of bank protection measures. In the close proximity of the SR 21 crossing, the geometry is straight from years of dredging and bank protection to maintain a straight approach to and from the culverts. The following figure shows a representative cross-section of the stream.
Figure 4. Representative Stream Cross-Section ~ 50 Feet Upstream from SR 21

Although difficult to interpret on the cross-section plot, the average bankfull width of the stream is approximately 15 feet. The stream banks are sloped at an average of 2.5:1 and generally are not undercut or over steepened. This is most likely a result of the stream banks being composed of gravel and cobble previously deposited in the alluvial fan.

Channel Alignment and Profile

The CCT have performed restoration work on this reach of stream on several occasions in the past 15 years. In 1994, the CCT performed the most substantial restoration project where they used large rock and woody debris to construct grade control structures and stream bank protection both above and below the SR 21 crossing. The work has been effective at controlling vertical instability and providing stream bank protection. The full extent of the project and design calculations are not known, but the remaining evidence indicates porous weirs were constructed of large rock in the channel and root wads and large rock were used to armor the stream banks. In 2007, the CCT performed restoration work consisting of dredging the channel to mitigate channel avulsion that occurred near the barn owned by Doug Aubertin, approximately 900 feet upstream from the SR 21 crossing. In 2008, CCT dredged a channel within the floodplain of the Sanpoil River to reconnect South Nanamkin Creek. This was necessary because avulsion occurred within the alluvial fan near the river causing the stream to flow South adjacent to the river. The new channel formed by the avulsion was considered to be limiting fish passage into South Nanamkin Creek and therefore was a priority for restoration.

Channel Migration and Avulsion Risk

The avulsion risk in the upstream segment is very high with the large amount of sediment deposition forcing the stream elevation higher than the surrounding ground. The geomorphology of the system lends itself to a high level of channel migration within the alluvial fan built by the stream on the valley floor. The stream crossing at SR 21 is
continually at risk from channel migration and being a hard vertical nick point in the reach is limiting the transport of sediment through the system. The restoration and maintenance of the channel is currently reactively controlling avulsion and aggravated channel migration, but a proactive solution must be found to alleviate the risk of future catastrophic damage to private and public resources.

**Head Cut**

The only head cut observed in the reach has traveled upstream from the San Poil River through the lower reach to the SR 21 crossing where it has developed an outfall drop. As long as the culverts remain under SR 21, the head cut is unable to travel any farther upstream into the upper reach. Additional head cuts are not anticipated in any of the reach segments under current conditions. Due to aggradation of the stream system in the lower and upper reaches, allowing head cuts to move through the stream would be beneficial. They would be an positive indicator of sediment transport downstream through the system and the stream returning to a vertically stable natural condition as desired.

**Riparian Conditions**

The riparian corridor has been fenced by the CCT during one of the phases of the restoration project. This has prevented overgrazing and other damaging use by livestock within the riparian corridor. By eliminating livestock use, the riparian vegetation is becoming established again and the stream banks are protected from trampling.

**Large Woody Debris**

The project reach does not contain a natural component of large woody debris (LWD), either in-stream or for recruitment. The restoration work done by the CCT has used root wads and logs for stabilization in areas. Further biological assessment to assess the need for LWD in the system, primarily at the end of the useful life of the existing LWD, will need to take place.

**Water Quality**

South Nanamkin Creek is not on Ecology’s 303(d) list of impaired waters, and is listed as Class III (Good) under the CCT’s Water Quality Standards.

**Fish Utilization and Habitat Availability**

Sheri Sears, Resident Fish Manager with the CCT’s Fish and Wildlife Department has verified (see Technical Memorandum in Appendix 1) this reach of South Nanamkin Creek is habitat for adfluvial rainbow trout as well as genetically pure interior redband trout. During the site assessment, the physical presence of varying sized salmonids was visually verified. Previous documented projects on South Nanamkin Creek state there is approximately 2.6 miles of habitat from the mouth upstream.
Evaluation of Treatment Alternatives

Mechanisms and Causes of Geomorphic Failure

The cause of geomorphic failure is directly related to sediment load and transport through the reach. The stream reach is located on the alluvial fan developed over geomorphologic time and continuing to form as time progresses. The reach is also located partially within the channel migration zone and floodplain for the Sanpoil River. This is only a qualitative relationship which can be very hard to predict, but has potential to influence the stream as the River meanders across the valley and transports sediment loading away from the mouth of the stream developing a sediment deficit. This would have the high probability of affecting the sediment transport regime in South Nanamkin Creek and the resulting geomorphic reaction.

Site-Reach Based Failure Mechanism Interaction

The culverts at the SR 21 crossing are a current hard nick point in the vertical profile of the stream. This limits the vertical change in the reach as well as influencing the sediment transport through the reach. Maintenance performed to ensure the stream flows through the culverts has modified the channel slope and geometry in the vicinity of the culverts also contributing to the lack of natural balance and stability in the reach. The interaction between the culverts and stream will always be the point of concern. Man-made structures are typically designed to resist change and natural systems are prone to change. Therefore, care must be exercised to design a stream crossing structure with a high tolerance to predicted change while maintaining physical and economic feasibility.

Primary Mechanisms of Failure

Any change to the natural stream has the potential to disrupt the fine balance between sediment load and size as related to stream discharge and gradient. Lane proposed this qualitative relationship in 1955 to describe how changing any of these variables starts a string of mutual adjustments in the remaining variables. Initially, the variable easiest to describe as a causal factor for failure in South Nanamkin Creek is sediment load. As Lane’s relationship shows, this narrows us down to three other variables to adjust to closely mimic the zone of natural balance in the system. It is believed the primary mechanism of failure is vertical grade control. This occurs both in the culverts under SR 21 and the porous weirs installed during the stream restoration work in 1994. It is believed the grade control is limiting the transition of head cuts and unimpeded sediment transport through the reach.

Alternatives for Abating the Primary Mechanisms of Failure

Four alternatives were considered to abate the casual mechanism of increased sediment load in the upper and lower reach. Each alternative still requires a replacement structure under SR 21 to re-establish fish passage, so it was not listed in each alternative. All of the alternatives are briefly presented below:

1. Take no action.
2. Moving the SR 21 roadway to a location along the foothills and out of the valley would provide a solution to the problems experienced at the crossing of South Nanamkin Creek. A new crossing for South Nanamkin Creek would still be
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necessary, but would be located in the lower portion of the sediment transport reach.

3. Constructing a facility where sediment could be collected and removed from the system is a possible solution. The goal would be to reduce the amount of sediment moving down from the sediment transport reach into the upper and lower reach while still maintaining low flow characteristics and fish passage throughout the stream system.

4. Removing existing grade control structures from the upper and lower reach and allowing the stream to naturally balance the factors of sediment load, sediment size, flow and stream gradient is another solution. The objective is to reduce the impact from man-made structures on the natural stream system.

**Evaluation of the Alternatives**

The four alternatives presented were evaluated using several criteria such as site conditions, reach conditions and habitat impacts. This process used the three matrices from the WDFW Integrated Streambank Protection Guidelines. The following discusses how each alternative fared during evaluation.

1. Taking no action is not a feasible alternative. The problems already experienced would continue, negatively impacting the environment as well as public and private property. Steps need to be taken to address the problems at the site.

2. SR 21 follows the Sanpoil River from the mouth up to Republic. Much of the highway is directly adjacent to or within the floodplain of the River. The problems at South Nanamkin Creek are consistent with the crossing of many other streams throughout the valley. Moving the location of SR 21 to a location along the foothills and out of the valley would provide a solution to the problems experienced at the crossing of South Nanamkin Creek as well as elsewhere if the entire corridor was relocated. This alternative would be the most costly and time consuming of all evaluated. It would eliminate the SR 21 crossing from the valley floor and position it where the stream is more incised and stable.

3. Constructing a sediment collection facility is an alternative that may be effective at limiting sediment transport. The challenges of this alternative are the long-term maintenance needs (possibly during large flow events) and maintaining fish habitat and passage through the entire stream segment. The biggest downfall to this alternative is it is reactive in nature and will never function naturally with the rest of the system. This alternative may have the lowest initial cost, but can exceed the others with the long-term maintenance required.

4. Removing the existing grade control structures from the upper and lower reach to allow the stream to naturally balance the factors of sediment load, sediment size, flow and stream gradient is an alternative that shows the most promise. Any form of hardened vertical grade control should be removed from the reach to allow the stream to naturally return to as vertically stable channel as possible. Any horizontal stream bank protection should also be evaluated for contribution to vertical instability and limited sediment transport. This alternative will cost
somewhere between alternative 2 & 3, but should be self sufficient once completed and the work areas are stabilized.

For all the alternatives listed the SR 21 crossing will need to be replaced with a structure capable of withstanding all anticipated stream transition and flood events while still maintaining characteristics conducive to fish passage. The structure should be founded deep enough to allow head cut transition and stream degradation without compromising the structural integrity. It is recommended the structure design follow the WDFW guidelines for stream simulation whether a bridge or 3-sided structure. This design methodology is proposed because it leaves enough room under the structure for the stream to flow naturally without excessive constraint.
Conclusions

The culverts at the SR 21 crossing need to be replaced with a fish passable structure to ensure passage of all aquatic species at all life stages. The WDFW stream simulation method of crossing design is recommended, although close coordination with the CCT’s Fish and Wildlife Department is necessary because they are the jurisdictional lead for aquatic projects on the Reservation. The average bankfull width through the upper and lower reach is 15 feet. Therefore, the structure should have a span of approximately 20 feet. A bottomless structure will likely be selected for cost, but for other reasons such as sediment transport and scour it is highly recommended to not use a culvert with a bottom. It is recommended the new structure be founded to a depth, so any head cuts or scour as the stream elevation varies, will not cause structural failure of the crossing. This can be achieved by using a best fit line matched to the stream profile from the mouth at the Sanpoil River to the timberline West of Aubertin’s barn and drawn vertically below all existing scour holes, head cuts, etc.

The primary mechanism of failure in the reach is sediment loading and impeded sediment transport. This results in aggradation throughout the reach and avulsion causing damage to both public and private properties. It is recommended at the time of culvert replacement another stream restoration project is conducted. This project will follow the selected alternative 4 and will remove all the grade control structures in the reach. If design calculations suggest a benefit, the project could mechanically remove some of the sediment loading already in the stream. The allowable limits of meander above and below the crossing shall be developed based on the general rule established by Leopold, et al, suggesting meander length follow the equation of \( L = 10.9 \times \text{width}^{1.01} \) and mean radius of curvature the equation \( L = 4.7 \times r_m^{0.99} \). It is recommended the meanders are allowed to develop naturally, within the established confines. Mechanically constructing the “natural” configuration of the stream will most likely throw the system out of balance and create other problems. It is anticipated that allowing the stream in this reach to flow naturally without any grade control will result in head cuts transitioning up through the reach. These head cuts will transport the excess sediment loading in the reach down to the mouth where the Sanpoil River will be allowed to transport the material downstream within its system. Once the sediment loading, size and transport is balanced with the flow rate and stream gradient, the stream will reach a point of natural equilibrium with only slight changes to maintain balance. At this point the stream will become more horizontally and vertically stable and should not be as great of a risk to avulsion and flooding of adjacent properties, including SR 21.
References


Washington State Department of Transportation, 2008 State Highway Log.
Site and Reach Assessment, SR 21 MP 133.6 at South Nanamkin Creek


Washington State Department of Transportation, 2009 Fish Passage Inventory, Progress Performance Report.


Washington State Department of Transportation. 2007 Standard Specifications for Road, Bridge, and Municipal Construction, English Units.

Washington State Department of Transportation. Bridge Engineering Information System (BEIST).

Appendix 1

Reach Delineation Map
Stream Gradient Map
Technical Memorandum from Sheri Sears, Resident Fish Division Manager, Colville Confederated Tribes Fish & Wildlife Department
Letter from Colville Confederated Tribes Fish & Wildlife Department
Reach Delineation - S Nanamkin Creek

Section 1 T32R32E W.M.
1 inch = 500 feet

- Waterbody
- Stream
- Reach Boundary
Stream Gradient - S Nanamkin Creek

Section 1 T32R32E W.M.

1 inch = 1,000 feet

SSHIAP Stream Gradient (% slope) - WDFW

- Less than 1% slope
- 1.1 to 2% slope
- 2.1 to 4% slope
- 4.1 to 8% slope
- 8.1 to 12% slope
- 12.1 to 20% slope
- Greater than 20% slope

Jul 31, 2009
South Nanamkin Creek is in the Sanpoil Sub-basin located in the Inter-Mountain Province of the Upper Columbia Basin. The Sanpoil is a major flow contributing tributary to Lake Roosevelt and the Columbia River both are Environmental Protection Agency (EPA) 303d listed. The project area is in Ferry County and within the exterior boundary line of the Colville Reservation. Historically the Sanpoil River supported vast numbers of salmon and steelhead and was fished extensively by the Colville Tribal Members that inhabited the area. Following the construction of Grand Coulee Dam the extirpation of the salmon resulted in the increased fishing pressure on the remaining native species particularly adfluvial rainbow trout, redband trout, and kokanee fisheries. Today the Sanpoil River and its tributaries continue to provide subsistence and recreational opportunities for the Colville Tribal Members as well as the general public.

Considerable habitat improvements have been implemented during the past two decades as “in place and out of kind” mitigation funded by the Bonneville Power Administration (BPA) under the Northwest Power and Conservation Council’s “Resident Fish Substitution Policy” to improve the resident fisheries that utilize the Sanpoil River, its tributaries and Lake Roosevelt. Several perennial and intermittent streams provide important habitat for support native adfluvial rainbow trout and kokanee populations in the Sanpoil and Lake Roosevelt for recreational and Tribal subsistence use.

The lower reaches of South Nanamkin Creek provide spawning habitat for adfluvial rainbow trout genetically 75% of these fish have tested to be pure interior redband and are thought to be the remnants of the steelhead stocks that once flourished in this area.
They are of significance since they will be an important stock the in the recovery of steelhead in the Upper Columbia when passage above Chief Joseph and Grand Coulee Dams is implemented. Genetically pure interior redband that exhibit the resident fluvial life history inhabit the perennial middle and upper reaches of South Nanamkin.

Considerable trapping has been done in South Nanamkin Creek to monitor the adfluvial stocks since the early 1990s. Although trapping is difficult in high flow years when presumably large numbers of fish are migrating to spawn, since 1994 on the average 28 adult adfluvial rainbow trout have been trapped annually in South Nanamkin Creek with a maximum of 68 in 1995 following the 1994 enhancement work. Years with high flows have demonstrated significant decreases in the number of spawning adults presumably when flows overwhelm the culvert at SR21 a velocity passage barrier develops. These same events have also transported large volumes of sediment cementing in spawning gravels and creating barriers requiring additional work to reestablish fish passage.

The lower adfluvial spawning beds are in an intermittent reach of South Nanamkin Creek annually in summer the lower reaches go sub-surface while some of the newly emerged fry are able to make it out into the Sanpoil where they rear to age two before the “smolts” migrate to Lake Roosevelt. Every year because of the gradient changes from down cutting and perching at the SR21 culvert hundreds of fry and at time adults are trapped in pools above the culvert. Tribal staff successfully moves these fish annually by manually placing them back into the Sanpoil River in attempts to protect this important stock.

The majority of the culverts that cross SR21 are fish passage barriers and considerably reduce the potential production of adfluvial rainbow trout in the Sanpoil River system. The replacement of South Nanamkin Creek culvert will be the first step in reestablishing consistent access to spawning habitat in the Sanpoil’s tributaries and recovering these native fish to their historic habitats.
Several culverts on the Sanpoil Highway (State Route 21) are perched and create passage barriers to resident fish. Two of the streams where these barriers are located are of high priority to the Colville Confederated Tribes. The culvert at South Nanamkin Creek and the culvert at Bear Creek both inhibit spawning migration of adfluvial rainbow trout into these streams. The adfluvial rainbow trout are a large hybrid trout genetically linked to the steelhead populations that once flourished in these waters and therefore are of great importance to the Tribes subsistence and recreational fishery. They are one species that has had considerable support from BPA to enhance passage and habitat as mitigation for salmon losses in the Upper Columbia resulting from the construction and operation of Grand Coulee and Chief Joseph Dams.

Bear Creek culvert is perched about five-feet and prevents passage upstream during lower flows and a velocity barrier to upstream passage during very high flows. Fish are frequently stranded in pools requiring Tribal staff to move them by hand to flowing water. The South Nanmakin Creek culvert is insufficient in size creating a velocity barrier in the spring to the migrating fish. No fish were able to pass the culvert at South Nanamkin this spring to spawning habitat above the highway. A few redds were found in the section below the highway but most fish that were spawned in this creek had to find other areas to lay their eggs. The impact that this had on production has not been quantified but is generally considered to be significant.

In 2006 the South Nanamkin culvert overflowed causing the stream to back up for several hundred yards changing its course, creating a new channel and causing significant damage to the Aubertin’s fields and the mitigation riparian fence that the Tribes had installed in 1995. Considerable work was required to repair the damage that occurred to South Nanamkin Creek and improvements that had previously been installed. More than $22,000 was spent to protect the streambanks, reconstruct the channel, reconnect the floodplain, and plant grasses and trees. Additional funds were required to reconstruct the riparian fence. Water flowed north along the highway ditch almost taking out the Aubertin’s driveway and up to culvert cross drains just before the North Nanamkin Creek crossing. Washington Department of Transportation (WDOT) responded to emergency calls from Doug Aubertin and deepened the ditch at the
highway where the water was beginning to erode the paved highway. Nothing has been
done with the site since that time.

During the 2007-2009 Northwest Power and Conservation Council’s (NPCC)
project solicitation and budget cycle, funds in the amount of $150,000 were approved
under the Lake Roosevelt Habitat/Passage Improvement Project to assist the WDOT
with the installation of a new culvert on the Sanpoil Highway. This money will become
available through Bonneville Power Administration (BPA) mitigation funding on February
1, 2008 and must be spent by January 31, 2009. I would like to begin the planning
process immediately so that WDOT’s cost share can be budgeted and design work,
planning, and permitting completed so that the work can be done during the low flows in
the summer of 2008. Please contact myself or the project lead Sheri Sears, our
Resident Fish Manager, to coordinate the planning process.

In 2003 a complete survey of all the culverts along the Sanpoil Highway (SR 21)
was completed by the Tribe’s Fish and Wildlife Department. This survey indicated that
greater than 90% of the WDOT culverts along the highway are barriers to fish during all
or part of the year. I have enclosed a copy of this survey to assist with future planning
efforts and have indicated the highest Tribal priorities. Although it would be beneficial to
consider replacement or improvements to all the culverts, we are aware of the expense
such revisions would incur and the Tribes will be available to assist your staff with the
development of a schedule for the revisions and will apply for additional mitigation
funding from BPA through the NPCC’s Fish and Wildlife Program to assist with this
work. I look forward to working with you on resolving these important fish passage
issues along the Sanpoil Highway.

Sincerely,

[Signature]

Joe Peone, Director Fish and Wildlife Department

Cc: Keith Muggock, Supervisor Ferry County Public Works
San Poil Highway 21 Culvert Repairs Needed

1. **French John Lake** - San Poil River Arm at French John Lake prevents flow cueing by migrating fish to find inlet (sensory barrier).

2. **Meadow Creek** - 6' X 6' cement culvert at Hwy. Perched at outlet 50-100 feet up rock wall. Must have been waterfall at one time. Series of cascades and falls drops abruptly about 300 meters in about 150 meters to San Poil River level. Complete barrier up and down all species all times. Good water flow.

3. **Jack Creek** - Double culverts at road below Hwy. North culvert velocity barrier at inlet and perched 4' at outlet. South culvert velocity barrier at inlet and perched 3' at outlet. Cascades below culverts to San Poil River. Mouth of Jack Creek passage down is ok, barrier up. Needs large bottomless arch.

4. **Brush Creek** - Culvert at Highway is half-full of debris two (2) beaver dams just below culvert outlet, some flow coming out below 2nd dam. Complete barrier up and down to all species and all times.

5. **Empire Creek** - Culvert at Highway is perched 6 feet at outlet is a 3 foot square cement culvert very long. Water is flowing through interstitial spaces, not deep enough for fish passage. Pools may support small juvenile if no temperature problem. Barrier up to all passage.

6. **Lime Creek** - Perched long cement culvert at Highway > 6% slope culvert Channel too wide, flow too shallow to support fish habitat. Historic mention of bull trout using this stream.

7. **Cache Creek** - Cement culvert at Highway is perched at the outflow. Barrier up to all no plunge pool to allow fish to jump.

8. **Capoose Creek** - 0.25 mile from mouth to Highway culvert perched at outlet. Barrier up

9. **Slim Creek** - Culvert at Highway potential barrier not barrier at this time.

10. **South Nanamkin Creek** - Metal Hwy culvert perched 3-4 feet at outlet. Culvert is 0.27 miles above start of reach. Too small to handle flows 2006 channel moved and had to be pushed back into channel went through Aubertin's field. Culvert at highway too small water flowing north along SP Highway 21 causing damage to road. Velocity barrier to migratory spawning fish during spring of most years.

11. **North Nanamkin Creek** - Highway 6' concrete arch with two overflow metals seasonal barrier too flat to concentrate channel to usable flow.

12. **Bear Creek** - Intermittent stream from mouth up for 0.26 miles. Culvert at Hwy barrier that is constricted and perched 3-4'. Good adfluvial RBT use in spring. But can be velocity barrier and as flows decrease too flat and perching traps fish above and below. Frequently have to move fish around barrier culvert at highway

13. **Anderson Creek** — Concrete culvert at highway perched.

14. **Nineteen Mile Creek** — Concrete culvert at highway

Bear Creek and South Nanamkin have the highest priority followed by Jack Creek. Bear Creek is a problem every year trapping fish above and below. South Nanamkin is a problem in non-drought years. This site has higher potential for property damage and damage to the highway and in recent years the spring flows fill the culvert beyond capacity creating a velocity barrier to fish.