Appendix A. Unit Conversion Chart Table

A-1. Metric - English Unit Conversions.

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (gal) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 gal = 3.78 L 1 L= 0.26 gal 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 gal = 11.35 L 3 L = 0.79 gal 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (cfs)[a]	Cubic Meters per Second (m^3/sec)	1 cfs = 0.03 m^3/sec 1 m^3/sec = 35.31cfs	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L[b]	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 lb
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 °C = 37.4 °F

[a] 1 cfs = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 cfs.
[b] The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water

Appendix B. State and Site-Specific Standards and Criteria

Water Quality Standards Applicable to Salmonid Spawning Temperature

Water quality standards for temperature are specific numeric values not to be exceeded during the salmonid spawning and egg incubation period, which varies with species. For spring spawning salmonids, the default spawning and incubation period recognized by DEQ is generally from March 15th to July 15 th each year (Grafe et al., 2002). Fall spawning can occur as early as August 15th and continue with incubation on into the following spring up to June 1st. As per IDAPA 58.01.02.250.02.e.ii., the water quality criteria that need to be met during that time period are:

13 ^{o}C as a daily maximum water temperature,

9 ^{o}C as a daily average water temperature.

For the purposes of a temperature TMDL, the highest recorded water temperature in a recorded data set (excluding any high water temperatures that may occur on days when air temperatures exceed the 90th percentile of highest annual MWMT air temperatures) is compared to the daily maximum criterion of 13 ^{o}C. The difference between the two water temperatures represents the temperature reduction necessary to achieve compliance with temperature standards.

Natural Background Provisions

For potential natural vegetation temperature TMDLs, it is assumed that natural temperatures may exceed these criteria during these time periods. If potential natural vegetation targets are achieved yet stream temperatures are warmer than these criteria, it is assumed that the stream's temperature is natural (provided there are no point sources or human induced ground water sources of heat) and natural background provisions of Idaho water quality standards apply. As per IDAPA 58.01.02.200.09:

> *When natural background conditions exceed any applicable water quality criteria set forth in Sections 210, 250, 251, 252, or 253, the applicable water quality criteria shall not apply; instead, pollutant levels shall not exceed the natural background conditions, except that temperature levels may be increased above natural background conditions when allowed under Section 401.*

Section 401 relates to point source wastewater treatment requirements. In this case if temperature criteria for any aquatic life use is exceeded due to natural conditions, then a point source discharge cannot raise the water temperature by more than 0.3 ^{o}C (IDAPA 58.01.02.401.03.a.v.).

Water Quality Standards Applicable to Cold Water Aquatic Life Temperature

As per IDAPA 58.01.02.250.02.b., Waters designated for cold water aquatic life are not to vary from the following characteristics due to human activities:

Water temperatures of twenty-two (22) degrees C or less with a maximum daily average of no greater than nineteen (19) degrees C.

Water Quality Standards Applicable to Primary Contact Recreation

As per IDAPA 58.01.02.251.01, Waters designated for recreation are not to contain *E.coli* bacteria, used as indicators of human pathogens, in concentrations exceeding:

A geometric mean of one hundred twenty-six (126) E. coli organisms per one hundred (100) ml based on a minimum of five (5) samples taken every three (3) to seven (7) days over a thirty (30) day period.

> *A water sample exceeding the E. coli single sample maximums below indicates likely exceedance of the geometric mean criterion, but is not alone a violation of water quality standards. If a single sample exceeds the maximums set forth in Subsections 251.01.b.i., 251.01.b.ii., and 251.01.b.iii., then additional samples must be taken as specified in Subsection 251.01.c.*

For waters designated as primary contact recreation, a single sample maximum of four hundred six (406) E. coli organisms per one hundred (100) ml.

Appendix C. Data Sources and Assessment Data

Table C-1. Data sources for Big Willow Creek TMDL.

Water Body	Data Source	Type of Data	When Collected
Big Willow Creek	DEQ State Technical Services Office	Pathfinder effective shade and stream width	June 2006
Big Willow Creek	DEQ State Technical Services Office	Aerial Photo Interpretation of existing shade and stream width estimation	March 2006
Big Willow Creek	DEQ IDASA Database	BURP data	1994-2005; See Ingham, 1999
Big Willow Creek AU03 above Fourmile Creek	USGS Gauging Station 13250600, Big Willow Creek near Emmett, ID	Measured discharge, water temperature, peak discharge (water chemistry)	1973-1982, (1980)
Payette River Subbasin	Western Region Climate Center; Payette, ID; 106891	Air Temperature and Precipitation	1948-2006
Payette River Subbasin/ Big Willow Creek watershed	USDA, NRCS; Major Land Resource Regions Custom Report, USDA Agriculture Handbook 296 (2006)	Regional soil type, climate, geology, land ownership, land use, water use	2006
Big Willow Creek watershed	US EPA	Level III and IV ecoregion	2002
Big Willow Creek watershed	USGS-StreamStats	Watershed delineation and basin statistics	2008

Table C-2. BURP summary fish data collected from Big Willow Creek, 2003-2005.

BURPID	Date Measured	AU	Percent Cold Water	SFI
2003SBOIA023	07/31/2003	03	18.33	45.56
2004SBOIA040	07/08/2004	03	2.44	33.50
2005SBOIA020	07/05/2005	03	7.69	37.31

SFI Stream Fish Index

Table C-3. BURP summary habitat data collected from Big Willow Creek, 1994-2005.

BURPID	Date Meas	STREAM	AU	Wolman Score	Bank Cover Score	Canopy Score	Embedded-ness Score	Surface Percent Fines	Percent Fines Score	SHI
1994SBOIA001	5/31/1994	BIG WILLOW 001	03	10	10	10	0	15.89	7	37
1994SBOIA002	5/31/1994	BIG WILLOW CREEK 002	03	10	10	4	0	41.41	3	27
1994SBOIA003	6/1/1994	BIG WILLOW 003	04	5	10	0	0	73.24	0	15
1994SBOIA004	6/1/1994	BIG WILLOW CR 004	03	10	3	0	0	17.14	6	19
1995SBOIA010	6/26/1995	BIG WILLOW CREEK (LOWER)	04	0	8	0	0	ND	10	38
1995SBOIA011	6/26/1995	BIG WILLOW CREEK (UPPER)	03	0	1	0	0	ND	10	33
1995SBOIT009	5/18/1995	BIG WILLOW CREEK	03	ND	ND	ND	ND	ND	ND	ND
1996SBOIA049	7/22/1996	BIG WILLOW CREEK (UPPER)	03	0	10	9	9	ND	10	66
1996SBOIA050	7/22/1996	BIG WILLOW CREEK (MIDDLE)	03	0	10	0	0	ND	10	36
1996SBOIA051	7/22/1996	BIG WILLOW CREEK (LOWER)	04	0	10	5	8	ND	10	52
1997SBOIB013	6/19/1997	BIG WILLOW CREEK(UPPER)	03	9	2	9	4	5.77	10	623
1997SBOIB014	6/19/1997	BIG WILLOW CREEK(MIDDLE)	03	7	10	0	0	30.99	10	401
1997SBOIB015	6/19/1997	BIG WILLOW CREEK(LOWER)	04	5	2	0	0	40.57	6	211
1998SBOIA045	7/20/1998	BIG WILLOW CREEK (MIDDLE)	03	9	4	0	0	8.27	10	411
1997SBOIA049	07/27/1997	FOURMILE CREEK	02	8	10	10	0	69.32	0	521
1997SBOIA050	07/29/1997	FOURMILE CREEK	02	8	10	10	0	61.54	2	451
1998SBOIA046	7/20/1998	BIG WILLOW CREEK (UPPER)	03	10	6	10	0	12.34	9	593
1998SBOIB036	7/9/1998	BIG WILLOW CREEK (LOWER)	04	6	8	0	0	60.91	3	371
1999SBOIA055	9/22/1999	BIG WILLOW CREEK (UPPER)	03	10	9	9	8	9.73	9	783
1999SBOIA056	9/22/1999	BIG WILLOW CREEK (MIDDLE)	03	8	10	0	0	7.92	10	311
1999SBOIA057	9/23/1999	BIG WILLOW CREEK (LOWER)	04	7	5	5	0	62.89	1	301
2001SBOIA033	7/26/2001	BIG WILLOW CREEK	03	9	5	9	7	30.2	5	723
2002SBOIA003	7/3/2002	BIG WILLOW CREEK	03	9	0	7	7	14.91	10	603
2003SBOIA023	7/31/2003	BIG WILLOW CREEK	03	10	10	9	5	22.58	7	673
2003SBOIA053	10/20/2003	BIG WILLOW CREEK-dry channel	04	0	0	0	0	Dry	ND	1011
2004SBOIA040	7/8/2004	BIG WILLOW CREEK	03	10	10	9	7	3.28	10	703
2005SBOIA020	7/5/2005	BIG WILLOW CREEK	03	10	10	8	5	10.78	10	723

SHI Stream Habitat Index, ND No Data

Table C-4. BURP summary temperature and macroinvertebrate data collected from Big Willow Creek, 1994-2005.

BURPID	Date Measured	AU	Total Abundance	Sum Obligate CWB	SMI	Water Temperature °C
1994SBOIA001	5/31/1994	03	238	0.00	49.81	
1994SBOIA002	5/31/1994	03	551	0.00	48.00	
1994SBOIA003	6/1/1994	04	120	0.00	27.56	
1994SBOIA004	6/1/1994	03	652	0.00	31.25	
1995SBOIT009	5/18/1995	04	ND	ND	ND	
1995SBOIA010	6/26/1995	03	491	0.00	20.41	
1995SBOIA011	6/26/1995	03	508	0.00	28.99	
1996SBOIA049	7/22/1996	03	71	0.00	44.13	17
1996SBOIA050	7/22/1996	03	83	0.00	27.20	26.5
1996SBOIA051	7/22/1996	04	19	0.00	18.88	31
1997SBOIB013	6/19/1997	03	645	0.00	59.28	17
1997SBOIB014	6/19/1997	03	608	0.00	34.72	23
1997SBOIB015	6/19/1997	04	501	0.00	30.10	28
1997SBOIA049	07/27/1997	02	511	0.00	29.67	17
1997SBOIA050	07/29/1997	02	495	0.00	23.97	19
1998SBOIB036	7/9/1998	04	483	0.00	30.41	26.7
1998SBOIA045	7/20/1998	03	558	0.00	37.86	24
1998SBOIA046	7/20/1998	03	476	0.00	60.46	23.1
1999SBOIA055	9/22/1999	03	517	1.00	62.01	15
1999SBOIA056	9/22/1999	03	613	0.00	42.91	20
1999SBOIA057	9/23/1999	04	607	3.00	46.95	13.9
2001SBOIA033	7/26/2001	03	549	0.00	76.49	18.6
2002SBOIA003	7/3/2002	03	511	0.00	67.37	17.7
2003SBOIA023	7/31/2003	03	531	3.00	60.05	22.3
2003SBOIA053	10/20/2003	04	Diversion/dry channel	Diversion/dry channel	Diversion/dry channel	Diversion/dry channel
2004SBOIA040	7/8/2004	03	527	1.00	66.91	19
2005SBOIA020	7/5/2005	03	519	0.00	57.83	17.3

SMI Stream Macroinvertebrate Index

Table C-5. Stream Bankfull Width as collected for the Beneficial Use Reconnaissance Program and Solar Pathfinder data collection.

Stream Segment Length (meters)	Source	Date Measured	AU	Stream Width (ft)	Average Stream Width (ft)
1460	Pathfinder		03	14.7	15
690	Pathfinder		03	12.7	12
	BURP-1994SBOIA004	6/1/1994	03	17.8	10
	BURP-1995SBOIA011		03	10.7	10
	BURP-1998SBOIA045	7/20/1998	03	8.1	10
	BURP-1999SBOIA056	9/22/1999	03	6.2	10
190	Pathfinder		03		
	BURP-1996SBOIA050	7/22/1996	03	10.3	10
1530	BURP-1997SBOIB014	6/19/1997	03	13.3	13
1730	BURP-1996SBOIA051	7/22/1996	03	10.7	18
	BURP-1998SBOIB036	7/9/1998	03	5.5	18
	BURP-1997SBOIB015	6/19/1997	03	13.1	18
	BURP-1994SBOIA003	6/1/1994	03	43.9	18
560	BURP-1999SBOIA057	9/23/1999	04	10.3	10
	BURP-2003SBOIAO53	10/20/2003	04	10.3	10
480	Pathfinder		04	11.4	11

Appendix D. Distribution List

Lower Payette River WAG Members

Tom Hoppell
501 E. Main Street
Emmett, ID 83617

Karl Siller
Emmett Irrigation District
1945 Jackson Ave.
Emmett, ID 83617

Kirk Vickery
Gem SWCD
2397 Mesa Ave.
Emmett, ID 83617

Sharon Pratt
Gem County Commissioner
415 E. Main Street
Emmett, ID 83617

Dar Olberding
5454 W. Central Road
Emmett, ID 83617

John Kientz
3512 Sunset
Emmett, ID 83617

Ron Shurtleff
District 65
102 North Main Street
Payette, ID 83661

George McClelland
1905 NW 1st Ave.
Fruitland, ID 83619

Others

Tom Pence
5433 Big Willow Road
Payette, Idaho 83661

J.G. Schwarz
6000 Big Willow Road
Payette, Idaho 83661

Russ Manwaring
West Central Highlands RC&D
1805 Hwy. 16
Emmett, Idaho 83617

Appendix E. Public Comments

The draft of the *Big Willow Creek Assessment and Temperature Total Maximum Daily Load: Addendum to the Lower Payette River Subbasin Assessment and TMDL* went out for public review and comment on March 26, 2007. The document was sent to the Payette City Public Library, Emmett Public Library, Boise Public Library, the Lower Payette River WAG, and was available at the DEQ Boise Region Office and through DEQ's web site at www.deq.idaho.gov/public/comment.cfm. The official public comment period ended at 5:00 p.m. MDT, Friday, May 4, 2007. This appendix records the public comments received and DEQ-BRO's response to comments.

Source and Comments

Donna Walsh, USEPA Region 10, Seattle, WA 98101--April 30, 2007

EPA 1: Water quality standards. The document should include a section on the water quality standards that apply to Big Willow Creek specifically. Appendix B shows the state water quality criteria for salmonid spawning, but does not show any information specific to Big Willow Creek. For example, it is not clear if the salmonid spawning criteria apply to the entire watershed or only part of the watershed or when salmonid spawning occurs in this watershed. The applicable beneficial uses, the temperature criteria for those uses, and where and when those criteria apply for this watershed should be identified. We would suggest you include this information in the main body of the document, but if you choose to include it in the appendices, please include a reference to the information in section 2.0 Water Quality Limited and Supporting Information.

Response: A description of water quality standards and criteria that apply to Big Willow Creek have been added to the main body of the document in the "Subbasin At A Glance" and Section 2, Table 8, and Appendix B to clarify that salmonid spawning, cold water aquatic life and primary contact recreation uses do apply to Big Willow Creek from the source to the mouth. These additions include the water quality standard criteria for each beneficial use.

EPA 2. Temperature data. The document should include a description and analysis of existing temperature data (or the lack of temperature data). For example, where and when violations of water quality standards occur should be described. The patterns of the temperature data and how this information can be used in the implementation of the TMDL should be explained.

Response: Historical temperature data was retrieved from the USGS National Water Information Service (NWIS) internet site and from all available BURP field visits. The USGS collected instantaneous data from a gauging station above the confluence of Fourmile Creek (AU03) on a monthly basis from 1973 through 1982 and instantaneous data was collected annually for BURP assessments by DEQ from 1994 through 2005. This data was reviewed to determine attainment of water quality standards and has been added, in the form of graphs and tables to the document and the appendices.

EPA 3. Map. It would be helpful if the document included a map showing the different reaches of Big Willow Creek (Upper and Lower) as well as temperature monitoring locations, the names of the tributaries, and other locations referenced in the text. (Also, some of the maps and figures were difficult to read. For example, it was difficult to read the writing in Figure 5, the key of Figure 15, and the monitoring stations shown in Figure 16 because the print was so small.)

Response. DEQ has revised the figures, tables, and appendices to add clarity to the document. These additions include data collection locations, tributary names, important location identifiers, and revisions of text size to improve readability.

EPA 4. Sediment TMDL must be done. Sediment is shown to be a pollutant impairing the waterbody. Sediment tolerant biota are found in the lower reach of Big Willow Creek and the text states that the cold water aquatic life designated use is impaired and sediments are the causative pollutant. TMDLs must be developed for identified pollutants. A sediment TMDL must be developed for Big Willow Creek. Though the sediment impairment may be associated with flow modification and stream alteration, and TMDLs are not required for these forms of pollution, a TMDL is required for an identified pollutant impairing the water.

Response: Big Willow Creek was negatively impacted by severe regional flooding from a rain on snow event in 1996 and 1997. This event is estimated to be greater in magnitude than a 100- year event and is briefly described in Section 1 "Watershed Characteristics" and Section 4. Because this event caused mass wasting in AU02, AU03, and AU04 and altered the morphology of Big Willow Creek from the middle of AU03 to the Payette River, beneficial uses were negatively affected. Due in part to the semi-arid climate, channel re-stabilization is still in process. In conformance with IDAPA 58.01.02.053, DEQ has reviewed all data available from other agencies (USGS and USDA) in addition to Tier I BURP data and cannot reasonably conclude at this time that excess sediment delivery to the stream (beyond effects of natural events) is a greater contributing factor than flow alteration and habitat modification in limiting the beneficial uses of Big Willow Creek.

All measures (flow alteration, habitat modification, and embeddedness) were assessed using rapid or qualitative methods. Analysis of the available data indicate that habitat and flow alteration can be directly linked to non-attainment of beneficial uses in Big Willow Creek, whereas qualitative stream measure assessments could not be used to quantitatively identify or define excess sediment pollution in the stream.

DEQ used benthic macroinvertebrate indices for temperature tolerance, accepted and widely used by other scientists in the region, to verify temperature impairment in Big Willow Creek. The data analyzed for this TMDL reflect that 90% of the macroinvertebrate organisms are tolerant of warm temperatures and were collected from sites that exhibit altered flow and/or modified habitat, in conjunction with increased stream embeddedness.

DEQ realizes that significant improvements have been made in the research arena regarding aquatic community response to sediment pollution and that the results of these efforts may be useful in determining the source and degree of sediment impairments to natural streams, once indices similar to temperature tolerance indices have been developed. At this time, an index to quantify the proportion of the benthic community correlated to specific sediment regimes is not available. When sediment indices similar to macroinvertebrate temperature indices are developed for ecoregions similar to Idaho, those indices will be included in analysis of data to assist in determination of sediment pollution, which may result in additional sediment TMDLs for Idaho streams.

In order to develop a more comprehensive and deterministic data set for the five-year review, DEQ recommends semi-annual (high flow/low flow) water chemistry and physical property (including turbidity and suspended sediment concentrations) data collection from at least five sites throughout the watershed. McNeil core samples to assess each AU for proportional subsurface fines and bank stability inventories would also provide quantitative information to determine other possible sources of water quality limiting factors. This data is expected to provide enough quantitative information to facilitate a reasonable determination of

parameter-specific impairments; which may lead to additional TMDLs in the Big Willow Creek subbasin for other pollutants (nutrients, DO, sediment, bacteria, etc.).

EPA 5. Sediment listing shown as Category 4C. EPA does not agree that Big Willow Creek can be placed in Category 4C of the integrated report for the pollutant sediment (as currently shown in Table B, page 2 and Table 17, page 52 of the TMDL.) A sediment TMDL should be developed and the sediment listing should subsequently be placed in Category 4a of the integrated report for waters with approved TMDLs.
Response: DEQ agrees with EPA that Section 4c is not the appropriate listing for a waterbody with quantified impairment by sediment pollution. For reasons explained in the previous response and based on a review of all available data, DEQ is recommending listing revisions summarized in Tables B and 24.

EPA 6. Shade targets established for Big Willow Creek only. Figure A shows several potentially significant tributaries to Big Willow Creek. Due to the cumulative effects of temperature increases and the potential impacts of these tributaries on the temperature of Big Willow Creek, PNV shade targets should be set for the tributaries or the tributaries should be shown to be in a natural state to ensure natural stream temperatures will be achieved in Big Willow Creek. Similar efforts have been developed for previous Idaho PNV TMDLs.

Response: DEQ acknowledges that tributary effects to water temperature in the Big Willow Creek is an unknown factor, and that in order to achieve PNV goals, tributaries must also be at natural background conditions. Because data, and access to collect data, in the subbasin is very limited, a PNV TMDL has been developed for the listed waterbody, which at this time is Big Willow Creek from source to mouth. Idaho has adopted a five-year review process and a schedule to facilitate attainment of designated beneficial uses of all state waters. As data become available for the 3rd and 4th order tributaries, additional waterbodies in the subbasin may be listed for specific impairments, including temperature. DEQ encourages TIR data collection from the Big Willow Creek subbasin to overcome data deficiency issues so that basin-wide assessments and tributary use attainment status can be determined. Data collection through the five-year review process may result in additional TMDLs in the subbasin.

EPA 7. Shade curves. It is difficult to connect the shade curves currently chosen to the vegetation in the Big Willow Creek watershed. Reviewing the local information and literature (BLM, USFS, NRCS, etc.) on the type, height and density of local natural vegetation could improve the selection of the shade curves. This local information could be used to select which existing shade curve(s) from regional TMDLs best represent local natural conditions. This method of choosing a shade curve, rather than the current method of averaging numerous shade curves which are often comprised of very different vegetation communities with very different underlying assumptions of PNV height and canopy density, should result in a more accurate estimate of natural shade for the specific watershed.

Response: DEQ has modified the shade curve to include a third vegetation type (basalt/ willow), and re-calculated excess solar load and lack of shade by linear meter for the entire

creek. This calculation provides PNV targets for each linear meter of Big Willow Creek from AU03 to the mouth. DEQ has revised the document to more clearly describe this situation and process but acknowledges some error in aerial photograph interpretation may still exist and be reflected in the target shade calculations. DEQ is currently cooperating with Region 10 EPA to develop shade curves for Idaho and plans to use those curves in the next five-year review. These curves should reduce the percent error in PNV analysis.

EPA 8. Areas where existing shade is greater than target shade. The assessment methodology and target selection processes are not precise. Areas identified as having shade above target levels are described as having "excess" shade. These areas should be considered as critical areas for protection to ensure natural temperature conditions. However, the current method of utilizing these “excess” shade areas is to average out impacted areas along the stream. This is not an accurate application of the PNV method and is well beyond the appropriate application of the modeling methodology used in this TMDL. The methodology is too imprecise to suggest areas have “excess” shade.

Response: The figures and text have been modified to remove language or other indicators that may imply that there is "excess" shade along any stream segment. Section 5.4 has been revised to clarify that there is no excess solar load capacity in the Big Willow Creek watershed. In order to achieve beneficial use support and natural background temperatures, additional removal of shade should be avoided as it would negatively impact achievement of that goal.

EPA 9. Averaging needed shade improvements. Averaging the needed shade improvements for a watershed can completely mask areas of needed restoration. For example, some areas in upper Big Willow Creek are shown to be lacking 30-35% of the expected natural shade. However, these problematic areas are ignored with the proposed averaging method if only the average conditions are used as an evaluation criterion for attainment of the PNV approach. This is not an accurate application of the PNV methodology because it does not ensure potential natural stream temperatures. Instead of averaging, we recommend describing the range of improvements needed; for example, 10 - 50% shade increases are needed, depending on the reach. Providing a map showing reach specific values of lack of shade (as you do now) is good. It would also be helpful to show the percent solar load reductions for each of the reaches in Tables 14 and 15, rather than the summed solar load reduction for the whole watershed. It is reasonable to suggest that land managers might want to initially target restoration on areas with the greatest departure from natural shade. However, it should be made clear, that to meet water quality standards, all areas that show any deviation from natural would need improvement.

Response: PNV calculations were also revised to quantify excess solar load and lack of shade by linear meter for each AU. Average values for large stream segments (upper and lower) were removed. Ranges, in percent, of excess solar load and lack of shade were calculated and included in the analysis tables and the corresponding maps for each AU.

EPA 10. Discussion of solar load reduction required. In the Key Findings, page 1, and in the Conclusions, page 52, you state that upper Big Willow Creek “may be sufficiently shaded to

meet solar loads" and "is in relatively good shape" with respect to solar load reductions required. We find the first description to be unsubstantiated and both descriptions to be counterproductive, clearly sending the message that restoration is not needed in these reaches. These statements should be deleted. As an alternative, it would be reasonable to suggest that restoration be prioritized based on the percent departure from target conditions on a reach-by-reach basis as discussed in comment 9. However, as stated above, it should be clear that all reaches would need to meet PNV shade targets in order to meet water quality standards.

Response: DEQ is sensitive to EPA concerns that some language may imply that very little effort is necessary to reach attainment of beneficial uses. Summaries of analysis results and conditions under which PNV will be successful have been revised to add clarity to the document.

EPA 11. Discussion of Margin of Safety (MOS). Suggesting that areas which are within a calculated MOS don't need improvement is not consistent with the principle or intent of the MOS (Figure 20 - "Within MOS"). A MOS is incorporated to account for uncertainties in the analysis, to ensure the TMDL is protective. Accordingly, language and technical documentation must be removed from this TMDL, which suggests that areas where solar load reductions are within MOS are meeting water quality standards. The MOS described on page 47 of this document is not a MOS; it is a general description of uncertainty associated with the method used in this effort. For its intended application (Figure 20 – "Within MOS"), this method is too limited because it does not address the many uncertainties inherent in this application of the PNV method. For, example, in the shade curves section you state that you increased the target shade by 10% to account for topographical shade. In addition, in the Monitoring Points section the existing shade estimated by the aerial photos was determined to be approximately 20% lower than the field verified existing shade so 20% was added to the existing shade for areas with 50% or greater shade. These are two examples showing that this particular PNV application is imprecise and includes a high degree of uncertainty. To suggest that the margin of safety can be calculated as an exact percentage based on one assumption under these circumstances is inappropriate. The concept of a MOS, which is a required element of a TMDL, is rendered moot if targets, allocations and load capacities derived incorporating the MOS are not used.

Response: Based on the known and undefined errors in the PNV model, DEQ is willing to remove MOS as it was defined and discussed and will revise the document regarding the errors and uncertainties in the model, within which the MOS is inherent.

EPA 12. Field Verification of Current Effective Shade Estimates and MOS– A very spatially limited sampling of shade measurements were used to add 20% to estimated current shade values in areas that were greater than 50% shade (Described on page 40 and the measurement locations are illustrated on Figure 19.). This addition results in a much less conservative MOS when shade conditions are compared between current and PNV conditions. It is also problematic that such a spatially limited sampling was used to modify such a significant parameter over a very large area.

Response: DEQ acknowledges that data essential to this PNV has margins of error that may be substantial. DEQ is working with EPA to develop vegetation types specific to Idaho in an effort to diminish these errors in future work. The shade curves were re-analyzed in an effort to reduce the error in interpretation of the aerial photographs. Calculations were revised to quantify solar load and lack of shade by linear meter for each assessment unit. The tables generated from this review were then used to document the range of excess solar load and range of lack of shade by linear meter for each AU. Maps were modified to portray the results of the revised spatial analysis.

EPA 13. Bankfull channel widths. The TMDL states that the creek has been highly channelized and sinuosity greatly reduced in the lower floodplain. It also discusses excess sediment deposition. These things suggest that the current channel widths may be different from previous natural channel widths, yet the current channel widths are all assumed natural. Existing bankfull channel width data should be provided in the document and compared to the estimated natural bankfull channel widths.

Response: Available bankfull width data collected by DEQ has been added to Appendix D. Historical data collected by the USGS, satellite images, and BURP data were reviewed to identify paleo stream morphology, results of 1996/1997 flood events, and potential sources of stream channel alteration. With the data presently available, it appears that the most likely source of excess sediment delivery to Big Willow Creek is a result of severe flooding in 1996 and 1997. The channel widths measured at Solar Pathfinder data collection transects have been added to the TMDL tables in red bold typeface and used in the load analysis. The document has been revised to more fully describe the location and extent of flow alteration in the basin.

EPA 14. Incorrect % solar load reduction shown for Lower Big Willow Creek. In the Key Findings on page 1 and in the Conclusions on page 52, the solar load reduction needed for Lower Big Willow Creek is incorrectly stated as 13%, rather than 20%. Rather than using either of these summed % reductions, we recommend you show the range of solar load reductions needed for the different reaches as discussed in comment 5 above.

Response: The PVN TMDL was revised to include a third vegetation type and aerial photograph interpretations re-visited to calculate the excess load and lack of shade by linear meter and results include range (in percent) of excess load and corresponding lack of shade for each AU, by linear meter. The results of revisions have been added to the TMDL in text, maps, and tables.

EAP 15. Salmonid spawning not a fully supported use. Salmonid spawning is stated to be a fully supported use above Table 5 on page 21. Of the four final condition ratings found in Table 5, two of the condition rating scores are below “2” showing that salmonid spawning is not fully supported.

Response: DEQ agrees that salmonid spawning is an existing use in AU03 but, based on assessment data, is not a supported use. This modification and clarification has been added to the document.

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