# Appendix A. Beneficial Use Reconnaissance Program Stream Data

## Table A-1. BURP Data for streams in the Beaver-Camas Subbasin

| Site ID No. | Same As | Stream Name | Elev Feet | Strm Ord | Ros Typ | % Fns | W/D Rat | % Stable LB | RB | % Cov LB | RB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02-A004 | | Alex Draw | 6840 | 2 | B | | | | | | |
| 01-A058 | | Bear Gulch Creek | 6680 | 2 | B | 35 | 20 | 100 | 100 | 100 | 64 |
| 96-Z049 | | Bear Gulch Creek East Fork | 6680 | 1 | A | 73 | 18 | 100 | 100 | 97 | 99 |
| 95-B060 | | Beaver Creek | 5900 | 3 | C | 24 | 12 | 62 | 62 | 62 | 56 |
| 02-A021 | | Beaver Creek | 5520 | 5 | | | | | | | |
| 03-A087 | | Beaver Creek | 5415 | 4 | | | | | | | |
| 95-B062 | | Beaver Creek | 5200 | 3 | C | 39 | 17 | 20 | 48 | 40 | 32 |
| 01-A055 | | Beaver Creek | 5140 | 3 | | | | | | | |
| 03-A101 | | Beaver Creek | 5117 | 4 | | | | | | | |
| 95-B063 | | Beaver Creek | 5080 | 3 | C | 18 | 32 | 78 | 80 | 0 | 0 |
| 95-B035 | | Beaver Creek | 4800 | 4 | | | | | | | |
| 98-C026 | | Berry Creek | 6720 | 1 | E | 96 | 3 | 94 | 94 | 100 | 100 |
| 02-A019 | | Brooks Canyon Creek | 6980 | 1 | C | | | | | | |
| 03-A069 | | Brooks Canyon Creek | 6750 | 1 | | | | | | | |
| 95-B061 | | Camas Creek | 5641 | 4 | | | | | | | |
| 95-B036 | | Camas Creek | 4800 | 4 | | | | | | | |
| 95-B064 | | Camas Creek | 4795 | 5 | | | | | | | |
| 03-A102 | | Camas Creek | 4800 | | | | | | | | |
| 95-B065 | | Camas Creek | 4785 | 5 | | | | | | | |
| 96-Z060 | | Camp Creek | 6380 | 1 | | | | | | | |
| 96-Z042 | | Castle Creek | 6925 | 1 | A | 80 | 9 | 100 | 97 | 100 | 100 |
| 02-A007 | | Castle Creek | 6860 | 1 | | | | | | | |
| 01-A057 | | Castle Creek | 6760 | 1 | B | 47 | 28 | 100 | 83 | 100 | 83 |
| 98-C031 | | Chicken Creek | 6520 | 1 | E | 57 | 10 | 92 | 70 | 90 | 100 |
| 98-C034 | | Ching Creek | 6390 | 2 | E | 50 | 7 | 70 | 86 | 80 | 100 |
| 03-A095 | | Ching Creek | 6400 | 3 | C | | | | | | |
| 98-C011 | | Corral Creek | 7120 | 1 | A | 42 | 7 | 94 | 95 | 100 | 100 |
| 98-C010 | | Corral Creek | 6010 | 2 | C | 49 | 10 | 84 | 61 | 48 | 66 |
| 03-A093 | | Corral Creek | 6058 | 2 | | | | | | | |
| 96-Z053 | | Cottonwood Creek | 6710 | 3 | B | 26 | 46 | 100 | 100 | 76 | 90 |
| 02-A023 | 96-Z066 | Cottonwood Creek East Fork | 7635 | 1 | C | | | | | | |
| 96-Z066 | 02-A023 | Cottonwood Creek East Fork | 7630 | 1 | B | 72 | 10 | 79 | 80 | 75 | 76 |
| 96-Z065 | | Cottonwood Creek West Fork | 7780 | 1 | B | 68 | 25 | 59 | 81 | 55 | 52 |
| 02-A024 | | Cottonwood Creek West Fork | 7640 | 1 | C | | | | | | |
| 96-Z064 | | Cow Creek | 7760 | 1 | A | 42 | 21 | 100 | 100 | 0 | 0 |
| 98-C033 | | Crab Creek | 6395 | 2 | C | 65 | 26 | 64 | 89 | 100 | 93 |
| 03-A100 | | Crab Creek | 6380 | 3 | | | | | | | |
| 03-A099 | | Crooked Creek | 6380 | 2 | | | | | | | |
| 98-C032 | | Crooked Creek | 6370 | 2 | DA | 88 | 5 | 22 | 14 | 100 | 100 |
| 98-C021 | | Dairy Creek | 6320 | 1 | E | 38 | 6 | 96 | 92 | 97 | 99 |
| 98-C020 | | Dairy Creek | 6070 | 2 | E | 21 | 8 | 68 | 97 | 86 | 95 |
| 03-A074 | | Dairy Creek | 6030 | 2 | | | | | | | |
| 96-Z047 | | Disaster Creek | 6825 | 1 | A | 89 | 6 | 98 | 95 | 98 | 95 |
| 02-A008 | | Disaster Creek | 6714 | 1 | A | | | | | | |
| 96-Z072 | | Ditch Creek | 6910 | 2 | B | 80 | 11 | 0 | 0 | 100 | 89 |
| 98-C024 | | Dry Creek | 5700 | 2 | B | 44 | 12 | 86 | 55 | 82 | 82 |
| 01-A060 | | Dry creek | 5660 | 3 | | | | | | | |
| 96-Z054 | | East Camas Creek | 6610 | 3 | B | 51 | 13 | 95 | 100 | 95 | 84 |
| 01-A059 | | East Camas Creek | 6590 | 3 | C | 21 | 20 | 86 | 72 | 94 | 80 |
| 98-C029 | | East Modoc Creek | 7520 | 1 | F | 45 | 5 | 94 | 100 | 98 | 100 |
| 03-A083 | | East Modoc Creek | 7440 | 2 | | | | | | | |
| 98-C007 | | East Three Mile Creek | 6900 | 1 | B | 38 | 7 | 64 | 77 | 76 | 72 |
| 03-A089 | | East Threemile Creek | 6780 | 1 | | | | | | | |
| 98-C028 | | Horse Creek | 7300 | 1 | A | 53 | 4 | 90 | 83 | 100 | 98 |
| 03-A085 | | Horse Creek | 7320 | 1 | | | | | | | |
| 01-A049 | | Huntley Canyon Creek | 5980 | 1 | B | 22 | 23 | 78 | 80 | 98 | 97 |
| 96-Z071 | | Idaho Creek | 6940 | 1 | B | 62 | 28 | 1 | 0 | 81 | 71 |
| 02-A002 | 96-Z045 | Jug Creek | 6880 | 1 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 96-Z045 | 02-A002 | Jug Creek | 6880 | 1 | B | 90 | 8 | 100 | 100 | 100 | 100 |
| 96-Z052 | | Kay Creek | 6775 | 1 | E | 81 | 23 | 100 | 100 | 98 | 99 |
| 02-A018 | | Kite Canyon Creek | 7000 | 1 | B | | | | | | |
| 96-Z057 | | Kite Canyon Creek | 6920 | 1 | B | 76 | 11 | 100 | 94 | 100 | 94 |
| 03-A067 | | Kite Canyon Creek | 6920 | 1 | | | | | | | |
| 02-A026 | 96-Z063 | Lava Creek | 7800 | 1 | | | | | | | |
| 96-Z063 | 02-A026 | Lava Creek | 7760 | 1 | | | | | | | |
| 03-A096 | | Little Creek | 6775 | 2 | | | | | | | |
| 98-C038 | | Little Creek | 6670 | 2 | B | 64 | 8 | 97 | 94 | 100 | 100 |
| 03-A086 | | Long Creek | 7040 | 1 | | | | | | | |
| 98-C025 | | Long Creek | 6880 | 1 | E | 61 | 7 | 96 | 100 | 98 | 100 |
| 01-A061 | | Meadow Creek | 6360 | 1 | | | | | | | |
| 96-Z056 | | Meadow Creek | 6310 | 1 | C | 97 | 4 | 100 | 96 | 100 | 96 |
| 03-A076 | | Meadow Creek | 6360 | 1 | | | | | | | |
| 03-A082 | | Middle Modoc Creek | 7600 | 1 | | | | | | | |
| 98-C006 | | Middle Three Mile Creek | 6560 | 1 | A | 25 | 9 | 92 | 86 | 69 | 80 |
| 98-C008 | | Middle Three Mile Creek West Fk | 6350 | 1 | A | 45 | 14 | 59 | 50 | 79 | 67 |
| 03-A091 | | Middle Threemile Creek | 6160 | 1 | | | | | | | |
| 98-C022 | | Miners Creek | 6260 | 2 | B | 40 | 5 | 96 | 93 | 98 | 98 |
| 03-A075 | | Miners Creek | 6195 | 2 | | | | | | | |
| 03-A084 | | Modoc Creek | 7400 | 2 | | | | | | | |
| 98-C027 | | Modoc Creek | 6710 | 2 | F | 50 | 6 | 92 | 100 | 100 | 100 |
| 02-A001 | | Pass Creek | 7062 | 1 | | | | | | | |
| 96-Z050 | | Pass Creek | 6875 | 1 | E | 94 | 2 | 100 | 100 | 100 | 100 |
| 03-A098 | | Pasture Creek | 7000 | 2 | | | | | | | |
| 96-Z051 | | Pasture Creek | 6990 | 2 | B | 65 | 28 | 97 | 99 | 90 | 96 |
| 01-A062 | | Patelzick Creek | 7200 | 2 | B | 33 | 32 | 97 | 98 | 97 | 98 |
| 96-Z043 | | Pete Creek | 6900 | 1 | B | 68 | 5 | 98 | 92 | 98 | 93 |
| 03-A079 | | Pete Creek | 6765 | 2 | | | | | | | |
| 96-Z061 | | Picnic Hollow Creek | 6340 | 1 | A | 88 | 13 | 100 | 100 | 100 | 100 |
| 03-A071 | | Picnic Hollow Creek | 6300 | 1 | | | | | | | |
| 96-Z059 | | Pleasant Valley Creek | 7160 | 1 | B | 62 | 13 | 92 | 98 | 58 | 46 |
| 03-A065 | | Pleasant Valley Creek | 6920 | 2 | | | | | | | |
| 96-Z069 | | Pleasant Valley Creek | 6820 | 2 | | | | | | | |
| 02-A020 | | Pleasant Valley Creek | 6760 | 2 | C | | | | | | |
| 03-A068 | | Pleasant Valley Creek | 6760 | 2 | | | | | | | |
| 03-A070 | | Ramshorn Creek | 6600 | 1 | | | | | | | |
| 98-C017 | | Rattlesnake Creek | 6370 | 2 | F | 36 | 33 | 98 | 96 | 99 | 98 |
| 98-C012 | | Rattlesnake Creek | 5930 | 3 | D | 40 | 35 | 75 | 55 | 69 | 69 |
| 03-A092 | | Rattlesnake Creek | 5890 | 3 | | | | | | | |
| 98-C019 | | Rattlesnake Creek East Fork | 6080 | 2 | C | 35 | 29 | 28 | 12 | 24 | 14 |
| 98-C009 | | Rattlesnake Creek North Fork | 6020 | 1 | F | 82 | 10 | 0 | 24 | 48 | 47 |
| 03-A090 | | Rattlesnake Creek West Fork | 6715 | 2 | | | | | | | |
| 98-C018 | | Rattlesnake Creek West Fork | 6110 | 2 | B | 35 | 8 | 8 | 64 | 81 | 96 |
| 02-A022 | | Rock Creek | 7480 | 1 | | | | | | | |
| 96-Z067 | | Rock Creek | 7400 | 1 | | | | | | | |
| 98-C036 | | Saw Creek | 6640 | 1 | B | 94 | 20 | 88 | 94 | 96 | 96 |
| 01-A048 | 96-Z070 | School Section Creek | 6440 | 1 | B | 59 | 25 | 69 | 68 | 96 | 100 |
| 96-Z070 | 01-A048 | School Section Creek | 6450 | 1 | B | 84 | 15 | 100 | 100 | 100 | 100 |
| 03-A077 | | Sheep Creek | 6730 | 2 | | | | | | | |
| 98-C023 | | Sheep Creek | 6660 | 2 | B | 56 | 5 | 0 | 13 | 100 | 95 |
| 04-A123 | | Spring Creek | 6247 | 3 | | | | | | | |
| 98-C015 | | Spring Creek | 6260 | 1 | A | 30 | 18 | 95 | 100 | 95 | 100 |
| 98-C014 | | Spring Creek | 6126 | 2 | C | 51 | 25 | 72 | 52 | 98 | 100 |
| 03-A094 | | Spring Creek | 6075 | 2 | | | | | | | |
| 98-C016 | | Spring Creek East Fork | 6260 | 1 | Aa+ | 35 | 9 | 100 | 96 | 97 | 94 |
| 96-Z048 | | Steel Creek | 6680 | 2 | A | 77 | 6 | 98 | 97 | 98 | 97 |
| 02-A025 | | Steel Creek | 6640 | 2 | E | | | | | | |
| 96-Z055 | | Stoddard Creek | 6730 | 1 | A | 63 | 18 | 97 | 96 | 74 | 84 |
| 03-A072 | | Stoddard Creek | 6120 | 1 | | | | | | | |
| 02-A003 | 96- | Stump Creek | 6840 | 1 | B | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Z046 | | | | | | | | | | |
| 96-Z046 | 02-A003 | Stump Creek | 6860 | 1 | B | 76 | 18 | 100 | 83 | 100 | 87 |
| 98-C013 | | Three Mile Creek | 5840 | 2 | D | 47 | 14 | 6 | 99 | 94 | 100 |
| 04-A005 | | Threemile Creek | 5890 | 3 | | | | | | | |
| 02-A027 | | Thunder Gulch Creek | 5800 | 1 | | | | | | | |
| 98-C037 | | Trail Creek | 7040 | 2 | A | 51 | 11 | 87 | 82 | 91 | 100 |
| 03-A097 | | Trail Creek | 7120 | 2 | | | | | | | |
| 04-A121 | | UNT to Beaver Creek | 5029 | 3 | | | | | | | |
| 04-A122 | | UNT to Beaver Creek | 6755 | 1 | | | | | | | |
| 04-A004 | | UNT to Beaver Creek | 4845 | 1 | | | | | | | |
| 04-A039 | | UNT to East Camas Creek | 6362 | 1 | | | | | | | |
| 98-C035 | | Van Noy Creek | 6180 | 1 | A | 64 | 8 | 88 | 88 | 100 | 98 |
| 03-A073 | | Van Noy Creek | 6125 | 1 | | | | | | | |
| 96-Z044 | | West Camas Creek | 6880 | 2 | E | 73 | 5 | 94 | 94 | 98 | 100 |
| 03-A078 | | West Camas Creek | 6880 | 2 | | | | | | | |
| 01-A056 | | West Camas Creek | 6680 | 3 | E | 32 | 10 | 100 | 56 | 100 | 63 |
| 03-A080 | | West Camas Creek | 6870 | 3 | G | | | | | | |
| 04-A040 | | West Camas Creek | 6490 | 3 | C | | | | | | |
| 96-Z068 | | West Dry Creek | 7740 | 1 | B | 69 | 27 | 100 | 100 | 100 | 100 |
| 98-C030 | | West Modoc Creek | 7660 | 1 | A | 36 | 7 | 92 | 74 | 98 | 87 |
| 03-A081 | | West Modoc Creek | 7640 | 1 | | | | | | | |
| 98-C005 | | West Three Mile Creek | 6170 | 1 | A | 46 | 11 | 92 | 99 | 97 | 94 |
| 03-A088 | | West Threemile Creek | 5090 | 1 | | | | | | | |
| 02-A017 | | White Pine Creek | 7060 | 1 | A | | | | | | |
| 03-A066 | | White Pine Creek | 6920 | 1 | | | | | | | |
| 96-Z058 | | White Pine Creek | 6920 | 1 | A | 88 | 7 | 98 | 100 | 98 | 99 |

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# Appendix B. Unit Conversion Chart

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**Table B-1. Metric - English unit conversions.**

| | English Units | Metric Units | To Convert | Example |
|---|---|---|---|---|
| **Distance** | Miles (mi) | Kilometers (km) | 1 mi = 1.61 km<br>1 km = 0.62 mi | 3 mi = 4.83 km<br>3 km = 1.86 mi |
| **Length** | Inches (in)<br>Feet (ft) | Centimeters (cm)<br>Meters (m) | 1 in = 2.54 cm<br>1 cm = 0.39 in<br>1 ft = 0.30 m<br>1 m = 3.28 ft | 3 in = 7.62 cm<br>3 cm = 1.18 in<br>3 ft = 0.91 m<br>3 m = 9.84 ft |
| **Area** | Acres (ac)<br>Square Feet ($ft^2$)<br>Square Miles ($mi^2$) | Hectares (ha)<br>Square Meters ($m^2$)<br>Square Kilometers ($km^2$) | 1 ac = 0.40 ha<br>1 ha = 2.47 ac<br>1 $ft^2$ = 0.09 $m^2$<br>1 $m^2$ = 10.76 $ft^2$<br>1 $mi^2$ = 2.59 $km^2$<br>1 $km^2$ = 0.39 $mi^2$ | 3 ac = 1.20 ha<br>3 ha = 7.41 ac<br>3 $ft^2$ = 0.28 $m^2$<br>3 $m^2$ = 32.29 $ft^2$<br>3 $mi^2$ = 7.77 $km^2$<br>3 $km^2$ = 1.16 $mi^2$ |
| **Volume** | Gallons (gal)<br>Cubic Feet ($ft^3$) | Liters (L)<br>Cubic Meters ($m^3$) | 1 gal = 3.78 L<br>1 L= 0.26 gal<br>1 $ft^3$ = 0.03 $m^3$<br>1 $m^3$ = 35.32 $ft^3$ | 3 gal = 11.35 L<br>3 L = 0.79 gal<br>3 $ft^3$ = 0.09 $m^3$<br>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<br>1 $m^3$/sec = 35.31cfs | 3 $ft^3$/sec = 0.09 $m^3$/sec<br>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<br>1 kg = 2.20 lbs | 3 lb = 1.36 kg<br>3 kg = 6.61 lb |
| **Temperature** | Fahrenheit (°F) | Celsius (°C) | °C = 0.55 (F - 32)<br>°F = (C x 1.8) + 32 | 3 °F = -15.95 °C<br>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.

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# Appendix C. State and Site-Specific Standards and Criteria

**003. DEFINITIONS**

For the purpose of the rules contained in IDAPA 58.01.02, "Water Quality Standards and Wastewater Treatment Requirements," the following definitions apply: (4-5-00)

**01. Acute**. Involving a stimulus severe enough to rapidly induce a response; in aquatic toxicity tests, a response measuring lethality observed in ninety-six (96) hours or less is typically considered acute. When referring to human health, an acute effect is not always measured in terms of lethality. (3-20-97)

**02. Acute Criteria**. Unless otherwise specified in these rules, the maximum instantaneous or one (1) hour average concentration of a toxic substance or effluent which ensures adequate protection of sensitive species of aquatic organisms from acute toxicity resulting from exposure to the toxic substance or effluent. Acute criteria will adequately protect the designated aquatic life use if not exceeded more than once every three (3) years. The terms "acute criteria" and "criterion maximum concentration" (CMC) are equivalent. (3-15-02)

**03. Acute Toxicity**. The existence of mortality or injury to aquatic organisms resulting from a single or short-term (i.e., ninety-six (96) hours or less) exposure to a substance. As applied to toxicity tests, acute toxicity refers to the response of aquatic test organisms to a concentration of a toxic substance or effluent which results in a LC-50. (3-20-97)

**04. Beneficial Use**. Any of the various uses which may be made of the water of Idaho, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use. (8-24-94)

**05. Available**. Based on public wastewater system size, complexity, and variation in raw waste, a certified wastewater operator must be on site or able to be contacted as needed to initiate the appropriate action for normal or emergency conditions in a timely manner.

**050. ADMINISTRATIVE POLICY.**

**01. Apportionment Of Water**. The adoption of water quality standards and the enforcement of such standards is not intended to conflict with the apportionment of water to the state through any of the interstate compacts or court decrees, or to interfere with the rights of Idaho appropriators, either now or in the future, in the utilization of the water appropriations which have been granted to them under the statutory procedure, or to interfere with water quality criteria established by mutual agreement of the participants in interstate water pollution control enforcement procedures. (7-1-93)

**02. Protection Of Waters Of The State**. (7-1-93) **a.** Wherever attainable, surface waters of the state shall be protected for beneficial uses which for surface waters includes all recreational use in and on the water surface and the preservation and propagation of desirable species of aquatic life; (4-5-00) **b.** In all cases, existing beneficial uses of the waters of the state will be protected. (7-1-93)

**03. Annual Program**. To fully achieve and maintain water quality in the state, it is the intent of the requirements of the State's Water Quality Management Plan. The Department's planned programs for water pollution control comprise the State's Water Quality Management Plan. (4-5-00)

**04. Program Integration**. Whenever an activity or class of activities is subject to provisions of these rules, as well as other regulations or standards of either this Department or other Governmental agency, the Department will seek and employ those methods necessary and practicable to integrate the implementation, administration and enforcement of all applicable regulations through a single program. Integration will not, however, be affected to the extent that applicable provisions of these rules would fail to be achieved or maintained unless the Department's role in these cases is limited by state statute or federal law. (7-1-93)

**05. Revisions**. These rules are subject to amendment as technical data, surveillance programs, and technological advances require. Any revisions made to these rules shall be in accordance with Sections 39-101, et seq., and 67-5201, et seq., Idaho Code. (8-24-94)

**051. ANTIDEGRADATION POLICY.**

**01. Maintenance Of Existing Uses For All Waters**. The existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. (7-1-93)

**02. High Quality Waters**. Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Department's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully. Further, the Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control. In providing such assurance, the Department may enter together into an agreement with other state of Idaho or federal agencies in accordance with Sections 67-2326 through 67-2333, Idaho Code. (7-1-93)

**03. Outstanding Resource Waters**. Where high quality waters constitute an outstanding national resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected from the impacts of point and nonpoint source activities.

**053. BENEFICIAL USE SUPPORT STATUS**

In determining whether a water body fully supports designated and existing beneficial uses, the Department shall determine whether all of the applicable water quality standards are being achieved, including any criteria developed pursuant to these rules, and whether a healthy, balanced biological community is present. The Department shall utilize biological and aquatic habitat parameters listed below and in the current version of the "Water Body Assessment Guidance", as published by the Idaho Department of Environmental Quality, as a guide to assist in the assessment of beneficial use status. Revisions to this guidance will made after notice and an opportunity for public comment. These parameters are not to be considered or treated as individual water quality criteria or otherwise interpreted or applied as water quality standards. (4-5-00)

**01. Aquatic Habitat Parameters**. These parameters may include, but are not limited to, stream width, stream depth, stream shade, measurements of sediment impacts, bank stability, water flows, and other physical characteristics of the stream that affect habitat for fish, macroinvertebrates or other aquatic life; and (3-20-97)

**02. Biological Parameters**. These parameters may include, but are not limited to, evaluation of aquatic macroinvertebrates including Ephemeroptera, Plecoptera and Trichoptera (EPT), Hilsenhoff Biotic Index, measures of functional feeding groups, and the variety and number of fish or other aquatic life to determine biological community diversity and functionality. (3-20-97)

**03. Natural Conditions**. There is no impairment of beneficial uses or violation of water quality standards where natural background conditions exceed any applicable water quality criteria as determined by the Department, and such natural background conditions shall not, alone, be the basis for placing a water body on the list of water quality limited water bodies described in Section 054. (3-15-02)

**054. WATER QUALITY LIMITED WATERS AND TMDLS.**

**01. After Determining That Water Body Does Not Support Use**. After determining that a water body does not fully support designated or existing beneficial uses in accordance with Section 053, the Department, in consultation with the applicable basin and watershed advisory groups, shall evaluate whether the application of required pollution controls to sources of pollution affecting the impaired water body would restore the water body to full support status. This evaluation may include the following: (3-20-97)

**a.** Identification of significant sources of pollution affecting the water body by past and present activities; (3-20-97)

**b.** Determination of whether the application of required or cost-effective interim pollution control strategies to the identified sources of pollution would restore the water body to full support status within a reasonable period of time; (3-20-97)

**c.** Consultation with appropriate basin and watershed advisory groups, designated agencies and landowners to determine the feasibility of, and assurance that required or cost-effective interim pollution control strategies can be effectively applied to the sources of pollution to achieve full support status within a reasonable period of time; (3-20-97)

**d.** If pollution control strategies are applied as set forth in this Section, the Department shall subsequently monitor the water body to determine whether application of such pollution controls were successful in restoring the water body to full support status. (3-20-97)

**02. Water Bodies Not Fully Supporting Beneficial Uses**. After following the process identified in Subsection 054.01, water bodies not fully supporting designated or existing beneficial uses and not meeting applicable water quality standards despite the application of required pollution controls shall be identified by the Department as water quality limited water bodies, and shall require the development of TMDLs or other equivalent processes, as described under Section 303(d)(1) of the Clean Water Act. A list of water quality limited water bodies shall be published periodically by the Department in accordance with Section 303(d) of the Clean Water Act and be subject to public review prior to submission to EPA for approval. Informational TMDLs may be developed for water bodies fully supporting beneficial uses as described under Section 303(d)(3) of the Clean Water Act, however, they will not be subject to the provisions of this Section. (3-20-97)

**03. Priority Of TMDL Development**. The priority of TMDL development for water quality limited water bodies identified in Subsection 054.02 shall be determined by the Director in consultation with the Basin Advisory Groups as described in Sections 39-3601, et seq., Idaho Code, depending upon the severity of pollution and the uses of the water body, including those of unique ecological significance. Water bodies identified as a high priority through this process will be the first to be targeted for development of a TMDL or equivalent process. (3-20-97)

**04. High Priority Provisions**. Until a TMDL or equivalent process is completed for a high priority water quality limited water body, new or increased discharge of pollutants which have caused the water quality limited listing may be allowed if interim changes, such as pollutant trading, or some other approach for the pollutant(s) of concern are implemented and the total load remains constant or decreases within the watershed. Interim changes shall maximize the use of cost effective measures to cap or decrease controllable human-caused discharges from point and nonpoint sources. Once the TMDL or equivalent process is completed, any new or increased discharge of causative pollutants will be allowed only if consistent with the approved

TMDL. Nothing in this section shall be interpreted as requiring best management practices for agricultural operations which are not adopted on a voluntary basis.

**100. SURFACE WATER USE DESIGNATIONS**
Waterbodies are designated in Idaho to protect water quality for existing or designated uses. The designated use of a waterbody does not imply any rights to access or ability to conduct any activity related to the use designation, nor does it imply that an activity is safe. For example, a designation of primary or secondary contact recreation may occur in areas where it is unsafe to enter the water due to water flows, depth or other hazardous conditions. Another example is that aquatic life uses may be designated in areas that are closed to fishing or access is not allowed by property owners. Wherever attainable, the designated beneficial uses for which the surface waters of the state are to be protected include: (3-15-02)

**01. Aquatic Life**. (7-1-93)

**a.** Cold water (COLD): water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species. (4-5-00)

**b.** Salmonid spawning: waters which provide or could provide a habitat for active self-propagating populations of salmonid fishes. (7-1-93)

**c.** Seasonal cold water (SC): water quality appropriate for the protection and maintenance of a viable aquatic life community of cool and cold water species, where cold water aquatic life may be absent during, or tolerant of, seasonally warm temperatures. (4-5-00)

**d.** Warm water (WARM): water quality appropriate for the protection and maintenance of a viable aquatic life community for warm water species. (4-5-00)

**e.** Modified (MOD): water quality appropriate for an aquatic life community that is limited due to one (1) or more conditions set forth in 40 CFR 131.10(g) which preclude attainment of reference streams or conditions.

**02. Recreation**. (7-1-93) **a.** Primary contact recreation (PCR): water quality appropriate for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such activities include, but are not restricted to, those used for swimming, water skiing, or skin diving. (4-5-00) **b.** Secondary contact recreation (SCR): water quality appropriate for recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur. (4-5-00)

**03. Water Supply**. (7-1-93)

**a.** Domestic: water quality appropriate for drinking water supplies. (4-5-00)

**b.** Agricultural: water quality appropriate for the irrigation of crops or as drinking water for livestock. This use applies to all surface waters of the state. (4-5-00)

**c.** Industrial: water quality appropriate for industrial water supplies. This use applies to all surface waters of the state. (4-5-00)

**04. Wildlife Habitats**. Water quality appropriate for wildlife habitats. This use applies to all surface waters of the state. (4-5-00)

**05. Aesthetics**. This use applies to all surface waters of the state. (7-1-93)

**101. NONDESIGNATED SURFACE WATERS**

**01. Undesignated Surface Waters**. Surface waters not designated in Sections 110 through 160 shall be designated according to Section 39-3604, Idaho Code, taking into consideration the use of the surface water and such physical, geological, chemical, and biological measures as may affect the surface water. Prior to designation, undesignated waters shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable. (3-23-98)

**a.** Because the Department presumes most waters in the state will support cold water aquatic life and primary or secondary contact recreation beneficial uses, the Department will apply cold water aquatic life and primary or secondary contact recreation criteria to undesignated waters unless Sections 101.01.b and 101.01c. are followed. (4-5-00)

**b.** During the review of any new or existing activity on an undesignated water, the Department may examine all relevant data or may require the gathering of relevant data on beneficial uses; pending determination in Section 101.01.c. existing activities will be allowed to continue. (3-23-98) **c.** If, after review and public notice of relevant data, it is determined that beneficial uses in addition to or other than cold water aquatic life and primary or secondary contact recreation are appropriate, then the Department will: (4-5-00) i. Complete the review and compliance determination of the activity in context with the new information on beneficial uses, and (3-23-98) ii. Initiate rulemaking necessary to designate the undesignated water, including providing all necessary data and information to support the proposed designation. (3-23-98)

**02. Man-Made Waterways**. Unless designated in Sections 110 through 160, man-made waterways are to be protected for the use for which they were developed. (7-1-93)

**03. Private Waters**. Unless designated in Sections 110 through 160, lakes, ponds, pools, streams and springs outside public lands but located wholly and entirely upon a person's land are not protected specifically or generally for any beneficial use.

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# Appendix D. Data Sources

## Table D-1. Data sources for Beaver-Camas Subbasin Assessment.

| Waterbody | Data Source | Type of Data | When Collected |
|---|---|---|---|
| All | Western Regional Climate Center (www.wrcc.dri.edu) | Climate | Period of Record |
| All | Agrimet Station Data (www.mac1.usbr.gov/agrimet/location.html) | Air | Period of Record |
| All | Snotel (www.wrcc.dri.edu) | Snow Water Content | Period of Record |
| Beaver Creek, and Camas Creek | USGS (www.waterdata.usgs.gov/id/nwis/peak) | Streamflow | Period of Record |
| Beaver Creek, West Camas Creek, and East Camas Creek | USFS-Idaho Falls, Lee Leffert | Temperature | 200-2003 |
| Beaver Creek, Stoddard Creek, Camas Creek, Miners Creek, Dairy Creek, Crooked Creek, Threemile Creek, and W. Fk. Rattlesnake Creek | DEQ-Idaho Falls, Melissa Thompson | Temperature | 2004 |
| Beaver Creek | BLM-Idaho Falls, Dan Kotanski | Nutrient | 2004 |
| Beaver Creek, Ching Creek, Camas Creek, Crooked Creek, Modoc Creek, E.Fk. Rattlesnake Creek, Stoddard Creek, Dairy Creek, Miners Creek, Threemile Creek, and Warm Creek | DEQ-Idaho Falls, Melissa Thompson | Nutrient, Pathogen | 2004 |
| All | DEQ-Idaho Falls, Steve Robinson | BURP Monitoring | 1993-2004 |
| Beaver Creek and Camas Creek | DEQ-Tech Services, Don Zaroban | McNeil Sediment | 2003 |
| Camas Creek | DEQ-Idaho Falls, Melissa Thompson | Streambank Erosion Inventory | 2004 |
| See Table 23 | DEQ-Idaho Falls, Steve Robinson | Fish | 1998, 2001-2004 |
| See Table 25 | BLM-Idaho Falls, Pat Koelsch | Fish | 1996, 1998, 2000 |
| See Table 26 | USFS-Idaho Falls, Jim Capurso | Fish | 2002 |
| See Table 23 | IDFG-Idaho Falls, Jim Fredericks | Fish | 2002 |
| Beaver Creek | BLM-Idaho Falls, Dan Kotanski | PFC | 1994 and 2004 |
| Beaver Creek, Camas Creek, Dairy Creek, West Camas Creek, East Camas Creek, Modoc Creek, Threemile Creek, Stoddard Creek, Miners Creek | DEQ-Idaho Falls, Melissa Thompson | Solar Pathfinder | 2004 |

# Appendix E. Subsurface Fine Sampling Results

## Table E-1. Beaver Creek McNeil Data

| | | | | | | |
|---|---|---|---|---|---|---|
| Stream Name: | **Beaver Creek** | | | | | |
| Date: (YYYY/MM/DD) | **2003 / 10 / 16** | | | | | |
| Location: | **upper** | | | | | |
| Lat/Long: | N: | **44.4138** | | W: | **112.19732** | |
| Lat/Long Accuracy | **5 Meters** | | | | | |
| Datum: | **WGS84** | | | | | |
| Site Desc: | **at Stoddard Creek exit of I-15** | | | | | |
| Personnel: | **M. Thompson, B. Valverde, D. Zaroban** | | | | | |
| Rosgen Channel: | | | | | | |
| Reach Gradient: | % | | | | | |
| Geology: (Q G V S) | | | | | | |
| Target Species: | | | | | | |
| Flow: | | | | | | |
| Surrounding Land Use: | | | | | | |
| | Core 1 ml | Core 2 ml | Core 3 ml | | | |
| Ocular Est% Surf Fines | | | | | | |
| **Sieve Size (Inches)** | | | | | | |
| 2.5 | 40 | 920 | 720 | | | |
| 1 | 1720 | 2605 | 2830 | | | |
| 0.5 | 1110 | 1520 | 1380 | | | |
| 0.25 | 37 | 965 | 990 | | | |
| 1.0 - 0.25" Subtotal | 2867 | 5090 | 5200 | | | |
| #4 | 5 | 320 | 430 | | | |
| #8 | 365 | 490 | 620 | | | |
| #20 | 365 | 340 | 370 | | | |
| #70 | 365 | 860 | 1000 | | | |
| #270 | 140 | 85 | 90 | | | |
| <0.25" Subtotal | 1240 | 2095 | 2510 | | | |
| Sample Total W/O 2.5" | 4107 | 7185 | 7710 | **Mean** | | **Std. Dev.** |
| % Fines W/O 2.5" | 0.301923545 | 0.29157968 | 0.325551232 | | 0.3063515 | 0.0174133 |
| Sample Total W/ 2.5" | 4147 | 8105 | 8430 | **Mean** | | **Std. Dev.** |
| % Fines W/ 2.5" | 0.299011333 | 0.258482418 | 0.297746145 | | 0.28508 | 0.0230428 |

## Table E-2. Camas Creek McNeil Data

| | |
|---|---|
| Stream Name: | Camas Creek |

| | | | | | | |
|---|---|---|---|---|---|---|
| Date: (YYYY/MM/DD) | **2003 / 10 / 21** | | | | | |
| Location: | upper | | | | | |
| Lat/Long: | N: | 44.1928 | | W: | 111.9817 | |
| Lat/Long Accuracy | | 5 Meters | | | | |
| Datum: | WGS84 | | | | | |
| Site Desc: | approx. 300 meters above lower end of inventory reach | | | | | |
| Personnel: | R. Lee, D. Zaroban | | | | | |
| Rosgen Channel: | | | | | | |
| Reach Gradient: | % | | | | | |
| Geology: (Q G V S) | | | | | | |
| Target Species: | rainbow trout | | | | | |
| Flow: | | | | | | |
| Surrounding Land Use: | State land, range, grazing | | | | | |
| | Core 1<br>ml | Core 2<br>ml | Core 3<br>ml | | | |
| Ocular Est% Surf Fines | | | | | | |
| **Sieve Size (Inches)** | | | | | | |
| 2.5 | 530 | 0 | 0 | | | |
| 1 | 4100 | 2220 | 2100 | | | |
| 0.5 | 2780 | 1295 | 1090 | | | |
| 0.25 | 2310 | 880 | 820 | | | |
| 1.0 - 0.25" Subtotal | 9190 | 4395 | 4010 | | | |
| #4 | 660 | 300 | 260 | | | |
| #8 | 1400 | 600 | 645 | | | |
| #20 | 950 | 600 | 470 | | | |
| #70 | 2430 | 1440 | 1070 | | | |
| #270 | 60 | 70 | 50 | | | |
| <0.25" Subtotal | 5500 | 3010 | 2495 | | | |
| Sample Total W/O 2.5" | 14690 | 7405 | 6505 | **Mean** | **Std. Dev.** | |
| % Fines W/O 2.5" | 0.374404357 | 0.406482107 | 0.383551115 | 0.388146 | 0.016525 | |
| Sample Total W/ 2.5" | 15220 | 7405 | 6505 | **Mean** | **Std. Dev.** | |
| % Fines W/ 2.5" | 0.361366623 | 0.406482107 | 0.383551115 | 0.3838 | 0.022559 | |

# Appendix F. Streambank Erosion Inventory Method

## Streambank Erosion Inventory

**The streambank erosion inventory used to estimate background and existing streambank erosion followed methods outlined in the proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (NRCS, 1983). Using the direct volume method, sub-sections of 1996 §303(d) watersheds were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.**

The NRCS Stream Bank Erosion Inventory is a field based methodology, which measures streambank/channel stability, length of active eroding banks, and bank geometry (Stevenson, 1994). The streambank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of streambank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating the factors and rating scores are:

**Bank Stability:**
- Do not appear to be eroding - 0
- Erosion evident - 1
- Erosion and cracking present - 2
- Slumps and clumps sloughing off - 3

**Bank Condition:**
- Some bare bank, few rills, no vegetative overhang - 0
- Predominantly bare, some rills, moderate vegetative overhang - 1
- Bare, rills, severe vegetative overhang, exposed roots - 2
- Bare, rills and gullies, severe vegetative overhang, falling trees - 3

**Vegetation / Cover On Banks:**
- Predominantly perennials or rock-covered - 0
- Annuals / perennials mixed or about 40% bare - 1
- Annuals or about 70% bare - 2
- Predominantly bare – 3

**Bank / Channel Shape:**
- V - Shaped channel, sloped banks - 0
- Steep V - Shaped channel, near vertical banks - 1
- Vertical Banks, U - Shaped channel - 2
- U - Shaped channel, undercut banks, meandering channel - 3

**Channel Bottom:**
- Channel in bedrock / noneroding - 0
- Soil bottom, gravels or cobbles, minor erosion - 1
- Silt bottom, evidence of active downcutting - 2

**Deposition:**
- No evidence of recent deposition - 1
- Evidence of recent deposits, silt bars - 0

**Cumulative Rating**

Slight (0-4) Moderate (5-8) Severe (9+)

From the Cumulative Rating, the lateral recession rate is assigned.

| | |
|---|---|
| 0.01 - 0.05 feet per year | **Slight** |
| 0.06 - 0.15 feet per year | **Moderate** |
| 0.16 - 0.3 feet per year | **Severe** |
| 0.5+ feet per year | **Very Severe** |

Streambank stability can also be characterized through the following definition and the corresponding streambank erosion condition rating from Bank Stability or Bank Condition above are included in italics.
Streambanks are considered stable if they do not show indications of any of the following features:

- **Breakdown** - Obvious blocks of bank broken away and lying adjacent to the bank breakage. *Bank Stability Rating 3*
- **Slumping or False Bank** - Bank has obviously slipped down, cracks may or may not be obvious, but the slump feature is obvious. *Bank Stability Rating 2*
- **Fracture** - A crack is visibly obvious on the bank indicating that the block of bank I about to slump or move into the stream. *Bank Stability Rating 2*
- **Vertical and Eroding** - The bank is mostly uncovered and the bank angle is steeper than 80 degrees from the horizontal. *Bank Stability Rating 1*

Streambanks are considered covered if they show any of the following features:

- Perennial vegetation ground cover is greater than 50%. *Vegetation/Cover Rating 0*
- Roots of vegetation cover more than 50% of the bank (deep rooted plants such as willows and sedges provide such root cover). *Vegetation/Cover Rating 1*
- At least 50% of the bank surfaces are protected by rocks of cobble size or larger. *Vegetation/Cover Rating 0*
- At least 50% of the bank surfaces are protected by logs of 4 inch diameter or larger. *Vegetation/Cover Rating 1*

Streambank stability is estimated using a simplified modification of Platts, Megahan, and Minshall (1983, p. 13) as stated in *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (Bauer and Burton, 1993). The modification allows for measuring streambank stability in a more objective fashion. The lengths of banks on both sides of the stream throughout the entire linear distance of the representative reach are measured and proportioned into four stability classes as follows:

- **Mostly covered and stable (non-erosional).** Streambanks are Over 50% Covered as defined above. Streambanks are Stable as defined above. Banks associated with gravel bars having perennial vegetation above the scourline are in this category. *Cumulative Rating 0 - 4 (slight erosion) with a corresponding lateral recession rate of 0.01 - 0.05 feet per year.*
- **Mostly covered and unstable (vulnerable).** Streambanks are Over 50% Covered as defined above. Streambanks are Unstable as defined above. Such banks are typical of Afalse banks" observed in meadows where breakdown, slumping, and/or fracture show instability yet vegetative cover is abundant. *Cumulative Rating 5 - 8 (moderate erosion)*

*with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*

- **Mostly uncovered and stable (vulnerable).** Streambanks are less than 50% Covered as defined above. Streambanks are Stable as defined above. Uncovered, stable banks are typical of streambanks trampled by concentrations of cattle. Such trampling flattens the bank so that slumping and breakdown do not occur even though vegetative cover is significantly reduced or eliminated. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*
- **Mostly uncovered and unstable (erosional).** Streambanks are less than 50% Covered as defined above. They are also Unstable as defined above. These are bare eroding streambanks and include ALL banks mostly uncovered, which are at a steep angle to the water surface. *Cumulative Rating 9+ (severe erosion) with a corresponding lateral recession rate of over 0.5 feet per year.*

Streambanks were inventoried to quantify bank erosion rate and annual average erosion. These data were used to develop a quantitative sediment budget to be used for TMDL development.

## Site Selection

The first step in the bank erosion inventory is to identify key problem areas. Streambank erosion tends to increase as a function of watershed area (NRCS, 1983). As a result, the lower stream segment of larger watersheds tend to be problem areas. These stream segments tend to be alluvial streams commonly classified as response reaches (Rosgen B and C channel types) (Rosgen,1996).
Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates are extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less. Typically between 10 and 30 percent of streambank needs to be inventoried. Often, the location of some stream inventory reaches is more dependent on land ownership than watershed characteristics. For example, private land owners are sometimes unwilling to allow access to stream segments within their property.
Stream reaches are subdivided into *sites* with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites. Subdivision of stream reaches is at the discretion of the field crew leader.

## Field Methods

Streambank erosion or channel stability inventory field methods were originally developed by the USDA USFS (Pfankuch, 1975). Further development of channel stability inventory methods are outlined in Lohrey (1989) and NRCS (1983). As stated above, the NRCS (1983) document outlines field methods used in this inventory. However, slight modifications to the field methods were made and are documented.

Field crews typically consist of two to four people and are trained as a group to ensure quality control or consistent data collection. Field crews survey selected stream reaches measuring bank length, slope height, bankfull width and depth, and bank content. In most cases, a Global Positioning System (GPS) is used to locate the upper and lower boundaries of inventoried stream reaches. Additionally, while surveying field crews photograph key problem areas.

## Bank Erosion Calculations

The direct volume method is used to calculate average annual erosion rates for a given stream segment based on bank recession rate determined in the survey (NRCS, 1983). The erosion rate (tons/mile/year) is used to estimate the total bank erosion of the selected stream corridor.

The direct volume method is summarized in the following equations:

$$E = [A_E * R_{LR} * \ _B]/2000 \text{ (lbs/ton)}$$

where:

$E$ = bank erosion over sampled stream reach (tons/yr/sample reach)

$A_E$ = eroding area ($ft^2$)

$R_{LR}$ = lateral recession rate (ft/yr)

$\ _B$ = bulk density of bank material (lps/$ft^3$)

The bank erosion rate ($E_R$) is calculated by dividing the sampled bank erosion (E) by the total stream length sampled:

$$E_R = E/L_{BB}$$

where:

$E_R$ = bank erosion rate (tons/mile/year)

$E$ = bank erosion over sampled stream reach (tons/yr/sample reach)

$L_{BB}$ = bank to bank stream length over sampled reach

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al, 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50 year flood event might cause five feet of bank erosion in one year and over a ten year period this events accounts for the majority of bank erosion. These factors have less of an influence where bank trampling is the major cause of channel instability.

The *eroding area* ($A_E$) is the product of linear horizontal bank distance and average bank slope height. Bank length and slope heights are measured while walking along the stream channel. Pacing is used to measure horizontal distance, and bank slope heights are continually measured and averaged over a given reach or site. The horizontal length is the length of the right or left bank, not both. Typically, one bank along the stream channel is actively eroding. For example, the bank on the outside of a meander. However, both banks of channels with severe headcuts or gullies will be eroding and are to be measured separately and eventually summed.

Determining the *lateral recession rate* ($R_{LR}$) is one of the most critical factors in this methodology (NRCS, 1983). Several techniques are available to quantify bank erosion rates: for example, aerial photo interpretation, anecdotal data, bank pins, and channel cross-sections.
**To facilitate consistent data collection, the NRCS developed rating factors used to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates.**

The *bulk density* ($\rho_B$) of bank material is measured ocularly in the field. Soil bulk density is the weight of material divided by its volume, including the volume of its pore spaces. A table of typical soil bulk densities can be used, or soil samples can be collected and soil bulk density measured in the laboratory.

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# Appendix G. Streambank Erosion Inventory Data Sheets

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# Table G-1. Camas Streambank Erosion Inventory Data Sheet

**STREAMBANK EROSION INVENTORY WORKSHEET**

| | | | | | |
|---|---|---|---|---|---|
| **Stream:** | Camas Creek | **Stream Segment Location (DD)** | | | **Elevation (ft)** |
| **Section:** | On BLM property below headwaters | *Upstream:* | 44.2666 | 111.91214 | |
| **Date Collected:** | 10/22/2004 | *Downstream* | 44.26201 | 111.91028 | |
| **Field Crew:** | MCT and TH | **Landuse and Notes:** | Grazing | | |
| **Data Reduced By:** | MCT | | | | |

| Streambank Erosion Calculations | | |
|---|---|---|
| Average Bank Height | 5.7 | ft |
| Total Inventoried Bank Length | 1863 | ft |
| Inventoried Bank to Bank Length | 3726 | ft |
| Erosive Bank Length | 1414 | ft |
| Bank to Bank Eroding Segment Length | 2828 | ft |
| Percent Eroding Bank | 0.758990875 | % |
| Eroding Area | 16119.6 | ft^2 |
| Recession Rate | 0.61 | |
| Bulk Density | 90 | lb/ft^2 |
| Bank Erosion over Sampled Reach (E) | 442.48302 | tons/year/sample reach |
| Erosion Rate (Er) | 1254.058157 | tons/mile/year |
| Feet of similar stream type | 32155.2 | ft |
| Eroding Bank Extrapolation | 51639.00676 | ft |
| Total Streambank Erosion | 8079.697193 | tons/year |

| Streambank Erosion Reduction Calculations | | |
|---|---|---|
| Eroding Area With Load Reductions | 4247.64 | ft^2 |
| Erosion over sampled reach (with load reduction (20%) | 116.59772 | tons/yr/sample |
| Erosion Rate | 330.45408 | tons/mile/year |
| Feet of Similar Stream Type | 32155.2 | ft |
| Eroding Bank Extrapoltation (with reduction) | 13607.28 | ft |
| Total Streambank Erosion | 2129.0631 | tons/year |

**Extrapolation goes from HW to 44.245545; 111.93041**

| Summary for Load Reductions | | | |
|---|---|---|---|
| Existing | | Proposed | |
| Erosion Rate (t/mi/yr) | Total Erosion (t/y) | Total Erosion (t/yr) | % reduction |
| 1254.058157 | 8079.697193 | 2129.063065 | 73.64922207 |

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# Appendix H. Potential Natural Vegetation for TMDLs

## Potential Natural Vegetation for Temperature TMDLs

There are a several important contributors of heat to a stream including ground water temperature, air temperature and direct solar radiation. Of these, direct solar radiation is the source of heat that is easiest to control or manipulate. The parameter that affects or controls the amount of solar radiation hitting a stream throughout its length is shade. Shade is provided by the surrounding vegetation and other physical features such as hillsides, canyon walls, terraces, and high banks. Again, the amount of shade provided by objects other than vegetation is not easy to control or manipulate. This leaves vegetation as the most likely source of change in solar radiation hitting a stream.

Depending on how much vertical elevation also surrounds the stream, vegetation further away from the riparian corridor can provide shade. However, riparian vegetation provides a substantial amount of shade on a stream by virtue of its proximity. We can measure the amount of shade that a stream enjoys in a number of ways. Effective shade, that shade provided by all objects that intercept the sun as it makes its way across the sky, can be measured in a given spot with a solar pathfinder or with optical equipment similar to a fish-eye lens on a camera. Effective shade can also be modeled using detailed information about riparian plants and their communities, topography, and the stream's aspect. In addition to shade, canopy cover is a similar parameter that affects solar radiation. Canopy cover is the vegetation that hangs directly over the stream, and can be measured using a densiometer, or estimated visually either on site or on aerial photography. All of these methods tell us information about how much the stream is covered and how much of it is exposed to direct solar radiation.

Potential natural vegetation (PNV) along a stream is that intact riparian plant community that has grown to its fullest extent and has not been disturbed or reduced in anyway. The PNV can be removed by disturbance either naturally (wildfire, disease/old age, wind-blown, wildlife grazing) or anthropogenically (domestic livestock grazing, vegetation removal, erosion). The idea behind PNV as targets for temperature TMDLs is that PNV provides the most shade and the least achievable solar loading to the stream. Anything less than PNV is allowing the stream to heat up from excess solar inputs. We can estimate PNV from models of plant community structure (shade curves for specific riparian plant communities), and we can measure existing vegetative cover or shade. Comparing the two will tell us how much excess solar load the stream is receiving, and what can be done to decrease solar gain.

Existing shade or cover will be estimated for entire lengths of streams from visual observations of aerial photos. These estimates can be field verified by measuring shade with solar pathfinders or cover with densiometers at randomly or systematically located points along the stream (see below for methodology). PNV will be determined from existing shade curves developed for similar vegetation communities. A shade curve shows the relationship between effective shade and stream width. As a stream gets wider, the shade decreases as the vegetation has less ability to shade the center of wide streams. Existing and PNV shade can be converted to solar load from data collected on flat plate collectors at the nearest weather station collecting these data. The difference between existing and potential solar load, assuming existing load is higher, is the load reduction necessary to bring the stream back into compliance with water quality standards. Existing shade cannot be greater than PNV shade, thus existing loads cannot be less than PNV loads. PNV shade and loads are assumed to be the natural condition, thus stream temperatures under PNV conditions are considered to be the lowest achievable temperatures (so long as there are no point sources or any other anthropogenic sources of heat in the watershed).

Pathfinder Methodology

The solar pathfinder is a device that allows one to trace the outline of shade producing objects on monthly solar path charts. The percentage of the sun's path covered by these objects is the effective shade on the stream at the spot that the tracing is made. In order to adequately characterize the effective shade on a stream, as many of these traces as possible should be taken at systematic or random intervals along the length of the stream in question. At a minimum, five charts should be taken to be averaged to represent shade on a stream reach.

At each sampling location the solar pathfinder should be placed in the middle of the stream about one foot above the water. Follow the manufacturer's instructions (orient to true south and level) for taking traces. Systematic sampling is easiest to accomplish and still not bias the location of sampling. Start at a unique location such as 100 m from a bridge or fence line and then proceed upstream or downstream stopping to take additional traces at fixed intervals (e.g. every 100m, every half-mile, every degree change on a GPS, every 0.5 mile change on an odometer, etc.). On can also randomly locate points of measurement by generating random numbers to be used as interval distances. The more traces the better, for example, if the stream is four miles long paralleled by a road, you could stop at every ¼ mile to take a trace resulting in a good number of traces (about 17). If you stopped at every 0.1 mile interval, you could take over 40 traces.

It is a good idea to take notes while taking solar pathfinder traces, and to photograph the stream at several unique locations. Pay special attention to changes in riparian plant communities and what kinds of plant species (the large, dominant, shade producing ones) are present. Additionally, one can take densiometer readings at the same location as solar pathfinder traces. This provides the potential to develop relationships between canopy cover and effective shade for a given stream.

# Appendix I. Aerial Photo Interpretation

## Aerial Photo Interpretation

Canopy coverage estimates are provided for 200-foot elevation intervals, or natural breaks in vegetation density, marked out on a 1:100K hydrography. Each interval is assigned a single value representing the bottom of a 10% canopy coverage class as described below (*adapted from the CWE process, IDL, 2000* ):

| Cover class | Typical vegetation type |
|---|---|
| 0 = 0 – 9% cover | agricultural (ag) land, denuded areas |
| 10 = 10 –19% | ag land, meadows, open areas, clearcuts |
| 20 = 20 – 29% | ag land, meadows, open areas, clearcuts |
| 30 = 30 – 39% | ag land, meadows, open areas, clearcuts |
| 40 = 40 – 49% | shrublands/meadows |
| 50 = 50 – 59% | shrublands/meadows, open forests |
| 60 = 60 – 69% | shrublands/meadows, open forests |
| 70 = 70 – 79% | forested |
| 80 = 80 – 89% | forested |
| 90 = 90 –100% | forested |

Additionally, a code can be provided to indicate condition or type of vegetation seen at that interval. These codes are as follows:

N = natural forest or larger than a buffer area around stream
B = buffer area around stream, cut or open area with a short distance from stream
C = opening or clearcut on stream itself (stream exposed)
M = meadow/shrubland or alpine type
NA = In some cases no recognizable channel was seen on the photo even though the map shows a stream at 1:100K hydrography. In these few instances we have marked them as NA, no channel visible. Doesn't mean that there is not something down there, we just can't see it.

The visual estimates of cover should be field verified with either a densiometer or a solar pathfinder. The pathfinder measures effective shade and is taking into consideration other physical features that block the sun from hitting the stream surface (e.g. hillsides, canyon walls, terraces, man-made structures). The densiometer simply measures the more immediate canopy surrounding the stream. The estimate of cover made visually from an aerial photo does not take into account topography or any shading that may occur from physical features other than vegetation. However, research has shown that measurements taken by the two techniques are remarkably similar (OWEB, no date).

Aerial photo estimates likely underestimate spots that have higher cover and overestimate spots that have lower cover, when looking at the entire stream, these discrepancies balance themselves out. (Shumar 2005)

References

IDL. 2000. Forest Practices Cumulative Watershed Effects Process for Idaho. Idaho Department of Lands. March 2000.

Shumar, M. January 20, 2005. Personal Communication. Estimating canopy cover target values via aerial photography.

# Appendix J. Canopy Cover Estimates and Targets

## Table J-1. Beaver Creek Shade Estimates and Targets

| Segment Length (m) | Stream Width (m) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|
| 1371 (modoc) | 7 | 0.5 | 3.08 | 0.58 | 2.58 | -0.49 | Bebb/Geyer Willow Community |
| 1595 | 7 | 0.4 | 3.69 | 0.58 | 2.58 | -1.11 | |
| 965 | 7 | 0.3 | 4.31 | 0.58 | 2.58 | -1.72 | |
| 425 | 7 | 0.2 | 4.92 | 0.58 | 2.58 | -2.34 | |
| 1033 | 7 | 0.3 | 4.31 | 0.58 | 2.58 | -1.72 | |
| 1761 | 7 | 0.2 | 4.92 | 0.58 | 2.58 | -2.34 | |
| 810 | 8 | 0.5 | 3.08 | 0.5 | 3.08 | 0.00 | Canyon (narrow)----Bebb/Geyer Willow Community |
| 664 | 8 | 0.4 | 3.69 | 0.5 | 3.08 | -0.62 | |
| 834 | 8 | 0.5 | 3.08 | 0.5 | 3.08 | 0.00 | |
| 1236 | 11 | 0.2 | 4.92 | 0.43 | 3.51 | -1.41 | Bebb/Geyer Willow Community |
| 235 | 11 | 0.1 | 5.54 | 0.43 | 3.51 | -2.03 | |
| 1898 | 11 | 0.4 | 3.69 | 0.43 | 3.51 | -0.18 | |
| 745 | 11 | 0.2 | 4.92 | 0.43 | 3.51 | -1.41 | Pathfinder Locations B34-B38 |
| 1367 | 11 | 0.1 | 5.54 | 0.43 | 3.51 | -2.03 | |
| 478 | 11 | 0.3 | 4.31 | 0.43 | 3.51 | -0.80 | |
| 1042 | 11 | 0.2 | 4.92 | 0.43 | 3.51 | -1.41 | |
| 972 | 11 | 0.5 | 3.08 | 0.43 | 3.51 | 0.43 | |
| 522 | 11 | 0.3 | 4.31 | 0.43 | 3.51 | -0.80 | |
| 467 | 11 | 0.2 | 4.92 | 0.43 | 3.51 | -1.41 | |
| 589 | 11 | 0.4 | 3.69 | 0.43 | 3.51 | -0.18 | |
| 570 | 11 | 0.5 | 3.08 | 0.43 | 3.51 | 0.43 | |
| 709 | 11 | 0.4 | 3.69 | 0.43 | 3.51 | -0.18 | |
| 479 (spencer) | 11 | 0.2 | 4.92 | 0.43 | 3.51 | -1.41 | |
| 1253 | 11 | 0.4 | 3.69 | 0.43 | 3.51 | -0.18 | |
| 879 | 10 | 0.6 | 2.46 | 0.43 | 3.51 | 1.05 | |
| 1316 | 14 | 0.5 | 3.08 | 0.5 | 3.08 | 0.00 | Canyon-----Dogwood/Yellow Willow/Coyote Willow |
| 7997 | 14 | 0.3 | 4.31 | 0.29 | 4.37 | 0.06 | Dogwood/Yellow Willow/Coyote Willow |
| 7851 | 14 | 0.2 | 4.92 | 0.29 | 4.37 | -0.55 | Pathfinder Locations B9-B33 |
| 741 | 14 | 0.3 | 4.31 | 0.29 | 4.37 | 0.06 | Pathfinder Locations B4-B8 |
| 2511 | 15 | 0.5 | 3.08 | 0.5 | 3.08 | 0.00 | Pathfinder Locations B1-B3 Canyon-----Dogwood/Yellow Willow/Coyote Willow |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 0.34 | 4.08 | 0.46 | 3.34 | -0.74 |

**Table J-2. Camas Creek Shade Estimates and Targets.**

| Segment Length (meters) | Stream Witdh (meters) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|
| 1164 (18 mile gauge) | 15 | 0.2 | 4.92 | 0.28 | 4.43 | -0.49 | Bebb Willow and Geyer Willow Community |
| 368 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | |
| 776 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | |
| 1637 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | |
| 929 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | |
| 965 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | |
| 3515 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | Pathfinder Locations C1-C8 |
| 1223 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | |
| 1103 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | |
| 2152 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | Canyon |
| 2880 | 15 | 0.2 | 4.92 | 0.28 | 4.43 | -0.49 | |
| 803 | 15 | 0.1 | 5.54 | 0.26 | 4.55 | -0.98 | Dogwood/yellow willow/coyote willow |
| 730 | 15 | 0.2 | 4.92 | 0.26 | 4.55 | -0.37 | |
| 5395 | 15 | 0.1 | 5.54 | 0.26 | 4.55 | -0.98 | |
| 681 | 15 | 0.2 | 4.92 | 0.26 | 4.55 | -0.37 | |
| 7551 | 15 | 0.1 | 5.54 | 0.26 | 4.55 | -0.98 | Pathfinder Locations C9-C23 |
| 2068 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | |
| 1748 | 15 | 0.1 | 5.54 | 0.26 | 4.55 | -0.98 | Dogwood/yellow willow/coyote willow |
| 1624 | 15 | 0.2 | 4.92 | 0.26 | 4.55 | -0.37 | |
| 4278 | 15 | 0.1 | 5.54 | 0.26 | 4.55 | -0.98 | |
| 408 | 15 | 0 | 6.15 | 0.28 | 4.43 | -1.72 | |
| 554 | 15 | 0.1 | 5.54 | 0.28 | 4.43 | -1.11 | Pathfinder Locations C24-C27 |
| | | **0.10** | **5.56** | **0.27** | **4.47** | **-1.09** | |

**Table J-3. Dairy Creek Shade Estimates and Targets.**

| Segment Length (meters) | Steam Width (m) | Existing Shade | Existing Summer Load (kWh/m²/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m²/day) | Potential Load minus Existing Load (kWh/day) | |
|---|---|---|---|---|---|---|---|
| 556 (headwaters) | 2 | 0.80 | 1.23 | 0.88 | 0.738 | -0.492 | Doug Fir/Lodgepole Pine |
| 887 | 2 | 0.70 | 1.85 | 0.88 | 0.74 | -1.107 | |
| 1899 | 5 | 0.60 | 2.46 | 0.53 | 2.89 | 0.4305 | Bebb/Geyer Willow |
| 110 | 5 | 0.50 | 3.08 | 0.53 | 2.89 | -0.1845 | Pathfinder Location D5 |
| 332 | 5 | 0.40 | 3.69 | 0.53 | 2.89 | -0.7995 | |
| 752 | 5 | 0.50 | 3.08 | 0.53 | 2.89 | -0.1845 | |
| 252 | 5 | 0.40 | 3.69 | 0.53 | 2.89 | -0.7995 | |
| 857 | 5 | 0.50 | 3.08 | 0.53 | 2.89 | -0.1845 | Pathfinder Location D1 |
| 217 (mouth) | 5 | 0.40 | 3.69 | 0.53 | 2.89 | -0.7995 | |
| | | **0.50** | **3.08** | **0.57** | **2.41** | **-0.46** | |

**Table J-4. East Camas Creek Shade Estimates and Targets.**

| Segment Length (meters) | Stream Width (meters) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|
| 8136 (headwaters) | 4 | 0.7 | 1.85 | 0.81 | 1.17 | -0.68 | Dougfir/lodgepole pine |
| 1279 | 4 | 0.6 | 2.46 | 0.81 | 1.17 | -1.29 | |
| 698 | 4 | 0.5 | 3.08 | 0.81 | 1.17 | -1.91 | |
| 605 | 4 | 0.6 | 2.46 | 0.81 | 1.17 | -1.29 | |
| 1104 | 8 | 0.4 | 3.69 | 0.44 | 3.44 | -0.25 | Bebb/Geyer Willow community |
| 1170 | 8 | 0.3 | 4.31 | 0.44 | 3.44 | -0.86 | |
| 579 | 8 | 0.4 | 3.69 | 0.44 | 3.44 | -0.25 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1487 | 8 | 0.2 | 4.92 | 0.44 | 3.44 | -1.48 | |
| 1399 | 8 | 0.5 | 3.08 | 0.44 | 3.44 | 0.37 | |
| 3344 | 8 | 0.4 | 3.69 | 0.44 | 3.44 | -0.25 | |
| 997 | 8 | 0.5 | 3.08 | 0.44 | 3.44 | 0.37 | |
| 1287 | 8 | 0.3 | 4.31 | 0.44 | 3.44 | -0.86 | |
| 2583 | 8 | 0.2 | 4.92 | 0.44 | 3.44 | -1.48 | |
| 2290 (Camas Creek) | 8 | 0.3 | 4.31 | 0.44 | 3.44 | -0.86 | |
| | | **0.42** | **3.56** | **0.55** | **2.79** | **-0.76** | |

## Table J-5. Modoc Creek Shade Estimates and Targets.

| Segment Length (~miles) | Segment Length (meters) | Stream Width (m) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|---|
| 0.5 (west) | 838 | 3 | 0.6 | 2.46 | 0.74 | 1.60 | -0.86 | Bebb Willow/Geyer Willow Community |
| 1.4 (middle) | 2253 | 3 | 0.6 | 2.46 | 0.74 | 1.60 | -0.86 | |
| 1 (east) | 1353 | 3 | 0.6 | 2.46 | 0.74 | 1.60 | -0.86 | |
| 0.3 (mainstem) | 573 | 3 | 0.6 | 2.46 | 0.74 | 1.60 | -0.86 | |
| 0.4 | 555 | 3 | 0.5 | 3.08 | 0.74 | 1.60 | -1.48 | |
| 1.6 | 3060 | 5 | 0.4 | 3.69 | 0.61 | 2.40 | -1.29 | M1-M5 |
| 1 | 1693 | 5 | 0.2 | 4.92 | 0.61 | 2.40 | -2.52 | |
| 1.3 | 2373 | 5 | 0.3 | 4.31 | 0.61 | 2.40 | -1.91 | |
| 0.6 | 1070 | 5 | 0.4 | 3.69 | 0.61 | 2.40 | -1.29 | |
| 0.9 | 1278 | 5 | 0.2 | 4.92 | 0.61 | 2.40 | -2.52 | |
| 0.6 | 1181 | 5 | 0.4 | 3.69 | 0.61 | 2.40 | -1.29 | |
| 0.3 | 1035 | 5 | 0.1 | 5.54 | 0.61 | 2.40 | -3.14 | |
| 0.2 | 331 | 5 | 0.2 | 4.92 | 0.61 | 2.40 | -2.52 | |
| 0.3 | 557 | 5 | 0.3 | 4.31 | 0.61 | 2.40 | -1.91 | |
| **Average** | | | **0.39** | **3.78** | **0.66** | **2.11** | **-1.66** | |

## Table J-6. Threemile Creek Shade Estimates and Targets.

| Segment Length (meters) | Stream Width (m) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1266 (East) | 3 | 0.8 | 1.23 | 0.83 | 1.05 | -0.18 | lodgepole pine/doug fir |
| 1564 | 3 | 0.7 | 1.85 | 0.83 | 1.05 | -0.80 | |
| 858 | 4 | 0.6 | 2.46 | 0.8 | 1.23 | -1.23 | Quaking Aspen/dogwood |
| 1317 | 4 | 0.7 | 1.85 | 0.8 | 1.23 | -0.62 | |
| 3079 | 4 | 0.6 | 2.46 | 0.8 | 1.23 | -1.23 | |
| 788 (Middle) | 3 | 0.7 | 1.85 | 0.83 | 1.05 | -0.80 | lodgepole pine/doug fir |
| 709 | 3 | 0.8 | 1.23 | 0.83 | 1.05 | -0.18 | |
| 674 | 4 | 0.7 | 1.85 | 0.8 | 1.23 | -0.62 | Quaking Aspen/dogwood |
| 813 | 4 | 0.6 | 2.46 | 0.8 | 1.23 | -1.23 | |
| 2637 | 4 | 0.5 | 3.08 | 0.8 | 1.23 | -1.85 | |
| 990 | 4 | 0.6 | 2.46 | 0.8 | 1.23 | -1.23 | |
| 724 (West) | 3 | 0.7 | 1.85 | 0.7 | 1.85 | 0.00 | Bebb/geyer Willow |
| 899 | 3 | 0.5 | 3.08 | 0.7 | 1.85 | -1.23 | |
| 1681 | 3 | 0.1 | 5.54 | 0.7 | 1.85 | -3.69 | |
| 404 | 3 | 0.3 | 4.31 | 0.7 | 1.85 | -2.46 | |
| 423 | 3 | 0.5 | 3.08 | 0.7 | 1.85 | -1.23 | |
| 2054 | 3 | 0.4 | 3.69 | 0.7 | 1.85 | -1.85 | |
| 990 (mainstem) | 5 | 0.6 | 2.46 | 0.53 | 2.89 | 0.43 | Solar Pathfinder Sites T1-T5 |
| 1309 | 5 | 0.5 | 3.08 | 0.53 | 2.89 | -0.18 | |
| 1302 | 5 | 0.4 | 3.69 | 0.53 | 2.89 | -0.80 | |
| 4677 | 5 | 0.2 | 4.92 | 0.53 | 2.89 | -2.03 | |
| 696 | 5 | 0.3 | 4.31 | 0.53 | 2.89 | -1.41 | |
| | | **0.54** | **2.85** | **0.72** | **1.74** | **-1.11** | |

**Table J-7. West Camas Creek Shade Estimates and Targets.**

| Segment Length (m) | Stream Width (m) | Existing Shade (fraction) | Existing Summer Load (kWh/m2/day) | Target or Potential Shade (fraction) | Potential Summer Load (kWh/m2/day) | Potential Load minus Existing load (kWh/m2/day) | |
|---|---|---|---|---|---|---|---|
| 1582 (headwaters) | 4 | 0.6 | 2.46 | 0.81 | 1.17 | -1.29 | Lodgepole Pine/douglas fir |
| 1301 | 8 | 0.5 | 3.08 | 0.68 | 1.97 | -1.11 | Aspen/dogwood |
| 538 | 8 | 0.4 | 3.69 | 0.68 | 1.97 | -1.72 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1578 | 8 | 0.5 | 3.08 | 0.68 | 1.97 | -1.11 | |
| 1272 | 8 | 0.4 | 3.69 | 0.68 | 1.97 | -1.72 | |
| 960 | 8 | 0.3 | 4.31 | 0.68 | 1.97 | -2.34 | |
| 2556 | 8 | 0.5 | 3.08 | 0.68 | 1.97 | -1.11 | |
| 4041 | 8 | 0.4 | 3.69 | 0.68 | 1.97 | -1.72 | |
| 1791 | 8 | 0.3 | 4.31 | 0.68 | 1.97 | -2.34 | |
| 951 | 8 | 0.2 | 4.92 | 0.68 | 1.97 | -2.95 | |
| 681 | 8 | 0.3 | 4.31 | 0.68 | 1.97 | -2.34 | |
| 819 | 8 | 0.4 | 3.69 | 0.68 | 1.97 | -1.72 | |
| 485 | 9 | 0.3 | 4.31 | 0.4 | 3.69 | -0.62 | Bebb/geyer Willow Community |
| 771 | 9 | 0.2 | 4.92 | 0.4 | 3.69 | -1.23 | |
| 1568 | 9 | 0.3 | 4.31 | 0.4 | 3.69 | -0.62 | |
| 2626 | 9 | 0.5 | 3.08 | 0.4 | 3.69 | 0.62 | |
| 787 | 9 | 0.4 | 3.69 | 0.4 | 3.69 | 0.00 | |
| 2431 | 9 | 0.3 | 4.31 | 0.4 | 3.69 | -0.62 | |
| 1192 | 9 | 0.1 | 5.54 | 0.4 | 3.69 | -1.85 | |
| 1832 | 9 | 0.2 | 4.92 | 0.4 | 3.69 | -1.23 | |
| 1617 | 9 | 0.1 | 5.54 | 0.4 | 3.69 | -1.85 | |
| 4894 | 9 | 0.2 | 4.92 | 0.4 | 3.69 | -1.23 | |
| 2259 (Camas Creek) | 9 | 0.3 | 4.31 | 0.4 | 3.69 | -0.62 | |
| 34691 | | **0.36** | **3.92** | **0.58** | **2.56** | **-1.36** | |

# Appendix K. Distribution List

| | |
|---|---|
| Idaho Falls Public Library<br>457 Broadway<br>Idaho Falls, ID 83402 | William Stewart<br>Idaho Operations Office<br>Environmental Protection Agency<br>1435 N. Orchard St.<br>Boise, ID 83706 |
| Gerald Messerli, Chairman<br>Continental Divide Watershed Advisory Group | Lee Leffert, Hydrologist<br>James Capurso, Fisheries Biologist<br>Caribou-Targhee National Forest<br>1405 Hollipark Dr,<br>Idaho Falls, ID 83401 |
| Idaho Department of Lands<br>3563 Ririe Hwy<br>Idaho Falls, ID 83401 | Dan Kotansky, Hydrologist<br>Pat Koelsch, Fisheries<br>Bureau of Land Management<br>1405 Hollipark Dr.<br>Idaho Falls, ID 83401 |
| Upper Snake River Basin Advisory Group | Water Quality Conservationist<br>Idaho Association of Soil Conservation Districts<br>315 East 5th North<br>St. Anthony, ID 83445 |
| James P. Fredericks, Regional Fisheries Manager<br>Gary Vecillio, Environmental Specialist<br>Idaho Department of Fish and Game<br>Upper Snake Region<br>4279 Commerce Circle<br>Idaho Falls, ID 83401 – 2198 | Amy Jenkins, Water Quality Analyst<br>Idaho Association of Soil Conservation Districts<br>1551 Baldy Ave., Ste. #2<br>Pocatello, ID 83201 |
| Bonneville County NRCS Office<br>Dennis Hadley, District Conservationist<br>1120 Lincoln Rd.<br>Idaho Falls, ID 83401 | Clark County Commissioners |
| Soil Conservation Commission<br>Kathy Weaver, District Operations Manager<br>3563 Ririe Hwy<br>Idaho Falls, ID 83402 | Soil Conservation Commission<br>Tony Bennett<br>P.O. Box 790<br>Boise, ID 83701-0790 |
| Environmental Protection Agency<br>Tracy Chellis, Biologist<br>1200 6th Avenue<br>OW-134 | Ron Mitchell<br>Idaho Sporting Congress<br>P.O. Box 1136<br>Boise, ID 83702 |

| | |
|---|---|
| Seattle, WA 98101 | |
| Rick Johnson<br>Idaho Conservation League<br>710 North Sixth St<br>Boise, ID 83702 | |

# Appendix L. Public Comments

## Public Comments and Responses

### *Comments by the USEPA*

Thank you for the opportunity to review the draft Beaver-Camas Subbasin Assessment and Total Maximum Daily Loads (TMDLs) that was released for public comment on March 18, 2004.

The following comments provide some suggestions on changes that would help clarify the draft Subbasin Assessment and TMDLs.

*Page 79, Table 20*

Table 20 documents two exceedances of the instantaneous measurement for *E. coli* levels for secondary contact recreation at Ching and Modoc Creek. Will DEQ be conducting further sampling or developing a TMDL to address these exceedances?

**According to Idaho water quality criteria, an exceedance of the instantaneous maximum criteria for E.coli does not in itself constitute a violation of water quality standards. An exceedance of the geometric mean criteria for *E. coli* is considered a violation. More detailed language regarding Idaho's water quality criteria for *E. coli* has been added for clarification.**

**In the case of Ching Creek and Modoc Creek, an instantaneous exceedance was documented however, further geometric mean sampling was not conducted. To further address this exceedance, additional *E. coli* sampling will be conducted on Modoc and Ching Creek during the 2005 field season.**

*Page 97, Conclusions*

The Subbasin Assessment contains a recommended de-listing for several intermittent streams or stream segments, however an evaluation of whether the pollutant is impairing beneficial uses is still needed, beyond simply establishing that the stream is intermittent. Idaho water quality standards, IDAPA
58.01.01.070.06 reads:

> "...Numeric water quality standards only apply to intermittent waters during optimum flow periods sufficient to support the uses for which the water body is designated. For recreation, the optimum flow is equal to or greater than five (5) cubic feet per second (cfs). For aquatic life uses, optimum flow is equal to or greater than one (1) cfs..."

This provision makes it clear that numeric standards do not apply below optimum flow levels, however narrative standards, such as sediment, still apply to these waters even when flows are below optimum. Based on this it would be helpful to know the flow for the segments that are being proposed for de-listing to determine if they meet the optimum flow targets for supporting beneficial uses.

**The sections Beaver Creek and Camas Creek proposed for sediment de-listing are no longer natural stream channels. Rather they are utilized as complex irrigation systems that show no connectivity to additional streams (closed system). In addition flow data provided for Beaver Creek at Dubois and Camas and flow data provided for Camas Creek at Camas show that both streams rarely meet the optimum flow targets for supporting beneficial uses.**

*Page 9-12 (TMDL Section), Tables 28-34*

These Shade Target Value Charts are a very useful tool for implementation purposes. It might be helpful to include a percent increase of shade needed, for reference.

**Information of this nature is provided in Appendix J.**

EPA appreciates the opportunity to comment on the draft Beaver-Camas Subbasin Assessment and TMDLs and looks forward to the final submission. If you have any questions regarding the comments on the draft TMDL, please contact me at 206-553-6326.

Sincerely,

Tracy Chellis
TMDL Project Manager

### *Comments By Idaho Association of Soil Conservation Districts (IASCD)*

The following comments, questions, and recommendations are submitted in response to the request by the Idaho Department of Environmental Quality (IDEQ) for comments regarding the Beaver-Camas Creek Subbasin Assessment and TMDL.

Subbasin Assessment

1) Page XX. Do you have good estimates of natural sediment loading in the subbasin that are required to recommend sediment loading targets? Please include the sources you used to calculate natural conditions.

**Section 2.4, Biological and Other Data (heading), Streambank Assessments (subheading) states that natural background sediment loading rates for the Beaver-Camas Subbasin were based on literature values showing that 80% bank stability**

**constitutes natural conditions. Proper citation of the source literature is contained therein.**

2) Figures 18-23. Define in the figure captions what the red, yellow and green stream sections represent.

**Corrected. Red stream sections are 303(d) listed, yellow stream segments are unlisted, and there are no green sections in the figures.**

3) Page 75. Two measurements are not a large enough sample size to determine an outcome. There is no statistical significance.
"A minimum of two measurements must be evaluated before the determination of a violation can be made."

**Corrected. Language removed from the document.**

4) Page 75-77. If an exceedance of the temperature criteria for cold water aquatic life or an exceedance of the temperature criteria for salmonid spawning warrants a TMDL, then why haven't TMDLs been developed for Miners Creek or Stoddard Creek (perennial streams, Table 17)? It is not clear why TMDLs have not been developed for Miners Creek and Stoddard Creek, since both streams have been reported to sustain flows greater than 1 cfs and Miners and Stoddard Creeks were only measured for flow once on May 3, 2004 (Table 20).

**Yes, it is stated in the document that flows greater than one cfs are regularly observed in Miners and Stoddard Creeks however, according to IDAPA 58.01.02.070.06, "Numeric water quality standards only apply to intermittent waters during optimum flow periods sufficient to support the uses for which the water body is designated…for aquatic life uses optimum flow is equal to or greater than one (1) cfs". Since numeric exceedances were documented during less than optimal flow (less than 1 cfs), they do not apply. In the absence of additional numeric temperature data, during flows greater than one cfs, a temperature TMDL is not warranted for Miners and Stoddard Creeks**.

5) Page 75. It is also unclear why Cow Creek, an ephemeral stream, is listed for unknown pollutants. Whereas, Rattlesnake Creek, an intermittent stream, is not listed even though it exceeds the temperature criteria for cold water aquatic life (W. Fork) and salmonid spawning (main stem). There appears to be inconsistent listing of streams.

IDAPA 58 Title 1 Ch. 2. S.070.06 Application of Standards to Intermittent Waters. Numeric water quality standards only apply to intermittent waters during optimum flow periods sufficient to support the uses for which the water body is designated. For recreation, optimum flow is equal to or greater than five (5) cubic feet per second (cfs). For aquatic life uses optimum flow is equal to or greater than one (1) cfs.

**As stated in Section 2, Water Quality Concerns and Status, of the document the 303(d) listing process is independent of the TMDL process. The 1998 303(d) list is based on**

**1993-1996 assessments performed through the Beneficial Use Reconnaissance Program (BURP) and other pertinent material regarding beneficial use status and water quality standards violations. Waters monitored and assessed through BURP after 1996 are not included on the 1998 303(d) list, as approved by the EPA in May 2000.**

6) Page 78. E. Fork Rattlesnake Creek exceeds the nutrient criteria for NO3/NO2; however, there has been no listing developed for this creek (continued from above). In addition, the E. Fork Rattlesnake Creek supports Yellowstone Cutthroat trout (Pg. 85- Table 23).

**As stated in Section 2.3, Water Column Data (heading), Nutrient Data (subheading), DEQ's narrative water quality criteria state that, "surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growth impairing designated beneficial uses." The numeric nutrient values are EPA guidelines and are not established water quality standards. So, NO3/NO2 values above the EPA suggested value is not an exceedance of state water quality criteria.**

**2.3, Conclusions (heading), explains why a nutrient TMDL is not necessary for E. Fork Rattlesnake Creek. Although, Nitrate ($NO_3$) + Nitrite ($NO_2$) Nitrogen concentrations were above the EPA suggested criteria on East Fork Rattlesnake Creek, visible slime growth and/or nuisance aquatic growth impairing designated beneficial uses were absent. A nutrient TMDL is not necessary for East Fork Rattlesnake Creek since Idaho's narrative water quality criteria for nutrients are met.**

**As stated in Section 2.3, Biological Data (heading), Fish Data (subheading), the DEQ is aware that E. Fork Rattlesnake Creek supports a Yellowstone Cutthroat trout population.**

7) Page 75. Stream temperature data were collected during the summer of 2004, which was a drought year. Is there any way to model what stream temperatures would be during "normal' water years, so that your temperature measurements are not biased by the drought conditions that were occurring during sampling?

**Bias occurs when sampling is skewed by human error or erroneous sample design. Elevated stream temperature during a year of low precipitation is not a bias. Stream temperature was accurately recorded with a device that samples hourly with accuracy adequate to portray stream temperature with precision. Water quality standards apply every year, not just when climatic conditions are "ideal". It is important to manage rangeland to adequately shade streams in all years regardless of precipitation levels. The targets for this TMDL are based on shading derived from adequate conditions to provide a thermal buffer to sustain cold water aquatic life in all years, including years with below average precipitation.**

**Additionally, the DEQ has an extant policy that removes temperature readings that are accumulated on days that are in excess of the 90th percentile of the 10 year average air**

**temperature. State water quality standards are not based on modeling and extreme temperature is taken into consideration.**

8) Table 20. Only one or two measurements were collected for E. coli, nitrate + nitrite, TKN, orthophosphate, and TP at each site and these were collected on different days/months for different sites. We are concerned about your use of one or two measurements to determine that nutrient and E. coli concentrations are meeting or exceeding water quality targets and standards. Are there plans to continue monitoring all of the tributaries to have a more reliable database to work with?

**The DEQ is aware that there are limitations to the quantity and frequency of water quality monitoring data presented in this document. However, where this watershed is concerned, low flow conditions (less than one cfs) prohibited sampling after late May at some of the sites listed in table 20. In addition, it must be noted that time and resource constraints prohibit continued and protracted ambient monitoring in every stream in every watershed in Idaho. There are ongoing plans to continue collecting nutrient and pathogen data from streams undergoing BURP monitoring.**

9) E. coli levels in Ching and Modoc creeks exceeded the standard for secondary contact recreation, but no TMDLs were written. How do you explain your completion of temperature TMDLs for non-listed streams, but the absence of TMDLs for non-listed streams exceeding E. coli standards?

**According to Idaho water quality criteria, an exceedance of the instantaneous maximum criteria for E.coli does not in itself constitute a violation of water quality standards. An exceedance of the geometric mean criteria for *E. coli* is considered a violation. More detailed language regarding Idaho's water quality criteria for *E. coli* has been added to Section 2.3 for clarification.**

**In the case of Ching Creek and Modoc Creek, an instantaneous exceedance was documented however, further geometric mean sampling was not conducted. To further address this exceedance, additional *E. coli* sampling will be conducted on Modoc and Ching Creek during the 2005 field season.**

10) Page 99. The Willow Creek Subbasin is named instead of the Beaver-Camas Subbasin.

**Corrected.**

11) Page 99. You did not collect data over the course of a year and therefore cannot make the statement that "the bulk of sediment comes from streambank erosion during several weeks of high spring flow."

**The statement that "the bulk of sediment comes from streambank erosion during several weeks of high spring flow" is true and can be stated. Based on basic hydrologic and geomorphic principals, it is known that at high stream velocities (occurring during**

**runoff events ) hydraulic stress along stream banks is greatest and the majority of bank scouring occurs at this time. When stabilizing bankside vegetation is removed and bank parent material is exposed the greatest quantity of streambank erosion will occur when stream flows are at or above bankfull discharge.**

12) Page 100. Define what is meant by trend data as used in the sentence "Trend data related to grazing impacts is also lacking." What would be measured?

Trend data would be any data collected by an agency that would assist in substantiating an upward or downward trend in land management practices directly related to riparian grazing. It is not the responsibility of the DEQ to explicitly define the mechanism in which land management agencies monitor grazing impacts it is the responsibility of the land management agency to determine that on their behalf.

13) Page 101. There have been several BMPs implemented in the Beaver Camas subbasin. In Madison and Clark Counties, there have been CCRP, EQIP, and SWCA/ACP projects. In Jefferson County, there was an extensive stream stabilization project.

The DEQ contacted the Madison County NRCS and SCC contacts through written and oral means on several occasions to solicit pollution control project information in the watershed. The agencies failed to provide such information for this document. Where information is not provided, it is understood that there must be no data available.

TMDLs

1) Page 8. Does the Upper Salmon River regional curve accurately describe the Beaver-Camas Subbasin? Why was this regional curve used instead of historical quantitative data? The Rosgen 1996 citation is not listed in the main references section.

The Upper Salmon River regional curve is the closest and most representative source of data available for this document. The development of a regional curve specific to this watershed is possible, however time and resource constraints prohibited such an activity. Where precise data, such as a regional curve created for a specific subbasin is not available, the next best available resource must be utilized.

**The Rosgen 1996 citation has been incorporated into the main reference section.**

2) Page 13. Please specify what the natural background provisions of Idaho water quality standards that will apply are?

**It is expected that riparian shading at or around the target value will provide stream temperatures where beneficial uses are supported. It is expected that if potential natural vegetation is achieved and stream temperatures exceed the criteria, beneficial uses will be supported at system potential and therefore the applicable water quality criteria will not apply.**

3) Page 15. It is incorrectly stated in the text that Table 29 includes the calculated estimated load for temperature TMDLs – it does not.

**Corrected. The calculated estimate load for temperature TMDL is located on table 35.**

4) Page 23. It is incorrectly stated in the text that Tables 29 and 30 include sediment load allocations.

**Corrected. The load allocations for sediment and temperature are located on tables 35 and 36.**

5) Page 23. Temperature load allocation information is not found in Section 2.3 (Subbasin Assessment Pg. 61).

Section 2.3 is utilized for the presentation of water quality monitoring data. Stream temperature and solar pathfinder data is presented in section 2.3 and the TMDL section of the document is where load allocation data is intended to be presented.

6) Page 27. These sites are not described in Section 5.1.
"Nutrient and flow levels should be monitored on Willow Creek (replace with Beaver and Camas Creeks) at the three designated monitoring sites (Section 5.1)."

**Corrected. The above mentioned sentence has been removed from the document.**

Appendices
1) Appendix E: Subsurface depth fines measured at only one location for Beaver and Camas Creeks. Is this an adequate representation of subsurface fines for these creeks?

**Subsurface depth fines were measured at one location in Beaver Creek for two principal reasons 1) limited property access and 2) lack of spawning gravels in areas of the stream where DEQ had approved access. Given these limitations, the one depth fine measurement is the only information available and it is adequate given the time constraints associated with the court ordered TMDL schedule.**

### *Comments from Caribou-Targhee National Forest, Dubois Ranger District*

I am writing this letter to make comments on the Beaver-C amas Subbasin Assessment and TMDL. I have read through the document and appreciate the great amount of work and effort that has gone into it.

Initially, I would like to support the proposal to de-list Cow Creek as a 303(d) stream (Executive Summary, pg. xxiii). You note that it is an ephemeral stream, and I would like to add that it has no connectivity to the Beaver Creek drainage. Cow Creek drains into Thunder Gulch which ends in the desert with no connectivity to another stream. I would also like to point out that Table B of the executive summary shows Cow Creek as "List" for recommended changes to the 303(d) list (Executive Summary, pg. xxiv). I assume this is incorrect as it is inconsistent with the previous discussion about Cow Creek.

**Corrected. The recommended change to the 303(d) list for Cow Creek is to de-list.**

I have one comment regarding high water temperatures in Dairy, East Camas, Modoc, Threemile, and West Camas Creeks. The draft assessment makes a statement about riparian grazing impacting the stream and water quality (Executive Summary, pg. xxiii). Although grazing does take place on all of these streams, grazing use standards are in place and they are monitored regularly by Forest Service personnel to ensure utilization standards are met. All of the streams mentioned also support active beaver complexes. Beaver dams hold water in shallow pools, causing a warming effect. Grazing riparian vegetation may be having some effect on water temperature, but please also make note of the beaver influence as well.

**Section 1.2, Subbasin Characteristics (heading), Beaver (subheading) has been added to explain the impacts of beaver activity in the subbasin, particularly the impact of beaver complexes on stream temperatures.**

**It is true that Beaver, Dairy, East Camas, Modoc, Threemile, and West Camas Creeks support active beaver complexes. Beaver dams do have the potential to increase stream temperatures by reducing stream flows and holding water back in stagnant pools where thermal loading to the stream is higher.**

I found a typo in the draft assessment on page 53. The first sentence under subheading <u>2.1 Water Quality Limited Assessment Units Occurring in the Subbasin</u> reads, "There are six water quality limited Assessment units………, and of the five, ………… If I read the table correctly under the same subheading, there are only five units identified.

**Corrected. The sentence now reads, "There are six water quality limited assessment units (AU) in the Beaver-Camas Subbasin, and of the six, only the upper halves of two of the listed segments are perennial."**

I have some concern regarding table 16, "DEQ temperature data" on page 76 of the draft assessment. There may be nothing that can be done about it at this point, but I question why temperature readings were taken at the Kilgore Road crossing for Threemile and Rattlesnake Creeks. Water tends to pool and stagnate where it crosses the road; and water levels also fluctuate through the season at those locations. Is this representative of those streams? The maximum temperature recorded in Threemile Creek was 85° F, and the average temperature was 68° F. Did water levels get low enough that temperature gauges were literally out of the water for some time?

**Later on in the season there were limitations to the placement of the temperature sensors in the stream and they may have been out of the water however, during peak flow (May 2005) gages were submerged and major exceedances in the salmonid spawning criteria were documented in both streams. According to State water quality criteria (IDAPA 58.01.02.070.06), "Numeric water quality standards only apply to intermittent waters during optimum flow periods sufficient to support the uses for which the water body is designated…for aquatic life uses optimum flow is equal to or greater than one (1) cfs". With this standard in place, when stream flows subside to 1 cfs the DEQ attempts to discard that temperature data.**

I would also like to make a comment regarding Subsurface Fines (Draft Assessment, pg. 80-81). Because measurements were taken in the fall of 2003, please make note that there were 4 consecutive years of drought prior to these measurements, with less than "normal" spring run off to "flush" fine sediments out of the system.

**It is difficult to make that type of assumption regarding the "flush" of fine sediments out of the system. Spring flows over the past four years have had enough stream power to flush fine sediment out of the system. During high flow fine sediments from upstream sources are transported downstream and then re-deposited when spring flows subside. It is important to note that through eliminating upstream sediment sources, less sediment transport and deposition will occur.**

The Draft Assessment has a section on streambank assessments (pg. 81-82). Table 22 shows results of a streambank inventory conducted on "upper" Camas Creek. Please be more specific on where this stability rating was conducted.

**The streambank erosion inventory was conducted approximately two miles downstream of Eighteenmile on BLM property. This clarification has been added to the document.**

On page 100 of the Draft Assessment, in reference to riparian areas a line reads, "Trend data related to grazing impacts is also lacking." A number of long-term trend studies have been installed on Forest Service lands on streams in the Beaver Creek and Camas Creek Assessment area. The following table shows the results of those studies.

| Drainage | Vegetative Seral Status | *Vegetative Trend | Greenline Stability Rating |
|---|---|---|---|
| East Threemile Creek | 52.4 (Mid Seral) | Stable | 6.7 (Moderate) |
| West Rattlesnake Creek | 77.5 (Late Seral) | --- | 6.3 (Moderate) |
| Bear Gulch | 70.6 (Late Seral) | --- | 6.6 (Moderate) |
| Little Creek | 68.0 (Late Seral) | Stable | 7.1 (Good) |
| West Camas Creek | 78.3 (Late Seral) | Up | 8.3 (Good) |
| Alex Draw Creek | 72.7 (Late Seral) | --- | 7.5 (Moderate)** |
| Corral Creek | 65.1 (Late Seral) | --- | 5.7 (Moderate) |
| McGarry Canyon | 49.5 (Mid Seral) | --- | 5.1 (Moderate) |
| Steel Creek | 101.6 (PNC) | --- | 8.0 (Good) |
| Stump Creek | 100.8 (PNC) | Up | 8.9 (Good) |
| Upper Pete Creek | 79.2 (Late Seral) | Stable | 7.9 (Good) |
| Lower Pete Creek | 79.1 (Late Seral) | --- | 8.3 (Good) |
| Cottonwood Creek | 56.8 (Mid Seral) | --- | 7.1 (Good) |
| Moose Creek | 59.5 (Mid Seral) | | 6.0 (Moderate) |

*Vegetative trend on these riparian areas is only indicated on stream reaches where a previous greenline study existed providing a baseline to compare present vegetation to.
**Alex Draw Creek stability rated out 7.47 which rates "good" based strictly on the stability index. However, the system is in an upward trend and although desired species are present, they are relatively young plants which are not supporting the very erosive soils as well as

they will after a few more years of maturity. Based on professional judgment, this stream is "moderately" stable.

**Comment Noted, data will be utilized for implementation monitoring.**

I appreciate the chance to comment on the Draft Beaver-Camas Subbasin Assessment and TMDL. I hope this information helps, if you have any questions, please contact myself or Shane Jacobson at the Dubois District office at (208) 374-5422.

Sincerely,

ROBBERT G. MICKELSEN
District Ranger

CC: S.O.

### *Comments from Jim Hagenbarth, Continential Divide WAG Member*

I received a copy of the Draft TMDL for the Beaver-Camas Subbasin Assessment. Gerald Messerli asked that I make any comments that I felt were appropriate. The document is well done and very professional. Some basic comments that I have are as follows:

1) Page 99, 3.1 Sources of Pollutants of Concern. Nonpoint Sources. As one looks at sediment and temperature we must keep in mind the soil types, impediments in the stream that slow down water flow and the quantity of water supplied by the ground water sources. In many of the creeks of interest, there is substantial beaver activity. This has resulted in captive sediments that are released as the dams divert water or are breached during higher flows or due to loss of beaver for various reasons. Also these dams tend to slow flows down and increase water temperature. I have seen this to be the case in other TMDL reports that I have worked with. Please take this into account in this report.

**Section 1.2, Subbasin Characteristics (heading), Beaver (subheading) has been added to explain the impacts of beaver activity in the subbasin, particularly the impact of beaver complexes on stream temperatures.**

**It is true that Beaver, Dairy, East Camas, Modoc, Threemile, and West Camas Creeks support active beaver complexes. Beaver dams do have the potential to increase stream temperatures by reducing stream flows and holding water back in stagnant pools where thermal loading to the stream is higher.**

**With that said, it must be noted that the temperature TMDLs for this document are based on potential vegetative cover, not stream temperature. This type of temperature**

**TMDL should make it easier for land managers and owners who have beaver complexes on their property meet the TMDL criteria.**

Any reference to vegetative composition in the watersheds and its impact on the water budget and water quantity is totally absent from this report. Charles Kay from Utah State did a vegetative study in this area based on old photography for the US Sheep Experiment Station in the 1990's. He found that there was twice as many brush and conifer acres than in the early 1900's in the Centennial Range. It is common knowledge that conifer encroachment has increased and that conifers have a direct impact on ground water discharges due to evapotranspiration and actual water consumption. As the basal area per acre increases, the ground water discharges decrease dramatically. This in itself could have a huge impact on the quantity of water flowing in the streams of interest and this would directly impact the temperature regimes. It is important that this be taken into consideration in this report as a contributor to the temperature pollutant component and also dewatering. I may be able to find Kay's report if you have any interest.

2) Page 101. Pollution Control Efforts. If this is in reference to the electric fence we put in our deeded land, the correct description is as follows: West Camas Creek, (T13N,R38E, Section 25).

**Corrected. It now reads, "We are aware of one private pollution control effort in the drainage consisting of one mile of electric riparian fencing on West Camas Creek (T13N, R38E, section 25)."**

3) Page 104, 5.1 In-stream Water Quality targets. See Comment 1, especially vegetative composition of the water shed in regard to the historic range of variation and also the beaver pond and temperature comment.

**The information you provided on conifer encroachment and its impacts on groundwater discharges and possible temperature regimes is very informative. However, Idaho's numeric temperature criteria apply when stream flows exceed one cfs regardless of the vegetative community and its potential ancillary impacts on stream temperatures. The numeric criteria do not take into consideration the complexity of factors affecting instream temperatures. Because of this, shade TMDLs have been developed for the Beaver-Camas Subbasin. The temperature TMDL's target values are not based on instream temperature measurements, the targets are based on vegetative potential in the riparian area. Vegetative potential targets allow land managers and owners to focus on riparian management as a means to reduce stream temperatures rather than focusing on numeric values. As stated in the TMDL, when riparian conditions meet the target potential, it will be assumed that stream temperatures will be at their lowest potential based on vegetative shading.**

4) Page 128, 5.5 Implementation Strategies. Time Frame. If one recognizes vegetative composition within the watershed and its impact on water quantity, the time frame to influence increased flows through vegetative manipulation would be several years. The enviromentyal activists are intend on forcing a no management mode for public land managing agencies.

**Comments noted.**

5) Page 129, 5.6 Conclusions. If you accept the impacts of vegetative encroachment and the water budget, it should be included in the conclusion along with the impact of slow moving water as it relates to temperature in Beaver Ponds. You get more surface exposure, consequently more heating.

**Answered above.**

Hopefully these comments help in your assessment.

Jim Hagenbarth

Jim Hagenbarth

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