APPENDIX D
SEDIMENT/HABITAT TARGET DEVELOPMENT

The development of sediment/habitat target values for the Middle Blackfoot and Nevada Creek watersheds requires the identification of parameters that are closely linked to a cold water fishery or aquatic life beneficial use support. In some cases the parameters also relate to the contact recreation beneficial use. That is, some streams have been listed as non-supporting or partially supporting of primary contact recreation due in part to problems with substrate or flow conditions, both of which can be assessed using parameters described below. The parameters for which target values have been developed to help determine the sediment/habitat impairment status include the following:

- Percent surface fines in riffles measured by pebble count
- Percent subsurface fines measured by McNeil Core
- Pool frequency
- Residual pool depth
- Width to depth ratio
- Percent surface fines in pool tailouts
- Woody bankline vegetation extent
- Macroinvertebrate metrics
- Pool extent
- Entrenchment Ratio
- Woody debris aggregate extent

These parameters address a broad range of direct habitat measures, channel condition measures, and direct measures of aquatic life.

Ideally, reference values for each of the parameters listed above would be directly measured from reference water bodies where all sediment and habitat conditions are functioning at their potential given historic land uses and the application of all reasonable land, soil, and water conservation practices. In general, however, there was very little internal reference data identified in the Middle Blackfoot and Nevada Creek Planning Areas. Some assessment sites do represent minimally impacted conditions for certain parameters, and those data have been compiled into reference datasets wherever possible. In other cases, target values are derived from a statistical analysis of the entire dataset for the planning area, as well as from regional data derived from outside the area. The following sections describe the approach taken in developing specific target values for the parameters utilized in the impairment assessment.

Substrate: Pebble Count Surface Fines in Riffles

Target values for percent surface fines provide important criteria used to help define whether excess sediment loading has resulted in a siltation related cause of impairment. The targets developed for surface fines concentrations of less than 2mm reflect statistically-derived values from the Middle Blackfoot/Nevada Creek planning areas (**Table D-1; Table D-2; Figure D-1**).

In the Nevada Creek Planning Area, B channel types were assigned a <10% target value for <2mm riffle surface fines concentrations. This value is based on the 75th percentile value (Q3) measured on minimally impaired B channels in the Nevada Creek planning area. The <2mm riffle substrate targets for C channels of the Nevada Creek planning areas is <7%, which reflects the 25th percentile values (Q1) for C channel type assessment reaches. For E channel types, the 25th percentile value of 20 percent for <2mm riffle surface fines was selected as a target for the Nevada Creek Planning Area.

Table D-1. Summary of Target Values for Percent Riffle Surface Fines <2mm and <6mm

Planning Area	Size Fraction	Channel Type	Value	Basis*
Nevada Creek	<2mm	B	≤10	NCPA reference 75th percentile
		C	≤7	NCPA 25th percentile
		E	≤20	NCPA 25th percentile
	<6mm	B	≤20	BDNF 75th percentile
		C	≤22	BDNF median
		E	≤36	MBPA reference 75th percentile; BDNF 75th percentile
Middle Blackfoot	<2mm	B	≤10	NCPA reference 75th percentile
		C	≤11	MBPA 75th percentile
		E	≤34	MBPA reference 75th percentile
	<6mm	B	≤20	BDNF 75th percentile
		C	≤22	BDNF median
		E	≤36	MBPA reference 75th percentile; BDNF 75th percentile

*NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area, BDNF: Beaverhead-Deerlodge National Forest

In the Middle Blackfoot Planning Area, the dataset contains only one B type channel (Buck Creek). As such, the dataset is too small to develop surface fines targets for the planning area. Because of the single B channel assessment site in the Middle Blackfoot Planning Area, the targets developed for the Nevada Creek Planning Area were also applied to Buck Creek. Based in part on best professional judgment, this value of <10% for surface fines of <2mm is considered appropriate for meeting beneficial use objectives in the Middle Blackfoot Planning Area B channel types. Measured fines concentrations in C channel types in the Middle Blackfoot are notably low with a 75th percentile value of 11%. The 25th percentile value is 3% surface fines <2mm. As the Middle Blackfoot C channels are characterized by very low percent fines values in riffles, the 75th percentile value (11%) was selected as a target in order to set an appropriate goal for meeting beneficial uses. A total of four E channel segments in the Middle Blackfoot planning area were identified as potentially showing minimally impaired conditions (DTM and AGI, 2004). The 75th percentile value for riffle surface fines <2mm was selected from these sites to define the target value; this value of <34% reflects the typical fine grained nature of E channel types in the area.

The <6mm targets are defined by statistics derived from the Beaverhead-Deerlodge National Forest dataset (Bengeyfield, 2006). This dataset provides <6mm measurements and associated statistics for an extensive number of assessment sites. The 75th percentile values for the BDNF data were adopted for the B and E channel types based on best professional judgment of feasible substrate values and provision of beneficial use support. Further support for the target value is the fact that the 75th percentile value for the BDNF E channel types is very close to that of the

least impaired streams of the Middle Blackfoot Planning Area. The median value of 22% for C channels in the BDNF dataset was also considered appropriate for meeting beneficial use support in the Middle Blackfoot and Nevada Creek planning areas.

The riffle surface fines targets values are applied to each channel in terms of its general (Level I) classification (Rosgen, 1996). As such, streams have not been segregated by substrate in either the data analysis or target application. This is because all of the streams in both planning areas are considered to have some potential for developing relatively coarse riffle substrates. Streams of a given channel type that currently have very high concentrations of riffle fines (eg. Nevada Creek Planning Area E channel types; **Figure D-1**) were not segregated from the dataset, because these channels were identified as having potential for fines reductions. It is recommended that the streams be monitored according to the targets set forth herein, and, if the fines targets are not feasible due to natural factors controlling the substrate gradation, that the targets be adjusted appropriately.

Table D-2. Summary Statistics for Percent Surface Fines Measurements

Fraction/Planning Area	Channel Type	Data Source*	Min	Q1**	Med	Q3**	Max	N
<2mm Nevada Creek Planning Area	B	NCPA reference sites	1	1	1	10	19	3
	C	NCPA all sites	6	7	8	16	100	9
	E	NCPA all sites	6	20	63	100	100	8
<2mm Middle Blackfoot Planning Area	B	NCPA reference sites	1	1	1	10	19	3
	C	MBPA all sites	0	3	5	11	43	11
	E	MBPA reference sites	1	4	9	34	100	4
<6mm Both Planning Areas	B	Beaverhead/ Deerlodge NF	0	6	9	20	58	40
	C	Beaverhead/ Deerlodge NF	6	14	22	29	55	184
	E	Beaverhead/ Deerlodge NF	1	4	10	36	100	4

*NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area
** Q1 = 25th percentile, Q3 = 75th percentile

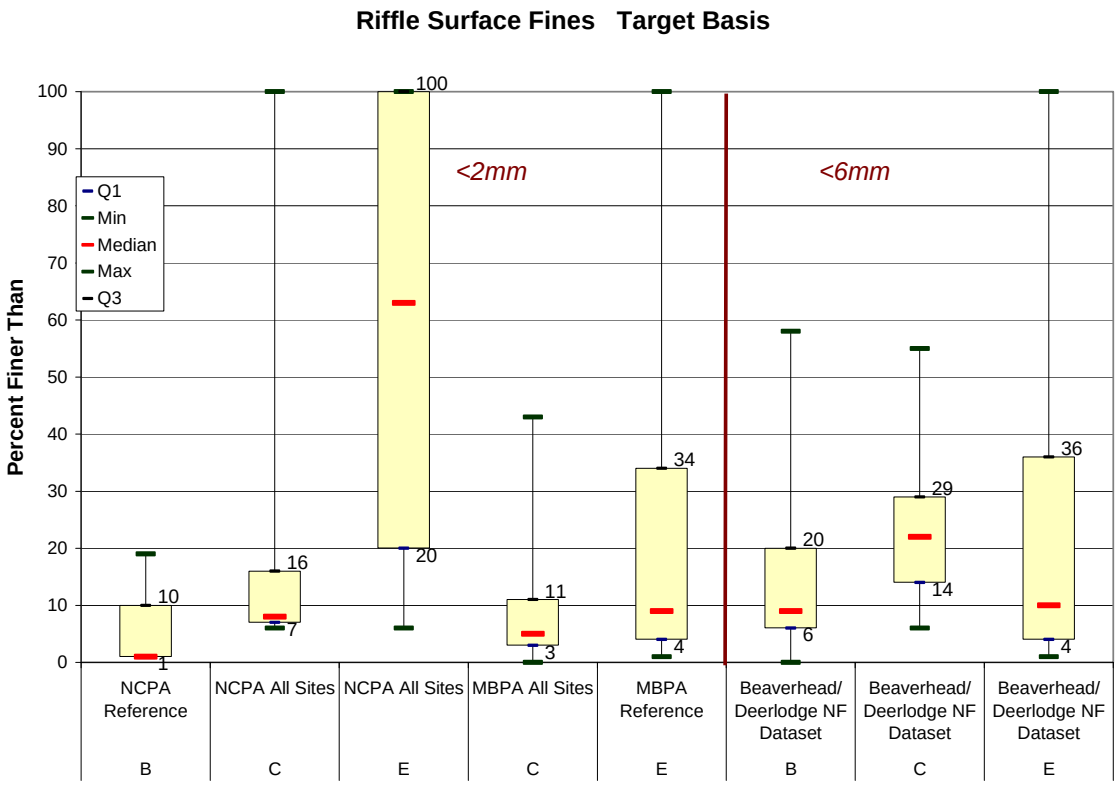

Figure D-1. Distributional Statistics for Riffle Percent Fines

Substrate: McNeil Cores

McNeil Core data provide a quantitative measurement of subsurface fines concentrations in pool tailouts. These measurements are important indicators of excess sediment loading and associated siltation impairment causes. A significant inverse relationship has been observed between the amount of material <6.35mm and bull trout fry emergence success (Weaver and Fraley, 1991). Weaver (1996) stated that streams are threatened as bull trout spawning/rearing streams when the <6.35mm value exceeds 35% in any given year. Based on Weaver and Fraley's data (1991), Tepper (2003) predicted an 8.4% decrease in egg fry emergence success with an increase in the <6.35mm substrate fraction from 25% to 31.7%.

McNeil Core data have been utilized to develop targets for three size fractions in pool tails (**Table D-3**). These data were collected in the Blackfoot River watershed between 2003 and 2006 (Helena National Forest). The targets reflect the 25th percentile value for the given size gradation and channel type. A summary of the statistics used in developing targets for B channel types are shown in **Table D-4** and **Figure D-2**. Similar data for C channel types are compiled in **Table D-5** and **Figure D-3**. The target value of 27% for the <6.35 size fraction reflects the 25th percentile value for samples collected in the watershed since 2003. This value is less than the 35% threshold value described as threatening bull trout spawning/rearing streams by Weaver (1996).

Table D-3. Target Values for Percent Subsurface Fines from McNeil Cores

Planning Area	Size Fraction	Channel Type	Value (%)	Basis
Nevada Creek Middle Blackfoot	<6.35mm	B	≤27	25th percentile for all data collected 2003-2006
		C	≤27	25th percentile for all data collected 2003-2006
	<2mm	B	≤12	25th percentile for all data collected 2003-2006
		C	≤15	25th percentile for all data collected 2003-2006
	<0.85mm	B	≤6	25th percentile for all data collected 2003-2006
		C	≤6	25th percentile for all data collected 2003-2006

Table D-4. Summary Statistics for McNeil Core Measurements on B Type Channels

Statistic	Mean % <6.3 mm	Mean % <2 mm	Mean % <0.85 mm
Q1	27	12	6
Minimum	19	9	4
Median	33	17	9
Maximum	49	35	24
Q3	38	24	14
N	21	19	21

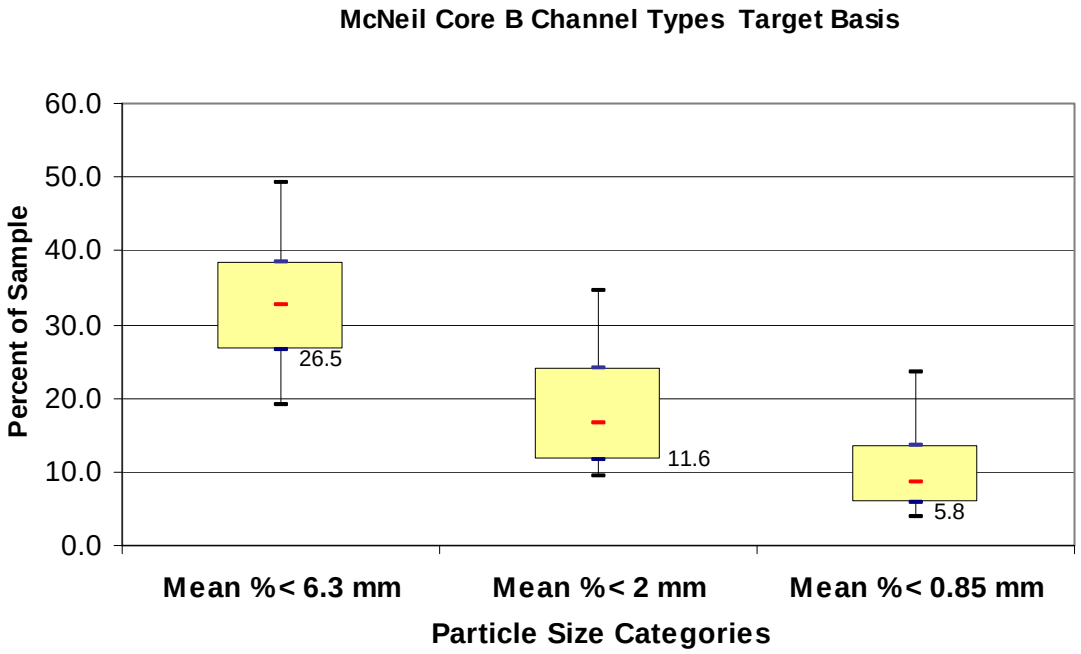

Figure D-2. Distributional Statistics for McNeil Cores from B Type Channels

Table D-5. Summary Statistics for McNeil Core Measurements on C type Channels

	Mean % <6.3 mm	Mean % <2 mm	Mean % <0.85 mm
Q1	27	15	6
Minimum	20	14	6
Median	29	18	8
Maximum	46	31	16
Q3	34	21	12
N	12	8	12

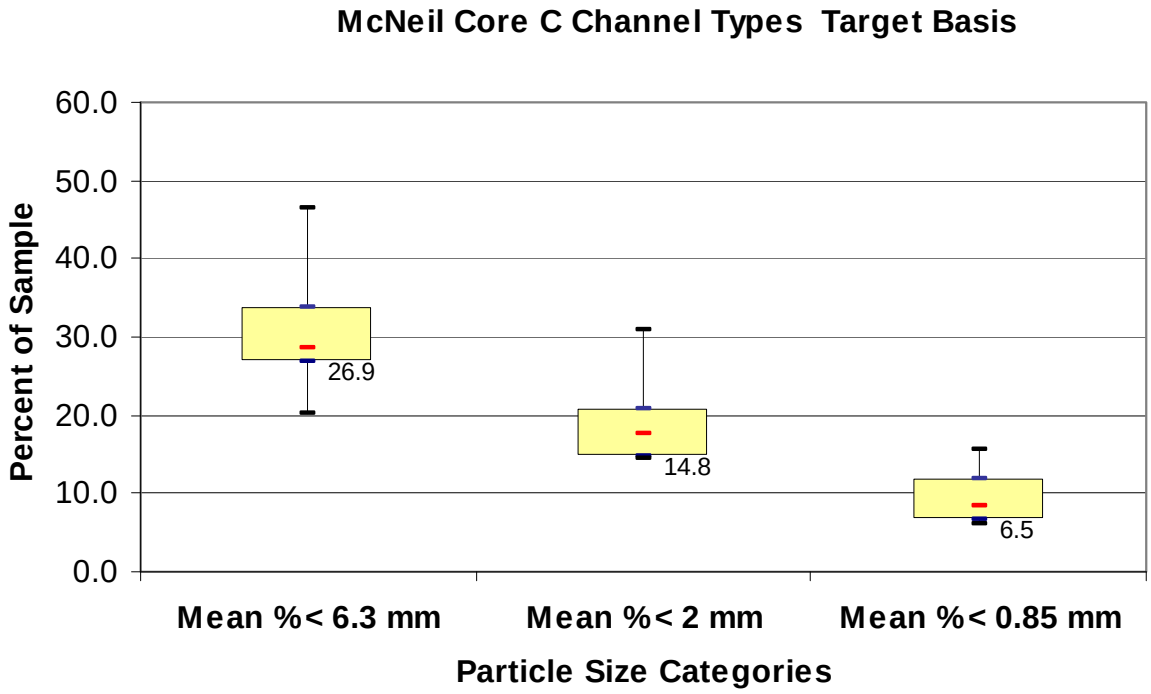

Figure D-3. Distributional Statistics for McNeil Cores from C Type Channels

Pool Frequency

Pool frequency is an important measure of stream habitat conditions. Pools provide critical habitat for cold-water fish and are linked to the storage, deposition, and sorting of sediment within a channel. The target values developed for pool frequency are summarized in **Table D-6**. The supporting statistics for these values are shown in **Table D-7** and **Figure D-4**.

Table D-6. Target Values for Pool Frequency

Planning Area	Channel Type	Target Value	Basis*
Nevada Creek	B	≥20	NCPA 75th percentile; Reference stream median
	C	≥46 for streams <30ft topwidth; ≥26 for streams >30 ft topwidth)	75th percentile for streams <30 ft topwidth; Measured Nev7 value and 5-7 width multiplier for >30 ft topwidth
	E	≥40	NCPA 75th percentile; MBPA reference 75th percentile
Middle Blackfoot	B	≥20	NCPA 75th percentile; Reference stream median
	C	55 for <40 ft topwidth 33 for >40 ft topwidth	MBPA 75th percentile
	E	≥40	NCPA 75th percentile; MBPA reference 75th percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

The selected pool frequency target for B channel types is 20 pools per mile for both planning areas. This value reflects the 75th percentile value for all measured B channel segments in the Nevada Creek planning area, and the value also correlates to the median value for B type streams

identified as least impaired with respect to in-channel habitat. The pool frequency targets for C channels have been stratified by width. This width-based target reflects the fact that, in pool/riffle channel types, pools tend to occur on the order of every 5-7 channel widths (Thorne, 1997). Thus pool frequency on a per mile basis decreases as streams become larger. Pool frequency targets developed for the Nevada Creek Planning Area use the 75th percentile of all C channel assessments for streams that are less than 30 ft in width (46 pools per mile). For wider stream segments, which are present on lower Nevada Creek, the selected target reflects a width-depth reference value from Nev7, which appropriately correlates to a value defined by channel width multiplier of six. In the Middle Blackfoot Planning Area, targets were developed for streams less than and more than 40 ft in width to separate out Monture Creek from the remaining dataset. The 75th percentile value for the Middle Blackfoot Planning Area C channels of each width category was adopted for the pool frequency target.

The pool frequency target values for E channel types reflect the 75th percentile values for all E channel assessments of the Nevada Creek Planning Area, which is also the median value measured for Middle Blackfoot Planning Area E channel segments identified as displaying minimally impaired conditions.

Table D-7. Summary Statistics for Pool Frequency

	Nevada Creek Planning Area			Middle Blackfoot Planning Area		
Statistic*	**B**	**C<30 ft topwidth**	**E**	**C (Monture)**	**C (Others)**	**E (ref)**
Min	6.6	0.0	0.0	13.2	19.8	33
Q1	13.2	6.6	6.6	13.2	19.8	36.3
Median	16.5	26.4	13.2	23.1	29.7	39.6
Q3	19.8	46.2	39.6	33.0	54.5	42.9
Max	79.2	59.4	72.6	33.0	72.6	46.2
N	6	9	9	4	6	3

* Q1 = 25th percentile, Q3 = 75th percentile

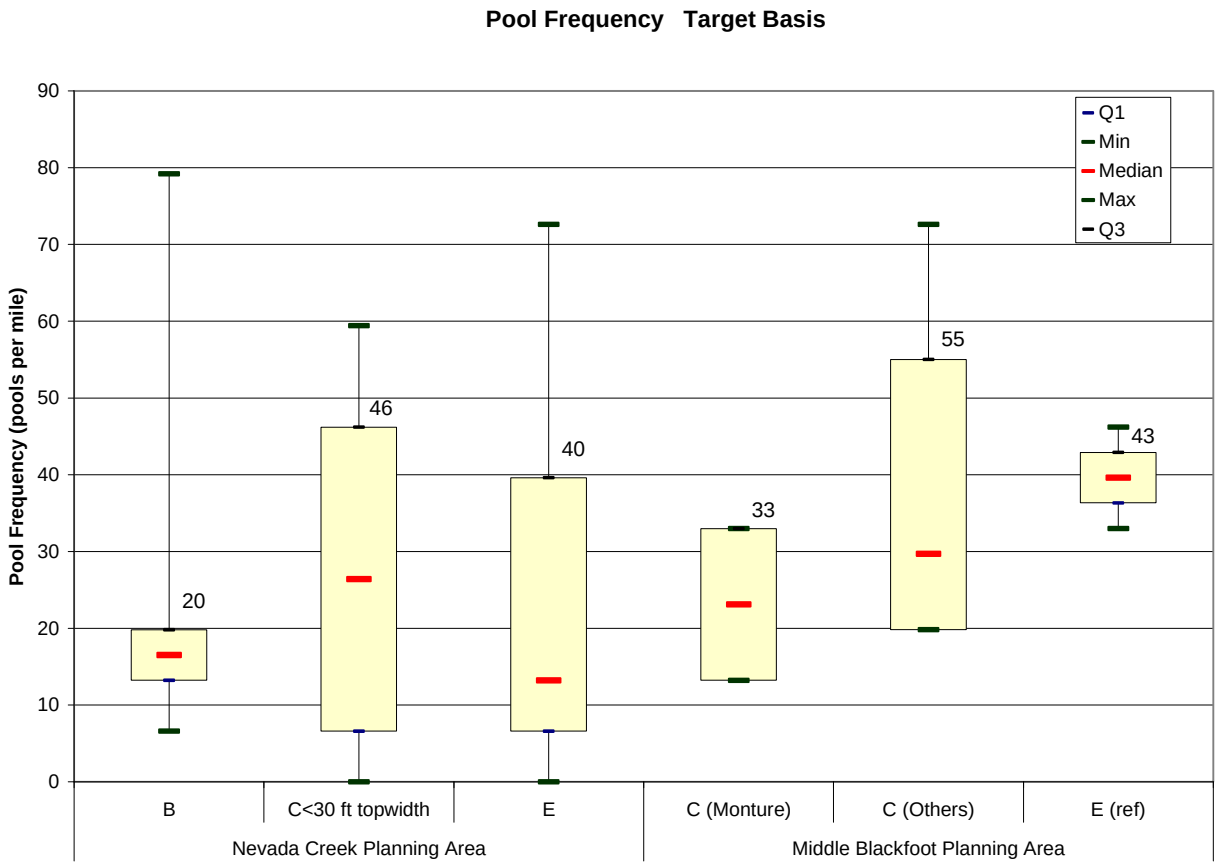

Figure D-4. Distributional Statistics for Pool Frequency

Residual Pool Depth

Residual pool depth is a general descriptor of overall pool quality. Pools provide important winter habitat for juvenile fish, as well as refuge from thermal stressors, cover from predators, food, and rearing areas. Pools also provide a general indicator of overall stream complexity. A summary of targets adopted for residual pool depth is shown in **Table D-8**. These targets were developed from base parameter assessment data statistics. For each of the channel types assessed, residual pool depth values equating to the 75th percentile value were adopted as targets (**Table D-9; Figure D-5**).

Table D-8. Target Values for Residual Pool Depth

Planning Area	Channel Type	Target Value	Basis*
Nevada Creek	B	≥0.6	NCPA 75th percentile
	C	≥2	NCPA reference 75th percentile; MBPA 75th percentile
	E	≥1.5	NCPA 75th percentile
Middle Blackfoot	B	≥0.6	NCPA 75th percentile
	C	2.0 for <40 ft topwidth 4.1 for >40 ft topwidth	NCPA reference 75th percentile; MBPA 75th percentile
	E	≥1.5	MBPA reference 75th percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

Table D-9. Summary Statistics for Residual Pool Depth

	B	C			E	
Statistic*	**NCPA**	**NCPA Reference**	**MBPA <40 ft topwidth**	**MBPA >40 ft topwidth**	**NCPA**	**MBPA Reference**
Q1	0.4	1.5	1.1	1.4	0.5	0.6
Min	0.2	1.2	0.5	0.7	0.0	0.2
Median	0.5	1.7	1.4	2.2	0.7	1.0
Max	0.9	2.4	2.8	6.9	2.6	2.9
Q3	0.6	2.0	2.0	4.1	1.5	1.5
N	23	7	35	14	20	18

* Q1 = 25th percentile, Q3 = 75th percentile

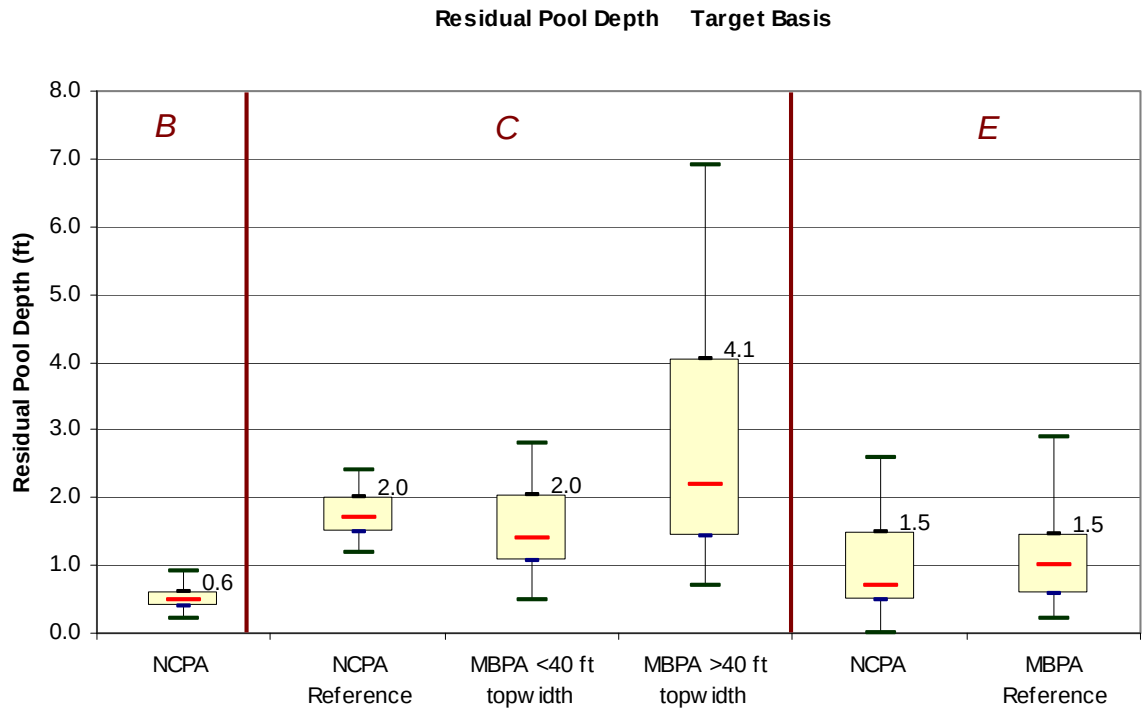

Figure D-5. Distributional Statistics for Residual Pool Depth

Width to Depth Ratio

Width to depth ratio, measured as the ratio of bankfull width to mean bankfull depth at riffle cross sections, is an important measure of overall channel form. The parameter is commonly used as a primary stream classification criteria (Rosgen, 1996) and means of site stratification. Width to depth ratios also can provide some indication of channel function, as alluvial streams that undergo significant changes in hydrology, sediment load, or bank stability will respond morphologically and thereby display altered channel cross sections. Reference data sets for width to depth ratio include the Beaverhead/Deerlodge National Forest dataset (Bengeyfield, BDNF), and internal reference reach data from the Middle Blackfoot/Nevada Creek Planning areas.

Target values for width to depth ratio consist of an optimal range for a given channel type. Although the range expresses a typical minimum value for a given channel type, departures are identified in terms of an exceedence of the maximum value of the range (excessively high width to depth ratios). In some cases, the measured width to depth ratio is lower than the expressed minimum of the range. These cases of low width to depth ratios typically reflect natural erosion resistance of bank materials. As a result, measured width to depth ratios below the minimum value do not indicate impairment with respect to aquatic life or the cold water fishery.

The targets developed for width to depth ratio are summarized in **Table D-10**. The statistics utilized to define those target values are shown in **Table D-11** and **Figure D-6**. Reference values developed for B channel types in both the Nevada Creek and Middle Blackfoot Planning Areas reflects the minimum width to depth ratio used to define the B channel type (Rosgen, 1996). The maximum, which is not defined in the channel classification, has been defined by reference B channel types in the Beaverhead/Deerlodge National Forest, as well as the 75^{th} percentile value for all B channel assessment values in the Nevada Creek Planning Area. Data from the Middle Blackfoot Planning Area were not used to define the value as there it contains only one B channel assessment reach (Buck Creek).

Table D-10. Target Values for Width-To-Depth Ratio

Planning Area	Channel Type	W:D Reference Value Range	Basis*
Nevada Creek	B	12-16	Minimum: B type classification Maximum: Beaverhead/Deerlodge National Forest (BDNF) 75th percentile; NCPA 75th percentile
	C	12-20	Minimum: C type classification Maximum: NCPA median
	E	6-11	Minimum: E type classification, NCPA 25th percentile Maximum: E type classification, NCPA 75th percentile
Middle Blackfoot	B	12-16	Minimum: B type classification Maximum: Beaverhead/Deerlodge National Forest (BDNF) 75th percentile; NCPA 75th percentile
	C	12-19 (<40 ft topwidth) 12-29 (>40 ft topwidth)	Minimum: C type classification Maximum: MBPA median
	E	6-11	Minimum: E type classification, MBPA 25th percentile Maximum: E type classification, MBPA 75th percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

The minimum width-to-depth value for C channel types is similarly defined by the Rosgen classification scheme (Rosgen, 1996). The upper limit of appropriate width to depth ratios for C channels reflects the median measured values in each planning area. The median value was selected as the upper end target based on best professional judgment regarding the appropriate maximum width to depth ratio for the C type channels in this region. The E channel range reflects the 25th and 75th percentile values measured in each planning area, and these values correlate to the range defined by the Rosgen classification (Rosgen, 1996).

Table D-11. Summary Statistics for Width-To-Depth Ratio

	NCPA All Sites	Bengeyfield Reference	NCPA All Sites	MBPA >40 ft	MBPA <40 ft	NCPA All Sites	MBPA All Sites
Statistic*	**B**	**B**	**C**	**C**	**C**	**E**	**E**
Q1	9.5	9.0	16.4	27.0	14.9	5.8	6.4
Min	6.2	3.2	10.1	19.3	10.8	3.0	3.9
Median	10.9	12.7	20.0	28.8	18.9	7.9	9.7
Max	30.8	29.1	35.2	40.1	32.7	14.5	14.0
Q3	14.4	15.7	23.3	31.0	22.9	10.3	11.1
N	17	41	25	9	17	20	25

* Q1 = 25th percentile, Q3 = 75th percentile

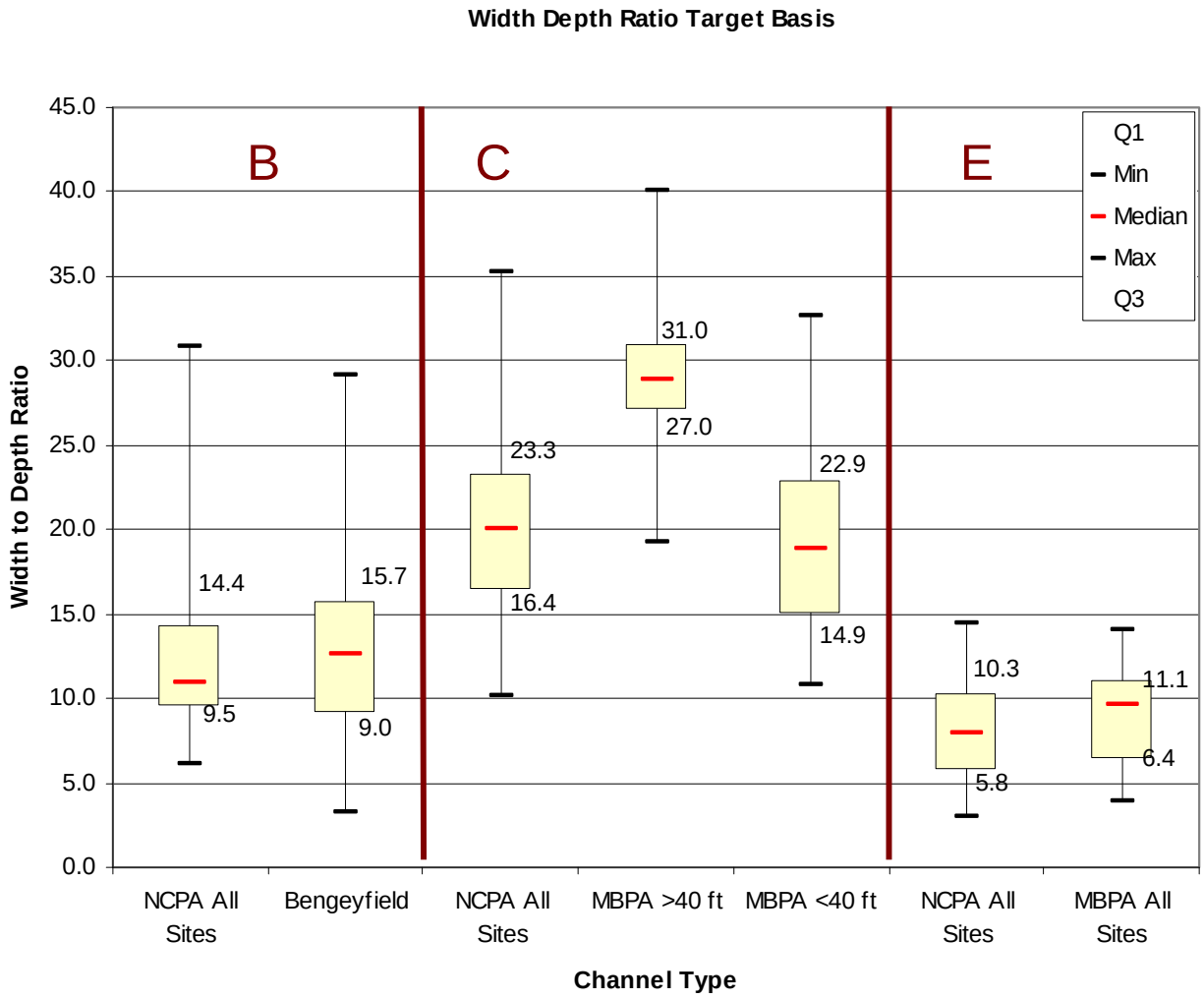

Figure D-6. Distributional Statistics for Width-To-Depth Ratio

Percent Surface Fines in Pool Tails

Target values developed for surface fines <6mm on the channel bed surface in pool tail environments provide criteria used to help define whether excess sediment loading has resulted in a siltation related cause of impairment. The targets developed for percent surface fines in pool tails are all derived from the Nevada Creek Planning Area and Middle Blackfoot Planning Area base parameter datasets. The target values are summarized in **Table D-12**. Statistics developed from the internal datasets from which the targets are derived are shown in **Table D-13** and **Figure D-7**.

In the Nevada Creek Planning Area, the target value of 17% developed for B channel types is derived from the 75th percentile value for all B channel assessment sites. This value was selected rather than the 25th percentile value as it is considered to be sufficiently low to achieve use support. For C channel types of the Nevada Creek Planning Area, assessment reaches that were identified as least impaired stratified well against all data (DTM and AGI, 2005). As such, the

75th percentile value of 23% for these least impaired streams has been adopted as the target value. For E channel types, the 25th percentile for all of the assessed sites is 82%, which reflects the high concentrations of fines in the E channels of the Nevada Creek Planning Area. Recognizing the natural tendency for fine grained accumulations in pool tailouts of E channels in the Nevada Creek Planning Area, the adopted target value for these streams is 82%.

Table D-12. Target Values for Pool Tailout Surface Fines

Planning Area	Channel Type	Target Value	Basis*
Nevada Creek	B	≤17	NCPA 75th Percentile
	C	≤23	NCPA Reference 75th Percentile
	E	≤82	NCPA 25th Percentile
Middle Blackfoot	B	≤17	NCPA 75th Percentile
	C	≤20	MBPA 75th Percentile
	E	≤48	MBPA Reference 75th Percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

In the Middle Blackfoot Planning Area, all targets are based on the 75th percentile values of data summarized by channel type. Due to a lack of B channel types in the MBPA (N=1), the target is based on Nevada Creek Planning Area sites. For C channel types, the target of 20% is the 75th percentile value for all assessment sites. As the E channel sites described as having potential reference conditions stratified favorably against the entire dataset (DTM and AGI, 2005), the reference dataset was used to define the target for E channels. These targets are appropriate for streams that are not wholly fine grained in nature and thus capable of producing relatively coarse grained pool tail environments. As field observations indicate that virtually all of the E channels in the Middle Blackfoot Planning Area have the potential for fines reductions in the pool tailouts, the targets have been applied to all E channel types in the Planning Area. It is important to monitor these substrate conditions, however, so that, if it becomes clear that the targets are unfeasible in some streams due to natural loading of fine sediment, their application can be managed adaptively.

Table D-13. Summary Statistics for Pool Tailout Surface Fines

	B	C		E	
Statistic*	**NCPA**	**NCPA Reference**	**MBPA**	**NCPA**	**MBPA Reference**
Q1	8%	4%	9%	82%	8%
Min	4%	0%	4%	35%	0%
Median	13%	10%	10%	98%	16%
Max	100%	86%	37%	100%	100%
Q3	17%	23%	20%	98%	48%
N	5	28	10	4	72

* Q1 = 25th percentile, Q3 = 75th percentile

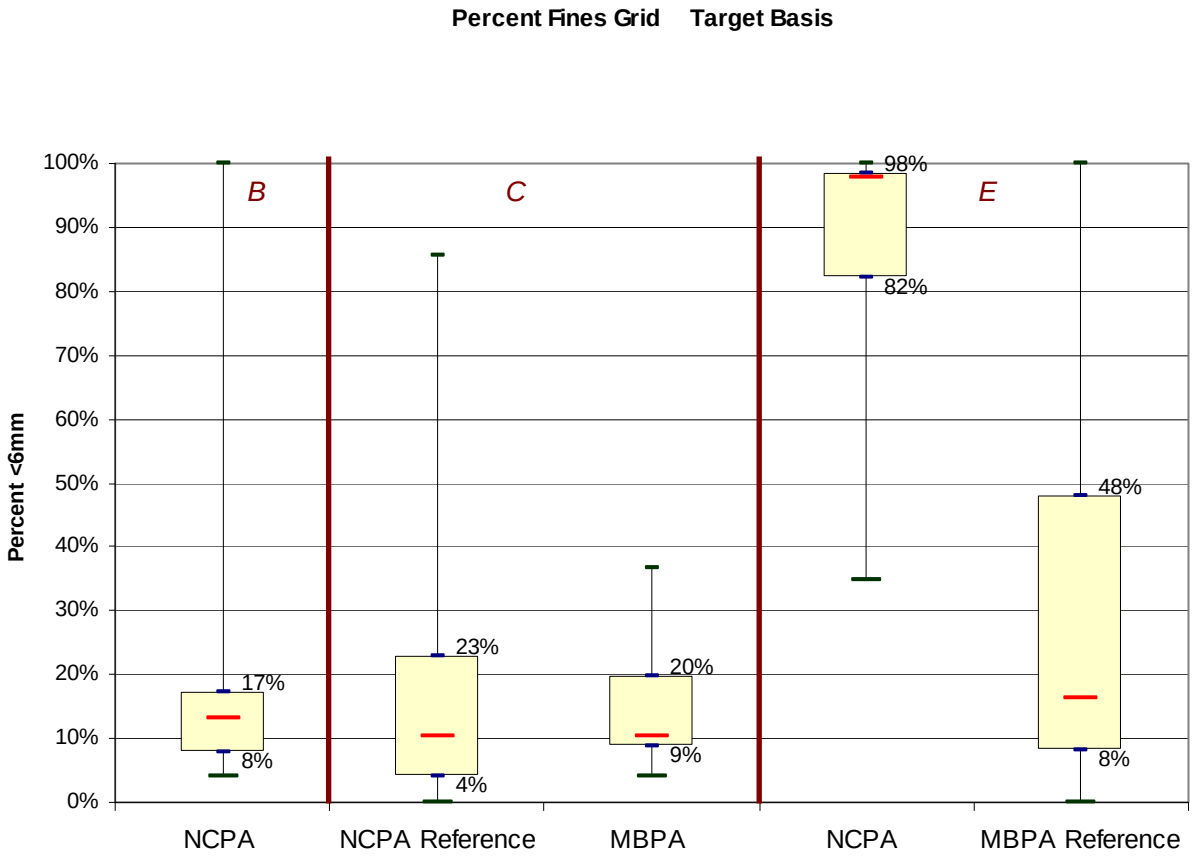

Figure D-7. Distributional Statistics for Pool Tailout Surface Fines

Macroinvertebrates

Targets developed for macroinvertebrate data reflect two macroinvertebrate assessment models described by Feldman (2006). These models are the Multimetric Indices (MMI), and the River Invertebrate Prediction and Classification System (RIVPACS). The models allow the determination of the degree of impairment based on MMI and RIVPACS scores. The range of model scores for each impairment condition is summarized in **Table D-14**.

Table D-14. Impairment Levels for the MMI and RIVPACS Macroinvertebrate Bioassessment Models

Measure	Site Classification	Unimpaired Range	Moderate Impairment Range	Severe Impairment Range
Multimetric Index (MMI)	Low Valley	≥48	38-47	≤37
	Mountain	≥63	29-62	≤28
Predictive Model Observed/Expected (RIVPACS)	N/A	≥0.8	0.44-0.79	≤0.43

Woody Vegetation Extent

The extent of woody vegetation on either channel bank is an important indicator for stream condition related to habitat in terms of cover, shade, and woody debris recruitment. Woody vegetation also adds to bank stability, and can thereby reduce sediment loading to streams. The targets developed for extent of bankline woody vegetation are all based on the base parameter datasets (**Table D-15**). These values reflect the 75th percentile (Q3) for each stream type (**Table D-16; Figure D-8**). The target values range from 61% on C channel types in the Nevada Creek Planning Area to 88% on B channel types for both planning areas. This 88% value for B channel types is derived solely from the Nevada Creek Planning Area dataset due to presence of only one B channel type in the listed stream segments of the Middle Blackfoot Planning Area.

Table D-15. Target Values for Bankline Woody Vegetation Extent

Planning Area	Channel Type	Target Value	Basis*
Nevada Creek	B	>88 %	NCPA 75th Percentile
	C	>61%	NCPA 75th Percentile
	E	>74%	NCPA 75th Percentile
Middle Blackfoot	B	>88 %	NCPA 75th Percentile
	C	>84%	MBPA 75th Percentile
	E	>69%	MBPA 75th Percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

Table D-16. Summary Statistics for Bankline Woody Vegetation Extent

	B	***C***		***E***	
Statistic*	**NCPA**	**NCPA**	**MBPA**	**NCPA**	**MBPA**
Q1	41%	31%	39%	45%	7%
Min	15%	0%	9%	29%	0%
Median	80%	46%	69%	55%	50%
Max	100%	70%	100%	89%	99%
Q3	88%	61%	84%	74%	69%
N	7	9	11	10	3

* Q1 = 25th percentile, Q3 = 75th percentile

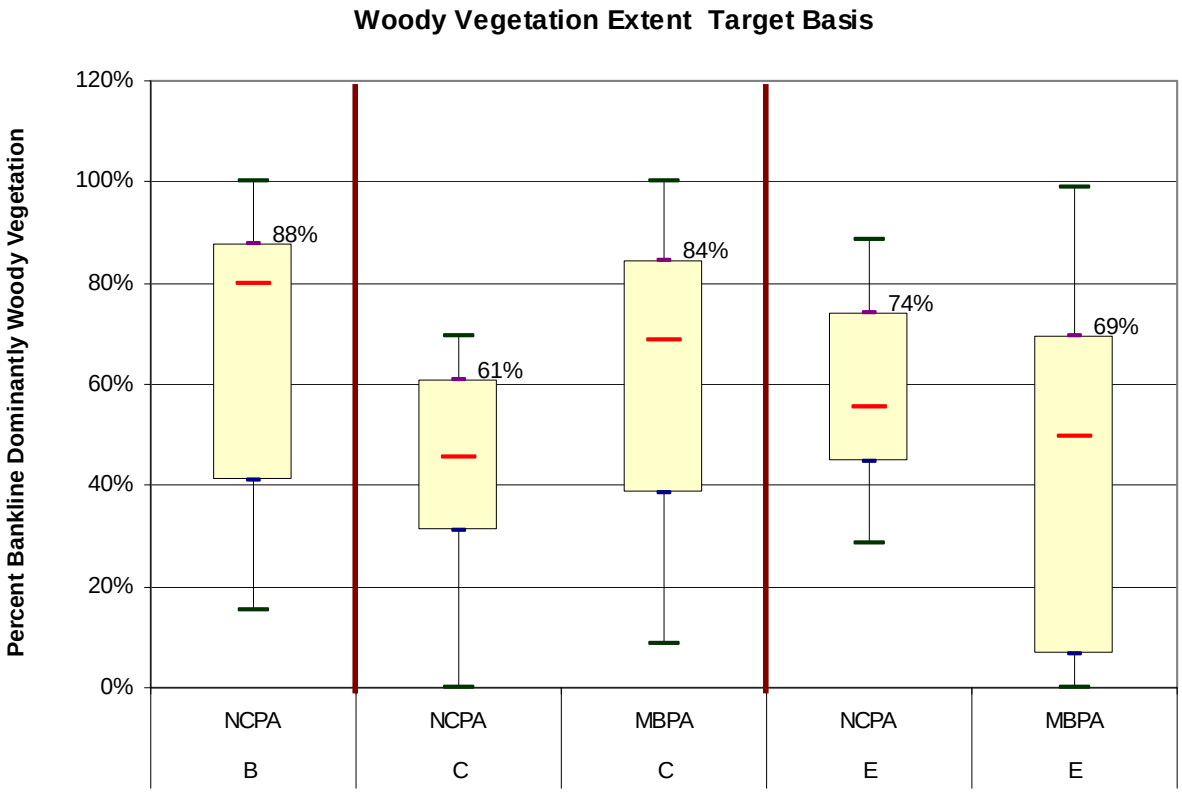

Figure D-8. Distributional Statistics for Bankline Woody Vegetation Extent

Entrenchment Ratio

Entrenchment ratio targets are applied to channels for which entrenchment is identified as a negative alteration of the natural channel form. An entrenched condition on open valley stream types reflects a loss in floodplain access. This may occur from channel incision below the active floodplain or potentially from channel widening and consequent reduction in mean channel depth. Entrenched channels classified as F or G channel types have an entrenchment target of >2.2, which defines the classification boundary between entrenched and unentrenched streams in the Rosgen classification scheme (Rosgen, 1996).

Pool Extent

The pool extent parameter refers to the percent of total channel length that is comprised of mapped pools units. This measure is linear, and does not reflect pool width or overall volume. However, it is a general indicator of overall channel complexity and extent of pool habitat area. Pool extent targets are based upon the 75th percentile values derived from the base parameter assessment data for the Nevada Creek and Middle Blackfoot planning areas (**Table D-17**). A summary of the internal data set statistics used to develop the targets is shown in **Table D-18** and **Figure D-9**. The pool extent target of ≥10% for B channel types reflects the Nevada Creek planning area reference B channel type compilation; this target has been applied to both planning areas due to an insufficiency in data from the Middle Blackfoot Planning Area. For C channels, the 75th percentile value of 35% pool extent for all sites is derived from both planning area

datasets. The 75th percentile value for pool extent in NCPA streams is 29%, which is somewhat higher than the 19% value derived for the MBPA E reference channel types.

Table D-17. Target Values for Pool Extent

Planning Area	Channel Type	Target Value	Basis*
Nevada Creek	B	≥10	NCPA Reference 75th Percentile
	C	≥35	NCPA 75th Percentile; MBPA 75th Percentile
	E	≥29	NCPA 75th Percentile
Middle Blackfoot	B	≥10	NCPA Reference 75th Percentile
	C	≥35	NCPA 75th Percentile; MBPA 75th Percentile
	E	≥19	MBPA 75th Percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

Table D-18. Summary Statistics for Bankline Woody Vegetation Extent

	B	C		E	
Statistic*	**NCPA Reference**	**NCPA**	**MBPA**	**NCPA**	**MBPA Reference**
Q1	5%	1%	11%	7%	8%
Min	3%	0%	8%	2%	0%
Median	7%	24%	24%	15%	12%
Max	14%	72%	37%	59%	38%
Q3	11%	34%	35%	29%	19%
n	3	9	10	8	4

* Q1 = 25th percentile, Q3 = 75th percentile

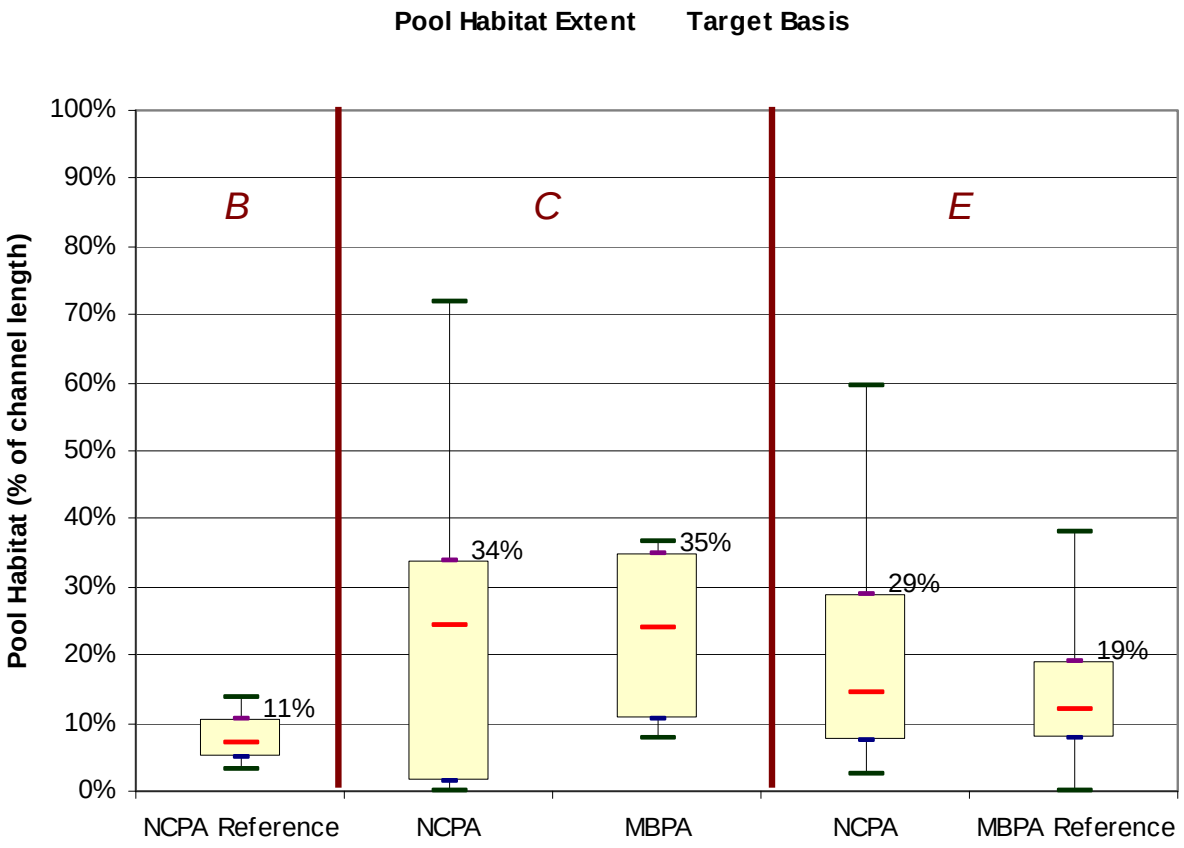

Figure D-9. Distributional Statistics for Pool Extent

Woody Debris Aggregate Extent

The percent of total channel length occupied by woody debris aggregates is a general indicator of channel complexity. The targets developed for this parameter all reflect 75th percentile values for the base parameter data (**Table D-19**). These targets are all less than 15% total channel length, reflecting the limited extent of woody debris aggregates in assessed reaches in both planning areas (**Table D-20; Figure D-10**).

Table D-19. Target Values for Woody Debris Aggregate Extent

Planning Area	Channel Type	Target Value	Data Source
Nevada Creek	B	>3 %	NCPA 75th Percentile
	C	>7%	NCPA 75th Percentile
	E	>12%	MBPA Reference 75th Percentile
Middle Blackfoot	B	>4 %	MBPA 75th Percentile
	C	>8%	MBPA 75th Percentile
	E	>12%	MBPA Reference 75th Percentile

* NCPA: Nevada Creek Planning Area, MBPA: Middle Blackfoot Planning Area

Table D-20. Summary Statistics for Woody Debris Aggregate Extent

Percent Jam Length				
	B	**C**		**E**
Statistic*	***NCPA***	***NCPA***	***MBPA***	***MBPA***
Q1	2.1%	0.0%	2.4%	0.5%
Min	0.6%	0.0%	0.0%	0.0%
Median	2.8%	1.4%	4.8%	2.5%
Max	4.4%	18.1%	29.4%	35.0%
Q3	3.2%	7.0%	8.4%	12.0%
n	6	9	10	4

* Q1 = 25th percentile, Q3 = 75th percentile

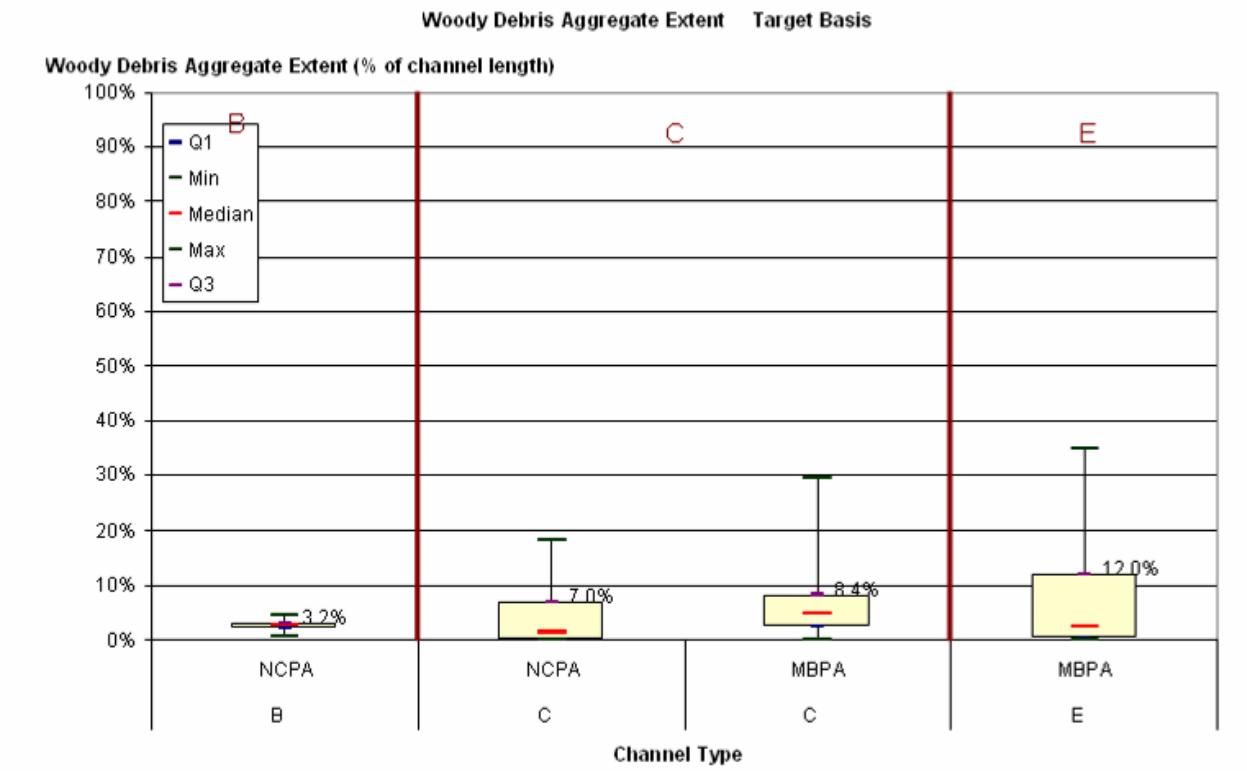

Figure D-10. Distributional Statistics for Woody Debris Aggregate Extent