APPENDICES

FOR

BEAVERHEAD NATIONAL FOREST FISHERIES:

SECOND ANNUAL REPORT

COVERING THE PERIOD JANUARY TO DECEMBER 1986

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A cooperative study between the Beaverhead National Forest
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Appendix A.

Description and explaination of information obtained from USGS maps (scale: 1:24,000).

EXPLANATION OF HOW TO ENTER DATA FROM MAPS ONTO MAPS DATA FORM

This document explains how to enter data from maps onto the "FORM TO ENTER DATA DERIVED FROM MAPS" data form. It is recommended that topographic maps of a scale of 1:24,000 be used to do reach delineation and calculations for areas. If it is necessary to use maps of other scales to obtain land-use and miles of road information convert that data to a scale of 1:24,000 if that was the scale used to obtain the other reach information. Be sure that all the data entered onto this form is taken or converted to the scale recorded on the form.

EXPLANATION OF VARIABLES

SERIAL - Serial numbers are alpha-numeric codes assigned by the MDFWP to uniquely identify each reach. It is a three (3) integer variable that is unitless.

STREAM - Name of the stream for the reach of interest. Name recorded from the map.

REACH - Number of the reach delineated from the map. Reaches are assigned numbers in ascending order from the stream mouth upstream. Reach numbers must start over again at 1 whenever a stream changes name. Reach numbers are unitless.

DATE - Date the map data is completed in the form of mm/dd/yy.

QUAD NAME - Name of the USGS quad or quads used to obtain the reach data.

SCALE - Scale of the map used to delineate reaches. All data entered onto this form must be converted to the scale listed in this space.

STREAM ORDER - Stream order is defined in this context as the number assigned any stream course delineated on a 1:24,000 USGS quad. Stream orders are assigned starting with the upstream most unbranched stream courses which are assigned as stream order 1. When two stream courses assigned as 1's come together the resulting stream course is assigned as stream order 2. To have a stream order of 4 two stream courses assigned as 3's must come together, the junction of a stream order 3 and 2 do not form a 4. Stream order is unitless.

REACH LENGTH - Reach length is the length of the reach from the lower to the upper boundary in miles to the nearest tenth of a mile.

GRADIENT - Gradient of the reach is estimated from the map by calculating the change in elevation (in feet) and dividing that by the length of the reach (also in feet). Gradient is reported in percent to the nearest tenth (0.1) of a percent.

AREA - DRAINED BY ENTIRE STREAM	The area drained by the entire stream is estimated by digitizing the area within the drainage boundary from the mouth of the stream. This area is estimated in acres to the nearest tenth of an acre.
AREA - DRAINED BY REACH	The area drained by the reach is estimated as above, however, the drainage area is subdivided into reaches by extending drainage boundaries to the lower bound of each reach following topography. This area is reported in acres to the nearest tenth of an acre.
LOWER - AND UPPER REACH LANDMARKS	The lower reach landmark is a description of the lower reach boundary based on easily recognized landmarks from the map or on the ground. Bridges, entering tributaries, etc. all make good landmarks. If a good landmark doesn't exist, express the reach landmark as the number of miles (to the nearest tenth of a mile) to the nearest good landmark.
LOWER - AND UPPER REACH LEGAL BOUND	The legal description to the quarter quarter section which locates the reach boundaries. Includes township, range, section and alphabetic code described by MDFWP for quarter quarter section.
LOWER - AND UPPER REACH ELEVATION	The elevation of the stream channel at the lower and upper bound of the reach as estimated from USGS quads. It is reported in feet to the nearest foot. Accuracy is usually to the nearest 10 feet.
VALLEY - LENGTH	Valley length is the straight line length of the valley bottom in miles to the nearest tenth of a mile.
CHANNEL - SINUOSITY	Channel sinuosity is the ratio of the length of the valley (in miles) to the length of the stream channel (in miles). Channel sinuosity is a unitless measure.
LANDTYPE - ASSOCIATION	Landtype association is the landtype association as determined by Dan Svoboda, the Forest Soils Scientist, for the reach.
CHANNEL - TYPE	Channel type as defined by Rosgen (1985). Types are based on gradient, valley shape, flow character and other variables. Recorded as a letter A, B, C or D.

LAND USE - Land use in the drainage will be estimate from forest land type maps. Land use will be broken down into the following categories:

Timbered land
Timber harvested (equivalent clearcut acres)
Range land
Type of range management
Estimated AUM's per acre
Irrigated cropland
Nonirrigated cropland
Mining disturbance
Miles of road (to tenths of mile) by type:
Main artery
Collector
Spur

Land use will be expressed as acres to the tenths of an acre for the major land activities. Roads will be expressed in miles to the nearest tenth of a mile.

Appendix B

Description and explaination of information collected during habitat surveys conducted by walking the entire reach (or a minimum of one mile).

EXPLANATION OF DATA ENTRY ONTO THE "ENTIRE REACH" FORM

This document explains how to enter data collected in the field for a survey of an entire reach onto the "FIELD FORM FOR SURVEYING ENTIRE REACH". Most of the data collected during the survey of the entire reach will be tallied on the form and then summed for computer entry. Other data will be based on locating certain aquatic habitat components within the reach by the surveyor's pace and later transfering these data to maps. The field survey will also allow the surveyor to verify map data and modify certain variables assigned using the maps if map information was inaccurate.

EXPLANATION OF VARIABLES

SERIAL – The serial number is an alpha-numeric code assigned by the MDFWP which uniquely identifies the stream reach. This code is three (3) characters long and is unitless.

STREAM – Name of the stream from USGS quad map.

REACH – Number of the reach assigned from map. Reaches are assigned in ascending order from the mouth of the stream upstream.

DATE: – Date of the survey in the format mm/dd/yy.

STAGE: – Relative stage of the stream at the time of the survey. Coded as L = low, M = moderate, and H = high.

BEGINNING OR ENDING LANDMARK – A landmark from the map or on the ground which identifies the lower (or upper) reach boundary. The surveyor may relocate the reach boundaries if the field conditions warrant a change. Any change must be clearly noted.

WETTED WIDTH – The wetted width at the upper and lower reach boundaries will be measured in feet to the nearest tenth of a foot.

PACE LENGTH – The length of the surveyor's pace in feet to the nearest tenth of a foot. The surveyor is responsible for keeping track of paces as he walks the reach. It is important to do this so important habitat features can be relocated on maps.

Data to be Tallied

HABITAT TYPE – The number of each habitat type will be counted for the entire reach and tallied as the surveyor walks the stream. Main habitat types will be pools, riffles, runs, pocketwaters, and side channels. Side channels are defined as channels carrying 25 % or less of the flow. Pool habitats will be classified into: 1) trench pools; 2) plunge pools; 3) dammed pools; and 4) beaver ponds. Riffles will be classified into: 1) low gradient riffles; 2) rapids; and 3) cascades. Pools within pocketwater types will be classified into: 1) backwater pools; 2) lateral scour pools; and 3) secondary channel pools. Main channel pools will also be rated based on width, depth and cover criteria. Habitat type

classification and pool rating will be done according to methods described by FHR.

SPAWNING GRAVEL - The amount of spawning gravel within the entire reach will be estimated by summing visual estimates tallied throughout the reach. Spawning gravel will be arbitrarly defined as areas larger than four (4) square feet predominated by streambed material in the 0.5 to 3.0 inch size category. Spawning gravel will be measured in square feet to the nearest whole square foot.

LOCATION OF HIGH QUALITY SPAWNING HABITAT - If an extensive area of spawning habitat is located within a reach, the surveyor will record the pace number at the beginning and end of the high quality spawning area so that it can be identified and recorded on a map.

SMALL AND LARGE CHANNEL DEBRIS - A tally will be kept of accumulations of small (less than 6.0 inches) and large (6.0 inches and larger) organic (woody) debris within the stream channel. For the purpose of these surveys, accumulations must cover at least four (4) square feet to be included.

PERCENT OF STABLE DEBRIS - The estimated percentage of large and small channel debris which will not be moved by a normal spring (high flow) event. Estimated seperately for large and small debris.

Variables Located within the Reach by Pace

BARRIER - All potential barriers to fish movement are to be located within the reach by pace. At each potential barrier the surveyor will record the type of barrier: 1) culvert; 2) debris jam; 3) diversion structure; 4) beaver dam; 5) falls; 6) cascade; or 7) other by name. The surveyor will also measure the depth (in inches to the nearest inch) of the water immediately below the barrier (to determine if it has adequate depth to serve as a jump pool),the water immediately above the barrier (to determine if it has adequate depth to serve as a catch pool), and the length of the barrier (in feet to the nearest tenth of a foot). The height of the barrier will be measured in feet to the nearest tenth of a foot. Comments should be made regarding the barrier to allow for assessing if passage is possible, probable, or impossible.

FEATURE - The feature variable is to be used to enter location information for any landmark or significant habitat variable the surveyor encounters within the reach. Examples of what should be included as features are: culverts; slumped banks; all road crossings; junctions with tributaries; areas impacted due to land-use activities; sediment sources; debris accumulations; swamps; beaver activity; etc. Record the location by pace or range of paces.

IRRIGATION WITHDRAWAL OR RETURN - The location of any irrigation water withdrawal or return must be noted by pace. The surveyor should estimate the flow (in cfs) or percentage of the stream's flow which is withdrawn or returned. Note whether the withdrawal or return is on the left right bank (looking downstream) and the type of diversion structure (if any).

SITE FOR FISH AND HABITAT WORK - During the reach survey try to select a representative site to conduct fish population estimates and detailed habitat surveys. Try to select a section which is near to an access point. Record pace location and landmarks. If it is near a road try to find the road and leave flagging on the road to mark the section.

CHANNEL TYPE - Type the channel according to criteria presented by Rosgen. A, B or C with the associated numbers.

GENERAL COMMENTS - Write down any general comment regarding the reach's capacity to support fish. Results of angling, evidence of past angling, the condition of the habitat, the condition of the riparian area, presence of macroinvertebrates, etc.

Appendix C

Description and explaination of information collected during detailed habitat surveys conducted within the sample section of each reach.

DOCUMENTATION OF DATA ENTRY INTO FIELD HABITAT TRANSECT FORM

This document explains how to enter data onto the field form "FIELD FORM FOR ENTERING HABITAT TRANSECT DATA BY REACH AND TYPE". This document will explain each variable, how it is measured, the units of measure, and the number of significant digits. Habitat data will be measured by habitat type. Analysis will be stratified based on habitat type. Each habitat type surveyed will have a unique transect number within each reach. Cross sections will be measured across each habitat unit with the number of cross sections dependent upon the length and uniformity of the habitat unit. Several parameters will be estimated for the entire habitat unit. A streamflow measurement must be completed for each reach surveyed near the habitat survey section. Use the standard USGS streamflow form and methodology. Be sure that no more than 10% of the flow is measured in any one cell measured.

PARAMETER EXPLANATIONS

Header Information

SERIAL - Unique serial number assigned by Montana Department of Fish, Wildlife and Parks. An alpha-numeric variable which is unitless.

STREAM - Name of the stream from USGS quad map.

REACH - Reach number of the stream reach surveyed. Reaches are assigned for each named tributary increasing in value from the mouth upstream. Reaches are generally uniform with respect to channel gradient, channel type, valley configuration, and volume of flow.

DATE - Date the survey is completed in the format of mm/dd/yy.

TEMPERATURE - Temperature of the water in the section surveyed in degrees Farenheit to the nearest whole degree.

FLOW - The measured streamflow in cubic feet per second (cfs) to the nearest tenth.

Information Collected for Whole Habitat Unit

TRANSECT NUMBER - Unique transect number for the specific habitat unit surveyed by stream and reach.

HABITAT TYPE - Main and secondary habitat type which the habitat unit is classified. Main types are pools, riffles, runs (glides), pocketwaters, and side channels. Side channels are defined as channels which flow 25% or less of the entire streamflow. Where more than one channel exists and each channel carries more than 25% of the flow, each channel is typed into units. Secondary habitat types are classified according to criteria presented in the FHR handbook.

LENGTH OF TYPE - Length of the habitat unit in feet to the nearest tenth of a foot.

LENGTH OF UNDERCUT - Total length of undercut banks on both sides of the channel within the habitat unit sampled. Length is measured in feet to the nearest tenth of a foot and can total more than the length of the habitat unit. Done for entire habitat unit.

POOL CLASS - Pool class is rated based on criteria of size, depth, and cover. Only classes with ratings of 5, 4 and 3 will generally be used because pools with ratings of 1 and 2 are defined as being less than the average stream width by 10% or more and these will usually be classed in the pocketwater habitat type.

CANOPY DENSITY - Estimated percentage of the stream channel having canopy covering the channel. Underbrush and willow growth are not considered as canopy cover.

INSTREAM COVER - Instream cover is estimated for the entire habitat unit as the percent of the wetted area where cover within the water is available. Instream cover can be provided by depth, substrate, debris, turbulence, and aquatic vegetation. To qualify as instream cover the surveyor must determine what percentage of the wetted area has the ability to hide fish.

LOW OH COVER - Low overhead cover is defined as cover one foot or less above the water's surface hanging over the water's surface. It is estimated for the entire habitat unit in percent of the wetted area covered by overhanging material less than or equal to one foot above the water's surface. This type of cover can be provided by grasses, forbes, shrubs, trees, debris, or man-made structures.

HIGH OH COVER - High overhead cover is cover as defined above which is higher than one foot above the water's surface.

SUBSTRATE - Substrate composition is estimated for the entire habitat unit sampled by estimating the percentage of each size class which makes up the streambed. Size classes are defined as follows:

Silt - less than 0.83 mm (usually organic material)
Sand - 0.83 to 2.0 mm
Small gravel - 2.1 to 6.34 mm
Large gravel - 6.35 to 76.0 mm
Cobble - 76.1 to 256.0 mm
Small boulder - 256.1 to 609.0 mm
Large boulder - Larger than 609.0 mm

SOIL ALT RATING - The soil alteration rating is the degree to which the streambank has been altered from its optimum condition according to criteria developed by Platts et al. (1983). The alteration can occur by the presence of animals (code with an A), logging (L), roads (R), high streamflows (S), or other (O). Soil alteration is recorded as percent altered to the nearest percent followed by the letter code for the expected reason for the alteration.

VEG STAB RATING - The vegetative stability rating is the ability of the vegetation on the streambank to resist erosion. Rating criteria for this parameter were also developed by Platts et al. (1983) in the form of a ranking system with "4" being excellent and "1" being poor. The rated portion of the streambank includes only that area from the stream to the top of the bank.

VEG USE BY - The vegetation use by animals is rated as a percentage use based on criteria established by Platts et al. (1983).

Variables Measured Across Cross Sections Within Sampled Habitat Unit

WET WIDTH - Width of the wetted stream channel in feet to the nearest tenth of a foot. The edge of the water is determined to be where any material is not completely surrounded by water. Any items protruding above the waters surface are included in the wetted width measurement except islands of inorganic sediment wider than one foot. The width of these islands are deducted from the total width to obtain wetted width.

CHANNEL WIDTH - Width of the stream channel at the "bankfull" stage as determined by rooted terestrial vegetation or water marks. Width is measured in feet to the nearest tenth of a foot. Multiple channels are summed to obtain total channel width.

AVE DEPTH - Average depth of the stream in inches to the nearest tenth of an inch. To calculate average depth, the depth is measured at five locations across the stream channel: at the two margins, and one-fourth, one-half, and three-fourths of the width across the habitat unit. These five measurements are then averaged to obtain average depth.

THAL DEPTH - Thalweg depth of each cross section is measured at the deepest point of the cross section in inches to the nearest tenth of an inch.

SHORE DEPTH - Shore depth is the water's depth adjacent to the shoreline. It is measured in inches to the nearest tenth of an inch. In cases where the streambank gradually slopes up, shore depth is "0". In cases where an overhanging or undercut bank exists, shore depth is measured from the top edge of the bank which overhangs the stream.

EMBEDDEDNESS Level to which the large dominant particles within the streambed are surrounded by fine silts, sands and small gravels. This level is estimated as percent of the height of the dominant particle which is surrounded by these fine materials. This value may be best estimated by removing several large particles from the stream bottom and observing where there is no periphyton growth. (NOTE: The method of Burns (1984) will be tested on several stream reaches and may be adopted for all reaches to better quantify embeddedness.)

SUBSTRATE - SCORE Substrate score was first proposed by Sandine (1974) and modified by Crouse et al. (1981). It is calculated by adding four ranked values: 1) the size class of the dominant particle within the streambed; 2) the size class of the second most abundant dominant particle; 3) the size class of the material surrounding these dominant particles; and 4) the level of embeddedness. At each habitat unit cross section, one point of streambed is to be randomly selected and a substrate score value will be calculated for that cross section based on that random point. An effort must be made to sample areas near shore, mid-channel, heads of units, middle of units, and tails of units.

D-90 - D-90 is a symbol for the diameter of a particle within the streambed which is larger than 90 percent of the material comprising the streambed. D-90 measurements are taken across an intermediate axis (not the longest axis) in inches to the nearest tenth of an inch.

DEPTH OF UNDERCUT BANK - Depth of the undercut bank measured in inches to the nearest tenth of an inch. Measured by holding a yard stick parallel to the water's surface and pushing the yard stick under the undercut bank until the verticle streambank immediately adjacent to the water's surface is encountered. The measurement is then read to the edge of the overhanging bank.

BANK ANGLE - Bank angle is the angle of the downward sloping streambank as it meets the streambottom. If the streambank is undercut the bank angle is always less than 90 degrees. Bank angle is measured by placing a clinometer on a rod placed with one end at the water's edge and then lain on the streambank or to the top edge of an undercut bank. Bank angle is reported in degrees to the nearest degree.

Appendix D.

Mean estimates of temperature (F), streamflow (cfs), length of each habitat unit (ft), wetted width (ft), channel width (ft), average depth (in), thalweg depth (in), and average depth at each bank (in) for streams draining the Beaverhead National Forest surveyed during 1986.

Table D1. Mean estimates of temperature (F), streamflow (cfs), length of each habitat unit (ft), wetted width (ft), channel width (ft), average depth (in), thalweg depth (in), and average depth at each bank (in) for streams draining the Beaverhead National Forest surveyed during 1986. Standard deviations are in parentheses.

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
ADSON CK								
1								
	Pools (11)	8.4	6.6	6.0	9.7	8.1	14.2	7.5
		(2.5)	(1.8)	(1.6)	(2.4)		(2.3)	(3.0)
	Riffles (12)	12.8	7.3	6.1	5.4	15.0	9.1	3.0
		(7.2)	(2.6)	(1.8)	(1.5)		(1.9)	(2.0)
	Runs (11)	10.4	5.8	5.4	5.9	12.5	9.3	4.3
		(2.2)	(1.2)	(1.0)	(1.8)		(2.2)	(2.1)
	Pockets (3)	12.3	8.0	5.6	5.6	12.4	9.5	2.5
		(2.5)	(2.4)	(0.3)	(1.0)		(2.3)	(1.3)
	Side C. (1)	10.0	2.5	2.5	10.7	2.8	15.8	7.0
		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)
	Reach summary (38)	406.0	6.6	5.7	6.9	11.7	10.8	4.8
			(2.1)	(1.5)	(2.7)		(3.2)	(3.0)
ELK CK								
1								
	Pools (11)	23.5	12.9	9.5	9.8	11.9	18.4	7.6
		(7.5)	(3.5)	(3.0)	(2.6)		(3.7)	(3.4)
	Riffles (10)	22.2	13.9	9.4	3.3	36.7	6.6	2.4
		(16.0)	(3.1)	(2.4)	(1.1)		(1.4)	(2.1)
	Runs (4)	22.5	11.5	7.5	7.3	13.1	12.3	5.0
		(15.5)	(2.7)	(1.5)	(2.1)		(1.3)	(2.7)
	Reach summary (25)	571.0	13.1	9.2	6.8	22.0	12.7	5.1
			(3.2)	(2.6)	(3.6)		(6.1)	(3.7)
2								
	Pools (10)	13.2	13.8	9.1	9.0	12.8	15.1	5.6
		(5.6)	(5.6)	(1.8)	(2.0)		(4.0)	(2.4)
	Riffles (7)	16.6	12.8	8.8	2.8	38.1	6.4	1.4
		(12.5)	(1.4)	(1.9)	(0.7)		(1.8)	(1.3)
	Runs (3)	14.3	12.7	7.4	4.7	19.7	7.9	2.5
		(7.6)	(5.9)	(1.9)	(0.8)		(0.8)	(2.3)
	Pockets (7)	33.9	13.0	8.3	4.0	25.0	8.0	2.7
		(19.1)	(1.8)	(1.2)	(0.6)		(1.3)	(0.7)
	Reach summary (27)	528.0	13.2	8.7	5.6	23.3	10.2	3.4
			(3.9)	(1.7)	(3.0)		(4.6)	(2.5)

Table D1. (continued).

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
JOHNSON CK								
1								
	Pools (4)	34.3	33.8	24.8	12.8	23.9	23.7	3.5
		(22.8)	(5.5)	(2.8)	(3.1)		(5.8)	(2.7)
	Riffles (9)	18.6	23.4	21.2	5.1	53.0	10.4	2.3
		(9.4)	(6.4)	(4.5)	(1.0)		(1.1)	(1.6)
	Runs (5)	25.8	23.5	18.8	8.9	26.2	15.9	2.6
		(11.4)	(7.1)	(3.2)	(1.4)		(1.2)	(0.7)
	Pockets (6)	27.3	20.4	17.6	8.3	26.3	14.3	2.9
		(9.5)	(2.3)	(1.4)	(1.5)		(1.6)	(2.1)
	Reach summary (24)	597.0	24.4	20.4	7.9	35.9	14.7	2.7
			(7.0)	(4.0)	(3.2)		(5.2)	(1.7)
2								
	Pools (4)	21.8	26.8	17.7	7.4	29.7	18.3	1.4
		(2.9)	(4.8)	(8.8)	(1.4)		(3.7)	(2.1)
	Riffles (6)	17.2	27.6	18.7	2.5	98.4	6.0	0.6
		(4.8)	(4.8)	(9.0)	(0.5)		(1.0)	(1.2)
	Runs (4)	20.8	25.1	12.2	4.8	30.0	9.5	0.4
		(5.3)	(8.2)	(4.3)	(1.0)		(1.6)	(0.7)
	Pockets (5)	41.6	29.6	24.4	4.8	62.4	12.9	2.6
		(10.7)	(6.0)	(8.5)	(1.3)		(5.4)	(1.8)
	Side C. (2)	26.5	26.6	11.9	5.5	29.7	9.9	3.8
		(6.4)	(2.8)	(4.2)	(3.7)		(5.5)	(4.6)
	Reach summary (21)	534.0	27.3	18.0	4.7	57.2	11.0	1.5
			(5.4)	(8.4)	(2.1)		(5.4)	(2.0)
JOSEPH CK								
1								
	Pools (12)	29.1	16.8	10.5	11.6	11.1	20.6	4.2
		(10.6)	(3.1)	(3.6)	(2.6)		(4.1)	(3.6)
	Riffles (7)	18.7	17.4	10.4	4.0	34.3	7.0	1.3
		(7.8)	(4.9)	(3.4)	(1.1)		(1.6)	(1.7)
	Runs (3)	31.7	13.2	10.1	7.0	17.1	12.6	2.2
		(28.9)	(0.9)	(4.5)	(0.5)		(0.7)	(2.6)
	Reach summary (22)	575.0	16.5	10.4	8.5	19.3	15.2	3.0
			(3.7)	(3.4)	(4.1)		(7.0)	(3.2)

Table D1. (continued).

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
JOSEPH CK (continued)								
2								
	Pools (16)	16.1	13.2	9.5	9.3	13.4	15.9	4.5
		(8.8)	(4.4)	(2.5)	(2.4)		(4.1)	(2.4)
	Riffles (11)	6.8	13.5	6.6	2.7	32.6	5.2	1.5
		(1.9)	(3.3)	(1.9)	(0.8)		(1.5)	(1.4)
	Runs (4)	20.3	14.2	6.3	5.1	15.0	9.7	3.1
		(8.7)	(3.0)	(1.5)	(0.8)		(1.4)	(1.4)
	Pockets (7)	25.4	12.6	7.4	4.1	24.1	8.2	1.7
		(15.2)	(3.3)	(1.3)	(1.1)		(2.0)	(1.0)
	Reach summary (38)	592.0	13.3	7.9	6.0	21.1	10.7	3.0
			(3.7)	(2.4)	(3.4)		(5.5)	(2.3)
LAMARCHE CK								
1								
	Pools (5)	19.4	36.4	31.5	13.1	34.5	26.4	6.4
		(2.8)	(10.1)	(9.9)	(4.3)		(5.8)	(5.9)
	Riffles (8)	44.0	38.6	30.5	9.0	42.1	16.8	2.3
		(21.1)	(9.4)	(5.2)	(2.2)		(2.7)	(2.0)
	Runs (1)	39.0	35.6	24.4	10.8	27.1	23.2	0.0
		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)
	Pockets (7)	75.7	43.6	34.8	8.8	47.4	17.2	2.0
		(35.9)	(8.0)	(5.8)	(0.8)		(2.4)	(1.1)
	Reach summary (21)	1018.0	39.6	31.8	10.0	41.4	19.5	3.1
			(8.9)	(6.8)	(3.0)		(5.3)	(3.6)
2								
	Pools (13)	50.8	33.6	25.9	26.5	12.3	45.3	13.0
		(16.2)	(6.4)	(6.0)	(8.8)		(9.8)	(7.0)
	Riffles (8)	28.1	33.4	25.3	9.6	34.2	18.4	5.5
		(23.4)	(2.5)	(5.0)	(2.6)		(5.6)	(4.7)
	Runs (5)	59.6	31.8	27.1	19.2	17.5	30.0	12.8
		(40.7)	(4.2)	(7.1)	(3.3)		(6.3)	(4.3)
	Reach summary (26)	1184.0	33.2	26.0	19.9	20.1	34.1	10.7
			(5.0)	(5.7)	(9.9)		(14.4)	(6.7)

Table D1. (continued).

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
MEADOW CK								
2								
	Pools (2)	8.5	10.8	10.1	7.0	17.2	14.0	3.5
		(2.1)	(0.1)	(0.5)	(0.1)		(4.0)	(1.4)
	Riffles (16)	17.6	10.2	8.6	4.5	23.3	10.0	2.0
		(9.5)	(2.4)	(2.4)	(0.6)		(2.1)	(1.2)
	Runs (2)	12.0	10.3	8.7	8.3	12.7	14.0	6.8
		(1.4)	(0.6)	(0.8)	(1.6)		(2.3)	(3.9)
	Pockets (9)	19.0	12.1	9.4	5.0	23.6	9.6	2.1
		(4.9)	(3.6)	(2.0)	(1.1)		(0.6)	(1.4)
	Reach summary (29)	493.0	10.8	9.0	5.1	22.3	10.4	2.5
			(2.8)	(2.2)	(1.4)		(2.3)	(1.8)
MONO CK								
1								
	Pools (4)	12.2	14.1	13.0	10.1	19.2	20.1	5.1
		(3.0)	(2.5)	(3.4)	(5.5)		(7.8)	(3.5)
	Riffles (7)	32.1	13.5	12.8	4.6	35.1	12.5	3.1
		(25.6)	(1.8)	(2.3)	(1.0)		(2.3)	(1.0)
	Runs (1)	31.0	12.1	12.1	8.6	16.9	15.2	7.0
		(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)
	Pockets (5)	38.2	13.2	12.9	5.1	30.2	12.8	4.6
		(11.0)	(3.6)	(3.2)	(0.5)		(4.7)	(1.8)
	Reach summary (17)	495.6	13.5	12.8	6.3	28.9	14.5	4.3
			(2.4)	(2.6)	(3.4)		(5.4)	(2.2)
2								
	Pools (21)	19.0	6.4	5.6	15.5	4.8	24.3	9.2
		(27.7)	(3.5)	(2.6)	(3.7)		(4.8)	(5.3)
	Riffles (8)	11.0	4.2	3.7	8.4	5.4	12.7	5.9
		(5.0)	(1.2)	(1.2)	(1.2)		(2.8)	(3.3)
	Runs (10)	18.3	4.5	3.8	13.4	3.7	20.3	7.3
		(7.5)	(1.9)	(1.8)	(3.2)		(4.8)	(5.4)
	Reach summary (39)	669.9	5.5	4.7	13.5	4.7	20.9	8.0
			(2.9)	(2.3)	(4.2)		(6.3)	(5.0)

Table D1. (continued).

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
SHEEP CK								
1								
	Pools (7)	17.6	12.5	9.0	12.9	9.1	20.6	9.2
		(6.9)	(3.4)	(2.1)	(5.0)		(5.9)	(5.8)
	Riffles (7)	27.0	14.7	7.3	4.1	26.5	7.4	2.7
		(14.9)	(6.2)	(3.5)	(1.5)		(1.9)	(2.1)
	Runs (4)	60.8	7.2	6.9	10.4	8.0	14.6	10.1
		(38.1)	(2.5)	(2.2)	(1.8)		(2.3)	(1.5)
	Reach summary (18)	555.0	12.2	7.9	8.9	15.6	14.1	6.9
			(5.2)	(2.8)	(5.2)		(7.1)	(5.1)
2								
	Pools (6)	9.8	14.2	12.0	8.1	17.8	14.3	4.8
		(3.8)	(2.2)	(3.5)	(1.4)		(2.7)	(2.0)
	Riffles (11)	17.1	14.7	10.5	3.4	40.2	7.2	2.1
		(5.1)	(2.9)	(2.3)	(0.9)		(1.3)	(1.2)
	Runs (3)	13.7	17.9	11.7	5.0	28.4	10.4	1.5
		(3.1)	(3.1)	(1.8)	(1.0)		(1.8)	(1.8)
	Pockets (10)	24.6	15.4	13.3	4.0	41.6	7.7	2.4
		(8.8)	(2.5)	(2.9)	(1.2)		(1.5)	(1.4)
	Reach summary (30)	534.0	15.2	11.9	4.7	35.0	9.1	2.7
			(2.7)	(2.9)	(2.1)		(3.2)	(1.8)
STEEL CK								
1								
	Pools (4)	50.8	35.4	27.1	11.2	30.4	19.0	2.0
		(22.5)	(4.6)	(3.1)	(3.0)		(3.6)	(2.3)
	Riffles (8)	33.0	35.6	26.4	4.1	86.3	7.3	1.0
		(19.1)	(11.4)	(5.9)	(1.2)		(1.4)	(1.5)
	Runs (7)	55.4	28.4	24.6	7.8	40.8	12.5	2.8
		(17.4)	(6.0)	(4.8)	(2.0)		(2.2)	(2.3)
	Reach summary (19)	855.0	32.9	25.9	7.0	57.8	11.7	1.9
			(8.9)	(4.9)	(3.4)		(5.0)	(2.0)

Table D1. (continued).

Stream Reach	Habitat type (n)	Length (ft)	Channel width (ft)	Wetted width (ft)	Average depth (in)	Width to depth ratio	Thalweg depth (in)	Bank depth (in)
WYMAN CK								
1								
	Pools (2)	14.5	18.9	12.8	12.3	13.1	23.3	6.3
		(3.5)	(6.2)	(3.7)	(2.5)		(3.9)	(8.8)
	Riffles (10)	24.5	21.7	15.9	6.8	30.2	14.2	3.4
		(19.6)	(6.4)	(2.2)	(1.7)		(2.5)	(1.9)
	Runs (6)	23.3	19.9	14.6	7.9	22.9	16.5	3.7
		(10.4)	(4.6)	(3.6)	(2.0)		(1.3)	(1.6)
	Pockets (6)	34.5	21.8	16.2	5.8	34.6	13.2	2.8
		(17.1)	(1.7)	(2.7)	(1.0)		(2.7)	(1.4)
	Reach summary (24)	621.0	21.0	15.4	7.3	28.1	15.3	3.6
			(4.9)	(2.8)	(2.3)		(3.5)	(2.6)
2								
	Pools (9)	38.4	24.6	19.4	16.3	14.7	29.9	5.8
		(8.3)	(9.2)	(8.2)	(4.1)		(4.8)	(3.8)
	Riffles (9)	20.9	26.6	18.3	4.9	50.7	9.8	2.8
		(11.8)	(7.6)	(5.6)	(1.4)		(2.2)	(3.1)
	Runs (3)	65.3	25.4	21.9	9.9	27.9	18.1	2.3
		(33.7)	(1.5)	(1.9)	(2.6)		(3.5)	(3.3)
	Pockets (3)	34.7	26.2	15.9	8.2	25.8	15.4	3.6
		(24.7)	(6.8)	(4.2)	(2.2)		(1.4)	(1.0)
	Reach summary (24)	834.0	25.7	18.9	10.2	31.3	19.1	4.0
			(7.4)	(6.3)	(5.8)		(9.6)	(3.4)

Appendix E

Mean estimates of cover availability including percentage undercut banks, canopy density over the water's surface (%), instream cover (%), low (1.0 foot or less above the water's surface) overhead cover (%), high (more than 1.0 foot above the water's surface) overhead cover (%), and depth of undercut banks (in.) by habitat type for waters draining the Beaverhead National Forest surveyed during 1986.

Table E1. Mean estimates of cover availability including percentage undercut banks, canopy density over the water's surface (%), instream cover (%), low (1.0 foot or less above the water's surface) overhead cover (%), high (more than 1.0 foot above the water's surface) overhead cover (%), and depth of undercut banks (in.) by habitat type for waters draining the Beaverhead National Forest surveyed during 1986. Standard deviations are in parentheses.

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover	
						Low (%)	High (%)
Adson 1							
	Pools (11)	65	7.3	4	41	14	24
		(26)	(3.4)	(9)	(31)	(12)	(34)
	Riffles (12)	54	3.3	3	35	10	23
		(34)	(3.5)	(12)	(34)	(11)	(32)
	Runs (11)	52	4.4	0	10	9	22
		(26)	(2.9)	(1)	(7)	(6)	(28)
	Pockets (3)	36	2.3	3	23	12	15
		(3)	(2.0)	(6)	(16)	(15)	(17)
	Side C. (1)	90	5.5	0	85	60	20
		(0)	(0.0)	(0)	(0)	(0)	(0)
	Average (38)	56	4.8	2	30	13	22
		(28)	(3.5)	(8)	(30)	(13)	(29)
Elk 1							
	Pools (11)	54	8.0	0	11	3	5
		(20)	(4.1)	(0)	(7)	(3)	(4)
	Riffles (10)	37	5.3	1	7	2	3
		(24)	(3.9)	(3)	(5)	(2)	(3)
	Runs (4)	54	5.2	1	6	7	9
		(29)	(4.2)	(1)	(3)	(12)	(14)
	Average (25)	47	6.5	1	9	3	5
		(24)	(4.1)	(2)	(6)	(5)	(6)

Table E1. (continued)

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover Low (%)	Overhead cover High (%)
Elk (cont.)							
2							
	Pools (10)	77	8.2	19	20	10	8
		(21)	(6.5)	(17)	(19)	(10)	(11)
	Riffles (7)	62	5.9	19	20	9	7
		(18)	(3.2)	(26)	(18)	(10)	(9)
	Runs (3)	56	6.4	0	5	7	5
		(6)	(2.6)	(0)	(5)	(6)	(5)
	Pockets (7)	61	6.3	24	27	12	11
		(14)	(2.5)	(25)	(17)	(7)	(10)
	Average (27)	66	6.9	18	20	10	8
		(18)	(4.5)	(21)	(18)	(9)	(10)
Johnson							
1							
	Pools (4)	41	4.1	7	39	11	16
		(32)	(3.7)	(6)	(22)	(13)	(14)
	Riffles (9)	34	1.6	6	44	7	13
		(19)	(1.5)	(7)	(20)	(5)	(6)
	Runs (5)	32	3.8	9	45	10	15
		(15)	(1.6)	(17)	(18)	(12)	(15)
	Pockets (6)	38	3.6	23	57	14	26
		(16)	(3.4)	(32)	(16)	(10)	(24)
	Average (24)	36	3.0	11	47	10	17
		(19)	(2.6)	(19)	(19)	(9)	(15)
2							
	Pools (4)	46	3.5	2	13	9	13
		(19)	(3.6)	(1)	(9)	(5)	(5)
	Riffles (6)	36	4.8	1	11	12	11
		(39)	(7.1)	(2)	(9)	(11)	(15)
	Runs (4)	20	2.1	3	16	16	14
		(18)	(3.1)	(3)	(9)	(12)	(6)
	Pockets (5)	59	8.3	6	54	49	45
		(22)	(6.6)	(7)	(34)	(40)	(34)
	Side C. (2)	78	16.5	20	11	13	19
		(15)	(18.4)	(28)	(13)	(11)	(16)
	Average (21)	44	6.0	5	22	21	20
		(30)	(7.7)	(9)	(25)	(25)	(22)

Table E1. (continued)

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover Low (%)	Overhead cover High (%)
Joseph							
1							
	Pools (12)	42	4.4	0	12	10	18
		(19)	(3.8)	(0)	(8)	(8)	(12)
	Riffles (7)	40	1.8	0	6	8	16
		(36)	(1.8)	(0)	(5)	(9)	(19)
	Runs (3)	68	3.4	0	10	7	28
		(45)	(1.7)	(0)	(5)	(5)	(10)
	Average (22)	45	3.4	0	10	9	19
		(29)	(3.2)	(0)	(7)	(8)	(14)
2							
	Pools (16)	63	7.9	13	18	7	14
		(19)	(3.2)	(24)	(12)	(9)	(14)
	Riffles (11)	37	5.5	6	10	5	8
		(32)	(7.3)	(18)	(11)	(4)	(7)
	Runs (4)	51	4.9	7	14	7	11
		(28)	(1.3)	(12)	(15)	(9)	(13)
	Pockets (7)	46	5.4	0	27	8	20
		(22)	(5.9)	(0)	(21)	(5)	(20)
	Average (38)	51	6.4	8	17	7	13
		(26)	(5.1)	(19)	(15)	(7)	(14)
LaMarche							
1							
	Pools (5)	28	5.9	7	39	2	10
		(20)	(6.9)	(10)	(14)	(2)	(4)
	Riffles (8)	15	3.3	3	55	3	7
		(11)	(3.1)	(3)	(30)	(2)	(5)
	Runs (1)	13	0.0	0	20	2	5
		(0)	(0.0)	(0)	(0)	(0)	(0)
	Pockets (7)	21	3.6	2	24	5	7
		(18)	(3.5)	(2)	(8)	(1)	(3)
	Average (21)	20	3.9	4	39	3	8
		(16)	(4.3)	(6)	(24)	(2)	(4)

Table E1. (continued)

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover Low (%)	Overhead cover High (%)
LaMarche (cont.) 2							
	Pools (13)	51	7.7	4	28	5	10
		(12)	(2.5)	(14)	(10)	(3)	(7)
	Riffles (8)	58	5.3	3	13	7	12
		(15)	(4.0)	(7)	(8)	(7)	(11)
	Runs (5)	60	6.7	0	16	7	12
		(15)	(2.6)	(1)	(9)	(5)	(7)
	Average (26)	55	6.8	3	21	6	11
		(14)	(3.1)	(10)	(11)	(5)	(8)
Meadow 2							
	Pools (2)	45	5.8	55	40	4	7
		(7)	(3.9)	(49)	(28)	(2)	(5)
	Riffles (16)	51	4.5	30	57	21	21
		(28)	(3.5)	(32)	(25)	(23)	(18)
	Runs (2)	78	4.5	58	15	15	20
		(20)	(6.4)	(46)	(0)	(7)	(7)
	Pockets (9)	55	3.9	30	43	16	18
		(16)	(2.3)	(35)	(21)	(13)	(19)
	Average (29)	53	4.4	34	49	18	19
		(24)	(3.2)	(34)	(25)	(19)	(17)
Mono 1							
	Pools (4)	19	4.3	15	83	10	9
		(22)	(3.6)	(24)	(10)	(4)	(8)
	Riffles (7)	5	2.7	14	89	7	10
		(5)	(2.9)	(26)	(3)	(8)	(18)
	Runs (1)	6	2.0	2	80	5	10
		(0)	(0.0)	(0)	(0)	(0)	(0)
	Pockets (5)	13	4.6	2	88	8	6
		(6)	(3.4)	(2)	(4)	(7)	(9)
	Average (17)	11	3.6	10	87	8	9
		(12)	(3.1)	(20)	(6)	(7)	(12)

Table E1. (continued)

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover Low (%)	Overhead cover High (%)
Mono (cont.)							
2							
	Pools (21)	50	5.5	0	18	8	0
		(22)	(2.5)	(0)	(19)	(6)	(0)
	Riffles (8)	34	2.9	0	8	5	0
		(27)	(1.9)	(0)	(6)	(1)	(0)
	Runs (10)	65	4.8	0	19	13	0
		(22)	(2.1)	(0)	(18)	(9)	(0)
	Average (39)	51	4.8	0	17	8	0
		(25)	(2.5)	(0)	(17)	(7)	(0)
Sheep							
1							
	Pools (7)	61	8.6	0	16	8	14
		(13)	(5.4)	(0)	(11)	(8)	(10)
	Riffles (7)	37	3.1	0	10	15	19
		(25)	(2.8)	(0)	(3)	(15)	(20)
	Runs (4)	90	11.5	0	9	25	50
		(13)	(3.8)	(0)	(3)	(12)	(34)
	Average (18)	58	7.1	0	12	14	24
		(27)	(5.3)	(0)	(8)	(13)	(24)
2							
	Pools (6)	60	7.8	31	38	31	42
		(31)	(7.2)	(48)	(14)	(14)	(26)
	Riffles (11)	45	7.9	33	33	12	23
		(26)	(6.6)	(31)	(25)	(12)	(19)
	Runs (3)	54	2.3	32	18	8	15
		(21)	(2.1)	(35)	(3)	(11)	(22)
	Pockets (10)	58	6.8	24	23	13	17
		(26)	(4.0)	(23)	(13)	(15)	(17)
	Average (30)	53	7.0	30	29	16	24
		(26)	(5.6)	(31)	(18)	(15)	(21)

Table E1. (continued)

Stream Reach	Habitat type (n)	Percent undercut bank	Depth undercut bank	Canopy density (%)	Instream cover (%)	Overhead cover Low (%)	Overhead cover High (%)
Steel							
1							
	Pools (4)	14	1.2	0	21	1	1
		(9)	(1.2)	(0)	(11)	(1)	(1)
	Riffles (8)	22	2.2	0	9	1	1
		(32)	(2.0)	(0)	(10)	(0)	(1)
	Runs (7)	26	2.6	0	16	2	5
		(21)	(2.3)	(0)	(8)	(2)	(9)
	Average (19)	22	2.1	0	14	1	2
		(24)	(1.9)	(0)	(10)	(1)	(6)
Wyman							
1							
	Pools (2)	24	1.5	5	43	15	50
		(1)	(2.1)	(7)	(39)	(7)	(42)
	Riffles (10)	30	3.1	3	70	6	14
		(19)	(2.3)	(9)	(13)	(6)	(10)
	Runs (6)	23	1.6	0	32	7	16
		(16)	(2.7)	(0)	(21)	(3)	(12)
	Pockets (6)	26	3.5	0	39	8	12
		(17)	(2.5)	(0)	(19)	(6)	(8)
	Average (24)	27	2.7	2	50	7	17
		(16)	(2.4)	(6)	(24)	(6)	(16)
2							
	Pools (9)	46	3.3	0	44	7	7
		(16)	(2.2)	(0)	(29)	(7)	(9)
	Riffles (9)	20	3.1	0	9	3	2
		(24)	(4.5)	(0)	(8)	(3)	(4)
	Runs (3)	31	4.1	0	13	3	3
		(17)	(2.0)	(0)	(3)	(2)	(4)
	Pockets (3)	35	2.3	0	66	5	2
		(20)	(1.5)	(0)	(7)	(3)	(1)
	Average (24)	33	3.2	0	30	5	4
		(22)	(3.1)	(0)	(28)	(5)	(6)

Appendix F

Embeddedness data by sample (hoop) and stream reach for streams sampled during 1986.

Table F1. Embeddedness data by sample (hoop) and stream reach for streams sampled during 1986

Stream	Reach	Hoop	Depth	Velocity	n	Embeddedness	Average particle size (mm) (range)
WISE RIVER DISTRICT							
Adson							
	1A	1	6.4	1.3	31	49	62.3
	1A	2	5.9	1.1	42	49	52.7
	1A	3	4.7	1.7	37	58	54.2
		AVERAGE FOR THE SITE			110	52	55.9 (24.0 - 113.0)
	1B	1	5.0	1.8	39	42	51.7
	1B	2	5.6	1.7	23	52	51.0
	1B	3	4.8	1.2	26	47	58.8
	1B	4	5.1	1.4	19	54	56.4
		AVERAGE FOR THE SITE			107	47	54.1 (18.0 - 121.0)
Jerry							
	1B	1	5.5	1.7	26	43	69.2
	1B	2	6.5	1.5	29	24	60.6
	1B	3	6.0	1.0	17	36	60.0
		AVERAGE FOR THE SITE			72	34	63.5 (28.0 - 164.0)
LaMarche							
	1	1	7.5	1.2	35	31	67.6
	1	2	9.5	1.8	33	33	78.9
	1	3	8.5	1.0	37	35	66.4
		AVERAGE FOR THE SITE			105	33	70.7 (28.0 - 243.0)
	2	1	11.0	2.0	34	46	50.6
	2	2	11.4	1.2	43	53	51.6
	2	3	11.0	1.5	35	45	51.4
		AVERAGE FOR THE SITE			112	48	51.3 (24.0 - 111.0)
	2B	1	6.5	1.3	39	34	62.4
	2B	2	8.0	1.8	41	30	53.4
	2B	3	5.5	1.2	25	37	61.5
		AVERAGE FOR THE SITE			105	33	58.7 (20.0 - 225.0)

Table F1. (continued)

Stream	Reach	Hoop	Depth	Velocity	n	Embeddedness	Average particle size (mm) (range)
Meadow							
	2	1	4.3	1.1	31	40	57.0
	2	2	4.3	0.9	28	50	55.8
	2	3	5.9	1.1	42	51	66.1
		AVERAGE FOR THE SITE			101	47	60.4 (27.0 - 144.0)
Mono							
	1	1	4.9	1.0	32	45	74.3
	1	2	5.8	1.0	34	54	65.3
	1	3	5.2	1.1	35	50	62.7
		AVERAGE FOR THE SITE			101	50	67.3 (24.0 - 196.0)
Wise River							
	3B	1	6.5	1.7	57	43	55.9
	3B	2	8.5	1.8	37	29	59.9
		AVERAGE FOR THE SITE			94	37	57.5 (28.0 - 133.0)
Wyman							
	1	1	7.3	1.4	29	48	88.0
	1	2	7.9	1.8	26	40	85.3
	1	3	9.6	2.0	29	31	79.2
	1	4	14.2	1.7	17	43	88.8
		AVERAGE FOR THE SITE			101	40	84.9 (33.0 - 231.0)
	2	1	7.1	1.1	41	38	51.2
	2	2	5.9	1.1	62	43	47.4
		AVERAGE FOR THE SITE			103	41	48.9 (29.0 - 80.0)
WISDOM DISTRICT							
Big Swamp							
	2B	1	6.5	1.3	33	35	57.7
	2B	2	7.0	1.3	22	29	64.0
	2B	3	7.5	1.5	21	43	58.8
	2B	4	6.5	2.0	19	35	60.8
		AVERAGE FOR THE SITE			95	35	60.0 (28.0 - 135.0)

Table F1. (continued)

Stream	Reach	Hoop	Depth	Velocity	n	Embeddedness	Average particle size (mm) (range)
Elk							
	1	1	6.3	1.3	38	47	50.7
	1	2	6.0	1.7	30	47	57.9
	1	3	4.7	1.8	34	56	55.1
		AVERAGE FOR THE SITE			102	50	54.3 (28.0 - 190.0)
	2	1	5.0	1.3	6	59	98.5
	2	2	5.0	0.8	13	56	78.8
	2	3	1.4	0.8	18	65	69.2
	2	4	2.0	1.3	13	55	69.0
	2	5	4.3	1.0	21	67	54.2
	2	6	4.4	1.0	13	75	77.5
	2	7	6.1	0.8	16	62	81.2
		AVERAGE FOR THE SITE			100	63	72.0 (40.0 - 175.0)
Johnson							
	2	1	4.7	1.3	13	33	50.0
	2	2	7.5	1.1	46	47	62.6
	2	3	4.3	1.3	33	54	65.0
	2	4	5.9	1.3	54	35	73.0
		AVERAGE FOR THE SITE			146	43	65.9 (23.0 - 200.0)
Joseph							
	1	1	4.3	2.0	60	37	41.2
	1	2	4.3	1.7	55	46	40.1
		AVERAGE FOR THE SITE			115	42	40.7 (19.0 - 84.0)
	2	1	5.9	1.5	36	38	50.5
	2	2	3.1	1.7	35	42	49.1
	2	3	6.3	1.1	37	43	51.2
		AVERAGE FOR THE SITE			108	41	50.3 (20.0 - 135.0)

Table F1. (continued)

Stream	Reach	Hoop	Depth	Velocity	n	Embeddedness	Average particle size (mm) (range)
Sheep							
	1	1	4.7	2.0	31	42	50.6
	1	2	5.5	1.7	36	50	64.3
	1	3	5.9	1.3	29	40	55.3
		AVERAGE FOR THE SITE			96	44	57.2 (27.0 - 137.0)
	2	1	5.9	1.0	8	74	68.3
	2	2	4.7	1.0	5	62	63.0
	2	3	5.9	1.1	17	62	60.4
	2	4	4.3	1.3	12	69	51.2
	2	5	5.5	0.9	11	75	80.6
	2	6	6.7	1.0	19	64	61.1
	2	7	4.9	1.8	20	72	64.7
	2	8	7.1	2.0	14	72	61.6
		AVERAGE FOR THE SITE			106	69	63.3 (30.0 - 205.0)
Steel							
	1A	1	2.6	1.3	95	39	38.6
		AVERAGE FOR THE SITE			95	39	38.6 (18.0 - 104.0)
	1B	1	5.1	1.1	99	38	38.6
		AVERAGE FOR THE SITE			99	38	38.6 (18.0 - 75.0)
Trail							
	2	1	9.0	1.1	29	30	39.6
	2	2	9.0	1.0	48	43	44.0
	2	3	8.0	0.9	27	28	38.1
		AVERAGE FOR THE SITE			104	36	41.2 (16.0 - 74.0)

Appendix G

Mean lengths and weights, condition factors and sample sizes by stream, reach, and species for all fish captured in streams draining the Beaverhead National Forest surveyed during 1986.

Table G1. Mean lengths and weights, condition factors and sample sizes by stream, reach, and species for all fish captured in streams draining the Beaverhead National Forest surveyed during 1986.

DISTRICT Stream	Reach	Species	n	Length (range) (in.)	Weight (range) (lbs.)	Condition
DILLON DISTRICT						
Browns Canyon Ck	2	WCT	70[1/]	4.8 (1.3 - 9.8)	-	-
Cow Cabin Ck	2	EBT	11	6.2 (3.3 - 9.3)	-	-
Morrison Ck	2	EBT	6	5.3 (2.6 - 7.5)	-	-
Painter Ck	2	WCT	42	5.3 (2.8 - 9.7)	-	-
Pass Ck	2	EBT	50	5.5 (2.8 - 8.8)	-	-
Pole Ck	2	EBT	14	4.7 (2.6 - 7.7)	-	-
		WCT	2	7.3 (6.3 - 8.2)	-	-
Reservoir Ck	2	WCT	42	4.3 (1.5 - 8.7)	0.06 (0.01 - 0.25)	88.5
WISE RIVER DISTRICT						
Adson Ck	1	EBT	3	4.8 (4.3 - 5.5)	0.06 (0.05 - 0.08)	58.9
		WCT	7	7.3 (6.8 - 7.8)	0.16 (0.12 - 0.18)	40.2

Table G1. (continued)

DISTRICT Stream	Reach	Species	n	Length (range) (in.)	Weight (range) (lbs.)	Condition
LaMarche Ck	1	RB	34	4.5 (2.7 - 9.5)	0.06 (0.01 - 0.39)	40.7
		EBT	201	5.4 (1.6 - 11.1)	0.08 (0.01 - 0.74)	40.9
	2	EBT	161	6.1 (1.4 - 13.3)	0.11 (0.01 - 0.98)	43.9
		WSUCK	1	9.6	0.36	40.7
		MWF	1	14.0	1.06	38.6
Meadow Ck	2	WCT	9	4.2 (1.7 - 6.4)	0.03 (0.01 - 0.07)	57.8
Mono Ck	1	WCT	70	3.6 (2.0 - 8.9)	0.03 (0.01 - 0.24)	49.4
	2	WCT	32	6.4 (4.6 - 11.3)	0.12 (0.05 - 0.32)	36.7
Wyman Ck	1	EBT	42	5.3 (2.1 - 8.2)	0.08 (0.01 - 0.21)	43.9
		RBXWCT	10	4.1 (2.3 - 6.2)	0.03 (0.01 - 0.08)	47.2
		LING	5	9.2 (7.9 - 11.7)	0.14 (0.08 - 0.22)	-
	2	EBT	268	5.8 (1.8 - 11.5)	0.10 (0.01 - 0.54)	42.1
		GR	1	9.1 (9.1 - 9.1)	0.22 (0.22 - 0.22)	29.2
		RBXWCT	13	7.3 (4.2 - 11.3)	0.18 (0.02 - 0.56)	34.9

Table G1. (continued)

DISTRICT Stream	Reach	Species	n	Length (range) (in.)	Weight (range) (lbs.)	Condition
WISDOM DISTRICT						
Elk Ck	1	EBT	78	4.7 (1.6 - 9.2)	0.07 (0.01 - 0.36)	57.0
	2	EBT	157	4.2 (1.4 - 7.5)	0.04 (0.01 - 0.18)	52.8
Johnson Ck	1	EBT	102	4.9 (2.0 - 9.2)	-	-
		LING	23	8.9 (6.7 - 10.2)	-	-
	2	EBT	82	4.4 (1.5 - 9.0)	-	-
Joseph Ck	1	EBT	91	5.8 (2.2 - 12.9)	0.37 (0.10 - 0.86)	39.8
		LING	2	8.6 (8.4 - 8.8)	-	-
	2	EBT	336	4.1 (1.3 - 8.8)	0.04 (0.01 - 0.30)	58.4
Sheep Ck	1	EBT	36	4.6 (1.6 - 8.8)	0.07 (0.01 - 0.31)	74.4
		LING	5	9.2 (8.3 - 10.2)	-	-
	2	EBT	52	4.5 (1.2 - 7.9)	0.05 (0.01 - 0.21)	61.9
Steel Ck	1	EBT	260	4.4 (2.5 - 10.5)	-	-
		GR	3	5.9 (4.0 - 8.7)	-	-
		LING	4	8.3 (5.7 - 10.3)	-	-

Table G1. (continued - footnote))

1/ Species abbreviations are: BBT = brook trout; GR = arctic grayling; LING = burbot; RB = rainbow trout; RBXWCT = undetermined rainbow or cutthroat trout or hybrids between the two; WCT = cutthroat trout.