COASTAL MULTISPECIES PLAN

APPENDIX E: STREAM SUMMARY APPLICATION

2016

Photo Credit 1: Confluence of Middle Fork Eel and Eel River, Dos Rio. *Credit: Erin Seghesio, NMFS*

December 2009

Description of Attributes in Tables produced in the
Stream Summary Application

The following report provides descriptions of attributes for the Stream Summary Application output database that was created for the California Department of Fish and Game - Hopland Office. The application was developed in 2008 by UC:ANR:Hopland Research Extension and Center GIS Lab under the Fisheries Restoration Grant Program (FRGP) grant number PO430411. The stream summary application was modified to provide additional information needed by the National Marine Fisheries Service (NMFS) to inform federal recovery planning underway in the North Central California Coast Recovery Domain: a geographic area encompassing the federally listed Distinct Population Segments (DPS) of Northern California steelhead and Central California Coast steelhead and the Evolutionarily Significant Units (ESU) of California Coastal Chinook and the Central California Coast coho salmon. This work was made possible under Sonoma County Water Agency (SCWA) Contract TW 08/09-125.

The Stream Summary Application was developed to provide additional information to regional biologists when assessing salmonid habitat based on stream habitat surveys. The Application produces 4 tables standard (stream summary, habitat criteria, ranked manual criteria, and reachsum_x), that contain all of the metrics in the Stream Habitat Program report (text, tables, and graphs) and some additional calculations from various Department of Fish and Game planning documents. For the SCWA contract we produced three additional tables (noaa_table, Units, and Populations), these additional tables were requested by NMFS planning team.

STANDARD TABLES:

The "stream summary" table reports the metrics in the text, tables, and graphs found in Stream Habitat Reports. Data is reported at specific habitat levels (1 - 4, California Salmonid Stream Habitat Restoration Manual III-30, and an additional habitat level of 0, this summarizes the data either at the stream or reach level without taking into account a habitat type.). Additionally data is reported for all metrics for all habitat types (Habitat Type Level field). The "stream summary" table provides the metrics at both the stream and the reach level (StreamOrReach field). In the "stream summary" table we also provide the sample sizes and sums of values for all of the metrics provided.

The "habitat criteria" table contains additional metrics and habitat criteria that can be used to evaluate stream condition. The criteria have been gleaned from various Department planning documents (see end of document for a detailed list of the metrics and source documents). The "habitat criteria" table provides the metrics at both the stream and the reach level (StreamOrReach field).

The "ranked manual criteria" table contains information about 6 habitat criteria as described in the California Salmonid Stream Habitat Restoration Manual. The table provides a boolean score, depending on whether they do (value 1) or do not meet (value 0) the criteria. The seventh value in the table is the numeric sum of criteria scores by each reach or stream. The table provides the metrics at both the stream and the reach level (StreamOrReach field).

The "reachsum_x" table is loosely based on the data reported in Stream Habitat Program table number 8. The "reachsum_x" table provides the metrics at the reach level. This table has been replaced by the "stream summary" table produced by the Stream Summary Application. "Reachsum_x," is provided as a reference to help older projects transition to the new "stream summary" table.

SCWA TABLES:

The "noaa_table" table contains additional metrics and habitat criteria that can be used to evaluate stream condition for salmonids species. These criteria have been developed by NMFS planning team through literature reviews and consultation with experts in the field of salmonid ecology. The "noaa_table" table provides the metrics at both the stream and the reach level (StreamOrReach field).

The "Units" table contains information that can be used to relate the stream and the reach level data to common aggregating layers, such as, county boundaries, USGS hydrologic unit codes (HUCs), ecoregional boundaries, and CALWATER boundaries.

The "Populations" table contains information that can be used to relate the stream and the reach level data to the NMFS salmonid populations planning dataset.

The data produced in this application can be joined to spatial data representing the streams or reaches surveyed by the California Department of Fish and Game. The spatial data available includes:
- Reach lines – Line shapefile that represents the surveyed reaches.
- Reach Sheds – Polygon shapefile that represents the surveyed reaches as watersheds.

How to link tables to GIS:
- Join the tables to the GIS data through two different fields. For the reach level data join based on the common field code and for the stream level join based on the Table field code to spatial data field code1.

Contact Information –

- For questions about data structure and database design, etc.
  Shane Feirer
  GIS Analyst
  Hopland Research Extension and Center GIS Lab
  4070 University Road Hopland, California 95449
  (707) 744-1424 voice
  (707) 744-1040 fax
  stfeirer@ucdavis.edu

- For questions about data, availability, distribution, use restrictions, etc.
  Derek Acomb
  Associate Fisheries Biologist
  Russian River Fisheries Resource Assessment
  Bay Delta Region California Department of Fish and Game
  4070 University Road Hopland, California 95449
  (707) 744-8713 voice
  (707) 744-8712 fax
  dacomb@dfg.ca.gov

Application Table: Stream Summary – All metrics in report (text, tables, and graphs).

The "stream summary" table contains all of the metrics in the Stream Habitat Program report (text, tables, and graphs). The "stream summary" table provides the metrics at both the stream and the reach level (StreamOrReach field). The Stream Habitat Program reports the metrics in the text, tables, and graphs at specific habitat levels (1 - 4, California Salmonid Stream Habitat Restoration Manual III-30, in the "stream summary" table we provided an additional habitat level of 0, this summarizes the data either at the stream or reach level without taking into account a habitat type.), in the "stream summary" table we provide the metrics at all habitat levels (Habitat Type Level field). In the "stream summary" table we also provide the sample sizes and sums of values for all of the metrics provided.

General Survey Information
This section contains basic information about the stream habitat survey such as the Site ID, site name, stream name, year of record, the duration of the sample, etc.
Reported in: All Tables
Inclusions:
Used in Calculations:

Attribute	Description
SurveyId	Survey identification number
Pname	Stream name
Pnmcd	Stream number
Year	Year of survey
StreamOrReach	Code used to delineate whether the measurements are at the stream or reach level
Code	Stream code or ReachID depending on StreamOrReach Value
Habitat Type Level	Habitat level 1 - 4 (figure 3-8, habitat manual)
MinOfL4_Number	Value used to sort data based on habitat type

Dates – The dates of the habitat surveys
Reported in: All Tables
Inclusions:
Used in Calculations:

Attribute	Description
Minimum Date	The minimum date of the survey in the reach or stream
Maximum Date	The maximum date of the survey in the reach or stream

Channel Type - Rosgen channel type classification. The channel type of the reach or stream based on the Stream Channel Type Work Sheet (Part III)
Reported in: Table 8
Inclusions:
Used in Calculations:

Attribute	Description
Channel Type	Rosgen channel type classification. The channel type of the reach or stream based on the stream channel type work Sheet (part III)

Base Flow (cfs) - The base flow is the flow that the stream reduces to during the dry season or a dry spell. This flow is supported by ground water and subsurface seepage into the channel.
Reported in: Table 8
Inclusions:
Used in Calculations:

Attribute	Description
Base Flow (cfs)	The mean base flow in cubic feet per second, measured at the beginning of the survey. If flows change significantly during the survey they are again measured at the end of the survey at the same location. The average of the two measurements is recorded.

Temperature Data – Temperature of the water and air taken during the surveys. Temperatures are taken at the beginning of each page record and recorded to the nearest degree Fahrenheit. Temperatures are taken in the shade and within one foot of the water surface.
Reported in: Table 8
Inclusions:
Used in Calculations: Temperature values > 0

Attribute	Description
Minimum Water Temperature ˚F	For those water temperatures greater than zero, the minimum water temperature during survey
Maximum Water Temperature˚F	For those water temperatures greater than zero, the maximum water temperature during survey
Average Water Temperature˚F	For those water temperatures greater than zero, the average water temperature during survey
Minimum Air Temperature˚F	For those air temperatures greater than zero, the minimum air temperature during survey
Maximum Air Temperature˚F	For those air temperatures greater than zero, the maximum air temperature during survey
Average Air Temperature˚F	For those air temperatures greater than zero, the average air temperature during survey

Bankfull Width (W_{bkf}) – The width of the stream at bankfull discharge (Q_{bkf}) is measured by stretching a level tape from one bank to the other, perpendicular to the stream and at the Q_{bkf} line of demarcation on each bank. Q_{bkf} is determined by changes in substrate composition, bank slope, and perennial vegetation caused by frequent scouring flows. Bankfull discharge is the dominant channel forming flow with a recurrence interval within the 1 to 2 year range.

Reported in: Table 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
Minimum Bankfull Width (ft)	The minimum Bankfull width in reach or stream
Maximum Bankfull Width (ft)	The maximum Bankfull width in reach or stream
Mean Bankfull Width	The mean Bankfull width in reach or stream

(ft)
StDev Of Bankfull   The standard deviation of Bankfull width in reach or stream
Width (ft)

Large Woody Debris – Wood debris is defined as a piece of wood having a minimum diameter of twelve inches and a minimum length of six feet. Root wads must meet the minimum diameter criteria at the base of the trunk but need not be at least six feet long.
Reported in: Table 8 and 10; Graph 7
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
Sum of LWD	For those units with Large Woody Debris (LWD), the sum of the number of LWD in the stream or reach
Occurrence of LWD (%)	For those units with Large Woody Debris (LWD), the sum of the percent cover of LWD in the stream or reach divided by the number of habitat units with percent canopy values in reach or stream multiplied by 100
LWD per 100 ft	For those units with Large Woody Debris (LWD), the sum of the number of LWD in the stream or reach divided by the number of sum length of reach or stream multiplied by 100

Stream Order - The Strahler Stream Order is a simple hydrology algorithm used to define stream size based on a hierarchy of tributaries.
Reported in:
Inclusions:
Used in Calculations: Primary pool and mean residual depth by nth stream order calculations.

Attribute	Description
Stream Order Minimum	The minimum stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.
Stream Order Maximum	The maximum stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.
Stream Order Majority	The majority stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.

Habitat Units Counts and Information – Habitat units are delineated in the field and represent different habitat types as defined in chapter III of the California Salmonid Stream Habitat Restoration Manual (Part III, Page 27).
Reported in: Table 1, 2, 3, 4, 5 and 6; Graph 1, 3
Inclusions:
Used in Calculations:

Attribute	Description
Units Fully Measured	Number of habitat unit fully measured (width measurements taken)
Total Units Fully Measured	Total number of habitat unit fully measured (width measurements taken)
Habitat Units	Number of habitat units by type
Total Habitat Units	Total number of habitat units surveyed
Habitat Type At Level	Habitat Level Name (Figure 3-8, Habitat Manual)

Habitat Occurrence (%) – Percent of the habitat type within the reach of stream surveyed, based on the frequency of occurrence
Reported in: Table 1, 2, 3, 4, 5, and 6; Graph 1, 3
Inclusions:
Used in Calculations:

Attribute	Description
Habitat Occurrence (%)	Percent of the habitat type within the reach of stream surveyed based on the frequency of occurrence. The number of each habitat unit type divided by the total number of habitat units surveyed multiplied by 100.
Total N Of Pool Units Table 3	Total Number of Pool Habitat Units at Level III
Total N Of Pool Units Table 4	Total Number of Pool Habitat Units at Level IV
Pool Occurrence (%) Table 3	Percent of the pool habitat types within the reach of stream surveyed based on the frequency of occurrence. The number of each habitat unit type divided by the total number of pool units at Level III surveyed multiplied by 100.
Pool Occurrence (%) Table 4	Percent of the pool habitat types within the reach of stream surveyed based on the frequency of occurrence. The number of each habitat unit type divided by the total number of pool units at Level IV surveyed multiplied by 100.

Mean Length – Length for the surveys is defined as the thalweg length of the habitat unit, measured in feet. Side channel units are included in calculating the mean length.
Reported in: Table 1, 2, 3 and 8; Graph 2
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: ***Mean Area, Mean Volume, Mean Residual Pool Volume,*** All Area, Pool depth, and volume calculations.

Attribute	Description
Sum Length (ft)	Sum of lengths for each habitat type
Mean Length (ft)	Mean length was obtained by taking the sum of lengths for each habitat type divided by the total number of habitat units
Dry Length (ft)	Sum of lengths classified as dry (7.0)
Total Length	Total length of all units
Total Length (%)	Sum of lengths for each habitat type divided by the total length of all habitat units including side channels.

Mean Width – Mean Width is defined as the mean of two or more wetted channel widths. Width measurements are recorded in feet.
Reported in: Table 1, 2, 3 and 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: ***Mean Area, Mean Volume, Mean Residual Pool Volume,*** All Area, Pool depth, and volume calculations.

Attribute	Description
Sum Mean Width (ft)	For the units that were fully surveyed, the summation of Mean Widths
N Of Mean Width	For the units that were fully surveyed, the number of Mean Widths
Mean Width (ft)	Sum Mean Width values divided by the number of units fully surveyed

Mean Depth - Mean Depth for the surveys is defined as the mean of several random depth measurements across the unit with a stadia rod in feet. Mean depths for pools are the mean residual depth that is the mean depth value from the survey minus the pool tail crest value.
Reported in: Table 1,2, and 3; Graph 5
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: All volume calculations

Attribute	Description
N Of Mean Depth (ft)	For the units that were fully surveyed and not null, the number of Mean Depth Values
Sum Mean Depth (ft)	For the units that were fully surveyed, for all types other than pools (see residual depth) the sum of mean depth values
N Of Residual Depth (ft)	For the units that were fully surveyed and not null, the number of Mean Depth Values. For the units that were fully surveyed and not null, the number of mean depth values minus pool tail crest depth value
Sum Residual Depth (ft)	For the units that were fully surveyed and not null, the sum of mean depth values minus pool tail crest depth value
Mean Depth (ft)	For pools the mean depth is the sum of residual depth (pool depths minus pool tail crest) divided by the number of units fully measured, for other types it is the sum of mean depth values divided by the total number of units that were fully measured.

Mean Maximum Depth - Enter the measured maximum depth for each habitat unit, in feet. Mean maximum depth for the surveys is defined as the mean maximum depth measurements in the unit in feet. Mean maximum depths for pools are the mean maximum residual depths (mean maximum depth value from the survey minus the pool tail crest value).
Reported in: Table 1,4 and 8; Graph 5
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
N Of Maximum Depth	For the units that were fully surveyed and not null, the number of Maximum Depth Values
Sum Maximum Depth (ft)	For units that were fully measured, the sum of maximum depth of all units
N Of Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the number of Residual Max Depth Values
Sum Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the sum of maximum depth values minus pool tail crest depth value
Mean Maximum Residual Depth (ft)	For the units that were fully surveyed and not null, the number of Residual Max Depth Values divided by the total number of residual max depth values
Mean Maximum Depth (ft)	For pools the mean maximum depth is the sum of residual maximum depth values divided by the total number of units fully measured, for other types it is the sum of maximum depth values divided by the total number of units fully measured

Maximum Depth - Enter the measured maximum depth for each habitat unit, in feet. Maximum depth for the surveys is defined as the maximum depth measurements in the unit in feet.

Maximum depths for pools is the maximum residual depths that is the maximum depth value from the survey minus the pool tail crest value.

Reported in: Table 2
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
Maximum Depth for Non-Pools	For non pool units, maximum depth of any unit
Maximum Depth (ft)	For the units that were residual max depth > 0, the maximum depth value

Depth Pool tail Crest - Depth pool tail crest for the surveys is defined as the maximum thalweg depth of pool tail crest, in feet. This measurement is only taken in pool habitat units.

Reported in: Not Reported
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: ***Mean Depth, Mean Residual Pool Volume,*** All Pool depth and volume calculations

Attribute	Description
N Of Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the number of Residual Max Depth Values
Sum Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the sum of maximum depth values - pool tail crest depth values

Maximum Residual Pool Depths by Strata – The number and the percent of pools with maximum residual depths less than or equal to 5 strata (less than 1 foot, between 1 foot and 2 feet, between 2 feet and 3 feet, between 3 feet and 4 feet, greater than 4 feet).

Reported in: Table 4 and 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
N Of Pools <1 Foot Maximum Residual Depth	For those units classified as pool, total number of pools with maximum residual depth < 1 foot
<1 Foot Percent Occurrence	The number of pools < 1 foot divided by the total number of pools with a residual maximum depth > 0 feet
N Of Pools 1<2 Feet Maximum Residual Depth	For those units classified as pool, total number of pools with maximum residual depth >= 1 Foot and < 2 Feet
1<2 Feet Percent Occurrence	The number of pools >= 1 foot and < 2 feet divided by the total number of pools with a residual maximum depth > 0 feet
N Of Pools 2<3 Feet Maximum Residual Depth	For those units classified as pool, total number of pools with maximum residual depth >= 2 Feet and < 3 Feet
2<3 Feet Percent Occurrence	The number of pools >= 2 feet and < 3 feet divided by the total number of pools with a residual maximum depth > 0 feet
N Of Pools 3<4 Feet Maximum Residual Depth	For those units classified as pool, total number of pools with maximum residual depth >= 2 Feet and < 3 Feet
3<4 Feet Percent Occurrence	The number of pools >= 3 feet and < 4 feet divided by the total number of pools with a residual maximum depth > 0 feet
N Of Pools >=4 Feet Maximum Residual Depth	For those units classified as pool, total number of pools with maximum residual depth >= 4 feet
>=4 Feet Percent Occurrence	The number of pools >= 4 feet divided by the total number of pools with a residual maximum depth > 0 feet

Mean Area - Mean Area is calculated for all habitat types and reported in square feet. Area calculations are based on the wetted width of the habitat units, that is the mean width multiplied by the product of 1 minus the percent exposed substrate. The wetted width is then multiplied by the length.
Reported in: Table 1, 2, and 3
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: ***Mean Volume, Mean Residual Pool Volume,*** All volume calculations

Attribute	Description
N Of Area (sqft)	For the units that were fully surveyed and had a mean depth > 0, the number of mean width values
Sum Of Area (sqft)	For the units that were fully surveyed and had a mean depth > 0, the sum of unit areas multiplied by the wetted width (mean width times (1 - percent exposed substrate)) times length
Mean Area (sqft)	For the units that were fully surveyed and had a mean depth > 0, the sum of unit areas multiplied by the wetted width (mean width times (1 - percent exposed substrate) times length times divided by the number of area values
Estimated Total Area (cuft)	The mean area of surveyed units multiplied by the total number of habitat units
Total Area (sqft)	Summed the estimated total area for the reach or streams

Mean Volume - Mean Volume is calculated for all habitat types and reported in cubic feet. Volume calculations are based on the wetted width of the habitat units, that is the mean width multiplied by the product of 1 minus the percent exposed substrate. The wetted with is than multiplied by the length and then multiplied by mean depth. Mean depths for pools are the mean residual depth that is the mean depth value from the survey minus the pool tail crest value.
Reported in: Table 1,2, and 3
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
N Of Volume (cuft)	For the units that were fully surveyed and had a mean depth > 0, the number of mean width values
Sum Of Volume (cuft)	For the units that were fully surveyed and had a mean depth > 0, the sum of unit volumes (multiplied the wet width (mean width * (1 - percent exposed substrate)) times length time the mean depth)
Mean Volume (cuft)	For the units that were fully surveyed and had a mean depth > 0, the sum of unit volumes (multiplied the wet width (mean width * (1 - percent exposed substrate)) times length time the mean depth) divided by the number of volume values
Estimated Total Volume (cuft)	The mean volume of surveyed units multiplied by the total number of habitat units
Total Volume (cuft)	Summed the estimated total area for the reach or streams
Sum Of Residual Pool Volume (cuft)	For pools the units that were fully surveyed and had a residual mean depth > 0, the sum of unit volumes (multiplied the wetted width (mean width * (1 - percent exposed substrate)) times length times the residual mean depth)
Mean Residual Pool Volume (cuft)	For pools the units that were fully surveyed and had a residual mean depth > 0, the sum of unit volumes (multiplied the wetted width (mean width * (1 - percent exposed substrate)) times length times the residual mean depth) divided by the number of volume values

Estimated Total Residual Volume (cuft)	The mean residual volume of surveyed units multiplied by the total number of habitat units
Total Residual Volume (cuft)	Summed the estimated total residual volume for the reach or streams

Riffle/Flatwater Mean Width (ft) - Riffle/Flatwater Mean Width for the surveys is defined as the mean of two or more wetted channel widths measurements in feet within the habitat unit.

Reported in: Table 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: *Mean Depth,* volume calculations

Attribute	Description
N Of Riffle/Flatwater Mean Width	For the units that were fully surveyed and classified as riffles/flat water, the number of mean width values
Sum Riffle/Flatwater Mean Width (ft)	For the units that were fully surveyed and classified as riffles/flat water, the sum of mean width values
Riffle/Flatwater Mean Width (ft)	For the units that were fully surveyed and classified as riffles/flat water, the sum of mean width values and divided by the number of mean width values

Pool Tail Embeddedness *-* Percent cobble embeddedness is determined at pool tail-outs where spawning is likely to occur. Sample at least five small cobbles (2.5" to 5.0") in diameter and estimate the amount of the stone buried in the sediment.

This is done by removing the cobble from the streambed and observing the line between the "shiny" buried portion and the duller exposed portion. Estimate the percent of the lower shiny portion using the corresponding number for the 25% ranges. Average the samples for a mean cobble embeddedness rating. Additionally, a value of 5 is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations:

Embeddedness Value	Amount of stone buried in sediment
1	0 to 25%
2	26 to 50%
3	51 to 75%
4	76 to 100%
5	unsuitable for spawning

Reported in: Table 8 and 9; Graph 6
Inclusions: Unit Mean Width > 0 feet, with embeddedness > 0
Used in Calculations:

Attribute	Description
N Of Embeddedness Values	For those units classified as pool, total number of embeddedness values >0
Sum Of Embeddedness Value 1	For those units classified as pool, summed the number of units with an Embeddedness value of 1
% Embeddedness Value 1	For those units classified as pool, the number of units with an Embeddedness value of 1 divided by the total number of Embeddedness Values > 0
Sum Of Embeddedness Value 2	For those units classified as pool, summed the number of units with an Embeddedness value of 2

% Embeddedness Value 2	For those units classified as pool, the number of units with an Embeddedness value of 2 divided by the total number of Embeddedness Values > 0
Sum Of Embeddedness Value 3	For those units classified as pool, summed the number of units with an Embeddedness value of 3
% Embeddedness Value 3	For those units classified as pool, the number of units with an Embeddedness value of 3 divided by the total number of Embeddedness Values > 0
Sum Of Embeddedness Value 4	For those units classified as pool, summed the number of units with an Embeddedness value of 4
% Embeddedness Value 4	For those units classified as pool, the number of units with an Embeddedness value of 4 divided by the total number of Embeddedness Values > 0
Sum Of Embeddedness Value 5	For those units classified as pool, summed the number of units with an Embeddedness value of 5
% Embeddedness Value 5	For those units classified as pool, the number of units with an Embeddedness value of >= 5 divided by the total number of Embeddedness Values > 0
Mean Embeddedness	For those units classified as pool, the sum of Embeddedness value of > 0 divided by the total number of Embeddedness Values > 0
Mean Embeddedness Integer	The integer value of the Mean Embeddedness Value

Pool tail Substrate – Pool substrate for the surveys is entered based on the code (A through G) for the dominant substrate composition of tail-out for all pools.
Reported in: Table 8; Graph 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: None

Attribute	Description
N Of Pool tail Silt/Clay Substrate	Number of units with a Pool tail Substrate of Silt/Clay (value A)
N Of Pool tail Sand Substrate	Number of units with a Pool tail Substrate of Sand (value B)
N Of Pool tail Gravel Substrate	Number of units with a Pool tail Substrate of Gravel (value C)
N Of Pool tail Small Cobble Substrate	Number of units with a Pool tail Substrate of Small Cobble (value D)
N Of Pool tail Large Cobble Substrate	Number of units with a Pool tail Substrate of Large Cobble (value E)
N Of Pool tail Boulder Substrate	Number of units with a Pool tail Substrate of Boulder (value F)
N Of Pool tail Bedrock Substrate	Number of units with a Pool tail Substrate of Bedrock (value G)
N Of Total Pool tail Substrate Values	The total count of all Pool tail Substrate Values
% Silt/Clay Pool tail Substrate	Number of units with a Pool tail Substrate of Silt/Clay (value A) divided by the total count of all Pool tail Substrate Values
% Sand Pool tail substrate	Number of units with a Pool tail Substrate of Sand (value B) divided by the total count of all Pool tail Substrate Values
% Gravel Pool tail Substrate	Number of units with a Pool tail Substrate of Gravel (value C) divided by the total count of all Pool tail Substrate Values
% Small Cobble Pool tail Substrate	Number of units with a Pool tail Substrate of Small Cobble (value D) divided by the total count of all Pool tail Substrate Values

% Large Cobble Pool tail Substrate	Number of units with a Pool tail Substrate of Large Cobble (value E) divided by the total count of all Pool tail Substrate Values
% Boulder Pool tail Substrate	Number of units with a Pool tail Substrate of Boulder (value F) divided by the total count of all Pool tail Substrate Values
% Bedrock Pool tail Substrate	Number of units with a Pool tail Substrate of Bedrock (value G) divided by the total count of all Pool tail Substrate Values

Shelter Value – Shelter value for the surveys is entered based on the number code (0 to 3) that corresponds to the dominant instream shelter type that exists in the unit (Part III- Instream Shelter Complexity).
Reported in:
Inclusions: shelter value >= 0 and cover >=0
Used in Calculations: Shelter Rating

Attribute	Description
N Of Shelter Values	For the units that had a shelter value >= 0, the number of shelter values
Sum Shelter Value	For the units that had a shelter value >= 0, the sum of shelter values
Mean Shelter Value	For the units that had a shelter value >= 0, the sum of shelter values divided by the number of shelter values

Percent Shelter Cover – Percent shelter cover for the surveys is the percentage of the stream area that is influenced by instream shelter cover.
Reported in: Table 2 and Table 8
Inclusions: Unit Cover >= 0
Used in Calculations: Shelter Rating

Attribute	Description
N Of Shelter Cover	Number of shelter cover values that were >= 0
Sum Of Shelter Cover	For those units classified with a shelter cover >= 0, take the sum of all shelter cover values
Mean Shelter Cover %	For those units classified with a shelter cover > 0, take the sum of all cover values and divide by the number of shelter cover values that were > 0

Shelter Rating – The product of shelter value multiplied by the percent shelter cover of the unit.
Reported in: Table 1, 2, 3, and 8
Inclusions: shelter value >= 0 and shelter cover >=0
Used in Calculations:

Attribute	Description
N Of Shelter Rating	For the units that had a shelter value >= 0, the number of shelter values
Sum Shelter Rating	For the units that had a shelter value >= 0, the sum of (shelter values times cover)
Mean Shelter Rating	For the units that had a shelter value >= 0, the sum of (shelter values times cover) divided by the number of shelter ratings

Instream Shelter – Instream shelter for the surveys is entered based on the percentage of the unit occupied by the instream shelter types. The totals per unit will equal 100 percent. Note: bubble curtain includes white water.
Reported in: Table 5 and 8; Graph 7 and 10

Attribute	Description
N Of Percent Cover	For those units with a shelter value > 0, summed the number of units with shelter values
Mean % Undercut Banks Cover	For those units with a mean width value > 0, summed the values for undercut bank cover and divided by the total number of percent cover values
Mean % SmallWood Cover	For those units with a mean width value > 0, summed the values for small wood cover and divided by the total number of percent cover values
Mean % LargeWood Cover	For those units with a mean width value > 0, summed the values for large wood cover and divided by the total number of percent cover values
Mean % RootMass Cover	For those units with a mean width value > 0, summed the values for root mass cover and divided by the total number of percent cover values
Mean % TerrestrialVeg Cover	For those units with a mean width value > 0, summed the values for terrestrial vegetation cover and divided by the total number of percent cover values
Mean % AquaticVeg Cover	For those units with a mean width value > 0, summed the values for aquatic vegetation cover and divided by the total number of percent cover values
Mean % WhiteWater Cover	For those units with a mean width value > 0, summed the values for whitewater cover and divided by the total number of percent cover values
Mean % Boulder Cover	For those units with a mean width value > 0, summed the values for boulder cover and divided by the total number of percent cover values
Mean % Bedrock Ledges Cover	For those units with a mean width value > 0, summed the values for bedrock cover and divided by the total number of percent cover values
% No Shelter Cover	100 minus the sum of all cover types

Substrates Composition – Substrate composition for the surveys tracks the dominant substrate (1) and co-dominant substrate (2). Note: changes in the dominant and co-dominant substrate may indicate that the channel type has changed.
Reported in: Table 6; Graph 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
N Of Dominant Substrate Values	Total number of dominant substrate values of units with substrate values > 0
Sum Of Silt/Clay Dominant Values	For those units with a mean width value > 0, summed the values of silt/clay
% Total Silt/Clay Dominant	For those units with a mean width value > 0, summed the values of silt/clay and divided by the total number of units with substrate values > 0
Sum Of Sand Dominant Values	For those units with a mean width value > 0, summed the values of sand
% Total Sand Dominant	For those units with a mean width value > 0, summed the values of sand and divided by the total number of units with substrate values >

0

Sum Of Gravel Dominant Values	For those units with a mean width value > 0, summed the values of gravel
% Total Gravel Dominant	For those units with a mean width value > 0, summed the values of gravel and divided by the total number of units with substrate values > 0
Sum Of Small Cobble Dominant Values	For those units with a mean width value > 0, summed the values of small cobble
% Total Small Cobble Dominant	For those units with a mean width value > 0, summed the values of small cobble and divided by the total number of units with substrate values > 0
Sum Of Large Cobble Dominant Values	For those units with a mean width value > 0, summed the values of large cobble
% Total Large Cobble Dominant	For those units with a mean width value > 0, summed the values of large cobble and divided by the total number of units with substrate values > 0
Sum Of Boulder Dominant Values	For those units with a mean width value > 0, summed the values of boulder
% Total Boulder Dominant	For those units with a mean width value > 0, summed the values of boulder and divided by the total number of units with substrate values > 0
Sum Of Bedrock Dominant Values	For those units with a mean width value > 0, summed the values of Bedrock
% Total Bedrock Dominant	For those units with a mean width value > 0, summed the values of bedrock and divided by the total number of units with substrate values > 0

Percent Total Canopy – Percent total canopy for the surveys is the percentage of the stream area that is influenced by the tree canopy. The canopy is measured using a spherical densiometer at the center of each habitat unit.
Reported in: Table 8; Graph 9
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
N Of Canopy Cover	Number of canopy cover values that were >= 0
Sum Of Canopy Cover	For those units classified with a canopy cover >= 0, take the sum of all canopy cover values
Mean % Canopy	For those units classified with a canopy cover > 0, take the sum of all canopy cover values and divide by the sum of canopy cover values that were > 0

Percent Hardwood and Coniferous Trees - Percent hardwood and coniferous trees for the surveys estimates the percent of the total canopy consisting of Broadleaf and coniferous trees. Note: there are semantic differences in some of the terms for this category. Broadleaf, Hardwood and Deciduous are synonymous and Evergreen is synonymous with Coniferous.
Reported in: Table 7, 8; Graph 9
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
N Of Canopy > 0	Number of canopy cover values that were > 0
Sum Of Deciduous Cover	For those units classified with a canopy cover > 0, take the sum of all deciduous cover values

Sum Of Coniferous Cover	For those units classified with a canopy cover > 0, take the sum of all coniferous or evergreen cover values
Mean Percent Hardwood	For those units classified with a canopy cover > 0, take the sum of all deciduous cover values and divide by the number of canopy cover values that were > 0
Mean Percent Conifer	For those units classified with a canopy cover > 0, take the sum of all coniferous cover values and divide by the number of canopy cover values that were > 1
Sum Of Open Cover	Number of canopy cover values that were = 0
Mean Percent Open Units	For those units with a canopy cover > 0, take the sum of all open cover values and divide by the number of canopy cover values that were > 0
Percent Mean Open Canopy Graph 9	For those units with a % mean canopy >0, take 100 - % mean cover
Percent Mean Coniferous Canopy Graph 9	For those units with a % coniferous > 0, take % mean cover multiplied by the % coniferous divided by 100
Percent Mean Deciduous Canopy Graph 9	For those units with a % deciduous > 0, take % mean cover multiplied by the % deciduous divided by 100

Bank Composition - Bank Composition for the surveys enter the number (1 through 4) for the dominant bank composition type as observed at the bankfull discharge level corresponding to the list located on the lower left hand side of the form. Enter one number only.

Reported in: Table 8 and 9; Graph 10

Inclusions: Unit Mean Width > 0 feet

Used in Calculations:

Attribute	Description
Number of Bedrock Units Right Bank	Count the number of units with a right bank composition of Bedrock (value 1)
Number of Bedrock Units Left Bank	Count the number of units with a Left bank composition of Bedrock (value 1)
Number of Boulder Units Right Bank	Count the number of units with a right bank composition of Boulder (value 2)
Number of Boulder Units Left Bank	Count the number of units with a Left bank composition of Boulder (value 2)
Number of Cobble/Gravel Units Right Bank	Count the number of units with a right bank composition of Cobble/Gravel (value 3)
Number of Cobble/Gravel Units Left Bank	Count the number of units with a Left bank composition of Cobble/Gravel (value 3)
Number of Sand/Silt/Clay Units Right Bank	Count the number of units with a right bank composition of Sand/Silt/Clay (value 4)
Number of Sand/Silt/Clay Units Left Bank	Count the number of units with a Left bank composition of Sand/Silt/Clay (value 4)
Total Mean (%) Bedrock	For those units with a composition value, summed the right and left banks unit counts for bedrock (value 1) and divided this value by the total number of composition values
Total Mean (%)	For those units with a composition value, summed the right and left

Boulder	banks unit counts for Boulder (value 2) and divided this value by the total number of composition values
Total Mean (%) Cobble/Gravel	For those units with a composition value, summed the right and left banks unit counts for Cobble/Gravel (value 3) and divided this value by the total number of composition values
Total Mean (%) Sand/Silt/Clay	For those units with a composition value, summed the right and left banks unit counts for Sand/Silt/Clay (value 4) and divided this value by the total number of composition values

Bank Dominant Vegetation - Bank Composition for the surveys enter the number (5 through 9) for the dominant vegetation type, from bankfull to 20 feet upslope, corresponding to the list located on the lower left hand side of the form. Enter one number only.
Reported in: Table 8 and 9; Graph 11
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
Number of Grass Units Right Bank	Number of units with a right bank Dominant Vegetation of Grass (value 5)
Number of Grass Units Left Bank	Number of units with a Left bank Dominant Vegetation of Grass (value 5)
Number of Brush Units Right Bank	Number of units with a right bank Dominant Vegetation of Brush (value 6)
Number of Brush Units Left Bank	Number of units with a Left bank Dominant Vegetation of Brush (value 6)
Number of Hardwood Tree Units Right Bank	Number of units with a right bank Dominant Vegetation of Hardwood (value 7)
Number of Hardwood Tree Units Left Bank	Number of units with a Left bank Dominant Vegetation of Hardwood (value 7)
Number of Coniferous Tree Units Right Bank	Number of units with a right bank Dominant Vegetation of Coniferous Trees (value 8)
Number of Coniferous Tree Units Left Bank	Number of units with a Left bank Dominant Vegetation of Coniferous Trees (value 8)
Number of No Vegetation Units Right Bank	Number of units with a right bank Dominant Vegetation of No Vegetation (value 9)
Number of No Vegetation Units Left Bank	Number of units with a Left bank Dominant Vegetation of No Vegetation (value 9)
Total Mean (%) Grass	For those units with a Dominant Vegetation value, summed the right and left banks unit counts for Grass (value 5) and divided this value by the total number of Dominant Vegetation values
Total Mean (%) Brush	For those units with a Dominant Vegetation value, summed the right and left banks unit counts for Brush (value 6) and divided this value by the total number of Dominant Vegetation values
Total Mean (%) Hardwood Trees	For those units with a Dominant Vegetation value, summed the right and left banks unit counts for Hardwood (value 7) and divided this value by the total number of Dominant Vegetation values
Total Mean (%) Coniferous Trees	For those units with a Dominant Vegetation value, summed the right and left banks unit counts for Coniferous Trees (value 8) and divided this value by the total number of Dominant Vegetation values
Total Mean (%) No Vegetation	For those units with a Dominant Vegetation value, summed the right and left banks unit counts for No Vegetation (value 9) and divided this value by the total number of Dominant Vegetation values

19

Percent Veg Cover   The sum of right and left bank values divided by the total number of left and right bank values

Percent Bank Vegetated – Estimate the total percentage of the bank covered with vegetation from the bankfull discharge elevation to 20 feet upslope.
<u>Reported in:</u> Table 7 and Table 8; Graph 9
<u>Inclusions:</u> Unit Canopy >= 0
<u>Used in Calculations:</u>

Attribute	Description
N Of Right Bank Cover	Number of right bank cover values that were >= 0
N Of Left Bank Cover	Number of left bank cover values that were >= 0
Sum Of Right Bank Cover	For those units with a right bank cover value > 0, take the sum of all right bank cover values
Sum Of Left Bank Cover	For those units with a left bank cover value > 0, take the sum of all left bank cover values
Mean Right Bank % Cover	For those units with a right bank cover value > 0, take the sum of all right bank cover values and divide by the total number of both left and right bank cover values > 0
Mean Left Bank % Cover	For those units with a left bank cover value > 0, take the sum of all left bank cover values and divide by the total number of both left and right bank cover values > 0

Application Table: Habitat Criteria – Select stream habitat criteria that can be used to evaluate stream condition.

The "habitat criteria" table contains additional metrics and habitat criteria that can be used to evaluate stream condition. The criteria have been gleaned from numerous plans and sources. For a list of sources contact Derek Acomb (note contact information page 2). The "habitat criteria" table provides the metrics at both the stream and the reach level (StreamOrReach field).

Attribute	Description
Example Record	
What are we looking at – Definition or explanation	
Reported in: *Where in the stream habitat program outputs do these values appear*	
Inclusions: *What is included in the calculations*	
Used in Calculations: *Where is this information used in calculations*	
Attribute	**Description**
Field Name	Description of field name (if necessary) and calculation

General Information

This section contains basic information about the stream habitat survey such as the Site ID, site name, stream name, year of record, the duration of the sample, etc.

Attribute	Description
SurveyId	Survey Identification Number
Pname	Stream Name
Pnmcd	Stream Number
StrOrRch	Code used to delineate whether the measurements are at the stream or reach level
Code	Stream code or ReachID depending on StreamOrReach Value
Year	Year of Survey

Channel Type - Rosgen channel type classification. The channel type of the reach or stream based on the Stream Channel Type Work Sheet (Part III)
Reported in: Table 8
Inclusions:
Used in Calculations:

Attribute	Description
Chnl_Type	Rosgen channel type classification. The channel type of the reach or stream based on the Stream Channel Type Work Sheet (Part III)

Stream Order - The Strahler Stream Order is a simple hydrology algorithm used to define stream size based on a hierarchy of tributaries.
Reported in:
Inclusions:
Used in Calculations: Primary pool and mean residual depth by nth stream order calculations.

Attribute	Description
StrOrMin	The minimum stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.
StrOrMax	The maximum stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.
StrOrMaj	The majority stream order of the stream or reach. Stream order is calculated based on the Shreve ordering system.

Temperature Data - Temperature of the water and air taken during the surveys. Temperatures are taken at the beginning of each page record and recorded to the nearest degree Fahrenheit. Temperatures are taken in the shade and within one foot of the water surface.

Reported in: Table 8

Inclusions:

Used in Calculations: Temperature values > 0

Attribute	Description
WtempMin	For those water temperatures greater than zero, the minimum water temperature during survey
WtempMax	For those water temperatures greater than zero, the maximum water temperature during survey
WtempAve	For those water temperatures greater than zero, the average water temperature during survey
AtempMin	For those air temperatures greater than zero, the minimum air temperature during survey
AtempMax	For those air temperatures greater than zero, the maximum air temperature during survey
AtempAve	For those air temperatures greater than zero, the average air temperature during survey

Pool Tail Embeddedness - Percent cobble embeddedness is determined at pool tail-outs where spawning is likely to occur. Sample at least five small cobbles (2.5" to 5.0") in diameter and estimate the amount of the stone buried in the sediment.

This is done by removing the cobble from the streambed and observing the line between the "shiny" buried portion and the duller exposed portion. Estimate the percent of the lower shiny portion using the corresponding number for the 25% ranges. Average the samples for a mean cobble embeddedness rating. Additionally, a value of 5 is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations:

Reported in: Table 8 and 9; Graph 6

Inclusions: Unit Mean Width > 0 feet, with embeddedness > 0

Used in Calculations:

Attribute	Description
MeanEmb	Mean Embeddedness Integer, For those units classified as pool, the sum of Embeddedness value of > 0 divided by the total number of Embeddedness Values > 0, converted to an integer value
DomEmb	Dominant Embeddedness Value(s), the most common embeddedness value, there may be more then one dominant value showing co-dominance.
EmbRange	Embeddedness Range of Value(s)
PerEmb12_pn	Percent Pools Embeddedness 1 and 2, the number of value 1 and 2 embeddedness values in pools, divided by the total number of embeddedness values in pools.
PerEmb12_sn	Percent Pools Embeddedness 1 and 2, the number of value 1 and 2 embeddedness values in pools, divided by the total number of habitat units in the stream.
PerEmb12_pl	Percent Pools Embeddedness 1 and 2 by length, the total length of value 1 and 2 embeddedness values in pools, divided by the total length of pools.

PerEmb12_sl	Percent Pools Embeddedness 1 and 2 by length by Stream, the total length of value 1 and 2 embeddedness values in pools, divided by the total length of the surveyed stream.
PerEmb34_pn	Percent Pools Embeddedness 3 and 4, the number of value 3 and 4 embeddedness values in pools, divided by the total number of embeddedness values in pools.
PerEmb34_sn	Percent Pools Embeddedness 3 and 4, the number of value 3 and 4 embeddedness values in pools, divided by the total number of habitat units in the stream.

Mean Residual Depth by Stream Order – Residual depth is the mean depth of the pools minus the pool tail crest depth.
Reported in:
Inclusions: Mean width > 0 feet
Used in Calculations:

Attribute	Description
MnResDpth1	Mean Residual depth of first order streams pools for the units that were fully surveyed and not null, the sum of mean depth values - pool tail crest depth value
MnResDpth2	Mean Residual depth of second order streams pools for the units that were fully surveyed and not null, the sum of mean depth values - pool tail crest depth value
MnResDpth3	Mean Residual depth of third order streams pools for the units that were fully surveyed and not null, the sum of mean depth values - pool tail crest depth value
MnResDpth4	Mean Residual depth of fourth order streams pools for the units that were fully surveyed and not null, the sum of mean depth values - pool tail crest depth value

Riffles - Shallow stretch of a river or stream, where the current is above the average stream velocity and where the water forms small rippled waves as a result. It often consists of a rocky bed of gravels or cobbles. This portion of a stream is often an important habitat for small aquatic invertebrates and juvenile fishes.
Reported in:
Inclusions:
Used in Calculations:

Attribute	Description
PerDomRif_n	Dominant Riffle Substrate Percent, the percent of most common Riffle Substrate value.
DomRifSub	Dominant Riffle Substrate Value(s), the most common Riffle Substrate value, there may be more than one dominant value showing co-dominance.
PerRif_l	Riffle Length Percent, Sum of lengths for riffle habitat types divided by the total length of all habitat units
RifRange_l	Riffle Substrate Range of Value(s)

Low-Gradient Riffle (LGR) – Shallow reaches with flowing, turbulent water with some partially exposed substrate. Gradient < 4%, substrate is usually cobble dominated.
Reported in:
Inclusions:

Attribute	Description
PerDomLGR	Dominant LGR Substrate Percent, the percent of most common LGR Substrate value.
DomLGRVal	Dominant LGR Substrate Value(s), the most common LGR Substrate value, there may be more than one dominant value showing co-dominance.
LGRRngVal	LGR Substrate Range of Value(s)

Mean Shelter Value - Shelter value for the surveys is entered based on the number code (0 to 3) that corresponds to the dominant instream shelter type that exists in the unit (Part III-Instream Shelter Complexity).
Reported in:
Inclusions: shelter value >= 0 and Shelter Cover >=0
Used in Calculations: Shelter Rating

Attribute	Description
MnShVal_s	Mean Shelter Value Stream, for the units that had a shelter value >= 0, the sum of shelter values divided by the number of shelter values.
MnShVal_p	Mean Shelter Value Pools, for the units that had a shelter value >= 0, the sum of shelter values divided by the number of shelter values in pools.

Mean Percent Shelter Cover - Percent shelter cover for the surveys is the percentage of the stream area that is influenced by instream shelter cover.
Reported in: Table 2 and Table 8
Inclusions: Unit Shelter Cover >= 0
Used in Calculations: Shelter Rating

Attribute	Description
PerMnCov_s	Mean percent shelter cover, for those units classified with a cover > 0, take the sum of all cover values and divide by the number of cover values that were > 0
PerMnCov_p	Mean percent shelter cover, for those pool units classified with a cover > 0, take the sum of all cover values and divide by the number of pool cover values that were > 0

Mean Shelter Rating – The product of Shelter Value multiplied by the Percent unit covered.
Reported in: Table 1, 2, 3, and 8
Inclusions: shelter value >= 0 and Shelter Cover >=0
Used in Calculations:

Attribute	Description
MnShRat_s	Mean Shelter Rating Stream, for the units that had a shelter ratings >= 0, the sum of shelter ratings divided by the number of shelter ratings.
MnShRat_p	Mean Shelter Rating Pools, for the units that had a shelter ratings >= 0, the sum of shelter ratings divided by the number of shelter ratings in pools.

Percent Total Canopy – Percent total canopy for the surveys is the percentage of the stream area that is influenced by the tree canopy. The canopy is measured using a spherical densiometer at the center of each habitat unit.
Reported in: Table 8; Graph 9
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
PerMnCan_s	Percent total canopy, for those units classified with a canopy > 0, take the sum of all canopy values and divide by the number of canopy values that were > 0
PerMnCan_p	Percent total canopy of pools, for those pool units classified with a canopy > 0, take the sum of all canopy values and divide by the number of pool canopy values that were > 0

Mean Maximum Depth by Stream Order - Enter the measured maximum depth for each habitat unit, in feet. Mean maximum depth for the surveys is defined as the mean of the maximum depth measurements. Mean maximum depths for pools are the mean maximum residual depths (mean maximum depth value minus the pool tail crest value).
Reported in: Table 1,4 and 8; Graph 5
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
AveMxDpth12	Mean Maximum Depth of 1 and 2 order streams, for the units that were fully surveyed and not null, the number of residual max depth values divided by the total number of residual max depth values
AveMxDpth34	Mean Maximum Depth of 3 and 4 order streams, for the units that were fully surveyed and not null, the number of residual max depth values divided by the total number of residual max depth values

Percent Maximum Pool Depths by Strata – The percent of pools with maximum residual depths in two strata (greater than or equal to 2 feet and greater than or equal to 3 feet).
Reported in: Table 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
PerPoolMxDgt1	Pool Max Depth >= 2 feet Percent Pool Freq
PerPoolMxDgt2	Pool Max Depth >= 3 feet Percent Pool Freq

Residual Pool Depths by Strata – The number and the percent of pools with maximum residual depths in two strata (greater than or equal to 2 feet and greater than or equal to 3).
Reported in: Table 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
PerPoolResDgt1	Residual Pool Depth >= 2 feet Percent Pool Freq
PerPoolResDgt2	Residual Pool Depth >= 3 feet Percent Pool Freq

Percent Conifer Canopy – For the surveys estimates the percent of the total canopy consisting of coniferous trees.
Reported in: Table 7; Graph 9

Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
PerMnCon_s	Mean Percent Conifer, for those units classified with a canopy cover > 0, take the sum of all coniferous cover values and divide by the number of canopy cover values that were > 1

Bank Substrate – (Bank Composition) Bank substrate for the surveys enter the number (1 through 4) for the dominant bank composition type observed at the bankfull discharge elevation corresponding to the list located on the lower left hand side of the form. Enter one number only.
Reported in: Table 8 and 9; Graph 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
DomBSubType	Dominant Bank Substrate Value(s), the most common Bank Substrate value, there may be more than one dominant value showing co-dominance.
BSubRngVal	Bank Substrate Range of Value(s)

Bank Substrate Not Meeting Canopy - (Bank Composition) Bank substrate for the surveys enter the number (1 through 4) for the dominant bank composition type corresponding to the list located on the lower left hand side of the form. Enter one number only.
Reported in: Table 8 and 9; Graph 10
Inclusions: Unit Mean Width > 0 feet and Mean canopy < 80%
Used in Calculations:

Attribute	Description
DomBSubVal_nc	Dominant Bank Substrate Value(s) not meeting canopy, the most common Bank Substrate value, there may be more then one dominant value showing co-dominance.
BSubRange_nc	Bank Substrate Range of Value(s) not meeting canopy

Percent Bank Cover - Estimate the total percentage of the bank covered with vegetation from the bankfull discharge elevation to 20 feet upslope.
Reported in: Table 7 and Table 8; Graph 9
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
PerMnBCov_s	The sum of right and left bank values divided by the total number of left and right bank values

Substrates Composition – Substrate composition for the surveys tracks the dominant substrate (1) and co-dominant substrate (2). Note: changes in the dominant and co-dominant substrate may indicate that the channel type has changed.
Reported in: Table 6; Graph 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
PerDomSub	Substrate Dominant Percent
DomSubVal	Substrate Dominant Value(s)

SubRange	Substrate Range

Pool tail Substrate - Pool substrate for the surveys is entered based on the code (A through G) for the dominant substrate composition of tail-out for all pools.
Reported in: Table 8; Graph 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: None

Attribute	Description
PerDomPTSub	Dominant Pool tail Substrate Percent
DomPTSubVal	Dominant Pool tail Substrate Value(s)
PTSubRngVal	Pool tail Substrate Range of Value(s)

Percent Pools – The percent pools based on area, frequency, and length.
Reported in: Table 1, 2, 3, 4, and 8; Graph 1, 2, 3, and 4
Inclusions:
Used in Calculations:

Attribute	Description
PerPoolArea	Percent pools by area, the sum of pool areas in square feet divided by the total area in square feet.
PerPoolFreq	Percent pools by frequency, the number of pool habitat units divided by the total number of habitat units.
PerPoolLen	Percent pools by length, the sum of pool lengths in feet divided by the total length in feet.

Percent Primary Pools - Primary pools are defined differently based on the stream order. First through 2nd order streams primary pools have a maximum depth >=2 feet and 3rd through 4th (nth) order streams primary pools have a maximum depth >=3 feet.
Reported in:
Inclusions:
Used in Calculations:

Attribute	Description
PerPrimP_p	Percent primary pools by total pools, the sum of pools that are classified as primary pools divided by the number of pool units.
PerPrimP_s	Percent primary pools, the sum of pools that are classified as primary pools divided by the number of habitat units.

Mean Depth - Mean Depth for the surveys is defined as the mean of several random depth measurements taken with a stadia rod across the unit recorded in feet. Mean depths for pools are the mean residual depth, that is the mean depth value minus the pool tail crest value.
Reported in: Table 1, 2, and 3; Graph 5
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: All volume calculations

Attribute	Description
AveMnDepth	For pools the mean depth is the sum of residual depth (pool depths - pool tail crest) divided by the number of units fully measured, for other types it is the sum of mean depth values divided by the total number of units that were fully measured.

Application Table: Ranked Manual Criteria - Evaluation of selected California Department of Fish and Game restoration manual criteria based on selected "Habitat Criteria" table fields.

The "ranked manual criteria" table contains information about 6 criteria that some biologist feel are important for salmonids in the region. The table provides that boolean score, depending on whether they do (value 1) or do not meet (value 1) the criteria. The seventh value in the table is the numeric sum of criteria Scores by each reach or stream. The table provides the metrics at both the stream and the reach level (StreamOrReach field).

Example Record	
Criteria	
Criteria from: *Where does the criteria come from.*	
Attribute	**Description**
Field Name	Description of field name (if necessary) and ranking criteria

General Survey Information
This section contains basic information about the stream habitat survey such as the Site ID, site name, stream name, year of record, the duration of the sample, etc.

Attribute	Description
SurveyId	Survey Identification Number
Pname	Stream Name
Pnmcd	Stream Number
StrOrRch	Code used to delineate whether the measurements are at the stream or reach level
Code	Stream code or ReachID depending on StreamOrReach Value
Year	Year of Survey

Percent Primary Pools (Length)
Criteria from: California Salmonid Stream Habitat Restoration Manual VI-6, V-15

Attribute	Description
PerPrimP_s	Percent Primary Pools, if the percent primary pools of the stream was >= 45% a value of one was assigned, if the percent of primary pools was < 45% a value of zero was assigned.

Mean Embeddedness
Criteria from: California Salmonid Stream Habitat Restoration Manual VI-8

Attribute	Description
MeanEmb	Mean Embeddedness, if the Mean Embeddedness of the stream was <= 1 a value of one was assigned, if the Mean Embeddedness was > 1 a value of zero was assigned.

Mean Canopy Cover of the Stream
Criteria from: California Salmonid Stream Habitat Restoration Manual VI-7and V-22

Attribute	Description
PerMnCan_s	Mean Canopy Cover of the Stream, if the Mean Canopy Cover of the Stream was >= 80% a value of one was assigned, if the Mean Canopy Cover of the Stream was < 80% a value of zero was assigned.

Mean Shelter Rating of Pools
Criteria from: California Salmonid Stream Habitat Restoration Manual VI-7and V-15

Attribute	Description
MnShRat_p	Mean Shelter Rating of Pools, if the Mean Shelter Rating of Pools in the stream was >= 80% a value of one was assigned, if the Mean Shelter Rating of Pools in the stream was < 80% a value of zero was assigned.

Coho Salmon Temperature
Criteria from: California Salmonid Stream Habitat Restoration Manual V-21

Attribute	Description
CohoTemp	Assigned a value of 1 if temperature between 48-60° F, a value of zero was assigned if the temperature was not within this range.

Steelhead Salmon Temperature
Criteria from: California Salmonid Stream Habitat Restoration Manual V-22 and V-23

Attribute	Description
SHTemp	Assigned a value of 1 if temperature between 40-65° F, a value of zero was assigned if the temperature was not within this range

Stream Rating – Based on the six criteria mentioned above

Attribute	Description
Criteria_cnt	Total of the six values in the criteria table, the higher the final count the more suitable the stream may be for salmonids.

Application Table: Reachsum_x – Based on report table 8

The "reachsum_x" table contains all of the metrics in the Stream Habitat Program table number 8. The "reachsum_x" table provides the metrics at the reach level. This table is being replaced by the other tables produced by the Stream Summary Application.   The table will directly join to the GIS data mentioned in the introduction on Page 1.

Example Record	
What are we looking at – Definition or explanation	
<u>Reported in:</u> *Where in the stream habitat program outputs do these values appear*	
<u>Inclusions:</u> *What is included in the calculations*	
<u>Used in Calculations:</u> *Where is this information used in calculations*	
Attribute	**Description**
Field Name	Description of field name (if necessary) and calculation

General Survey Information

This section contains basic information about the stream habitat survey such as the Site ID, site name, stream name, year of record, the duration of the sample, etc.

Attribute	Description
StreamName	Stream name as recorded in the reachsum database.
LLID	Latitude-Longitude identifier of stream
Reach	Reach number (standardized to two digits, i.e. 01, 02, etc.).
ReachLLId	Alternative unique reach identifier, based on Llid
St_unit	Starting (minimum), main channel or primary side channel, habitat unit number.
End_unit	Ending (maximum), main channel or primary side channel, habitat unit number.

Channel Type - Rosgen channel type classification. The channel type of the reach or stream based on the Stream Channel Type Work Sheet (Part III)
<u>Reported in:</u> Table 8
<u>Inclusions:</u>
<u>Used in Calculations:</u>

Attribute	Description
Chan_typ	Rosgen channel type classification.

Length of Survey - Thalweg length of the habitat unit, in feet.
<u>Reported in:</u> Table 1,2,3, and 8; Graph 2
<u>Inclusions:</u> Unit Mean Width > 0 feet
<u>Used in Calculations:</u> ***Mean Area, Mean Volume, Mean Residual Pool Volume,*** All Area, Pool depth, and volume calculations.

Attribute	Description
Chan_len	Total length of all main channel habitat units.
Side_len	Total length of all side channel habitat units.

Riffle/Flatwater Mean Width (ft) - Riffle/Flatwater Mean Width for the surveys is defined as the mean of two or more wetted channel widths measurements in feet within the habitat unit.
<u>Reported in:</u> Table 8
<u>Inclusions:</u> Unit Mean Width > 0 feet

30

Used in Calculations: *Mean Depth* and volume calculations

Attribute	Description
Rf_fl_wdth	Average of the surveyed mean width for main channel riffle and flatwater habitat units (habitat types 1.x, 2.x and 3.x). Average not weighted by habitat unit length.

Mean Pool Depth - Mean pool depth for the surveys is defined as the mean of several random depth measurements using a stadia rod and recorded in feet. Mean depths for pools are the mean residual depth, that is the mean depth value from the survey minus the pool tail crest value.
Reported in: Table 8
Inclusions: shelter value >= 0 and cover >=0
Used in Calculations: Shelter Rating

Attribute	Description
Pool_dpth	Average of the surveyed mean depth for main channel pool habitat units (habitat types 4.x, 5.x and 6.x). Average not weighted by pool area.

Base Flow (cfs) - The base flow is the flow that the stream reduces to during the dry season or a dry spell. This flow is supported by ground water and subsurface seepage into the channel.
Reported in: Table 8
Inclusions:
Used in Calculations:

Attribute	Description
Flow	The mean base flow in cubic feet per second, measured at the beginning of the survey. If flows change significantly during the survey they are again measured at the end of the survey at the same location. The average of the two measurements is recorded.

Temperature Data - Temperature of the water and air taken during the surveys. Temperatures are taken at the beginning of each page record and recorded to the nearest degree Fahrenheit. Temperatures are taken in the shade and within one foot of the water surface.
Reported in: Table 8
Inclusions:
Used in Calculations: Temperature values > 0

Attribute	Description
Lwater	Minimum surveyed water temperature ˚F
Uwater	Maximum surveyed water temperature ˚F
Lair	Minimum surveyed air temperature ˚F
Uair	Maximum surveyed air temperature ˚F

Bank Dominant Vegetation - Bank Vegetation for the surveys enter the number (5 through 9) for the dominant vegetation type, from bankfull to 20 feet upslope, corresponding to the list located on the lower left hand side of the form. Enter one number only. The dominant bank vegetation of the reach is highlighted.

Reported in: Table 8 and 9; Graph 11
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description

Dom_bk_veg   Vegetation class (Grass, Brush, Deciduous Trees, Coniferous Trees or No Vegetation) most frequently identified as dominant vegetation type in habitat units surveyed for dominant vegetation.

Percent Vegetative Cover – Average percent vegetative cover for habitat units surveyed for vegetative cover.
Reported in: Table 8
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
Veg_cov	Average percent vegetative cover for habitat units surveyed for vegetative cover. Average not weighted.

Dominant Bank Composition – Bank Composition for the surveys enter the number (1 through 4) for the dominant bank composition type corresponding to the list located on the lower left hand side of the form. Enter one number only. The dominant bank composition reach is highlighted.
Reported in: Table 8 and 9; Graph 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations:

Attribute	Description
Dom_bk_sub	Bank substrate class (Bedrock, Boulder, Cobble/Gravel or Silt/Clay/Sand) most frequently identified as dominant bank substrate in habitat units surveyed for bank composition.

Pool Tail Embeddedness - Percent cobble embeddedness is determined at pool tail-outs where spawning is likely to occur. Sample at least five small cobbles (2.5" to 5.0") in diameter and estimate the amount of the stone buried in the sediment.

This is done by removing the cobble from the streambed and observing the line between the "shiny" buried portion and the duller exposed portion. Estimate the percent of the lower shiny portion using the corresponding number for the 25% ranges. Average the samples for a mean cobble embeddedness rating. Additionally, a value of 5 is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations:

Reported in: Table 8 and 9; Graph 6
Inclusions: Unit Mean Width > 0 feet, with embeddedness > 0
Used in Calculations:

Attribute	Description
Emb_one	Percentage of main channel pool tail-outs, surveyed for embeddedness and containing suitable spawning substrate (not classified with pool tail embeddedness = 5), with an embeddedness classification of 1 (0% to 25% embeddedness).
Emb_two	Percentage of main channel pool tailouts, surveyed for embeddedness and containing suitable spawning substrate (not classified with pool tail embeddedness = 5), with an embeddedness classification of 2 (25% to 50% embeddedness).
Emb_three	Percentage of main channel pool tailouts, surveyed for embeddedness and containing suitable spawning substrate (not classified with pool tail embeddedness = 5), with an embeddedness classification of 3 (50% to 75% embeddedness).

Emb_four	Percentage of main channel pool tailouts, surveyed for embeddedness and containing suitable spawning substrate (not classified with pool tail embeddedness = 5), with an embeddedness classification of 4 (75% to 100% embeddedness).

Percent Hardwood and Coniferous Trees - Percent hardwood and coniferous trees for the surveys estimates the percent of the total canopy consisting of Broadleaf and coniferous trees. Note: there are semantic differences in some of the terms for this category. Broadleaf, Hardwood and Deciduous are synonymous and Evergreen is synonymous with Coniferous.
Reported in: Table 7, 8; Graph 9
Inclusions: Unit Canopy >= 0
Used in Calculations:

Attribute	Description
Canopy	Average canopy density for habitat units surveyed for canopy cover. Average not weighted.
Conif	Average percent evergreen canopy for habitat units surveyed for canopy cover. Average not weighted.
Decid	Average percent deciduous canopy for habitat units surveyed for canopy cover. Average not weighted.

Mean Length - Length for the surveys is defined as the thalweg length of the habitat unit, in feet.
Reported in: Table 1, 2, 3 and 8; Graph 2
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: *Mean Area, Mean Volume, Mean Residual Pool Volume,* All Area, Pool depth, and volume calculations

Attribute	Description
Pct_pls_ln	Percent of main channel, by length, composed of pools (habitat types 4.x, 5.x and 6.x). Includes dry (habitat type 7.0) and recorded but not non-surveyed (habitat type 9.x) habitat units.
Dry	Total length of main channel habitat units surveyed as Dry (habitat type = 7.0).
Wet	Total length of main channel habitat units not surveyed as Dry (habitat type = 7.0). Units recorded, but not surveyed (habitat types 9.0 and 9.1), are not included in this total.

Residual Pool Depths by Strata – The number and the percent of pools with residual depths in two strata (greater than or equal to 2 feet, greater than or equal to 3 feet).
Reported in: Table 8
Inclusions: shelter value >= 0 and cover >=0
Used in Calculations: Shelter Rating

Attribute	Description
Pools_2ft	Percent of main channel pools (habitat types 4.x, 5.x and 6.x) greater than, or equal to, two feet deep.
Pools_3ft	Percent of main channel pools (habitat types 4.x, 5.x and 6.x) greater than, or equal to, three feet deep.

Shelter Rating of Pools – The product of shelter value multiplied by the percent shelter cover of the pool unit.
Reported in: Table 1, 2, 3, and 8
Inclusions: shelter value >= 0 and cover >=0

Used in Calculations:

Attribute	Description
Pol_sh_rtn	Average shelter rating (ShelterValue x Cover) for main channel pools surveyed for in-stream shelter.

Dominant Instream shelter – Instream shelter for the surveys is entered based on the percentage of the unit occupied by the instream shelter types. The totals per unit will equal 100 percent. Note: bubble curtain includes white water. The dominant instream shelter of the reach is highlighted.
Reported in: Table 5 and 8; Graph 7 and 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: LWD for Table 8

Attribute	Description
Dom_shel	Shelter type (Undercut Banks, Small Woody Debris, Large Woody Debris, Root Masses, Terrestrial Vegetation, Aquatic Vegetation, White Water, Boulders and Bedrock Ledges) representing highest total percent composition of instream shelter in all habitat units surveyed.

Riffle/Flatwater Mean Width (ft) - Riffle/Flatwater Mean Width for the surveys is defined as the mean of two or more wetted channel widths measured within the habitat unit and recorded in feet.
Reported in: Table 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: *Mean Depth,* volume calculations

Attribute	Description
Rf_fl_mean	Weighted average of the surveyed mean width for main channel riffle and flatwater habitat units (habitat types 1.x, 2.x and 3.x). Average weighted by habitat unit length.

Mean Pool Area - Mean pool area is calculated for all Pool habitat types and reported in square feet. Area calculations are based on the wetted width of the habitat units, that is the mean width multiplied by the product of 1 minus the percent exposed substrate. The wetted with is than multiplied by the length.
Reported in: Table 1,2,3 and 8
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: *Mean Volume, Mean Residual Pool Volume,* All volume calculations

Attribute	Description
Pool_area	Proportion of main channel surface area composed of pools (habitat types 4.x, 5.x and 6.x). Pool surface area calculated as the sum of length x average width for each main channel pool. Remaining (non-pool) surface area calculated as non-pool wet length x adjusted mean riffle/flatwater width.

Instream shelter - Instream shelter for the surveys is entered based on the percentage of the unit occupied by the instream shelter types. The totals per unit will equal 100 percent. Note: bubble curtain includes white water.
Reported in: Table 5 and 8; Graph 7 and 10
Inclusions: Unit Mean Width > 0 feet
Used in Calculations: LWD for Table 8

Attribute	Description
Cov_under	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by undercut banks.
Cov_swood	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by small woody debris.
Cov_lwood	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by large woody debris.
Cov_root	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by root mass.
Cov_tveg	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by overhanging terrestrial vegetation.
Cov_aveg	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by aquatic vegetation.
Cov_water	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by white water or bubble curtain.
Cov_bould	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by boulders.
Cov_bed	The proportion of main channel pool (habitat types 4.x, 5.x and 6.x) area which is provided shelter by bedrock edges.

Large Woody Debris – Large Wood is defined as a piece of wood having a minimum diameter of twelve inches and a minimum length of six feet. Root wads must meet the minimum diameter criteria at the base of the trunk but need not be at least six feet long.
Reported in: Table 8
Inclusions: shelter value >= 0 and cover >=0
Used in Calculations: Shelter Rating

Attribute	Description
Lod	Percentage of habitat units containing shelter from large woody debris or root mass (LargeWood > 0 or RootMass > 0).
Lwd_pools	Number of main channel pools enhanced by large woody debris (habitat types 5.2, 5.3, 6.3 and 6.4).
Prob_lwdp	Number of main channel pools that are probably enhanced by large woody debris (habitat types 5.2, 5.3, 6.3, 6.4 and 6.5).
Pot_lwdp	Number of main channel pools that are potentially enhanced by large woody debris (habitat types 5.2, 5.3, 5.6, 6.3, 6.4 and 6.5).
Part_lwdp	The proportion of main channel pools enhanced by large woody debris (habitat types 5.2, 5.3, 6.3 and 6.4).

Application Table: NOAA_Table - The "noaa_table" table contains additional metrics and habitat criteria that can be used to evaluate stream condition for salmonids species. These criteria have been developed by NMFS planning team through literature reviews and consultation with experts in the field of salmonid ecology. The "noaa_table" table provides the metrics at both the stream and the reach level (StreamOrReach field).

Example Record	
Criteria	
<u>Criteria from:</u> *Where does the criteria come from.*	
Attribute	**Description**
Field Name	Description of field name (if necessary) and ranking criteria

General Survey Information

This section contains basic information about the stream habitat survey such as the Site ID, site name, stream name, year of record, the duration of the sample, etc.

Attribute	Description
SurveyId	Survey Identification Number
Pname	Stream Name
StrOrRch	Code used to delineate whether the measurements are at the stream or reach level
Code	Stream code or ReachID depending on StreamOrReach Value

Spawning Substrate (Area)

– The amount of spawning substrate is defined as riffle habitat directly below a primary pool that is potentially used by spawning salmonids. Primary pools are defined differently based on the stream order. First through 2nd order streams primary pools have a maximum depth >=2 feet and 3rd through 4th (nth) order streams primary pools have a maximum depth >=3 feet. The spawning substrate values are further divided by the embeddedness value of the primary pool, which is an estimate of the amount of sediment in the spawning habitat.

Attribute	Description
SpawningSub_lt5	The area of spawning substrate in square meters, where the primary pools have an embeddedness value < 5. The value is the product of the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.
spavearea_lt5	For those primary pools with embeddeness values < 5 and a riffle unit below, the area of the riffle (the mean width ^2).
spembcnt_lt5	The count of primary pools with embeddeness values < 5 and a riffle unit below.
spvalueft_lt5	The area of spawning substrate in square feet, where the primary pools have an embeddedness value < 5. The value is the product of the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.
spavearea_lt4	For those primary pools with embeddeness values < 4 and a riffle unit below, the area of the riffle (the mean width ^2).
spembcnt_lt4	The count of primary pools with embeddeness values < 4 and a riffle unit below.
SpawningSub_lt4	The area of spawning substrate in square meters, where the primary pools have an embeddedness value < 4. The value is the product of the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.
spvalueft_lt4	The area of spawning substrate in square feet, where the primary pools have an embeddedness value < 4. The value is the product of

the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.

spavearea_lt3	For those primary pools with embeddeness values < 3 and a riffle unit below, the area of the riffle (the mean width ^2).
spembcnt_lt3	The count of primary pools with embeddeness values < 3 and a riffle unit below.
SpawningSub_lt3	The area of spawning substrate in square meters, where the primary pools have an embeddedness value < 3. The value is the product of the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.
spvalueft_lt3	The area of spawning substrate in square feet, where the primary pools have an embeddedness value < 3. The value is the product of the sum of the area of riffle habitat multiplied by the count of primary pools with riffles below.

Pool to Riffle Ratio

Attribute	Description
PR Ratio Length	The sum of pool lengths divided by the sum of riffle lengths.
PR Ratio Freq	The number of pool units divided by the number of riffle units.
Pool_L	For those pool units (habitat type >= 4 and < 7), the sum of the length of pool units
RiffleL	For those riffle units (habitat type >= 1 and < 4), the sum of the length of riffle units
RiffleF	For those riffle units (habitat type >= 1 and < 4), the sum of the number of riffle units
Pool_F	For those pool units (habitat type >= 4 and < 7), the sum of the number of pool units

Percent Total Canopy – Percent total canopy for the surveys is the percentage of the stream area that is influenced by the tree canopy. The canopy is measured using a spherical densiometer at the center of each habitat unit.

Attribute	Description
N Of Canopy Cover	Number of canopy cover values that were >= 0
Sum Of Canopy Cover	For those units classified with a canopy cover >= 0, take the sum of all canopy cover values
Mean % Canopy	For those units classified with a canopy cover > 0, take the sum of all canopy cover values and divide by the sum of canopy cover values that were > 0

Large Woody Debris – Wood debris is defined as a piece of wood having a minimum diameter of twelve inches and a minimum length of six feet. Root wads must meet the minimum diameter criteria at the base of the trunk but need not be at least six feet long.

Attribute	Description
Sum of LWD	For those units with Large Woody Debris (LWD), the sum of the number of LWD in the stream or reach
Occurrence of LWD (%)	For those units with Large Woody Debris (LWD), the sum of the percent cover of LWD in the stream or reach divided by the number of habitat units with percent canopy values in reach or stream multiplied by 100
LWD per 100 ft	For those units with Large Woody Debris (LWD), the sum of the

number of LWD in the stream or reach divided by the number of sum length of reach or stream multiplied by 100

Instream Shelter – Instream shelter for the surveys is entered based on the percentage of the unit occupied by the instream shelter types. The totals per unit will equal 100 percent. Note: bubble curtain includes white water.

Attribute	Description
N Of Percent Cover	For those units with a shelter value > 0, summed the number of units with shelter values
Mean % Undercut Banks Cover	For those units with a mean width value > 0, summed the values for undercut bank cover and divided by the total number of percent cover values
Mean % SmallWood Cover	For those units with a mean width value > 0, summed the values for small wood cover and divided by the total number of percent cover values
Mean % LargeWood Cover	For those units with a mean width value > 0, summed the values for large wood cover and divided by the total number of percent cover values
Mean % RootMass Cover	For those units with a mean width value > 0, summed the values for root mass cover and divided by the total number of percent cover values
Mean % TerrestrialVeg Cover	For those units with a mean width value > 0, summed the values for terrestrial vegetation cover and divided by the total number of percent cover values
Mean % AquaticVeg Cover	For those units with a mean width value > 0, summed the values for aquatic vegetation cover and divided by the total number of percent cover values
Mean % WhiteWater Cover	For those units with a mean width value > 0, summed the values for whitewater cover and divided by the total number of percent cover values
Mean % Boulder Cover	For those units with a mean width value > 0, summed the values for boulder cover and divided by the total number of percent cover values
Mean % Bedrock Ledges Cover	For those units with a mean width value > 0, summed the values for bedrock cover and divided by the total number of percent cover values

Shelter Rating – The product of shelter value multiplied by the percent shelter cover of the unit.

Attribute	Description
N Of Shelter Rating	For the units that had a shelter value >= 0, the number of shelter values
Sum Shelter Rating	For the units that had a shelter value >= 0, the sum of (shelter values times cover)
Mean Shelter Rating	For the units that had a shelter value >= 0, the sum of (shelter values times cover) divided by the number of shelter ratings

Mean Depth - Mean Depth for the surveys is defined as the mean of several random depth measurements across the unit with a stadia rod in feet. Mean depths for pools are the mean residual depth, that is the mean depth value from the survey minus the pool tail crest value.

Attribute	Description

N Of Mean Depth (ft)	For the units that were fully surveyed and not null, the number of Mean Depth Values
Sum Mean Depth (ft)	For the units that were fully surveyed, for all types other than pools (see residual depth) the sum of mean depth values
Sum Residual Depth (ft)	For the units that were fully surveyed and not null, the sum of mean depth values minus pool tail crest depth value
Mean Depth (ft)	For pools the mean depth is the sum of residual depth (pool depths minus pool tail crest) divided by the number of units fully measured, for other types it is the sum of mean depth values divided by the total number of units that were fully measured.

Mean Maximum Depth - Enter the measured maximum depth for each habitat unit, in feet. Mean maximum depth for the surveys is defined as the mean maximum depth measurements in the unit in feet. Mean maximum depths for pools are the mean maximum residual depths (mean maximum depth value from the survey minus the pool tail crest value).

Attribute	Description
N Of Maximum Depth	For the units that were fully surveyed and not null, the number of Maximum Depth Values
Sum Maximum Depth (ft)	For units that were fully measured, the sum of maximum depth of all units
N Of Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the number of Residual Max Depth Values
Sum Residual Maximum Depth (ft)	For the units that were fully surveyed and not null, the sum of maximum depth values minus pool tail crest depth value
Mean Maximum Depth (ft)	For pools the mean maximum depth is the sum of residual maximum depth values divided by the total number of units fully measured, for other types it is the sum of maximum depth values divided by the total number of units fully measured

Maximum Depth - Enter the measured maximum depth for each habitat unit, in feet. Maximum depth for the surveys is defined as the maximum depth measurements in the unit in feet. Maximum depths for pools is the maximum residual depths, that is the maximum depth value from the survey minus the pool tail crest value.

Attribute	Description
Maximum Depth (ft)	For non pool units, maximum depth of any unit
Residual Maximum Depth (ft)	For the units that were residual max depth > 0, the maximum depth value

Channel Type - Rosgen channel type classification. The channel type of the reach or stream based on the Stream Channel Type Work Sheet (Part III)

Attribute	Description
Channel Type	Rosgen channel type classification. The channel type of the reach or stream based on the stream channel type work Sheet (part III)

Percent Primary Pools - Primary pools are defined differently based on the stream order. First through 2nd order streams primary pools have a maximum depth >=2 feet and 3rd through 4th (nth) order streams primary pools have a maximum depth >=3 feet.

Attribute	Description
Percent Primary Pools by Pools by Stream	Sum of primary pool habitat lengths divided by the total length of all units.

Percent Primary Pools by Pools	Sum of primary pool habitat lengths divided by the total length of all pool units.
Primary Pool Length	Total length of all primary pool units.
Total Length	Total length of all habitat units.
Total Length Pools	Total length of all pool units.

Percent Off Channel Habitat – Off Channel Habitat Types (3.1, 3.5, >= 5 and <7)

Attribute	Description
LengthOfOffChannel	Sum of lengths for off channel habitat types
TotalLength	Total length of all units
OffChannelRatio	Sum of off channel habitat lengths divided by the total length.

Application Table: Units – The "Units" table contains information that can be used to relate the stream and the reach level data to common aggregating layers, such as, county boundaries, USGS hydrologic unit codes (HUCs), ecoregional boundaries, and CALWATER boundaries.

Example Record	
Unit Descriptions	
Source: *Where does the data come from.*	
Attribute	**Description**
Field Name	Description of field name (if necessary) and ranking criteria

Bailey's Ecoregions and Subregions of the United States, Puerto Rico Attributes
Source: USDA Forest Service

Attribute	Description
OBJECTID	Internal feature number.
	A five-character code that corresponds to the narrative description in the attribute Section. Ecocode and Section represent the lowest mapping
	level in the hierarchy of ecoregions and subregions. The first character is an indication of whether the section is mountainous.
	The next three digits are a code identifying the province, and the last
ECOREGP075	character is a letter identifying the section within the province.
	A major ecoregion distinguished from other domains by climate, precipitation and temperature. This is the highest level in the
ECOCODE	hierarchy of ecoregions.
	A subdivision of a domain. A division represents a climate within a domain and is differentiated from other divisions based on
	precipitation levels and patterns as well as temperature. This is the
DOMAIN_	second level in the hierarchy of ecoregions.
	A subdivision of a division. A province represents variations in vegetation or other natural land covers within a division.
	Mountainous areas that exhibit different ecological zones based on elevation (elevational zonation) are distinguished according to the character of the zonation by listing the elevational zones from lower
DIVISION	to upper. This is the third level in the hierarchy of ecoregions.
	A subdivision of a province. A section represents different landform groupings within a province. This is the lowest level in the hierarchy of ecoregions and subregions. Narrative descriptions of sections
PROVINCE	correspond to unique Ecocode values, above.
	A code used to identify mountainous ecoregions with variations due
SECTION_	to elevation.
MCODE	A numeric code identifying the Province.
	A code identifying the section within the Province. This is the last character of Ecocode. This field is designed for cartographic
PCODE	production.
SCODE	The first three characters of the Section value.
	The last four digits of Ecocode. This is a cartographic production
KEY_	field for labeling Sections.
	The first four digits of Ecocode. This code identifies mountainous
FDIGIT	and non-mountainous Provinces.
MTEXT	String field

California County Boundaries Attributes
Source: California Department of Forestry and Fire Protection

Attribute	Description
CNTY24K97_	Internal feature number.
CNTY24K971	User-defined feature number.
NAME	County name
NAME_CAP	County name in capitals
NUM	County number (1 - 58)

California Interagency Watersheds Attributes

Source: California Interagency Watershed Map of 1999 (Calwater 2.2.1)

Attribute	Description
CALW221_	Internal feature number.
CALW221_ID	User-defined feature number.
CALWNUM	Unique identifier (type=character) of watershed polygon; concatenates HR+RB+HU+"."+HA+HSA+SPWS+PWS
SWRCBNUM21	Unique identifier (type=character) of watershed polygon as published by SWRCB on HBPA Map Series (revised 1986); concatenates RB+HU+"."+HA+HSA
HRC	Hydrologic Region Code
HBPA	Hydrologic Basin Planning Area
RBU	Concatenates HR+RB+HU into single integer
RBUA	Concatenates HR+RB+HU+HA
RBUAS	Concatenates HR+RB+HU+HA+HAS
RBUASP	Concatenates HR+RB+HU+HA+HSA+SPWS
RBUASPW	Concatenates HR+RB+HU+HA+HSA+SPWS+PWS
HR	Hydrologic Region (as a number)
RB	Region Water Quality Control Board number
HU	Hydrologic Unit
HA	Hydrologic Area
HSA	Hydrologic Sub-Area
SPWS	Super-Planning Watershed
PWS	Planning Watershed
HRNAME	Hydrologic Region Name
RBNAME	Regional Water Quality Control Board Name
HBPANAME	Hydrologic Basin Planning Area Name
HUNAME	Hydrologic Unit Name
HANAME	Hydrologic Area Name
HSANAME	Hydrologic Sub-Area Name
CDFSPWNAME	CDF Super-Planning Watershed Name
CDFPWSNAME	CDF Planning Watershed Name
ACRES	Acreage of watershed polygon
HUC_8	SubBasin (USGS Hydrologic Unit Code, HUC)
HUC_8_NAME	SubBasin Name
HUC_8_ALT2	If populated, is an additional SubBasin that overlaps a State-designated watershed
HUC_8_ALT3	If populated, is a 3rd SubBasin that overlaps a State-designated watershed
DWRNUM20	DWR Alternate watershed identifier
DWRHUNAME	DWR Alternate Hydrologic Unit Name
DWRHANAME	DWR Alternate Hydrologic Area Name
DWRHSANAME	DWR Alternate Hydrologic Sub-Area Name
CDFNUM22	CDF Unique identifier (character) of watershed polygon; concatenates HR+RB+HU+"."+HA+HSA+SPWS+PWS

OUT   Binary
NOTES   String field

Join Fields
<u>Source:</u> Hopland Research and Extension Center

Attribute	Description
Code	Join the code field of the output tables to this field to query the data based on surveyed reaches
Code1	Join the code field of the output tables to this field to query the data based on surveyed stream

Application Table: Populations - The "Populations" table contains information that can be used to relate the stream and the reach level data to the NMFS salmonid populations planning dataset.

Salmonid Populations Planning Dataset
Source: National Marine Fisheries Service (NMFS)

Attribute	Description
OBJECTID	Internal feature number.
POPULATION	Salmonid Population Name
STRATUM	Population Stratum
ESU_DPS	The name of the ecological significant unit (ESU) or distinct population segment (DPS, for steelhead)
POP_ID	Internal coding that combines the species with the population name (ST = steelhead, CO = coho, CH = Chinook, SS = Steelhead (summer), CW = Chinook (winter (Sacramento River winter-run only))
WS_ID	What watershed the population falls into (often a population is a watershed but occasionally the population is a subset of the watershed)
IS_WS	Indicates whether the population and watershed boundaries are coincident (1 = population and watershed are one and the same, 0 = population and watershed boundaries are different (pop is probably a small subset of the watershed)
PLAN_NAME	What Recovery Plan is addressing that population (CCV multi = Central Valley Multispecies Plan, NCCC Multi = NCCC domain multispecies plan, NCCC coho = NCCC domain coho plan, SONCC coho = SONCC domain coho plan, SCCC steelhead = South-central CA Coast steelhead plan. SC steelhead = Southern CA steelhead recovery plan.

Join Fields
Source: Hopland Research and Extension Center

Attribute	Description
Code	Join the code field of the output tables to this field to query the data based on surveyed reaches
Code1	Join the code field of the output tables to this field to query the data based on surveyed stream

Detailed list of the metrics and source documents

Parameter	Level	description	Does-Not Meet Criteria	Meets Criteria	source	document	page	object	species	range	manual page
Pool	1	% primary pools by length compared to all others	<40%	>=40%	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	VI-6, V-15	2a	all, coho	all, coastal	VI-6, V-15
		Primary pool Definition: 1st through 2nd order streams, max depth >=2'	<2'	>=2'	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-15		all	all	V-15
		Primary pool Definition: 3rd through 4th (nth) order streams, max depth >=3'	<3'	>=3'	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-15		all	all	V-15
Pool	1	% pool area compared to all others	<40%	>=50%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Pool	1	% pool frequency number compared to all others	<40%	>=50%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Pool	1	% stream length consisting of primary pools	<40%	>=40%	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	VI-6, V-15
Pool		% pool length [stream] of primary pools	undefined	undefined	undefined	undefined					
Pool	1	% pool length compared to all others	<43%	43-50%	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	
Pool	1	% pool length compared to all others	<40%	>=40%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19		all	North Coast	
Pool	1	% pool depth frequency, number pools >= 2' max depth for order 1 and 2 compared to all other pools	<40%	>=40%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Pool	1	% pool depth frequency, number pools >= 2' residual depth for order 1 and 2 compared to all other pools	<40%	>=40%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Pool	1	% pool depth frequency, number pools >= 3' max depth for order 3 and 4 compared to all other pools	<40%	>=40%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Pool	1	% pool depth frequency, number pools >= 3' residual depth for order 3 and 4 compared to all other pools	<40%	>=40%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Pool	1	residual pool depth for first order stream	<1.0	>1.5	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Pool	1	residual pool depth for second order stream	<1.5	>2.0	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	

Category	Value	Metric	Low	High	Author	Reference	Page	Table	Species	Region	Fig
Pool	1	residual pool depth for third order stream	<2.5	>3.0	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Pool	1	residual pool depth for fourth order stream	<2.6	>3.1	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	86	Table 17	all	Russian River	
Pool	1	mean pool depth (all pools)	<1.25'	>=1.25'	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	
Pool	1	average maximum pool depth 1st and 2nd order stream	<2'	>=2'	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	V-15
Pool	1	average maximum pool depth 3rd and 4th order stream	<3'	>=3'	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	V-15
Pool	0	Minimum Stream Order	undefined	undefined	undefined	undefined					
Pool	0	Maximum Stream Order	undefined	undefined	undefined	undefined					
Pool	0	Majority Stream Order	undefined	undefined	undefined	undefined					
Embededness	0	average embededness rating	>1	<=1	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	VI-8	7a	all	all	VI-8
Embededness	0	dominant embededness rating	undefined	undefined	undefined	undefined					
Embededness	1	pool embededness value (not value 5?)	>50%	<25%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Embededness	1	%pools [pools] (number) <50% embeded (1 and 2)	<50%	>=50%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Embededness	1	%pools [stream] (number) <50% embeded (1 and 2)	undefined	undefined	undefined	undefined					
Embededness	1	%pools [pools] (length) <50% embeded (1 and 2)	<50%	>=50%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	
Embededness	1	%pools [stream] (length) <50% embeded (1 and 2)	undefined	undefined	undefined	undefined					
Embededness	1	% pools [Pools] (number) having fines (3-4)	>25%	<=25%	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	VI-8
Embededness	1	% pools [Stream] (number) having fines (3-4)	undefined	undefined	undefined	undefined					
Embededness	0	cobble embededness	2,3,4	1	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	VI-8
Riffle	4	LGR dominant substrate	A,B,E,F,G	C,D	California Salmonid Stream Habitat Restoration Manual	Salmon, in the Mendocino Coast Hydrologic Unit	VI-9	8b	all	all	VI-9

Category	#	Description	Poor	Good	Contact	Source	Page	Table	Species	Region	Ref
Riffle	1	riffle substrates, list %, chose dominant	sand/silt	gravel/small cobble	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85		all	Russian River	VI-9
Riffle	2	% riffle length compared to all others	<10%, >30%	15-30%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85		all	Russian River	
Canopy	0	canopy density	<80%	>=80%	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	VI-7, V-22	4b	all, coho	all	VI-7, V-22
Canopy	0	canopy	<70%	>80%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Canopy	1	pool canopy	<60%	>80%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Canopy	0	% coniferous	<30%	>=50%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Canopy	0	canopy	<93%	>=93%	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	
Canopy	0	%canopy	<80%	>=80%	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	VI-7, V-22
Canopy	0	% canopy	<80%	>=80%	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	VI-7, V-22
Shelter	1	mean pool shelter rating	<80	>=80	California Salmonid Stream Habitat Restoration Manual	Salmon, in the Mendocino Coast Hydrologic Unit	VI-7, V-15	3a	all	all	VI-7, V-15
Shelter	0	stream shelter rating	<80	>100	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Shelter	0	stream complexity value (Shelter Value)	<=1	2-3	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Shelter	0	stream %coverage	<40%	>=40%	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	all	Russian River	
Shelter	1	pool shelter rating	<80	>=80	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	19	Table 8	all	North Coast	VI-7, V-15
Shelter	1	pool complexity value (Shelter Value)	undefined	undefined	undefined	undefined					
Shelter	1	pool % coverage	undefined	undefined	undefined	undefined					
Shelter	1	mean shelter rating all pools	<80	>=80	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	VI-7, V-15
Shelter	0	shelter rating	<80	>=80	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	all	Mendocino Coast Hydrologic Unit	VI-7, V-15

Category		Description			Source	Document	Page	Table	Species	Region	Ref
Bank	0	dominant banks substrate	undefined	undefined	undefined	Salmon, in the Mendocino Coast Hydrologic Unit					
	0	*dominant banks substrate [where canopy does not meet criteria] (*criteria for planting projects)	1,2	3,4	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	VI-8	4c	all	all	VI-8
Bank	0	mean % of stream banks vegetation (both banks)	<65%	>=65%	Doug Albin	personal communication			coho	Mendocino Coast Hydrologic Unit	
Substrate	0	chinook dominant substrate, 1-3"	A,B,E,F,G	C,D	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-21		chinook	all	V-21
Substrate	0	chinook substrate range, 0.5-10"	A,B,F,G	C,D,E	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-21		chinook	all	V-21
Substrate	0	steelhead dominant substrate, 2-3"	C,D	C,D	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-22		steelhead	all	V-22
Substrate	0	steelhead substrate range, 0.5-6"	C,D	C,D	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-22		steelhead	all	V-22
Substrate	1	dominant pool tail substrate	undefined	undefined	undefined	undefined					
Temperature	0	chinook temperature	>65	40-65	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	chinook	Russian River	
Temperature	0	coho temperature	>65	48-60	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	coho	Russian River	
Temperature	0	steelhead temperature	>70	40-65	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft	85	Table 16	steelhead	Russian River	
Temperature	0	coho temperature		48-60	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-21		coho	all	V-21
Temperature	0	steelhead temperature	>65	40-65	California Salmonid Stream Habitat Restoration Manual	California Salmonid Stream Habitat Restoration Manual	V-22,23		steelhead	all	V-22,23
Temperature	0	MWAT	>65	50-60	NCWAP	Gualala River Watershed Assessment Report, Appendix 5	4-6		all	North Coast	
Temperature	0	coho temperature		48-60	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	coho	Mendocino Coast Hydrologic Unit	V-21
Temperature	0	steelhead temperature	>65	<65	Doug Albin	Assessment of Environmental Effects on Salmonids, with Emphasis on Habitat Restoration for Coho Salmon, in the Mendocino Coast Hydrologic Unit	61	Table 7	steelhead	Mendocino Coast Hydrologic Unit	V-22,23
Survey Year	0	Survey Year	undefined	undefined							

Channel Type	0	Channel Type, suitable for fish	D, F1,2,6	B,C,E,G,F3-5	Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft			all	Russian River	
Habitat Diversity		Manual Pages V-3, V-19, V-20 and associated other pages			Bob Coey	Russian River Basin Fisheries Restoration Plan, 2002 Draft			all	Russian River	