OFF-CHANNEL COARSE WOODY DEBRIS (V_{OFFCWD})

Data Located in Appendix B-1 through B-12

Scaling Rationale The Authors scaled V_{OFFCWD} using a combination of reference system data, field observations, and best scientific judgment. Data for off-channel CWD from the vegetative point-centered-quarter (PCQ) sampling protocol were analyzed. The Authors examined the effects of grouping all subclasses for analyses, especially in light of lack of reference standard conditions in the Low gradient subclass. Data for the High and Moderate gradient subclasses were reasonably consistent across disturbance gradients. For Moderate and High gradient subclasses, the Authors observed a consistent trend of decreasing off channel CWD volumes with increasing human alterations of the stream channel and associated riparian ecosystems (*e.g.*, removal of in-channel CWD by SB County Flood Control). However in many cases in the moderately altered condition, human alterations of off channel CWD volumes (*e.g.,* slash disposal/ dumping) resulted in augmentation of off channel CWD volumes when compared to reference standard conditions.

For Low gradient systems, the Authors observed no reference standard conditions. However, historical evidence suggest that Low gradient systems sustained large volumes of off-channel CWD contributed by species such as *Salix lasiolepis*, *Salix laviagata*, *Platanus racemosa*, *Quercus agrifolia*, *etc.* In addition, the Authors have observed that Low gradient reaches receive some off-channel CWD inputs from intact upgradient sources (*e.g.* adjacent, steep hillslope forests). Given accounts of historical conditions, and the Authors' direct observation of low to very low off-channel CWD volumes in degraded Low gradient riparian forests, the Authors used best professional judgment and lumped the Low gradient channel reach CWD variable scaling with the Moderate and High gradient subclasses (see Table 5.14 below). The Authors suspect, however, that relatively unperturbed Low gradient riparian ecosystems would have had significantly higher off channel CWD volumes.

Confidence The Authors' confidence that reasonable logic and/or data support the variable scaling for all subclasses is MEDIUM for High and Moderate gradient subclasses and LOW for Low gradient subclasses.

Variable: OFF-CHANNEL COARSE WOODY DEBRIS (V_{OFFCWD})

Table 5.14 Mean, standard deviation and range of the total CWD volume below OHW for the High, Medium and Low gradient subclasses

Land Use Gradient	Sample Size	Total CWD Volume/ .1 acre Above OHW, in VAA (Mean, SD, Range)	
Unaltered / Reference Standard	4	77.71 $\pm$ 75.56	(7.4 to 144.6)
Minimally Altered	12	43.01 $\pm$ 35.5	(0 to 113.0)
Moderately Altered	19	78.05 $\pm$ 115.1	(0 to 436.3)
Extensively Altered	20	9.69 $\pm$ 20.0	(0 to 82.4)
Unrecoverable	0	0	

Scaling for High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR V_{OFFCWD}	INDEX
a. Total CWD volume above OHW and within the VAA is $\geq$ 125 ft^3 **and** b. VAA has been unaltered by human activities.	1.00
a. Total CWD volume above OHW and within the VAA is $\geq$ 75 ft^3 and < 125 ft^3 **and** b. CWD volume within the channel has been altered by human activities.	0.75
a. Total CWD volume above OHW and within the VAA is $\geq$ 50 ft^3 and < 75 ft^3 **or** b. Total CWD volume above OHW and within the VAA is $\geq$ 125 ft^3 due to artificial (human) augmentation via dumping of slash material, *etc.*	0.50
a. Total CWD volume above OHW and within the VAA is $\geq$ 25 ft^3 and < 50 ft^3 **and** b. CWD volume within the channel has been altered by human activities (*i.e.*, flood control removal).	0.25
a. Total CWD volume above OHW and within the VAA is < 25 ft^3 **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and restoration measures are applied.	0.10
a. Total CWD volume above OHW and within the VAA is < 25 ft^3 **and** b. Variable is not recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and restoration measures are applied.	0.00

PATCH AREA ($V_{PATCHAREA}$)

Definition

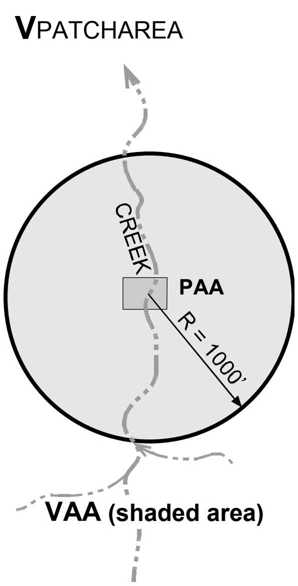
Patch Area is the relative area of habitat patches, as calculated from the ETM Habitat Patch Analysis map, within a 1000 ft radius ring surrounding the PAA.

Rationale for Selection of The Variable

The relative area (measured as a percentage of the 1000 ft VAA ring) of patches is an indicator of the site's capacity to function as habitat for faunal communities. The relative area, in combination with a measure of the total number of patches (*i.e.*, $V_{PATCHNUMBER}$), is an indicator of the size distribution of the habitat patches available for utilization by faunal communities. Large habitat patches have low edge-to-interior ratios and thus a diversity of interior niches that are critical for resting, hiding, escape, thermal, and feeding dynamics. For aquatic dependent species with both large and small home ranges, large intact habitat patches are critical for completion of their lifecycles. In addition, habitat patch size affects the maintenance of native vegetation communities through factors such as seed dispersal, light, and temperature regulation, *etc.*

Measurement Protocol

The VAA for $V_{PATCHNUMBER}$ consists of a 1,000 ft. radius ring, with its center located at the center of the PAA. Within the GIS, display or print an ETM Habitat Patch map showing the watershed that contains the project site of interest. Plot the location of the project site on the map (see example map provided in Appendix F). Using the 1:24,000 mapping scale circles provided in Appendix F, or an equivalent technique in Arc/Info, generate a 1000' radius VAA ring surrounding the project site. Using the 1:24,000 mapping scale grids provided in Appendix E, or an equivalent GIS technique such as "Tabulate Area" in Arc/Info Spatial Analyst, measure the size of the "high habitat structure and functioning" and "moderate habitat structure and functioning" habitat patches as classified on the ETM Habitat Patch Analysis map that are within the 1000 ft VAA ring. Habitat patches that extend beyond the 1000 ft VAA ring should be truncated and only the area within the 1000 ft VAA ring should be included in the area measurement (in order to produce a relative area). Count habitat patches separately if they do not share a common edge, or are connected only diagonally on the map (see Appendix D for more detail).



Convert the "high" and "moderate" habitat patch areas from m^2 to ft^2 to maintain consistency of units (*i.e.*, the ETM Habitat Patch map units/pixels are in meters). Using these calculations, sum the patch areas to calculate the total patch area for "high" and "moderate" habitat within the 1000 ft VAA ring. Divide the total patch areas by the area of the 1000 ft VAA ring (3,140,000 ft^2 [*i.e.*, 1000 ft x 1000 ft x 3.14]) and multiply by 100 to calculate the percentage of total habitat patch area within the 1000 ft VAA ring. Use the relative area of habitat patches in the 1000 ft VAA ring to scale the $V_{PATCHAREA}$ variable.

Data

Located in Appendix B-65 through B-100

Variable: PATCH AREA ($V_{PATCHAREA}$)

Scaling Rationale

$V_{PATCHAREA}$ was scaled by field observations and best scientific judgment. Empirical data on individual patch sizes are not as useful for scaling this variable because the patches included in the ETM Habitat Patch Analysis (*i.e.*, $V_{PATCHNUMBER}$) may have intersected, but also extend beyond the aerial limit of the 1000 ft VAA ring. Therefore, it was possible for the cumulative patch area to exceed the total area of the 1000 ft VAA ring (*i.e.*, 72.1 acres). Rather than scale the variable based upon a complicated set of size distribution data of patch sizes, which could be somewhat misleading in some cases, the Authors chose to scale the $V_{PATCHAREA}$ variable based upon the relative patch area as compared to the 1000 ft VAA ring area (*i.e.*, a percentage of the 1000 ft VAA ring area or 72.1 acres). Nevertheless, the patch area size distributions are included in Appendix F for reference. The Authors observed a trend of an increasing number of habitat patches, of decreasing overall size, with increasing human disturbance. Reference to near reference standard sites were typified by a single large (approximately 98,441 acres or 153 $miles^2$ as calculated in the ETM Habitat Patch Analysis) homogenous native chaparral/forest or native chaparral/woodland vegetation patch (*i.e*., habitat classified in the ETM Habitat Patch analysis as “high habitat structure and function”) that covered both the project site and extended to the ridgeline of the Santa Ynez Mountains and into the Santa Ynez River Valley/Los Padres National Forest. Highly disturbed sites in the Low gradient subclass exhibited one of two trends; 1) an average of more than 6 “high” and “moderate” habitat patches per 1000 ft VAA ring with an average size of approximately 9 acres, or 2) a total lack of habitat patches due to urbanization/vegetation clearing. As a result of this disturbance gradient, the Authors chose to separate the Low gradient subclass from the Moderate and High gradient subclasses for scaling of the $V_{PATCHAREA}$ variable.

Variable: PATCH AREA ($V_{PATCHAREA}$)

Scaling For High and Moderate Gradient Subclasses

MEASUREMENT CONDITION FOR $V_{PATCHAREA}$	INDEX
Habitat patches classified as "high" habitat cover $\geq$ 95 % of the 1000 ft VAA ring.	1.00
Habitat patches classified as "high" habitat cover $\geq$ 75 % but < 95 % of the 1000 ft VAA ring.	0.75
Habitat patches classified as "high" and/or "moderate" habitat cover $\geq$ 50 % but < 75 % of the 1000 ft VAA ring.	0.50
Habitat patches classified as "high" and/or "moderate" habitat cover $\geq$ 25 % but < 50 % of the 1000 ft VAA ring.	0.25
a Habitat patches classified as "high" and/or "moderate" habitat cover < 25 % of the 1000 ft VAA ring **and** b Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.10
a Habitat patches classified as "high" and/or "moderate" habitat cover < 25 % of the 1000 ft VAA ring **and** b Variable is not recoverable to reference standard conditions are not sustainable through natural processes if the existing land us is discontinued and no restoration measures are applied.	0.00

Variable: PATCH AREA ($V_{PATCHAREA}$)

Scaling For Low Gradient Subclasses

MEASUREMENT CONDITION FOR $V_{PATCHAREA}$	INDEX
Habitat patches classified as "high" habitat cover $\geq$ 65 % of the 1000 ft VAA ring.	1.00
Habitat patches classified as "high" habitat cover $\geq$ 45 % but < 65 % of the 1000 ft VAA ring.	0.75
Habitat patches classified as "high" and/or "moderate" habitat cover $\geq$ 30 % but < 45 % of the 1000 ft VAA ring.	0.50
Habitat patches classified as "high" and/or "moderate" habitat cover $\geq$ 15 % but < 30 % of the 1000 ft VAA ring.	0.25
a Habitat patches classified as "high" and/or "moderate" habitat cover < 15 % of the 1000 ft VAA ring **and** b Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.10
a Habitat patches classified as "high" and/or "moderate" habitat cover < 15 % of the 1000 ft VAA ring **and** b Variable is not recoverable to reference standard conditions are not sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.00

Confidence The Authors' confidence that reasonable logic and/or data support the variable scaling is HIGH for all subclasses.

HABITAT PATCH CONTIGUITY ($V_{PATCHCONTIG}$)

Definition

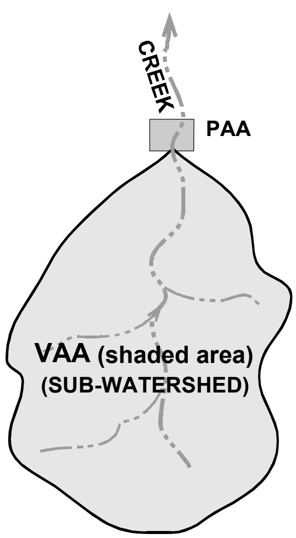
Habitat Patch Contiguity is the contiguity of habitat patches, as generated from the ETM Habitat Patch Contiguity Analysis, within the proposed project site sub-watershed.

Rationale for Selection of The Variable

The contiguity of habitat patches within project site sub-watershed is an indicator of the site's capacity to function as habitat for faunal communities. In the SCSBC, less disturbed riparian ecosystems are connected through a single contiguous native chaparral/forest or native chaparral/woodland vegetation patch to the "core" wilderness habitat patch that encompasses both the ridgeline of the Santa Ynez Mountain Range and much of the upper Santa Ynez River Valley/Los Padres National Forest. The contiguity of habitat from this "core" wilderness habitat patch to riparian ecosystems on the South Coast decreases with human disturbance and thus influences the ability of faunal communities to locate, access, utilize, and disperse from a variety of habitat types.

Measurement Protocol

The VAA for $V_{PATCHCONTIG}$ consists of the sub-watershed that contributes flow to the PAA. Within the GIS, display or print an ETM Habitat Patch Contiguity Map showing the watershed that contains the PAA of interest. Plot the location of the project site on the map (see example map provided in Appendix G). Identify the shortest route, along the DLG stream network, from the project site to the "core" wilderness habitat patch on the map. Along this shortest stream network route, count the number of DLG stream arcs classified as "discontiguous" habitat between the PAA and "core" wilderness habitat patch. Count all stream arcs classified as "discontiguous" no matter how small they may be (i.e., very small portions of the stream arcs, which can be difficult to see, may be classified). Use the number of DLG stream arcs within the " discontiguous " habitat class, between the PAA and the "core" wilderness habitat patch, along the stream network, to scale the $V_{PATCHCONTIG}$ variable.



Count stream arcs as being "discontiguous" habitat only if they are bordered by "discontiguous" habitat on both sides of the stream arc (*i.e.*, in instances where a stream arc splits "contiguous" and "discontiguous" habitat polygons, do not count the stream arc as "discontiguous" habitat because one side of the arc/channel is accessible through "contiguous" habitat). Record your results on the Minimum Submittal Worksheet provided in Appendix D.

Data Located in Appendix B-65 through B-100

Variable:HABITAT PATCH CONTINGUITY ($V_{PATCHCONTIG}$)

Scaling Rationale

$V_{PATCHCONTIG}$ was scaled by using reference data, field observations, and best scientific judgment. In the field, the Authors observed two general trends with increasing human disturbance (1) an increase in the number of discontiguous habitat patches within a project site sub-watershed, and/or (2) a total lack of habitat patches due to urbanization/vegetation clearing. Due to the difficulty in assessing/calculating this type of landscape scale variable in the field, the Authors relied upon the ETM Habitat Patch Contiguity Analysis to provide empirical data for scaling of this variable.

In the ETM Habitat Patch Contiguity Analysis, reference to near reference standard site sub watersheds contained no stream reaches classified as "dis-contiguous" habitat and the project site was connected to the "core" wilderness habitat patch by a single stream reach classified as "contiguous" habitat throughout its entirety. Highly disturbed sites in the Moderate and Low gradient subclasses averaged approximately six stream reaches classified as "discontiguous" habitat. The stream networks within these highly disturbed sub-watersheds alternated frequently between "contiguous" and "discontiguous" reaches indicating a high level of discontiguity (*i.e.*, "patchi-ness") in riparian habitat. Based upon the trends in these data, the Authors chose to scale $V_{PATCHCONTIG}$ linearly using the empirical data from the ETM Habitat Patch Contiguity Analysis.

Variable: HABITAT PATCH CONTINGUITY ($V_{PATCHCONTIG}$)

Scaling For High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR $V_{PATCHCONTIG}$	INDEX
The project site sub-watershed contains no stream reaches classified as "discontiguous" habitat.	1.00
The project site sub-watershed contains 1 to 3 stream reaches classified as "discontiguous" habitat.	0.75
The project site sub-watershed contains 4 to 6 stream reaches classified as "discontiguous" habitat.	0.50
The project site sub-watershed contains 7 to 9 stream reaches classified as "discontiguous" habitat.	0.25
a. The project site sub-watershed contains 1. > 9 stream reaches classified as "discontiguous" habitat, **and/or** 2. The stream network in the project site sub-watershed never reaches the "core" wilderness habitat patch, **and/or** 3. >50% of the stream network in the project site sub-watershed is classified as "discontiguous" habitat due to urbanization/vegetation clearing, **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.10
a. The project site sub-watershed contains 1. > 9 stream reaches classified as "discontiguous" habitat, **and/or** 2. The stream network in the project site sub-watershed never reaches the "core" wilderness habitat patch, **and/or** 3. > 50% of the stream network in the project site sub-watershed is classified as "discontiguous" habitat due to urbanization/vegetation clearing, **and** b. Variable is not recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.00

Confidence The Authors' confidence that reasonable logic and/or data support the variable scaling is HIGH for all subclasses.

PATCH NUMBER ($V_{PATCHNUMBER}$)

Definition

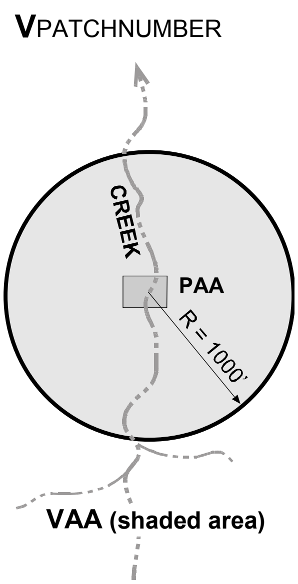
Patch Number is the number of habitat patches, calculated from the ETM Habitat Patch Analysis map, within the 1000 ft radius VAA surrounding the project site.

Rationale for Selection of the Variable

The number of habitat patches within a 1000 ft radius of the project site is an indicator of the site's capacity to function as habitat for faunal communities. On the SCSBC, the number of patches increases with human disturbance and thus influences the ability of faunal communities to locate, access, utilize, and disperse from a variety of habitat types. The access and utilization of habitat patches by faunal communities is essential for population dynamics such as resting, hiding, escape, thermal, and feeding.

Measurement Protocol

The VAA for $V_{PATCHNUMBER}$ consists of a 1,000 ft. radius ring, with its center located at the center of the PAA. Within the GIS, display or print an ETM Habitat Patch map showing the watershed that contains the project site of interest. Plot the location of the project site on the map. Using the 1:24,000 mapping scale circles provided in Appendix F, or an equivalent Arc/Info technique, generate a 1000 ft radius VAA ring surrounding the project site. Count the number of "high habitat structure and functioning" and "moderate habitat structure and functioning" habitat patches as classified on the ETM Habitat Patch Analysis map that are within the 1000 ft VAA ring. Habitat patches that are intersected by, but also extend beyond, the 1000 ft VAA ring should be included in the count of habitat patches. Count habitat patches separately if they do not share a common edge, or are connected only diagonally on the map (Appendix F)



Data

Located in Appendix B-65 through B-100

Scaling Rationale

$V_{PATCHNUMBER}$ was scaled by using reference data, field observations, and best scientific judgment. The Authors observed a trend of an increasing number of habitat patches with increasing human disturbance. As well as increasing in number, the habitat patches tended to transition from native chaparral/forest and native chaparral/woodland communities (*i.e.*, habitat classified in the ETM Habitat Patch analysis as "high" habitat) to scrub-shrub/coastal chaparral and grassland vegetation communities (*i.e.*, habitat classified as "moderate" habitat) with increasing levels of disturbance. Reference to near reference standard sites were typified by a single large homogenous native chaparral/forest or native chaparral/woodland vegetation patch (*i.e.*,

Variable: PATCH NUMBER ($V_{PATCHNUMBER}$)

"high" habitat) that covered both the project site (*i.e.*, within a 1000 ft radius of the project site), and extended to the ridgeline of the Santa Ynez Mountains and into the Santa Ynez River Valley/Los Padres National Forest. Highly disturbed sites in the Low gradient subclass exhibited one of two trends (1) an average of more than six "high" and "moderate" habitat patches per 1000 ft VAA ring with an increased proportion of the patches consisting of scrub shrub/coastal chaparral and grassland vegetation (*i.e.*, "moderate" habitat), or (2) a total lack of habitat patches due to urbanization/vegetation clearing. As a result of this trend, the Authors chose to scale $V_{PATCHNUMBER}$ linearly using the empirical data from the ETM Habitat Patch analysis.

Scaling for High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR $V_{PATCHNUMBER}$	INDEX
The 1000 ft VAA ring contains/intersects 1 "high" habitat patch.	1.00
The 1000 ft VAA ring contains/intersects 2 to 3 "high" habitat patches	0.75
The 1000 ft VAA ring contains/intersects: a. 4 to 5 "high" habitat patches **and/or** b. 1 to 2 "moderate" habitat patches	0.50
The 1000 ft VAA ring contains/intersects: a. ≥ 6 "high" habitat patches **and/or** b. 3 to 4 "moderate" habitat patches	0.25
a The 1000 ft VAA ring contains/intersects: 1. ≥ 6 "high" habitat patches **and/or** 2. ≥ 5 "moderate" habitat patches **and/or** b There are no habitat patches within the 1000' VAA ring and the variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.10
a The 1000 ft VAA ring contains/intersects: 1. ≥ 6 "high" habitat patches **and/or** 2. ≥ 5 "moderate" habitat patches **and/or** b There are no habitat patches within the 1000' VAA ring and the variable is not recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.00

Confidence: The Authors' confidence that reasonable logic and/or data support the variable scaling is HIGH for all subclasses.

RATIO OF NATIVE TO NON-NATIVE PLANT SPECIES (V_{RATIO})

Definition

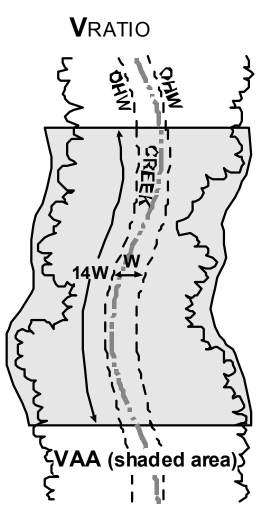
The Ratio of Native to Non-Native Plant Species is the ratio of the dominant plant taxa within the VAA that are native to SCSBC to those that have been introduced to the region.

Rationale for Selection of the Variable

Native plant species dominate reference standard conditions. This is true for any plant community or ecosystem that have not been disturbed by humans. Anthropogenic disturbance provides opportunities for nonnative weedy taxa to enter and subsequently, to become established within the disturbed portions of the community. However, it has been suggested that most nonnative species have little or no effect on species in the invaded community (Simberloff 1981). Some nonnative species can and do interact with native species in ways that may be detrimental to the native species. Nonnative taxa may hybridize with closely related species (Thompson 1991, Abbot 1992), outcompete natives (see Parker and Reichard 1998 for a review), and alter ecosystem processes such as nitrogen fixation (Vitousek *et al.* 1987), site water balance (Carman and Brotherson 1982), and mycorrhizal interactions (Goodwin 1992). Non-native taxa also may negatively affect the use of the native communities by wildlife (Neill 1983, Olson and Knopf 1986). Therefore, the ratio of native to non-native plant species in an assessment area is a general measure of the degree to which native plant communities have departed from reference standard conditions as a result of anthropogenic activities.

Measurement Protocol

The VAA for V_{RATIO} consists of a channel reach length that is fourteen times (14X) the OHW channel width at the PAA cross section. The VAA is centered on the main PAA cross section, so that 7.0 OHW channel widths are upstream, and 7.0 OHW channel widths are downstream from the main PAA cross section. The width of the VAA spans from edge of the intact vegetative buffer on stream right to the edge of the intact vegetative buffer on stream left.



To develop a measurement for $V_{RATIO,}$ start at the PAA cross section. Walk thoroughly through the VAA (upstream 7.0 OHW channel widths and downstream 7.0 OHW channel widths). During this walk of the VAA, determine the three dominant species for each of the four strata (*i.e.*, tree, shrub, vine, and herb) (see Figure 5.10). Record your results on the Minimum Submittal Worksheets in Chapter 7. If three species are not present within a stratum, list all that are present. For instance if only *Sambucus mexicanna* and *Rhamnus californica* occur in the shrub stratum within the VAA, then only record these two species. If you encounter problems in determining the dominant species within the VAA for a particular stratum, then begin by assigning a cover class midpoint value for all species that occur in that stratum within the VAA. Then select the three species from that stratum with the highest cover class values.

Variable RATIO OF NATIVE TO NON-NATIVE PLANT SPECIES (V_{RATIO})

For all dominant speceis, identify their indigenous status using either *The Jepson Manual* (Hickman 1993) or Appendix B-41 through B-45. Group all species by their status (native or nonnative) across strata and calculate a single ratio of native to non-native species for the VAA. An example is provided below.

Example Calculation for the Ratio of Native to Non-Native Plant Species

Stratum #1:	Tree layer dominants:	
	Coast live oak (*Quercus agrifolia*)	Native
	Western sycamore (*Platanus racemosa)*	Native
	White alder (*Alnus rhombifolia*)	Native
Stratum #2:	Shrub layer dominants:	
	Toyon (*Heteromeles arbutifolia*)	Native
	Canyon Gooseberry (*Ribes menziesii*)	Native
	Coffeeberry (*Rhamnus californica)*	Native
Stratum #3:	Vine layer dominants:	
	English ivy (*Hedera helix*) Nonnative	
	Poison oak (*Toxicodendron diversiloba)*	Native
	German ivy (*Senecio mikanioides*)	Nonnative
Stratum #4:	Herb layer dominants:	
	Smilo grass (*Piptatherum miliaceum)*	Nonnative
	Water bentgrass *(Agrostis viridis)*	Nonnative
	Giant horsetail (*Equisetum telmateia* var. *braunii)*	Native
	Total Number of Native Species =	8
	Total Number of Non-native Species =	4
	Ratio of Native to Nonnative =	8:4 (2:1)

Data Located in Appendix B-33 through B-60

Scaling Rationale The variable was scaled using reference data, field observation, published literature, and best scientific judgment. Ideally, the reference standard condition for all three subclasses using this protocol should be set at a ratio of 20:0 (*i.e.*, no exotic, cultivated, or ornamental species are present within the VAA). However, a large diversity of exotic, cultivated, and ornamental species have invaded and become established within riparian ecosystems throughout the reference domain (Table 5.15 below). Therefore, V_{RATIO} was scaled primarily based upon reference data rather than an ideal reference standard.

Variable RATIO OF NATIVE TO NON-NATIVE PLANT SPECIES (V_{RATIO})

Table 5.15 Mean, standard deviation and range of the ratio of native to non-native plant species for High, Moderate, and Low Gradient subclasses

Disturbance Gradient	Sample Size	Ratio of Native to Non-Native Dominant Plant Species (Mean, SD, Range)	
Unaltered / Reference Standard	4	6.69 ± 1.28	(5.25 to 8.00)
Minimally Altered	13	2.71 ± 1.8	(1.29 to 6.75)
Moderately Altered	18	1.41 ± 1.29	(0.50 to 6.00)
Extensively Altered	20	1.16 ± 1.71	(0.17 to 8.00)
Unrecoverable	2	0.58 ± 0.6	(0.15 to 1.00)

Scaling for High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR V_{RATIO}	INDEX
Average ratio of native to non-native dominant plant species ≥ 7:1.	1.00
Average ratio of native to non-native dominant plant species ≥ 5:1 and < 7:1.	0.75
Average ratio of native to non-native dominant plant species ≥ 3:1 and < 5:1.	0.50
Average ratio of native to non-native dominant plant species ≥ 1:1 and < 3:1.	0.25
a Average ratio of native to non-native dominant plant species is < 1:1 **and** b The variable is recoverable and sustainable to reference standard conditions through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.10
a Average ratio of native to non-native dominant plant species is < 1:1 **and** b The variable is not recoverable and not sustainable to reference standard conditions through natural processes if the existing land use is discontinued and no restoration measures are applied.	0.00

Confidence Authors' confidence that reasonable logic and/or data support scaling is HIGH for all subclasses.

REGENERATION (V_{REGEN})

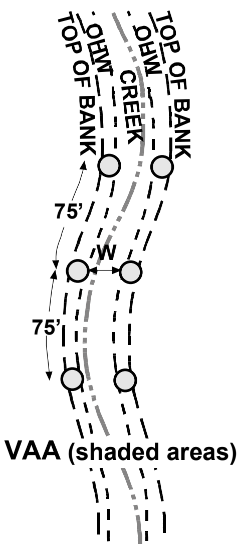
Definition

Regeneration is the reestablishment of plants from seedlings, saplings, and clonal shoots.

Rationale for Selection of the Variable

Population processes such as the births and deaths of individuals occur in every community, and they emerge as a fundamental property of communities and higher levels of organization (*e.g.*, ecosystem). A population maintains itself when the rate of births (ultimately recruitment) is balanced by the rate of deaths (mortality). Therefore, maintenance of population function and structure, and by extension, community diversity is a fundamental process of a natural ecosystem.

VREGEN



The understory of a riparian ecosystem characteristically will contain seedling/ saplings of species that occur in the overstory. Seedlings/ saplings persist in the understory until an opportunity (*e.g.,* tree fall) to replace canopy trees occurs. When an opportunity such a tree fall or lightening strike does occur, seedlings/ saplings in the understory will grow up to the canopy layer (Hubbell & Foster 1986).

In addition, seedlings/saplings of understory species (*i.e.*, shrubs, herbs, and vines) are found in the lower strata. These understory species by definition never reach the upper or emergent canopy layer, but instead, occupy recruitment sites (often in the long term) that are not available for canopy species recruitment unless a catastrophic disturbance (*e.g.,* fire, debris flow, flood) occurs. Thus, the presence and composition of seedling/saplings in the understory of a riparian ecosystem is generally useful to predict the future composition and structure of a plant community.

Measurement Protocol

The VAA for V_{REGEN} consists of six 0.01 acre circular plots (radius = 11.8 feet) established along the two vegetation transects, located on stream right and stream left. To measure $V_{REGEN,}$ utilize the six plot centers on the two vegetative transects, stream right and stream left, to define 0.01-acre plots. This is best accomplished by stretching a tape from the plot center to the targeted radius, and woking slowly in a circle around the plot center. Within each of the six circular plots, make ocular estimates of the percent canopy cover for all seedlings, saplings, and clonal shoots (Figure 5.10) using midpoints of standard canopy cover classes (Appendix E). Record these estimates of percent cover on the Minimal Submittal Worksheets provided in Chapter 7. Average the six measurements of canopy cover to calculate the final estimate of regeneration.

Data

Located in Appendix B-33 through B-60

Variable: REGENERATION (V_{REGEN})

Scaling Rationale The Authors scaled V_{REGEN} using reference data, field observations, and best scientific judgment. Specifically, reference data for all three subclasses were grouped because of overall similarities in plant community structure. Ranges of seedling/sapling percent coverage were identified from field data (see Table 5.16 below), and used to describe the natural range of variation in native tree regeneration within forested riparian communities of the SCSBC. Although the natural variation is high, late successional riparian communities in the reference domain or those with minor impacts from human activities tend to have a higher average percent canopy cover of seedling/saplings than early successional communities, or those that have been extensively disturbed by human activities (*e.g.*, extensive trampling, clearing, construction activities, *etc.*).

Table 5.16 Mean, standard deviation, and ranges of average seedling/sapling percent coverage for High, Medium and Low Gradient subclasses

Disturbance Gradient	Sample Size	Ave. Seedling/Sapling Coverage (Mean, SD, Range)	
Unaltered / Near Reference Standard	4	11.1 $\pm$ 7.2	(3 to 20.5)
Minimally Altered	13	6.5 $\pm$ 10.5	(0 to 38)
Moderately Altered	18	11.1 $\pm$ 10.8	(0 to 38)
Extensively Altered	20	3.8 $\pm$ 4.2	(0 to 10.5)
Unrecoverable	2	0	

Variable: REGENERATION (V_{REGEN})

Scaling For High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR V_{REGEN}	INDEX
Average seedling/sapling percent cover class $\geq$ 38%	1.00
Average seedling/sapling percent cover class $\geq$ 20.5% but < 38%	0.75
Average seedling/sapling percent cover class $\geq$ 10.5 % but < 20.5%	0.50
Average seedling/sapling percent cover class $\geq$ 2 % but < 10.5%	0.25
a. Average seedling/sapling percent cover class is <2%, **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use (*e.g.*, site cleared through heavy grazing of domestic livestock, developed park, and crop production) is discontinued and no restoration measures are applied.	0.10
a. Average seedling/sapling percent cover class is <2%, **and** b. Variable is neither recoverable nor sustainable to reference standard conditions through natural processes if the existing land use (*e.g.*, concrete trapezoidal channel, parking lot, box culvert, roads, *etc.*) is discontinued and no restoration measures are applied.	0.00

Confidence: The Authors' confidence that reasonable logic and/or data support scaling is HIGH for all subclasses

RESIDUAL POOL ($V_{RESIDPOOL}$)

Definition

Residual Pool refers to the number and average distance between residual pools >10ft² in area and >0.5 ft deep (at their deepest point) within the active channel at low flow to base flow conditions.

Rationale for Selection of the Variable

Residual pools in SCSBC stream ecosystems are especially important with respect to geochemical (water quality), plant community, and faunal support/ habitat functions. For example, residual pools in intact High, Medium, and Low gradient SCSBC streams commonly exist in various sizes, depths, and degrees of connectedness to in-channel and subsurface flows (inputs and outputs). As such, these residual pools form specialized and relatively unique areas within the stream ecosystem where geochemical and/or microbial processing of nutrients, organic matter, and contaminants can occur at differential rates. In effect, residual pools along a given channel reach constitute a linked series of geochemical and/or microbial "hot spots" because they occur along relatively steep and highly differentiated gradients of oxidation, reduction, and stream energy that exist nowhere else in the riverine ecosystem or in the surrounding landscape. On a similar note, residual pools serve as sumps and temporary storage areas for plant detritus and other forms of organic carbon (both refractory and labile). Partial decomposition of plant detritus (*e.g.,* leaves, twigs, propagules) in the wet and reducing environments of the residual pools forms the basis of food webs for semi-aquatic and aquatic vertebrates and invertebrates.

Plant community functions are facilitated to a certain degree by the existence of residual pools. For example, at low to base flow conditions, the shallow surface and subsurface water exchanges that occur between pools and stream banks create relatively moist to saturated pool-edge microsites. On these sites, plants adapted to life in saturated soil conditions can germinate, become established, and regenerate. Commonly, residual pools, in and of themselves, offer microsites for germination, establishment and regeneration of many of the woody species typical to the tree, sapling, and shrub strata of the riparian forest communities.

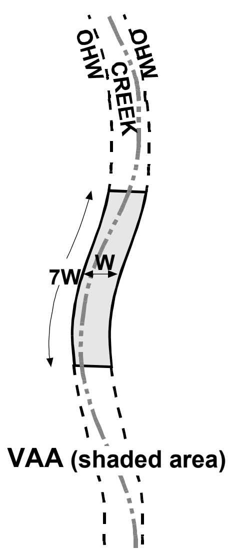
Residual pools offer a wide array of aquatic and semi-aquatic vertebrates and invertebrates food and cover resources. For example, adult and juvenile salmonids, and several species of salamanders and newts regularly use residual pools as hiding, escape, and/or thermal cover, and for reproduction. Wading birds regularly feed on the macroinvertebrates and fish that colonize residual pools. Wide ranging carnivores such as bears or mountain lions use residual pools as sources of water, and for thermal, resting, and escape cover. Especially in the Low gradient subclass, access to intact residual pools in transitional areas where brackish and fresh water coalesce is critical for anadromous and catadromous species that need time and thermal and escape cover to adjust to physiological (osmotic) stresses associated with making the transition from salt to fresh water.

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Measurement Protocol

The VAA for $V_{RESIDPOOL}$ consists of a channel reach length that is seven times (7X) the OHW channel width at the main VAA cross section. The VAA is centered on the PAA cross section, so that 3.5 OHW channel widths are upstream, and 3.5 OHW channel widths are downstream from the main PAA cross section. The width of the VAA is from OHW on stream right to OHW on stream left.

$V_{RESIDPOOL}$



To develop a measurement for $V_{RESIDPOOL}$, start at the downstream end of the VAA section. Walk upstream a total distance of 7 times the OHW cross section width. Along your walk, (1) count the number of all residual pools > 10 ft^2 in area and > 0.5 ft deep (at their deepest point) within the VAA study reach, and (2) measure the distance (in feet) between adjacent pools (see Figure 5.13). In making the distance measurements, measure from the downstream end of the upstream pool to the upstream end of the downstream pool. Record your counts and between pool measurements on the Minimum Submittal Worksheet provided in Chapter 7. Use the between-pool distance measurements to calculate an average between pool distance (expressed in feet).

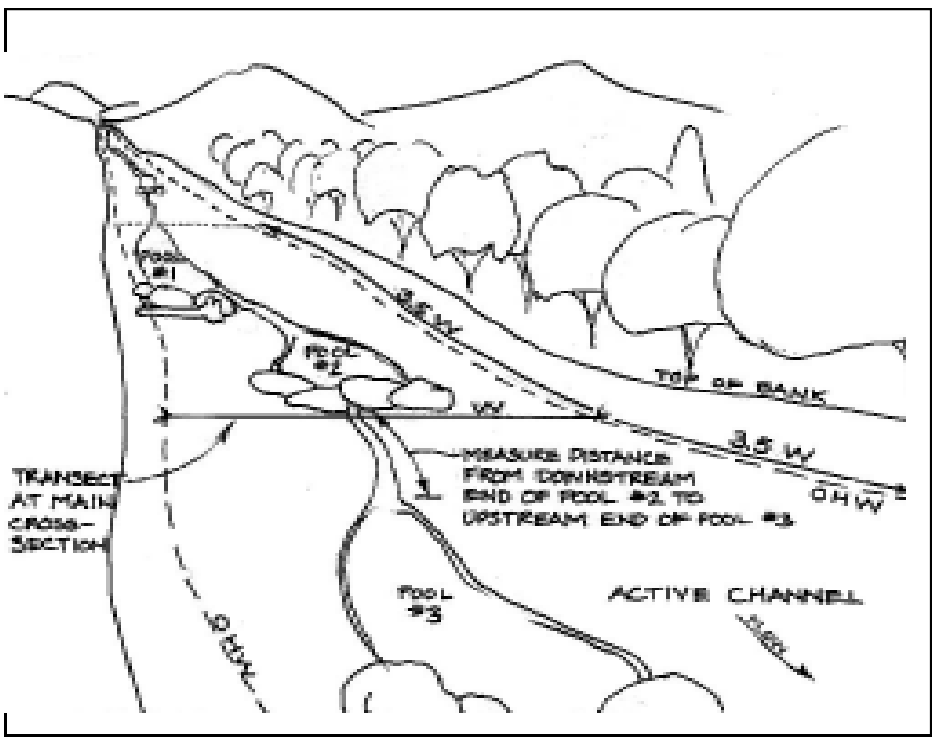
In the event that there is very low to no flow of water in the stream, you must use the technique of "visualizing" or "projecting" residual pools > 10 ft^2 in area and > 0.5 ft deep (at their deepest point) that would exist at low flow or base flow conditions. This requires practice in observation and use of field indicators of ponding in drying or dried depressions. During your practice using HGM, calibrate your observations of residual pools at several stages of discharge to low-flow or base flow conditions. Reliable field indicators of ponding include, but are not limited to, cracked soils, stained leaves, accumulated wrack in the pools and at their downstream ends, *etc.*). At moderate and certainly at high flow conditions, the residual pool measurements will be nearly impossible to complete. If possible, return to the VAA at lower flow conditions to complete your measurements. If a return is impossible, estimate the number of residual pools and annotate your estimate, citing flow conditions at the time of measurement.

Data Located in Appendix B-1 through B-12

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Scaling Rationale The Authors scaled $V_{RESIDPOOL}$ using a combination of reference data, field observations, and best scientific judgment. Throughout the reference domain and within all three subclasses, the Authors observed that both the number of residual pools within the VAA (density) and the average distance between residual pools within the VAA (frequency) varied greatly and in close association with the degree of human activity in and adjacent to the stream ecosystem (Tables 5.17, 5.18, and, 5.19). For example, the effects of anthropogenic perturbation are demonstrated well by dramatic decreases in the number of pools, and increases in distance between pools in the Low gradient subclass (Table 5.19). Five examples of the kinds of anthropogenic activities that influence the density and frequency of residual pools include residential and/or commercial developments, clearing of riparian vegetation, construction of debris basins, channel straightening, and lining of channels with rip-rap or concrete.

Figure 5.13 Measurement protocol for the residual pool variable ($V_{RESIDPOOL}$)



Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Residual Pool
Without Water
Carpinteria Creek

Residual Pool
With Water
Cold Springs Creek

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Table 5.17 Mean, standard deviation, and range of the number and average distance between of residual pools in the High Gradient subclass

Disturbance Gradient	Sample Size	# of Residual Pools in VAA (Mean, SD, Range)	Ave. Distance Between Pools (Mean, SD, Range)
Unaltered / Reference Standard	3	12.7 ± 8 (3 to 18)	25.7 ± 9.5 (19 to 37)
Minimally Altered	2	5 (4 to 6)	33.1 (26 to 40)
Moderately Altered	0	N/A	N/A
Extensively Altered	0	N/A	N/A
Unrecoverable	0	N/A	N/A

Table 5.18 Mean, standard deviation, and range of the number and average distance between of residual pools in the Moderate Gradient subclass

Disturbance Gradient	Sample Size	# of Residual Pools in VAA (Mean, SD, Range)	Ave. Distance Between Pools (Mean, SD, Range)
Unaltered / Reference Standard	1	17	18
Minimally Altered	8	6.9 ± 3 (4 to 11)	29 ± 7 (23 to 45)
Moderately Altered	16	5.8 ± 3 (1 to 11)	37 ± 18 (12 to 74)
Extensively Altered	8	2 ± 2 (0 to 4)	43 ± 8 (36 to 54)
Unrecoverable	0	NA	NA

Table 5.19 Mean, standard deviation, and range of the number and average distance between of residual pools in the Low Gradient subclass

Disturbance Gradient	Sample Size	# of Residual Pools in VAA (Mean, SD, Range)	Ave. Distance Between Pools (Mean, SD, Range)
Unaltered / Reference Standard	0	NA	NA
Minimally Altered	2	4.5 (4 to 5)	35.8 (21 to 50)
Moderately Altered	3	5.3 ± 2 (4 to 7)	59 ± 20 (45 to 73)
Extensively Altered	12	1.7 ± 1.9 (0 to 7)	99.5 ± 114 (19 to 180)
Unrecoverable	2	0	0

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Scaling for the High gradient subclass

MEASUREMENT CONDITION FOR $V_{RESIDPOOL}$	INDEX
a. Number of residual pools in the VAA is ≥ 12 and the average distance between them is ≤ 30 ft **and** b. No evidence of human alteration of the residual pools.	1.00
a. Number of residual pools in the VAA is ≥ 12 and the average distance between them is > 30 ft but ≤ 150 ft, **and** b. Some evidence of human alteration of the residual pools(*e.g.* stacking of rocks for swimming or for minor and temporary enhancement of fish habitat; informal hiking trails among pools, *etc.*) is observable.	0.75
a. Number of residual pools in the VAA is ≥ 5 but < 12 and the average distance between them is ≤ 50 ft **and** b. Evidence of human alteration of the residual pools via manipulation of the channel bed or banks (*e.g.* some channel straightening, clearing or smoothing of the channel banks for vegetation control) is observable.	0.50
a. Number of residual pools in the VAA is ≥ 5 but < 12 and the average distance between them is > 50 ft but ≤ 150 ft **and** b. Evidence of human alteration of the residual pools via manipulation of the channel bed or banks (*e.g.* some channel straightening or installation of non-hardened rip-rap in the channel bed or on channel banks; in-channel grade control structures, post and pole bank control structures, *etc.*) is observable.	0.25
a. Number of residual pools in the VAA is ≤ 4 or the average distance between pools is > 150 ft **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.*, channel bed graded to remove vegetation; vegetation cleared and channel bed and banks trampled due to heavy grazing by domestic livestock; channel straightened, but not hardened for developed park, crop or orchard production, urban or suburban development).	0.10
a. Number of residual pools in the VAA is ≤ 4 or the average distance between pools is > 150 ft **and** b. Variable is neither recoverable nor sustainable to reference standard conditions through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.,* concrete trapezoidal channels, hardened rip-rap on both channel banks and hardened channel bottom, parking lot in channel, box culvert throughout VAA, road throughout VAA, *etc.)*.	0.00

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Scaling for the Moderate gradient subclass

MEASUREMENT CONDITION FOR $V_{RESIDPOOL}$	INDEX
a. Number of residual pools in the VAA is ≥ 10 and the average distance between them is ≤ 50 ft, **and** b. No evidence of human alteration of the residual pools.	1.00
a. Number of residual pools in the VAA is ≥ 10 and the average distance between them is > 50 ft but ≤ 150 ft **and** b. Some evidence of human alteration of the residual pools (*e.g.* stacking of rocks for swimming or for minor and temporary enhancement of fish habitat; informal hiking trails among pools, *etc.*) is observable.	0.75
a. Number of residual pools in the VAA is ≥ 2 but < 10 **and** b. Average distance between them is ≤ 50 ft (*e.g.* some channel straightening, clearing or smoothing of the channel banks for vegetation control).	0.50
a. Number of residual pools in the VAA is ≥ 2 but < 10 **and** b. Average distance between them is > 50 ft but ≤ 150 ft (*e.g.* some channel straightening or installation of non-hardened rip-rap in the channel bed or on channel banks; in-channel grade control structures, post and pole bank control structures, *etc.*)	0.25
a. Number of residual pools in the VAA is < 2 or the average distance between pools is > 150 ft **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.*, channel bed graded to remove vegetation; vegetation cleared and channel bed and banks trampled due to heavy grazing by domestic livestock; channel straightened, but not hardened for developed park, crop or orchard production, urban or suburban development).	0.10
a. Number of residual pools in the VAA is < 2 or the average distance between pools is > 150 ft **and** b. Variable is neither recoverable nor sustainable to reference standard conditions through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.,* concrete trapezoidal channels, hardened rip-rap on both channel banks and hardened channel bottom, parking lot in channel, box culvert throughout VAA, road throughout VAA, *etc.*)	0.00

Variable: RESIDUAL POOL ($V_{RESIDPOOL}$)

Scaling for the Low gradient subclass

MEASUREMENT CONDITION FOR $V_{RESIDPOOL}$	INDEX
a. Number of residual pools in the VAA is $\geq$ 5 **and** b. Average distance between them is $\leq$ 50 ft, and there is no evidence of human alteration of the residual pools.	1.00
a. Number of residual pools in the VAA is $\geq$ 5 and the average distance between them is > 50 ft but $\leq$ 150 ft **and** b. Some evidence of human alteration of the residual pools (*e.g.* stacking of rocks for swimming or for minor and temporary enhancement of fish habitat; informal hiking trails among pools, *etc.*) is observable.	0.75
a. Number of residual pools in the VAA is $\geq$ 2 but < 5 **and** b. Average distance between them is $\leq$ 50 ft (*e.g.* some channel straightening, clearing or smoothing of the channel banks for vegetation control).	0.50
a. Number of residual pools in the VAA is $\geq$ 2 but < 5 **and** b. Average distance between them is > 50 ft but $\leq$ 150 ft (*e.g.* some channel straightening or installation of non-hardened rip-rap in the channel bed or on channel banks; in-channel grade control structures, post and pole bank control structures, *etc.*)	0.25
a. Number of residual pools in the VAA is < 2 or the average distance between pools is > 150 ft **and** b. Variable is recoverable to reference standard conditions and sustainable through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.*, channel bed graded to remove vegetation; vegetation cleared and channel bed and banks trampled due to heavy grazing by domestic livestock; channel straightened, but not hardened for developed park, crop or orchard production, urban or suburban development).	0.10
a. Number of residual pools in the VAA is < 2 or the average distance between pools is > 150 ft **and** b. Variable is neither recoverable nor sustainable to reference standard conditions through natural processes if the existing land use is discontinued and no restoration measures are applied (*e.g.,* concrete trapezoidal channels, hardened rip-rap on both channel banks and hardened channel bottom, parking lot in channel, box culvert throughout VAA, road throughout VAA, *etc.*).	0.00

Confidence The Authors' confidence that reasonable logic and/or data support the variable scaling is HIGH for all subclasses.

SEDIMENT DEPOSITION (V_{SED})

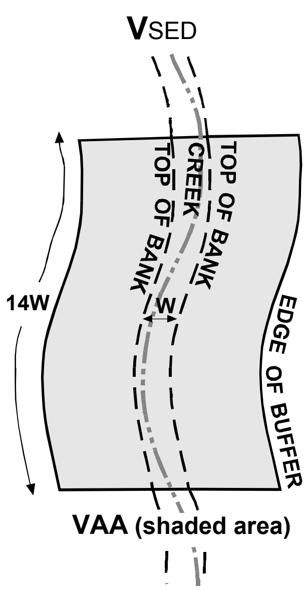
Definition

Sediment Deposition refers to the sources and amount of sediment delivery and deposition to waters/wetlands from upgradient landscape positions.

Rationale for Selection of the Variable

SCSBC stream ecosystems characteristically convey large amounts of sediment. However, human activities often result in impacts on the sources and/or the timing, rate, and amount of sediment delivery and deposition to riverine waters/wetlands (*i.e.,* significant increases or decreases over reference standard conditions). Human induced changes in the sediment dynamics of riverine ecosystems usually have negative impacts on all classes of ecosystem functions (*i.e.,* hydrologic, geochemical, plant community and faunal support/habitat functions)(Ward & Standford 1979). For example, alteration of channel geometry and hydraulic roughness due to either accelerated rates of sediment deposition, or elimination of sediment (*e.g.,* installation of debris basins) can inhibit or enhance conveyance of flood flows. Similarly, sediment accumulations from upgradient, developed source areas (*e.g.,* avocado production areas on steep unvegetated slopes, "can yards" for the cut flower industry) can be the mechanism by which riverine ecosystems and downstream ecosystems (*e.g.,* estuaries and beaches) are chronically loaded with nutrients, organic matter, or contaminants. Too much or too little sediment moving through riverine ecosystems can have large effects on the productivity and diversity of *in situ* faunal communities (Platts & Megahan 1975, Bestcha & Platts 1986) and on downstream faunal communities that depend on maintenance of the integrity of upstream habitats and food webs.

Measurement Protocol



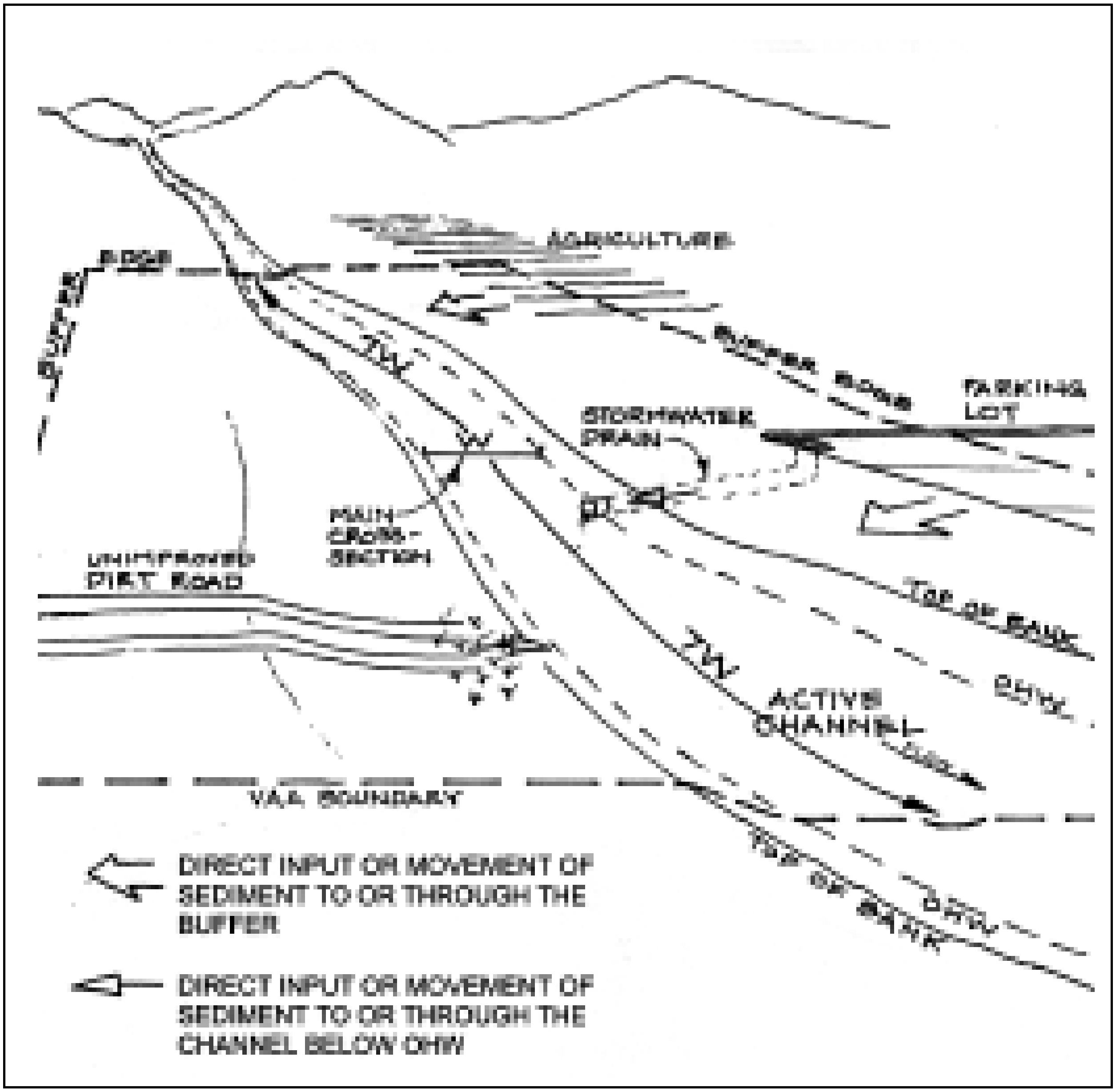
The VAA for V_{SED} consists of two transects: one upstream and one downstream. These transects originate at the PAA cross section. Their length is seven times the OHW cross section width. Thus, you will walk a total distance of fourteen times the OHW cross section width. The width of the VAA for V_{SED} (*i.e.*, the zone wherein you will look for V_{SED} field indicators) is from the outer edge of the Santa Barbara County required buffer or setback on stream left, to the outer edge of the Santa Barbara County required buffer or setback on stream right.

To develop a measurement for $V_{SED,}$ walk upstream and downstream within the VAA. During this walk, identify and count the number and type of natural and/or anthropogenic sources of sediment delivery or accumulation within the VAA (Figure 5.14). Note especially, direct input, accumulation, or movement of sediment to or through the stream channel system below OHW, or (b) direct input, accumulation, or movement of sediment to or through the County "setback" or buffer. Examples of anthropogenic sources of disturbance that may impact sediment inputs into the stream channel and/or buffer areas are clearing of vegetation, grading and/or dredging of the channel bed, recreational trails and/or dirt roads, public roads and other impervious surfaces such as

Variable: SEDIMENT DEPOSITION (V_{SED})

parking lots, agriculture, construction activities without the proper sediment and erosion control measures, *etc.* In addition, reference Table 5.13 for all streams within the SCSBC that have an engineered structure (*i.e.,* debris basins, grade control structures) in their upper reaches that impact the level of sediment input downstream.

Figure 5.14 Measurement protocol for the sediment variable (V_{SED})



Variable: SEDIMENT DEPOSITION (V_{SED})

Data Located in Appendix B-13 through B-20

Scaling Rationale The Authors scaled V_{SED} using a combination of reference data, field observations, and best scientific judgment. After review of the reference system data, pertinent literature, and the Authors' field observations, the Authors chose to group High, Moderate and Low gradient subclasses for the scaling of V_{SED}. This decision was based mostly on (a) the Authors' recognition of clear trends in the reference system data collected for all three subclasses, and (b) the Authors' observations of the relatively consistent effects of human activities on sediment delivery and accumulation throughout the reference domain.

During the field work for this project, the Authors observed dramatic human induced increases in the rate and amount of sediment delivery and accumulation in SCSBC stream channels, riparian zones, and setbacks. Examples include clearing of vegetation for flood or weed control, heavy grazing by domestic livestock, crop production, development of moderately dense to dense commercial space and/or residential housing, road construction, and avocado production on steep, unvegetated slopes. In addition, on the SCSBC, engineered, hardened structures (*i.e.,* debris basins, hardened grade control structures, weirs, dams, *etc.*) that are designed to either control flow or stop sediment movement altogether play an important role in altering sediment dynamics from reference standard conditions.

For the purposes of V_{SED} scaling, the Authors argue that (a) intact, native vegetation cover coupled with little to no human intrusion into the Santa Barbara County designated buffer, the riparian zone, or the stream channel represents the reference standard condition, and (b) either too much or too little human induced sediment delivery or accumulation to the setback, riparian zone or stream channel represents significant departure from reference standard conditions.

Confidence The Authors' confidence that reasonable logic and/or data support scaling is HIGH for all subclasses.

Variable: SEDIMENT DEPOSITION (V_{SED})

Scaling for High, Moderate, and Low Gradient Subclasses

MEASUREMENT CONDITION FOR V_{SED}	INDEX
Sources and/or amount of sediment delivery and deposition into waters/wetlands and into associated county setbacks (buffers) within the VAA is unaltered by human activities.	1.00
Sources and/or amount of sediment delivery and deposition into waters/wetlands and into associated county setbacks (buffers) within the VAA is currently unaltered by limited human activities (*e.g.,* light livestock grazing; very low density [Ag 100 county zoning] housing, small, paved roads, *etc.*)	0.75
Sources and/or amount of sediment delivery and deposition into waters/wetlands and into associated county setbacks (buffers) within the VAA is altered by human activities (*e.g.* clearing of vegetation, well managed agriculture with "best management practices" in place and maintained; hiking trails; low density housing - RR 5 county zoning).	0.50
a Direct observation of **input** of sediment to water/wetland portions of the VAA from up gradient sources, **or** b Sources and/or amount of sediment delivery and deposition into waters/wetlands and into associated county setbacks (buffers) within the VAA are significantly altered by human activities (*e.g.,* extensive clearing of vegetation; high intensity and poorly manage agriculture with no "best management practices" in place; construction activities; grading or dredging; unpaved roads; suburban housing densities at 1 house/acre, *etc.*)	0.25
a Direct observation of **accumulation** of sediment in the water/wetland portions of the VAA from up gradient sources, **or** b Sources and/or amount of sediment delivery and deposition into waters/wetlands and into associated County setbacks (buffers) within the VAA are significantly altered by either: 1 Filling of the channel bed and/or bank with engineered, hardened, impervious materials (*e.g.* concrete trapezoids, weirs, grade control structures, housing densities of 4 houses/acre, *etc.*), **or** 2 Prevention of sediment movement to the VAA through the use of structures (*e.g.,* sediment accumulations behind post and wire structures), **and** c The variable is recoverable to reference standard conditions and sustainable through natural processes, if the existing land use is discontinued and no restoration measures are applied.	0.10
a Sources and/or the amount of sediment delivery and deposition into waters/wetlands within the VAA are significantly altered due to the presence of hardened engineered structures (within the VAA and/or up or down gradient) that are specifically designed and maintained to alter and permanently control the amount and rate of sediment delivery to or through the VAA (*e.g.* debris basins), **and** b Variable is not recoverable to reference standard conditions and not sustainable through natural processes, if the existing land use is discontinued and no restoration measures are applied.	0.00

SHADE OVER THE STREAM CHANNEL (V_{SHADE})

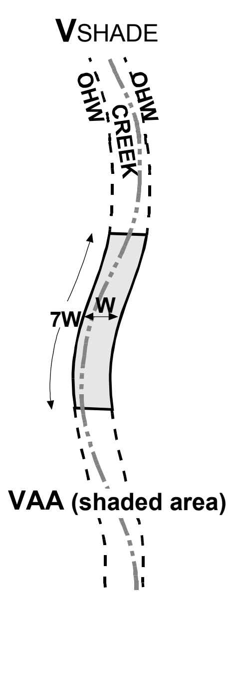
Definition

Shade Over the Stream Channel refers to tree, shrub and undergrowth vegetation canopy cover overhanging the active stream channel.

Rationale for Selection of the Variable

Trees, shrubs, and undergrowth vegetation that overhangs the stream channel and casts shade below OHW have been shown to have important influences on a wide range of riparian ecosystem processes. The presence or absence of riparian shade has particularly important influences on: (1) stream water temperatures, (2) the quality and quantity of food and cover resources available for vertebrate and invertebrate faunal species, and (3) riparian microclimatic conditions (Gregory *et al*. 1991). For example, regulation of stream water temperatures by riparian tree, shrub and undergrowth canopy shade is important to the maintenance of dissolved oxygen in stream water, and thus to maintenance of aquatic and semi-aquatic vertebrate and invertebrate faunal assemblages. Specifically, it has been shown that dramatic fluctuations in diurnal water temperature (and thus dissolved oxygen content) can have deleterious short and long term effects on essential components of a aquatic and semi-aquatic species' life cycles (incubation of eggs and/or larvae). Vegetation that overhangs stream channels provides direct inputs of organic matter to the stream ecosystem, and thus to aquatic food webs (Bestcha & Platts 1986, Gregory *et al.* 1991). The presence or absence of riparian shade can have significant influences on (a) the movement of faunal species within or to and from riparian zones, and/or (b) species use of riparian habitat for feeding, escape, reproductive, and thermal cover.

Measurement Protocol



The VAA for V_{SHADE} consists of a channel reach length that is seven times (7X) the OHW channel width at the PAA cross section. The VAA is centered on the PAA cross section so that 3.5 OHW channel widths are upstream, and 3.5 OHW channel widths are downstream from the main PAA cross section. The width of the VAA extends from OHW on stream right to OHW on stream left.

To develop a measure for $V_{SHADE,}$ begin at the PAA cross sectin. Look upstream on stream right a total distance of 3.5 times the OHW channel width. Identify the OHW mark along this reach. Make an ocular estimate of the average percent canopy cover of trees and shrubs that are overhanging the channel below OHW using the standard canopy midpoint cover classes provided in Appendix E. Along the same reach (upstream - stream right), measure the average perpendicular distance of tree, shrub, and undergrowth canopy overhang from OHW towards the center of the channel within the upstream channel reach (Figure 5.15). Record the canopy cover estimate and overhang distance measure on the Minimum Submittal Worksheet provided in Chapter 7. The same set of measurements should be made for (a) upstream stream left, (b) downstream stream left, and (c) downstream stream right. You will thus have a total of four sets of measurements. Using these four sets of measurements,