

Watershed Management Council Networker

Advancing the art and science of watershed management

Summer 1999

Volume 8 No. 4

Aquatic Habitat and Watershed Approaches

Rick Kattelman
Guest Editor

Conservation of fish and other water-borne critters has been a critical driving force in many of our watershed-based efforts. Maintenance and enhancement of aquatic habitat is usually one of the main rationales (along with water quality and soil conservation) for "watershed work". Fisheries biologists are often the primary partners of hydrologists and soil scientists on interdisciplinary teams within land-management agencies. Until recently, these associations have generally been implicit (but obvious to the professionals) rather than explicit (and known to administrators and the public). In the past decade, aquatic conservation programs have become more holistic and wide-ranging. Declines of many aquatic species have been widely recognized as consequences of habitat degradation, and that degradation has been increasingly recognized as a cumulative result of human disturbances within, adjacent to, and upslope from a stream and its tributaries. Thus, river basins and watersheds have become part of the essential framework of many of these recent and current efforts. This issue of the Networker provides a cursory overview of a few of the high-profile species-recovery and habitat-conservation programs that use a watershed approach and are making news in 1999.

In the Pacific Northwest, the March listing of eight species of salmon and steelhead as threatened and one as endangered brought a long-simmering watershed-and-aquatic-habitat issue to network newscasts and national magazines. The complex relationships between landscape degradation, water management, and endangered species as well as a host of other associated issues are becoming more common topics of conversation in the affected region. In the Colorado River basin, efforts at recovery of four endangered species of fish may produce major changes in reservoir operations and land management. A systematic review of options for restoring the habitat of these fish is underway throughout the Upper Colorado River basin. In northern California, a joint state-federal purchase of a red

What Can Thalweg Profiles Tell Us?

A Case Study from Redwood Creek, California

Mary Ann Madej
USGS-BRD Redwood Field Station, Arcata, California

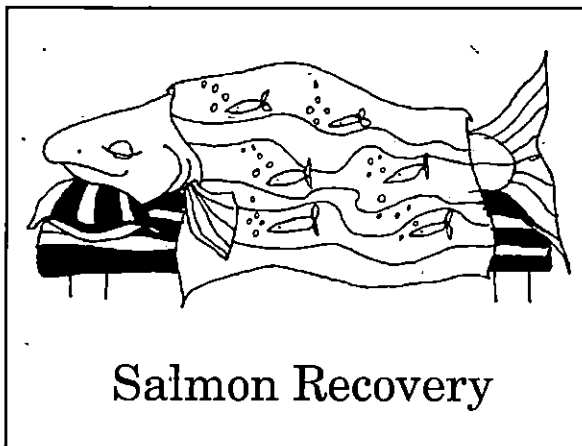
In recent years, many land management and regulatory agencies have searched for various indices of stream health, which can be used to assess watershed conditions. The Environmental Protection Agency, through its Water Quality Attainment Strategy and Implementation Plan (commonly known as the Total Maximum Daily Load, or TMDL process) is required to use in-stream targets to evaluate the status of sediment and temperature-impaired watersheds. The use of in-stream targets is confounded by the lag time between hillslope erosion and channel response, as well as the history of disturbance in a watershed. However, in-stream measurements can be used as a trend monitoring tool to show changes in streambed conditions through time. Redwood National and State Parks and the U.S. Geological Survey have been evaluating the

usefulness of several in-stream measurements to describe and quantify stream channel changes, based on monitoring started in the early 1970s. This article will focus on our results of using thalweg profiles to document changes in river conditions.

Disturbances such as major floods and large sediment inputs can modify channel bed topography, and so influence aquatic habitat. In gravel-bed rivers, low gradient (<2%) reaches commonly display a pool-riffle morphology, and disturbances can decrease the size and frequency of deep pools. Following the introduction of large sediment

loads, a river channel will adjust and evolve. The trajectories and timing of this adjustment ("recovery") are of interest to both geomorphologists and aquatic ecologists. Disturbances in riffle-pool channels which result in aggradation lead to more extensive riffles; smaller, shallower pools; and finer textures of the bed material (Lisle, 1982; Jackson and Beschta, 1984).

Several methods of quantifying longitudinal channel bed patterns, especially the presence of pools, have been developed in previous research. A frequently used technique in the United States to determine the distribution of pools is "habitat typing"



Salmon Recovery

What Can Thalweg Profiles Tell Us? A Case Study from Redwood Creek

Continued from page 1

in which an observer walks the channel with a tape and measures the length of pools, riffles and other features. There are several problems with habitat typing, including high operator variability, lack of replicability, and discharge dependency. Hogan and Church (1989) suggested, instead, using depth and velocity distributions across the entire channel area for more complete habitat assessment; however, these distributions will change with increasing discharge, and are difficult to measure for high flows.

Peterson et al. (1992) attempted to set target conditions for pool frequency, but they admitted that criteria used to define pools varied considerably among studies used in their analysis. Another method that has been used is to determine the best fit regression line of the thalweg profile survey points, compute the residuals from that regression, and use the sum of residuals as an indication of channel roughness. In forested, mountain regions, log jams or bedrock can form major irregularities in a thalweg profile, which violates the assumption that the channel bed can be characterized by a linear relationship. O'Neill and Abrahams (1984) show why this method may not accurately define pools because of channel bed nonlinearities, and suggested an objective method of determining pools. However, their method determines only numbers of pools and riffles, and it is still based on a single threshold measure of the deepest part of the pool.

The problem with these approaches is that they assume the pool is the only feature of interest in channel spatial structure, and that a pool can be objectively and consistently identified. In addition to pools, the degree of variation of channel bed elevations is an important component of aquatic habitat, which cannot be derived simply from an analysis of maximum pool depths. In practice, two pools with equal maximum depths may have very different bed morphologies and be formed by different fluvial processes.

To monitor pool depths independently of discharge, Lisle (1987) adapted the concept of residual water depths introduced by Bathurst (1981). A residual pool depth (d_r) is the depth of water in the pool below the elevation of the downstream riffle crest. This can be thought of as the water depth that would be present in the pool if there were no flow in the stream. Considering the distribution of residual water depths along the entire longitudinal profile, which incorporates all thalweg topography, would provide more useful information than an analysis of pools alone.

What is a Thalweg Profile?

A thalweg profile is constructed by surveying the elevation of the channel bed in a downstream direction along the deepest part of the channel. Typically, bed elevation, water surface elevation, bar height, and substrate size is recorded at each surveyed point, as well as comments on the local channel feature (pool, riffle, run, presence of large woody debris, etc.). Where possible, high water marks are also surveyed. In-stream points are surveyed at all breaks-in-slope, riffle crests, maximum pool depths, and tails of pools. It is essential that the spacing of survey shots be close enough to define the bed features of interest. The length of channel surveyed should be at least 20 channel widths long, and we usually survey a length of 30 to 40 channel widths. Channel distance is measured

down the centerline of the high flow channel. Different levels of precision have been used in various channel types, from hand levels and tapes in steep channels, to surveying with laser equipment in low gradient reaches. Surveys have been conducted at various time intervals as well. Ramos (1996) gives a detailed description of survey techniques to construct thalweg profiles.

What Do Thalweg Profiles Tell Us?

Longitudinal profiles have been used for years by geomorphologists to determine channel gradient in a stream reach. Stream gradient is an important variable in determining stream power and sediment transport relationships in streams. However, longitudinal profiles used to measure general channel gradient are not necessarily surveyed in enough detail to define channel bed topography and bedforms. In this paper the term 'thalweg profile' is used to distinguish between the two types of surveys. The thalweg profile can show the number of pools, depths of pools, pool-riffle spacing, and the spatial pattern of pool distribution. Successive thalweg profiles can document trends in aggradation or degradation. Thalweg profiles are also useful in combination with cross-sectional profiles or channel planform analysis to determine the vertical dimension of channel morphologic features.

The "bumpiness" of the thalweg profile can be used as an indicator of channel roughness. For example, in Redwood Creek, we observed that the channel bed was almost flat and featureless following an aggradational episode in 1975. Since that time bar forms and pools have developed as the channel reorganized its sediment load. The development of bed forms is most pronounced in reaches where the stream has degraded after 1975, but some increased pool development has occurred even in reaches that are still aggraded. These observations led to the development of a method to quantify these changes (Madej and Ozaki, 1994). The underlying assumption is that the increases in the variation of channel bed elevations increases the complexity of the aquatic habitat and the degree of channel roughness.

Field Area

The Redwood Creek watershed is located in the northern Coast Ranges of California. The Redwood Creek basin is underlain by rocks of the Franciscan Assemblage, mostly sandstones, mudstones and schist. Redwood Creek is a gravel-bedded river that drains 720 km², and the channel gradient ranges from 12 percent in the headwaters to 0.01 per cent in the lower reaches. The catchment receives an average of 2000 mm of precipitation annually, most of which falls as rain between October and March. Total basin relief is 1615 m, average hillslope gradient is 26 per cent. About 80 km of its 100 km length is characterized by a pool-riffle morphology. Most of its tributaries are steep (> 4%), but the four largest tributaries have low-gradient reaches with well developed pool-riffle morphology as well. Two tributaries, Lost Man and Bridge Creeks, are included in this study.

Following a 25-year flood in 1975, the channel beds of Redwood Creek and Bridge Creek were almost flat and featureless in

many areas. Between 1977 and 1997 longitudinal thalweg profiles of several reaches of Redwood Creek and its tributary Bridge Creek were surveyed several times to determine the changes in pool distribution and depths following the sedimentation events. The depth and frequency of pools in Redwood Creek increased from 1977 to 1995 (Madej, 1996; Madej and Ozaki, 1996), and pools are presently spaced at three channel widths apart in most of the study reaches. Channel cross-sectional changes have also been monitored, which have shown patterns of bank erosion, aggradation and subsequent degradation (Madej and Ozaki, 1996). From 1977 to 1996, no flow exceeded a five-year recurrence interval, and channel changes were moderate. In 1997, a 12-year flood occurred, initiating many debris flows that contributed large volumes of sediment to the rivers and renewed aggradation in several areas.

Study reaches were chosen to represent a range of channel conditions and types. Three reaches of Redwood Creek, three in Bridge Creek, and one in Lost Man Creek were analyzed in the present study. Upstream reaches of Redwood Creek aggraded after the 1975 flood, and have subsequently degraded (Madej and Ozaki, 1996). Redwood Creek at Weir Creek represents this degrading section of river, and has degraded 1.2 to 1.6 m since 1977, with localized 0.2 m of aggradation following the 1997 flood (Ozaki and Jones, Redwood National Park, personal communication). Farther downstream, Redwood Creek at Bond Creek and Redwood Creek at Elam Creek are two reaches that aggraded 0.4 m to 0.9 m from 1975 to 1986, and subsequently degraded from 0.1 to 0.6 m from 1986 to 1995 (Madej and Ozaki, 1996). Much of the channel length in this part of the basin aggraded slightly (0.1 m) after the 1997 flood.

Three reaches of Bridge Creek are also analyzed. Bridge Creek is a gravel-bed stream draining 30 km². The reaches range in gradient from 1.1 to 1.7 percent. In 1954 and 1971 large woody debris was removed from the channel of Bridge Creek to salvage merchantable timber (Klein et al., 1987). Since 1971, the input of new large woody debris has been limited and, due to the extensive harvesting of streamside trees, the present debris loading is lower than it would be under pristine conditions. Upper Bridge Creek received high sediment inputs in 1975 (as detected from aerial photographs and field observations), but longitudinal profile surveys were not conducted until 1986. Cross section monitoring showed that by 1986 much sediment had been transported out of the upper reach and only 0.2 m of degradation occurred between 1986 and 1995. In 1997 a debris flow delivered 13,000 m³ to the channel upstream of the upper surveyed reach and the channel aggraded locally.

A narrow canyon, in which large woody debris, boulders and bedrock outcrops are common, separates the upper and lower reaches of Bridge Creek. In Lower Bridge Creek the channel degraded two metres between 1975 and 1986, but the rate of downcutting had decreased to 0.1 m by 1996. In 1986 woody debris loading was low in Lower Bridge Creek, but landslides from the 1997 flood contributed many new pieces of woody debris to this reach.

Lost Man Creek drains an area of 20 km², and has a channel gradient of 0.7 percent. The basin underwent timber harvesting and road construction in the 1950s and 1960s, but has not experienced land use disturbances since then. This stream is used as a point of comparison with other study reaches.

Field Methods

Three to five sets of surveys document the development of channel bed pattern, especially pools and riffles, in many sections of the channel network during two decades after the 1975 flood (1977 to 1997). A longitudinal thalweg profile of the downstream-most 22 km of Redwood Creek was surveyed by the U.S. Geological Survey in the summer of 1977. The author resurveyed selected reaches of this area in 1983, 1986, 1995 and 1997. Surveys in Bridge Creek were conducted by Klein and others (1987) in 1986, and by the author in 1995 and 1997. Survey transects began and ended at riffle crests and survey distances were measured along the centerline of the high-flow channel. Elevations of the thalweg and water surface were surveyed with an automatic level and stadia rod, or electronic distance meter and target. The spacing of survey points averaged 15 m in Redwood Creek and 4 m in Bridge Creek. In Redwood Creek, surveyors used staff plates at three gaging stations and twenty permanent bench marks established for channel cross-sectional monitoring as a control on survey accuracy. The total error in elevation between the surveys was less than 0.2% (0.08 m). The length of each survey transect was 20 to 55 channel widths (400 to 2500 m long, depending on the stream reach).

Analysis

For each thalweg survey, a distribution of residual water depths was calculated. First, bed elevations between survey points were linearly interpolated (at a 5 m spacing for Redwood Creek and a 3-m spacing for Bridge and Lost Man Creeks) to obtain a common base from which to compare profiles for different years. Because channel widths vary from 60 to 110 m in Redwood Creek, and 12 to 23 m in the tributaries, this spacing of points defined all but the finest features of longitudinal bed topography. A computer program was written to plot the profiles, convert the surveys into standardized data sets, calculate the distribution, mean and standard deviation of residual water depths, and compute the percent of channel length occupied by riffles (i.e., point on the channel bed having a residual depth = 0). Figure 1 shows an example of a surveyed thalweg profile (a) and the transformation of the profile data into a set of residual water depths (b). Variability in bed elevations was evaluated using the standard deviations of residual water depth for each study reach. To test for differences in the means, medians, and distributions of successive thalweg profiles, the t-test, Mann-Whitney test, and Kolmogorov-Smirnov test were used, respectively, on the sets of residual water depths.

In addition to the depths of pools, the spatial distribution of pools and riffles is also of ecological and geomorphological interest, and the above measures do not contain information on the spatial ordering of the fluvial system. Spatial statistics are an objective technique to look for channel structures, such as pools or bar units. To analyze the spatial pattern of pool distribution and channel bed elevations, residual water depths were analyzed by the use of a spatial autocorrelation coefficient (Moran's I). The relationship of pool frequency to large woody debris loading, bedrock outcrops, etc. can also be explored. A discussion of spatial statistics is beyond the scope of this paper, but results using Redwood Creek data do show the development of regularly spaced bedforms following disturbance (Madej, in press), but with significant differences in streams with high woody debris loading.

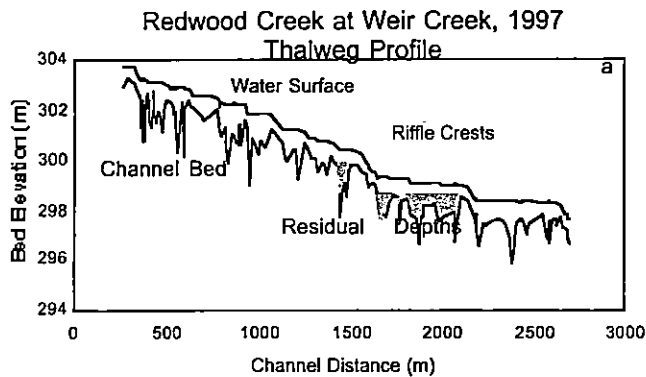


Figure 1: Examples of a longitudinal thalweg profile plot (a) showing how residual water depths are calculated, and the corresponding residual water depth plot (b) for Redwood Creek at Weir Creek.

Results

Figure 2 is a typical box-and-whisker plot of residual water depths in Redwood Creek. In all study reaches of Redwood Creek, the mean water depth was low immediately following the 1975 flood, and mean and maximum depths increased, until 1995. After the flood of 1997, mean and maximum residual water depths decreased to approximately 1983 levels. Although the mean residual depths were not significantly different between some surveys, distributions for all reaches are significantly different from one another (Kolmogorov-Smirnov test, 95% confidence levels). A consideration of the entire distribution of residual water depths may thus give a more detailed picture of trends in the channel bed status than just the means and maxima alone.

Figure 3 is a plot of mean residual depth of the study reaches over the period 1977 to 1997. Mean depth increased rapidly from 1977 to 1986, but the rate of change has been moderate since 1986. Mean residual depths in all study reaches decreased slightly after the 1997 flood (recurrence interval = 12 years). A reduction in residual water depth is consistent with the finding of increases in fine bed material in pools (V_s) in high sediment load streams (Lisle and Hilton, 1992).

Figure 4 shows the percent of channel length classified as riffle (residual depth = 0) in all study reaches. Trends in percent riffle are the inverse of those in residual depths: the percent of

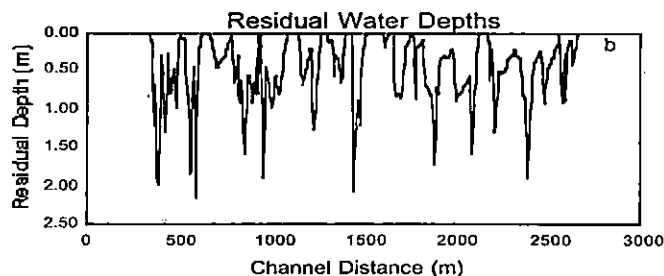


Figure 2: Box plots of residual water depths for 'Redwood Creek at Weir Creek' study reach for the period 1977 to 1997. The upper and lower lines of the box are the 75 and 25 percentiles of the residual water depth distribution, the notches and centerline show the median values, and the "*" sign is the mean of the distribution. Values that fall beyond the whiskers, but within three interquartile ranges are plotted as individual points (outliers).

channel length occupied by riffles decreased in the years following the 1975 flood, until 1997 when the percent increased again slightly.

The variance of bed elevations was evaluated by using the standard deviation of the population of residual water depths (Figure 5). The underlying assumption is that increased variance in bed elevations reflects increased morphologic diversity in the channel bed. In Redwood Creek, standard deviations increased rapidly in the 10 years following the 1975 flood. Since the mid-1980s, standard deviations have increased only slightly. This flattening of the curve may indicate a probable

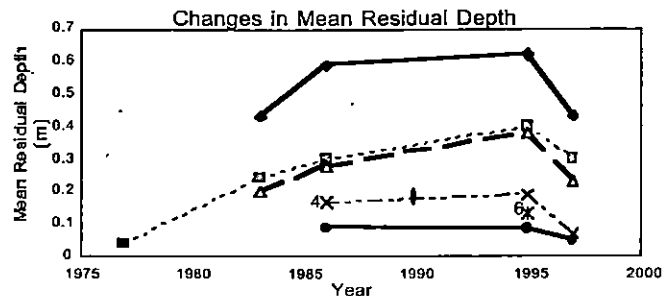


Figure 3: Mean residual water depth for each surveyed transect.

upper limit to the degree of bed variation that can develop in this river under the present sediment regime. The standard deviations decreased in all reaches after the 1997 flood, but none decreased to the 1977 level (immediately following the larger 1975 flood).

If one wants to compare measurements over a range of stream sizes, a standard index is needed. The commonly used statistic of coefficient of variation $[(\text{standard deviation}/\text{mean}) * 100]$ did not show any obvious pattern except that the magnitude of

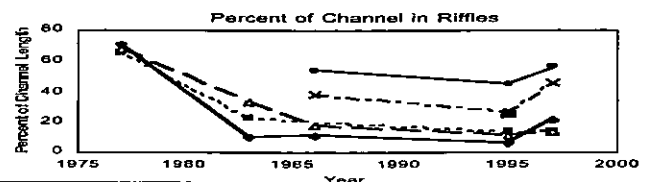
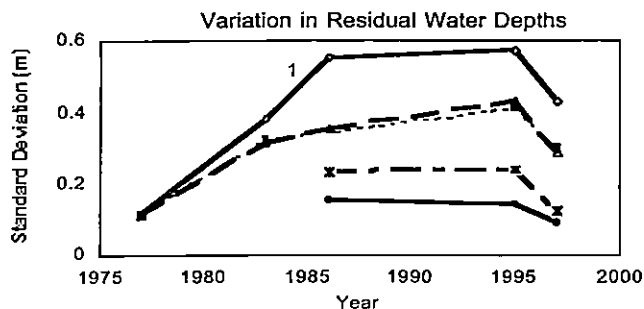


Figure 4: Percent of channel length classified as 'riffle' in the thalweg profile surveys. Riffles are defined as points where the residual water depth equals zero.

the standard deviation is frequently the same as the mean residual depth. Both mean residual depth and standard deviation change through time, but not necessarily at the same rate. As an alternative method, bankfull depth was used to normalize residual depths. Although bed topography was changing through time, the reach-averaged bankfull depth was consid-

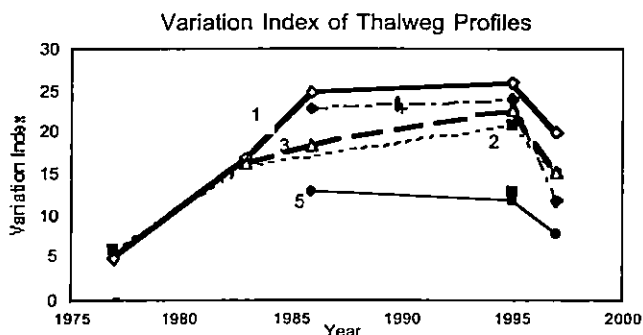


Legend

- 1 Redwood Creek at Weir Creek
- 2 Redwood Creek at Bond Creek
- 3 Redwood Creek at Elam Creek
- 4 Upper Bridge Creek
- 5 Lower Bridge Creek
- 6 Bridge Creek Canyon
- 7 Lost Man Creek

Figure 5: Variation in residual water depths in the thalweg profile surveys. The standard deviation of the population of residual water depths is plotted against time for the individual reaches.

ered to be constant during this period. In some cases, bankfull indicators are not always obvious (Ramos, 1996), and a careful determination of bankfull depth is needed. Figure 6 shows this new variation index $[(\text{standard deviation}/\text{bankfull depth}) * 100]$. A general trend emerges in which index values are higher at sites with better habitat conditions. The stream reaches with the smallest amount of remaining flood deposits (Upper Bridge Creek, Redwood Creek near Weir Creek, and Lost Man Creek) all plot above a value of 20. The values for all surveyed reaches dropped after the 1997 flood.



Legend

- 1 Redwood Creek at Weir Creek
- 2 Redwood Creek at Bond Creek
- 3 Redwood Creek at Elam Creek
- 4 Upper Bridge Creek
- 5 Lower Bridge Creek
- 6 Bridge Creek Canyon
- 7 Lost Man Creek

Figure 6: Variation index for study reaches plotted against time. The variation index is defined as $[(\text{standard deviation of residual water depths}/\text{bankfull depth}) * 100]$.

Conclusions

Thalweg profiles are easy to survey, and can be used to show trends in the development of channel bed topography through time. An analysis of thalweg profiles in the Redwood Creek basin surveyed between 1977 and 1997 showed there were statistically significant differences in the distributions of residual water depths and the variation of channel bed eleva-

tions in streams impacted by high sediment loads. (Of course, more interdisciplinary work is necessary to evaluate if statistical significance of change is equivalent to biological significance). In the 22 years following the 1975 flood, mean residual water depth and variation of depths increased and the length of channel in riffles decreased. The method for analysis of thalweg profiles presented here provides an objective way of quantifying changes in channel bed topography in low gradient streams in north coastal California. Further work is needed to determine the applicability of this method in different channel systems.

If one wants to compare thalweg profile data from different streams, the survey results need to be normalized. For this purpose, a variation index was developed to compare the variation of residual water depths in streams of different sizes. Increased variation of residual water depths is indicative of increased spatial heterogeneity of the physical environment, which is assumed to contribute to increased diversity in biological communities. The variation index $[(\text{standard deviation of residual water depths}/\text{bankfull width}) * 100]$ was highest (> 20) in stream reaches with the least amount of remaining flood deposits. Results from the variation index on the study streams corresponded to field observations of improved fish habitat and shows promise as a trend monitoring tool to indicate more favorable stream habitat conditions. This index, like any in-channel measure, cannot by itself determine habitat quality, but must be used in conjunction with other information on watershed conditions.

An issue of concern in the Pacific Northwest regarding management of forested lands is the range of variability in natural systems. Variability in the magnitude and frequency of many processes has not been adequately quantified. The results of the present research provide a base upon which to compare variability of longitudinal profile patterns in different sized streams and in response to large floods and sediment loads. The method presented here is relatively easy to implement, yet can yield useful information for both biologists and geomorphologists.

Acknowledgements

Many people helped on the survey crews over the years, and I especially want to thank Randy Klein, David Best, Vicki Ozaki, Deadra Knox, Greg Gibbs, Julie Miller, Brian Adkins, Brian Barr, Natalie Cabrera, Anna Bloom and Tera Curren for the long, wet hours of surveying, and the longer, drier hours of data analysis. Dwain Goforth developed the computer software to analyze longitudinal thalweg surveys. I am grateful to Vicki Ozaki, Gordon Grant, Julia Jones and Tom Lisle for their insight and helpful comments on aspects of this study.

References

- Bathurst, J.C. 1981. 'Bar resistance of gravel-bed streams—Discussion', American Society of Civil Engineers Journal of the Hydraulics Division. HY10. 107, 1276-1278.
- Hogan, D. L. and M. Church. 1989. 'Hydraulic geometry in small, coastal streams: progress toward quantification of salmonid habitat', Canadian Journal of Fisheries and Aquatic Science 46, 844-852.
- Jackson, W. L. and R. L. Beschta. 1984. 'Influences of increased sand delivery on the morphology of sand and gravel channels', Water Resources Bulletin. 20:4, 527-533.

What Can Thalweg Profiles Tell Us? A Case Study from Redwood Creek

Continued from page 17

Klein, R., R. Sonnevill, and D. Short. 1987. Effects of woody debris removal on sediment storage in a northwest California Stream. p. 403-404 in *Erosion and Sedimentation in the Pacific Rim*. International Association of Hydrological Sciences Publication No. 165. Beschta, R. L., T. Blinn, G.E. Grant and F. J. Swanson, eds. 510 p.

Lisle, T.E. 1987. Using "Residual Depths" to monitor pool depths independently of discharge. USDA Pacific Southwest Forest and Range Experiment Station Research Note PSW-394. 4 p.

Lisle, T. E. 1982. 'Effects of aggradation and degradation on riffle-pool morphology in natural gravel channels, northwestern California'. *Water Resources Research*, 18:6, 1643-1651.

Lisle, T.T. and S. Hilton. 1992. The volume of fine sediment in pools: an index of sediment supply in gravel-bed streams. *Water Resources Bulletin* 28(2), 371-383.

Madej, M.A. 1996. Measures of stream recovery after watershed restoration. p. 47-56 in *Watershed Restoration Management: Physical, Chemical and Biological Considerations*. McDonnell, J.J., J. B. Stribling, L. R. Neville, and D. J. Leopold, eds. American Water Resources Association. Herndon, Virginia. 574 p.

Madej, M.A. and V. Ozaki. 1996. Channel response to sediment wave propagation and movement, Redwood Creek, California, USA, *Earth Surface Processes and Landforms*, 21, 911-927.

Madej, M.A. and V. Ozaki. 1994. Pool development and sediment loads, Redwood Creek, California. *EOS, Transactions, American Geophysical Union*. Vol. 75:44. p. 302-303.

O'Neill and A. D. Abrahams. 1984. Objective identification of pools and riffles. *Water Resources Research*. 20: 7: 921-926.

Peterson, N. P., A. Hendry, and T. P. Quinn. 1992. 'Assessment of cumulative effects on salmonid habitat: Some suggested parameters and target conditions.' *Timber Fish and Wildlife*. Center for Streamside Studies. University of Washington. Seattle. 75 p.

Ramos, C. 1996. Quantification of stream channel morphological features: Recommended procedures for use in watershed analysis and TFW ambient monitoring. Northwest Indian Fisheries Commission. TFW-AM9-96-006. 89 p. plus appendices.

disciplines and will likely be relevant to the research mandates of several federal agencies. Policy implications of scientific research are of course important, because public funding of research is based at least in part on the premise that there will be benefits to the public. However, because NSF is a science agency, its motivation is primarily scientific.

The study will identify and describe the few grand challenges that appear to have the greatest scientific importance and research potential with a clear effort to set priorities and to document the scientific reasons for its choices. A specific effort will be made to identify multidisciplinary approaches to identifying and researching the questions.

The anticipated result of the project is a report containing findings and recommendations regarding grand challenge research priorities in environmental sciences. The report will describe the criteria for identifying and describing a few major scientific questions, document the reasons for choosing them, and prioritize them in terms of research. More information is available at www.nas.edu/gces

USFS Committee of Scientists Report Released

Advice on National Forest policy from an independent scientific panel was released in March. The report, "Sustaining the People's Lands", suggests that sustainability—ecological and social—should be the first priority in managing Forest Service natural resources. Other general recommendations included conservation of critical species and habitats, greater use of science, more flexibility in forest plans, and consideration of greater geographic scope than individual forests when updating forest plans. The report provided several recommendations regarding watershed management: develop a strategy for conserving and restoring watersheds; maintain and restore the natural composition, structure, and processes of watersheds, including their flow regimes; provide conditions for the viability and native riparian and aquatic species; recognize watersheds in assessment and planning; develop an overall strategy for setting priorities for restoration and use; energize the people of the watershed to help provide stewardship; and monitor watershed conditions over time as part of adaptive management.

The team was appointed by the Secretary of Agriculture in December 1997. The group of 13 scientists held forums in each region of the country, gathering information from Forest Service employees, tribal representatives, members of state and local governments, other federal agencies and the public.

Although many of the recommendations are already Forest Service policy, the report will serve as the basis for new planning guidelines under the National Forest Management Act.

The full report is available at
www.fs.fed.us/news/science

Additional background information is available at
www.cof.orst.edu/org/scicomm

The May 1999 issue of the *Journal of Forestry* (volume 97, number 5) was devoted to articles about the Committee of Scientists report.

NRC Looking for Some Grand Ideas

The National Research Council (NRC) has been asked by the National Science Foundation (NSF) to identify grand challenges in the arena of environmental sciences. NSF places a high value on interdisciplinary and multidisciplinary approaches because it believes many interesting environmental problems transcend traditional science disciplines, although those disciplines are essential components of any research program. Therefore, the NSF is seeking advice from the scientific community on research initiatives and programs that would address scientific (not management) uncertainties in environmental science. These initiatives will likely involve researchers from a variety of