Scott River Watershed
Water Quality Compliance and Trend Monitoring Plan

Prepared by North Coast Regional Water Board Staff

Monitoring Objective

The overall objective of this monitoring plan is to provide a framework for collection of data that can be used to determine, on a watershed scale, if water quality standards are being met, and to track progress towards meeting water quality standards. The objectives of individual monitoring parameters are explained below.

Background

In September of 2006, the *Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads* (Action Plan) was incorporated into the *Water Quality Control Plan for the North Coast Region.* The Action Plan directs Regional Water Board staff to develop a compliance and trend monitoring plan for the Scott River watershed "to determine, on a watershed scale, if water quality standards are being met, and to track progress towards meeting water quality standards." The Action Plan also contains specific direction for Regional Water Board staff:

> "The plan shall include a description of monitoring objectives, parameters to monitor, procedures and techniques, locations of monitoring stations, frequency and duration, quality control and quality assurance protocols, data management procedures, data and analysis distribution procedures, benchmark conditions where available, measurable milestones, and specific due dates for monitoring and data analysis."

This *Scott River Watershed Water Quality Compliance and Trend Monitoring Plan* incorporates the required elements described above and satisfies the requirements of the Action Plan.

The term "compliance" has many meanings in the context of water quality regulation. In this case, compliance refers to compliance with water quality objectives, as set forth in the *Water Quality Control Plan for the North Coast Basin* (NCRWQCB, 2007). Use of the term in this plan is not in reference to compliance with permits, prohibitions, or other elements of the Action Plan (NCRWQCB, 2007).

Plan Organization

This plan documents Regional Water Board staff's recommendations to local watershed monitoring practitioners regarding a monitoring framework to achieve the objective stated above. Parameters describing both sediment and temperature related conditions are described. The specific objective, procedures and techniques, locations, frequency and duration, benchmark conditions, and measureable milestones are described for each parameter. These terms are defined in the table below.

Parameter	The title and description of the particular metric to be measured
Objective	A description of the specific objective of monitoring the parameter
Procedures and Techniques	A description of the specific methods, or references describing specific methods, to be used during data collection and analysis

Locations	Suggested locations for monitoring the specified parameters
Frequency and Duration	Suggested frequency and/or duration of measurements
Benchmark Conditions where available	A description of current conditions in the Scott River watershed for each parameter, where available
Measurable Milestones	A goal for the specified parameter and a target date for achievement of the goal

Re-evaluation
This plan is intended to be a living document periodically updated to reflect new understandings as they develop. The locations of data collection sites, milestones, data collection frequency, and data collection procedures and techniques should be revised when new information (e.g., scientific literature, results of other monitoring programs, data collected pursuant to this plan, groundwater study findings, etc.) supports a revision.

Milestones
The milestones identified in this plan are based on scientific literature and Regional Water Board staff's judgment. The milestones are meant to reflect conditions that meet water quality standards, or show progress towards achieving water quality standards, but are not numeric water quality standards in themselves. In some cases, compliance with water quality standards may be met without this plan's milestones being achieved. For instance, natural processes occurring in a particular subwatershed may prevent the attainment of the milestone. In cases where monitoring of reference streams indicate the literature-based milestone is unwarranted, the milestone should be adjusted based on the value of the parameter derived from the reference streams.

Priority of Data
While all of the data parameters identified for monitoring pursuant to this plan are expected to provide valuable information, limited funding may only allow for monitoring of a subset of parameters. Regional Water Board staff have assigned a priority level (high, medium, low) to each of the parameters in this plan to ensure that the most important parameters are monitored.

Sediment-Related Monitoring
The Scott River Watershed *Staff Report for the Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads* confirmed that sediment-related water quality conditions are contributing to the impairment of beneficial uses in the Scott River watershed. The sediment-related water quality issues that impact beneficial uses in the Scott River watershed relate to both coarse and fine sediment. Coarse sediment loads affect beneficial uses in many ways, including channel aggradation and consequent changes in channel widths and lateral migration. Fine sediment loads also affect beneficial uses in a multitude of ways, including filling of pool habitats, degradation of spawning gravel quality, and impairment of feeding ability of aquatic species.

Sediment-Related Parameters:

Parameter (Medium)	**Surface particle size distribution (Pebble Counts)** This measure of surface sediment size distribution can be obtained by doing pebble counts. The surface particle size distribution is an effective measure of sediment supply trends. Knopp *et al* (1993) demonstrated that the median particle size (often referred to as "D50") is an effective indicator of sediment supply in north coast streams. The surface particle size distribution has also been demonstrated to be an effective indicator of the balance of sediment supply and sediment transport capacity when compared to the subsurface particle size distribution. One major advantage of this technique is that it is relatively cheap and easy, requiring no special equipment or extensive processing time.
Objective	The objective of monitoring surface particle size distribution is to track the trends in both gravel quality and sediment supply.
Procedures and Techniques	Pebble counts should be conducted in a minimum of 3 riffles, using the methods described in section 4.1.1 of Bunte and Abt (2001). Data analysis should be conducted consistent with methods specified by Bunte and Abt.
Locations	Regional Water Board staff recommend pebble counts at sites where the RCD has previously done McNeil sampling and other reaches with gradients <3%, as shown in Figure 1.
Frequency and Duration	This parameter is an appropriate parameter to measure every 5 years, or the summer low flow period following the next significant flood event, whichever occurs first.
Benchmark Conditions where available	Table 1 presents median surface particle sizes of six Scott River tributaries.
Measurable Milestones	Knopp *et al* (1993) found a statistically significant difference between the median surface particle sizes of streams with and without extensive management. Their study showed that watersheds without extensive previous management had an average median surface particle size of 63 mm. Milestone: median surface particle size of 63mm or greater by 2046.

Parameter (Medium)	**Subsurface particle size distribution (McNeil Samples)** This measure of subsurface gravel quality can be obtained by collecting McNeil samples. The subsurface sediment size distribution is an effective measure of sediment conditions as they relate to spawning gravel quality. Previous sampling occurred in 1989, 2000, and 2006.
Objective	The objective of measuring the subsurface particle size distribution is to track the trends in subsurface gravel quality as it relates to spawning, primarily.
Procedures and Techniques	Monitoring should use a McNeil sediment core sampler similar to the specifications found in McNeil and Ahnell (1964), except the diameter of the sampler's throat should be 2-3 times larger than the largest particle usually encountered. Monitoring should occur according to the protocols

	found in *Scott River Watershed Monitoring Program – Water Quality: Water Temperature Monitoring and Sediment Sampling and Analysis 2005, 2006, and 2007* (Quigley 2008). A 0.85 mm and a 6.4 mm sieve should be used during sample processing. The wet volumetric method is recommended with the use of the dry gravimetric method on 10% of samples.
Locations	Regional Water Board staff recommend continuing sampling at sites where the RCD has previously done McNeil sampling, and other reaches with gradients <3%, with a preference for known spawning areas such as spawning reaches of the Scott River canyon. See Figure 1 for suggested locations.
Frequency and Duration	Subsurface particle size distributions are not expected to change greatly from year to year. The collection of subsurface particle size distribution data is costly. Because of the tendency of this parameter to change slowly and the cost of collecting the data, Regional Water Board staff recommend that this parameter be monitored at least every 10 years, or the summer low flow period following the next significant flood event, whichever occurs first. The last effort to monitor subsurface particle size distributions occurred in 2006, thus the next survey of this parameter should occur prior to 2016.
Benchmark Conditions where available	See Table 2. Also, Sommarstrom's (2001) *Scott River Monitoring Plan: Sediment Sampling and Analysis – 2000* presents and interprets data collected in 2000, a comparison of data collected in 1989 and 2000, and recommendations.
Measurable Milestones	Regional Water Board staff have reviewed literature pertaining to the appropriate subsurface particle size distributions for support of salmonids (NCRWQCB, 2006). That review determined that $\leq$14% fines <0.85 mm and $\leq$30% fines <6.4 mm together provide a benchmark for subsurface gravel quality in relation to salmonid spawning. Milestones: • No more than 30% of the gravel subsurface volume has an intermediate diameter of 6.4 mm or less by 2046. • No more than 14% of the gravel subsurface volume has an intermediate diameter of 0.85 mm or less by 2046.

Parameter (Low)	**Turbidity** Turbidity is a measure of water clarity and is an inexpensive and commonly used surrogate for measuring suspended sediment concentrations. While turbidity values reflect the effects of any substance that reduces clarity (such as suspended algae, tannins, etc.) those substances are not typically found in the waters of the Scott River watershed (lower Kidder Creek and Big Slough may be exceptions). Thus, turbidity is an appropriate monitoring parameter for tracking suspended sediment trends.
Objective	The objective of monitoring turbidity is to track the trends in water quality as it relates to suspended sediment levels by measuring a closely related

	surrogate.
Procedures and Techniques	Turbidity data should be collected consistent with protocols described in USGS National Field Manual: (Anderson 2005) Anderson, C.W., 2005, Turbidity, (version 2.1): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A6, section 6.7, http://water.usgs.gov/owq/FieldManual/Chapter6/6.7_contents.html.
Locations	Automated turbidity data collection should occur at the USGS flow gauge near Fort Jones and in the confined reach of Moffett Creek just upstream of Scott Valley. The Quartz Valley Indian Tribe currently operates turbidimeters at both of these locations, in addition to a site on Shackleford Creek.
Frequency and Duration	Measurements should be taken at a frequency no greater than every hour, from November through June.
Benchmark Conditions where available	Very little turbidity data exists to establish baseline conditions. Turbidity values were recorded at the USGS gauge near Fort Jones throughout 2008. The 2008 turbidity values resulted in a 10% exceedence turbidity of 5.1 NTUs.
Measurable Milestones	Decreasing trend in Moffett Creek turbidity values. Klein *et al* (2008) compared turbidity conditions of 27 north coast forested watersheds, using the 10% exceedence level (the turbidity level that was exceeded 10% of the time) as a metric for comparison. Because the Moffett Creek watershed has a geology unlike most north coast watersheds (calcareous siltsone with abundant mica of Silurian age), Moffett Creek turbidity exceedences may not be comparable to the north coast watersheds analyzed by Klein *et al*. Although they analyzed watersheds in a different geological setting than the Scott Watershed, their work is still useful as a point of reference for salmonid streams. Their analysis found that forested watersheds without previous timber harvest (n=12) had an average turbidity level of 13 FNUs at the 10% exceedence level (range = 3 - 22), while watersheds with lower harvest rates (<1.02% annual clearcut equivalent, mean =0.67%) had an average 10% exceedence turbidity of 20 FNUs (range = 4 - 37, n = 5). Watersheds with higher rates of harvest (>1.57% annual clearcut equivalent, mean = 2.35%) had an average 10% exceedence turbidity of 61 FNUs (range = 27 – 116, n=10). The turbidity conditions should be reported using the 10% exceedence value and FNUs as the metric.

Parameter (High)	**V*** (V-star) V* is a measure of the fraction of a pool's volume that is filled with fine sediment. It has been demonstrated to be an effective measure of pool habitat loss due to fine sediment loading, and has also been demonstrated to be responsive to changes in fine sediment loading in the French Creek watershed. Cover *et al* (2008) demonstrated a statistically significant relationship between the magnitude of sediment loading estimated by USFS cumulative effects models and the value of V* in downstream pools.

Objective:	The objective of measuring V* is to track trends in fine sediment levels as they relate to pool habitat quality.
Procedures and Techniques	V* data should be collected as described in Hilton and Lisle (1993). Sample sizes should follow their recommendations: "If all pools in a reach have similar values of V*, measure 6-10 pools relatively intensively. If V* varies somewhat (V* for all pools is within 20-30 percent of the mean), measure 10-15 pools. If V* is highly variable (some V*'s of 0.4 or more and others 0.1 or less), measure as many pools as possible, up to 20 or so. If the objective is to monitor changes over time in a single reach, and if the pools in the reach are structurally stable, intensive measurement of a few pools (4-5 minimum) may minimize variability and provide additional information about changes in individual pools."
Locations	V* monitoring should continue at sites previously monitored by the Siskiyou RCD and French Creek Watershed Advisory Group (WAG), shown in figure 2.
Frequency and Duration	Every 5 years, or the summer low flow period following the next significant flood event, whichever occurs first.
Benchmark Conditions where available	The Siskiyou RCD and French Creek WAG have collected V* data at various locations in the Scott River watershed in 2006 and 2007. V* values of Scott River tributaries are shown in Table 3. Note that the data in Table 3 reflects the effects of the large storm event of 2006. The effects of that storm can be seen in the French Creek V* data presented in Figure 3. Additional information is available in *Scott River Watershed Monitoring Program – Water Quality: Water Temperature Monitoring and Sediment Sampling and Analysis 2005, 2006, and 2007* (Quigley 2008).
Measurable Milestones	Mean of all reaches less than 0.20 by 2019, less than 0.17 by 2028, less than 0.13 by 2037, and less than 0.10 by 2046. The three streams identified by Cover *et al* (2008) as having low sediment supplies have a mean V* value of 0.064 (range = 0.05 – 0.076). This milestone, in particular, should be re-evaluated as new data become available. Milestones derived from a watershed analysis may be established for a sub-basin, as appropriate.

Parameter (Low)	**Channel Cross-Sections** The shape and area of channel cross-sections are responsive to changes in sediment load, and can be used to assess trends in sediment load.
Objective	The objective of measuring channel cross-sections is to track trends in channel widths and depths, as well as changes in channel elevations that result from aggradation or degradation.
Procedures and	Channel cross-sections should be measured consistent with techniques

Techniques	described in the USFS' General Technical Report RM-245: *Stream Channel Reference Sites: An Illustrated Guide to Field Technique* (1994).
Locations	Cross-section monitoring should continue at sites previously monitored by the Siskiyou RCD and French Creek Watershed Advisory Group (WAG) in addition to other locations, as shown in figure 4.
Frequency and Duration	Every five years.
Benchmark Conditions where available	Scott River channel cross-sections were previously measured by the Siskiyou RCD in 1989 (Sommarstrom *et al*, 1990). Many of the sites were resurveyed since that time, the results of which are reported by *Scott River Watershed Monitoring Program – Water Quality: Water Temperature Monitoring and Sediment Sampling and Analysis 2005, 2006, and 2007* (Quigley 2008).
Measurable Milestones	n/a

Parameter (High)	**Riffle-Surface Fine Sediment** Cover *et al* (2008) found a significant correlation between the percent of the riffle-surface covered in fine sediment and sediment production model estimates in the Klamath mountains.
Objective	The objective of monitoring riffle-surface fine sediment is to track trends in fine sediment levels.
Procedures and Techniques	Collection and processing of riffle-surface fine sediment data should be done using a sampling grid, consistent with methods described in Cover, *et al* (2008), and Bunte and Abt (2001).
Locations	This data should be collected at the same reaches that V* is monitored. See Figure 4.
Frequency and Duration	Every five years.
Benchmark Conditions where available	Regional Water Board staff are unaware of data describing current or historic riffle-surface fine sediment levels.
Measurable Milestones	Average riffle-surface fine sediment percentage of all reaches less than 10% by 2046. The three streams identified by Cover *et al* (2008) as having low sediment supplies have an average riffle-surface fine sediment value of 7.5% (range = 3.7% – 10.2%).

Temperature-Related Monitoring

The dominant controllable factors influencing stream temperatures in the Scott River watershed are streamside shade and groundwater accretion. Progress towards recovering natural levels of streamside shade can be tracked by measuring shade directly or by measuring changes in the extent of riparian vegetation. Changes in the accretion of groundwater to Scott River can be tracked by measuring stream flows at sites distributed longitudinally along the Scott River. Of course, the ultimate measure of progress in achieving the goals of the temperature TMDL is the stream temperatures themselves.

Temperature-Related Parameters:

Parameter (High)	**Stream Temperature** Monitoring trends in stream temperature will yield the ultimate measure of beneficial use support and compliance with the water quality objective for temperature.
Objective	The objective of monitoring temperature is to establish temperature conditions.
Procedures and Techniques	Stream temperature data should be collected consistent with SWAMP protocols.
Locations	Stream temperature measurements should continue to occur at sites previously monitored by the SRCD in Scott Valley, the USFS in the East Fork Scott watershed and Scott River canyon, and private timber companies in the west side tributaries and Moffett Creek, as shown in *Water Temperatures in the Scott River Watershed in Northern California* (Quigley *et al*, 2001). Additional sites should be established nearer to the headwaters of select streams to track the effects of climate change on source temperatures, and downstream of areas where substantial restoration or management changes are proposed. Suggested temperature monitoring locations are presented in Figure 5.
Frequency and Duration	Stream temperatures should be monitored annually from May through September. Sampling interval should be no greater than one hour.
Benchmark Conditions where available	Table 4 presents documented water temperatures collected at a large number of sites monitored by the Siskiyou RCD. Additional temperature data are reported by Quigley *et al* (2001) and in the Scott TMDL staff report (NCRWQCB, 2005).
Measurable Milestones	Temperature goals and compliance points for the Scott River cannot currently be determined, due to uncertainty regarding the interaction of groundwater and surface water in Scott Valley. Temperature goals and compliance points should be developed by Regional Water Board staff once the ongoing Scott Valley groundwater study generates sufficient information to do so.

Parameter (Medium)	**Effective Shade** Effective shade is a useful surrogate measure of solar radiation. The temperature TMDL load allocations are expressed in terms of effective shade. Effective shade is a measure of the amount of the total available solar energy that is blocked by vegetation or topography. Effective shade is not the same as percent canopy measurements commonly used in forestry because percent canopy measures the percent of the entire sky blocked by vegetation, as seen by a viewer on the ground, whereas effective shade measures the percent of the sun's path that is blocked by vegetation or topography and weights the location of the sun's path accordingly based on sunlight intensity throughout the day.
Objective	The objective of monitoring effective shade is to measure the amount of solar energy reaching a stream.
Procedures and Techniques	The Solar Pathfinder Quality Assurance Program Plan (see appendix) provides a detailed description of the appropriate procedure for collection of Solar Pathfinder data.
Locations	Effective shade data should be collected at sites where stream temperatures are monitored (see Figure 5), and in reaches affected by management activities, both before and after the proposed activities.
Frequency and Duration	Effective shade values change as vegetation grows. Given the pace of typical vegetative growth, it's appropriate to measure effective shade every fifth year.
Benchmark Conditions where available	Regional Water Board staff developed estimates of potential effective shade on perennial streams in the Scott River watershed, adjusted for the effects of fire, windthrow, disease, and other natural disturbances. Those estimates are presented in Figure 6.
Measurable Milestones	The effective shade curves presented in Figures 7-9 present the amount of potential effective shade expected under natural conditions, based on vegetation type, stream orientation, and channel width. Other natural factors, such as geologic or soil conditions, may reduce the site-potential effective shade at a location. Where natural factors affect site-potential effective shade, the site-potential effective shade meets the load allocation for excess solar radiation.

Parameter (Medium)	**Riparian Vegetation Extent** Riparian vegetative extent measured from aerial imagery allows for tracking of progress in re-establishing riparian vegetation communities before the vegetation manifests in effective shade or temperature measurements. An advantage of this type of monitoring is that large areas can be monitored. Another advantage is that riparian vegetation trends can be tracked without the need for extensive time in the field or private property access.
Objective	The objective of monitoring vegetative extent is to track changes in near-stream vegetation.
Procedures and Techniques	Riparian areas should be mapped from aerial imagery with a scale sufficient for identification of individual trees (1:2500 to 1:5000 scale). The mapping should delineate polygons that are distinguished by tree species, canopy density, and tree height.
Locations	Reaches of the Scott River and tributaries within Scott Valley.
Frequency and Duration	The extent of riparian vegetation changes as vegetation grows. Given the pace of typical vegetative growth, it's appropriate to measure effective shade every five years.
Benchmark Conditions where available	Regional Water Board staff mapped near-stream vegetation in Scott Valley as it existed in 2003, using the low level aerial imagery (after rectification) that was collected as part of the FLIR survey. These data are available from Regional Water Board staff as GIS shapefiles.
Measurable Milestones	n/a

Parameter (Medium)	**Surface Stream Flow** The Scott River Temperature TMDL identifies the influence of groundwater on surface water temperature as a major factor determining temperatures of the Scott River. Measurements of Scott River flow rates, spaced longitudinally, will aid in the development of understandings of how use of water in the basin affects groundwater accretion, and ultimately water temperatures.
Objective	The objective of measuring flow is to track changes in groundwater accretion that affect temperature.
Procedures and Techniques	Surface stream flow should be measured consistent with the techniques described by Rantz (1982).

Locations	Stream flow should be measured at Scott River sites previously monitored by SWRCB staff in 1972 & 1973, Regional Water Board staff in 2003, and Siskiyou RCD staff in 2004-2006. Stream flow should be gauged at Young's Dam, Island Road, and the USGS gauge.
Frequency and Duration	Annual surveys in July, August, and September.
Benchmark Conditions where available	Tables 5-8 present measured Scott River flows at sites distributed along the Scott River in Scott Valley in 1972, 1973, 2003, and 2006.
Measurable Milestones	Surface stream flow milestones for the Scott River cannot currently be determined, due to uncertainty regarding the interaction of groundwater and surface water in Scott Valley. Surface streamflow goals should be developed in consultation with Regional Water Board staff once the ongoing Scott Valley groundwater study generates sufficient information to do so.

Parameter (low)	**Photo Point Monitoring** Photo point monitoring provides a visual record of changes to the environment over time in a given location.
Objective	The objective of photo point monitoring is to record changes in vegetation characteristics by capturing images of the same location over time. The photos may also prove useful in qualitatively evaluating sediment conditions.
Procedures and Techniques	Photo points should be monitored consistent with the techniques described by Hall (2001).
Locations	Photo points should be established or maintained at all cross-section and pebble count data collection sites.
Frequency and Duration	Photo points should be re-photographed at least every five years, at the same time of year.
Benchmark Conditions where available	The Siskiyou Resource Conservation District has a collection of photos taken from Scott Valley bridges that provide a number of benchmarks.
Measurable Milestones	n/a

Quality Control and Quality Assurance Protocols

Each entity conducting monitoring in support of this plan should develop their own Quality Assurance Project Plan (QAPP) to ensure data quality. Many entities currently conducting monitoring in the Scott River watershed (USFS, QVIR, SRCD, etc.) already have QAPPs developed.

Data Management, Analysis, and Distribution Procedures

The Klamath Watershed Institute is developing a web-based data sharing process for data describing fisheries and water quality conditions in the Klamath Basin, through a grant

administered by the Regional Water Board. The details of this process and associated infrastructure are still being developed; however, the intent is that this process will be a comprehensive catalog of Klamath Basin water quality and fisheries data. The data collected as part of this Scott River Watershed Water Quality Compliance and Trend Monitoring Plan, and any analyses, should be incorporated in to this larger effort to maintain a comprehensive Klamath Basin data collection. To ensure the data collected pursuant to this plan is retained and available, data summaries, raw data files, and field sheets should be submitted to both the Klamath Watershed Institute and the Regional Water Board for data sharing and archiving.

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Table 1: Median particle size in selected Scott River tributaries representing surface sediment particle size distributions. (USFS, unpublished data)

Stream	Location	D50 (mm)
Kelsey Creek	Mouth to 1000 m	26
Kelsey Creek	1000 m to 1250 m	45
Middle Creek	Mouth to 917 m	56
Pat Ford Creek	Mouth to 450 m	64
Deep Creek	Mouth to 430 m	91
Wooliver Creek	Mouth to 1000 m	25
Mill Creek	from bridge down 1000 m	64

Table 2: Scott River watershed subsurface particle size benchmark conditions (Quigley, 2008)

	< 6.3 mm			< 0.85 mm		
Mainstem Sites	1989	2000	2006	1989	2000	2006
Below S. and E. Fk Confluence	30.6	32.6	20.0	6.4	4	4.7
Below Sugar Ck	-	18.3	18.8	-	4	5.0
Above Fay Lane	28.2	25.8	17.8	7.4	5.8	5.7
Below French Ck	36.8	40.2	41.3	12.2	11.3	23.2
Above Etna Ck	40.1	41.6	28.7	10.5	11	9.5
Below Etna Ck	56.7	57.6	51.1	17	16.8	18.4
Serpa Lane	82.1	75.7	75.6	21.6	14.2	16.5
Below Moffett Ck	36.5	36.4	35.9	11	11	8.2
Above Shackleford Ck	41	50.5	32.5	11.1	10.4	9.1
Below Shackleford Ck	26.8	33.7	20.1	8	7.4	6.6

	< 6.3 mm			< 0.85 mm		
Tributary Sites	1989	2000	2006.0	1989	2000	2006.0
Kangaroo Ck	-	-	39.7	-	-	12.8
East Fk at Ranger Station	-	-	21.0	-	-	5.9
Sugar Creek	30.8	33.8	23.2	6.3	9.9	6.8
French Ck at HW3	42.6	33.9	25.2	8.2	6.9	5.5
French Ck WAG site	33.4	46	25.9	8.2	10.9	7.6
Etna Ck at HW3	28.3	16.9	30.1	5.1	2.8	5.5
Patterson Ck	-	-	34.0	-	-	6.6
Moffett Ck	-	-	34.0	-	-	7.7
Mill Ck	-	-	27.2	-	-	7.0
Shackleford Ck	-	-	35.7	-	-	7.8

Table 3: V* values of Scott River tributaries. (Quigley 2008)

V* location	Mean V*
Rail Creek	0.27
East Fork	0.30
Fox Creek	0.22
South Fork	0.18
Sugar	0.13
Miners	0.53
French	0.25
Etna	0.18
Patterson	0.27
Kidder	0.16
Moffett	0.32
Mill	0.27
Shackleford	0.23
Mill (Shackleford)	0.27
Canyon	0.18
Kelsey	0.12
Tompkins	0.29
Mean =	0.24

Table 4: Scott River Watershed Temperatures 1992-2007; (maximum of weekly average [MWAT], Celsius degrees)

Location	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2
Scott River above Canyon Ck				22.7						23.3			
Scott River above mouth of Etna				20.7	19.8		17.2		17.6				
Scott River belowFrench				20.9	18.2	18.7	19.1		19.0	20.3	19.7	19.8	1
Scott River above French				20.7	19.7	18.5	19.8	18.0	20.0	20.3	19.9	20.3	
Scott River at Alexander's					17.0	19.9				20.2			
Scott River at Buker Br (d/s of Canyon Ck)			21.2		21.1			20.3		22.4			
Scott River at Deep Creek	21.7									22.5			
Scott River d/s of Moffett Ck (Eiler Ranch)				21.7	21.1	19.9	22.5						
Scott River at Fay Lane		18.4		19.5	19.2		20	19.3		20.1	19.7		
Scott River at Horn Lane				19.5			19.4						
Scott River at Hwy 3 -1				22.8		21.2							
Scott River at Hwy 3 -2		20.6	23.9	21.7	21.1	19.9	22.5		24.2				
Scott River at Jones Beach	24.6		22.4	23.1	22.0			24.1		23.3			
Scott River at McGuffy Cr			21.9	22.9	21.8								
Scott River at Meamber Br.				22.8		21.2			21.4	22.5	21.6	21.4	
Scott River at Meamber Cr.				23.1		19.8	21.8	21.4	20.7	22.5	21.3	21.2	
Scott River at mouth of Boulder Creek			16.0	14.0									
Scott River at mouth of Canyon Creek	21.0			15.4	15.2			14.8					
Scott River at mouth of Kelsey Creek					16.7								
Scott River at mouth of McGuffy Creek			21.9	22.9	22.0								
Scott River at mouth of Tompkins creek					17.6								
Scott River at Red Bridge			18.4		18.3	17.1				20.4			
Scott River at Serpa Lane				23.1		21	23.6			23.2	23.3		
Scott River at Steelhead Bridge	26.2	20.8	24.2		22.2								
Scott River at Steelhead Bridge			22.8										
Scott River at Townsend Gulch	23.4		21.8					22.8		22.6			
Scott River at USGS Gaging Station - (USFS)		20.5		21.7	21.1					22.7			
Scott River below Black Bridge				22.1	20.5	19.9	22.5		22.0	21.9		22.5	
Scott River below mouth of Etna				20.6	20		20.6						
Scott River u/s of Sugar Creek (Middle Tailings)							20.3			20.0	19.8	19.2	1
Scott River at Meamber Creek				21.0		19.8	21.8						
Scott River between Kidder and Moffett Cks									24.2	23.3	23.3		
Scott River at Roxbury Br.										23.9			
Scott River at Sweazey's Bridge										21.0			

Location	1992	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Alder Creek near 123 deg long.				15.4	15.2	14.0	16.0							
Boulder Creek - high		11.5												
Boulder Creek - lower		14.3												
Boulder Creek - mid		12.8												
Boulder Creek - near mouth			14.4	14.0										
Boulder Creek (SF) near mouth			16.0											
Cabin Meadows Creek at rd 41N04											15			
Cabin Meadows Creek d/s of rd 41N03											16.9			
Canyon Creek 500ft d/s of Canyon Ck Br		14.2		15.4	15.2			14.8						
Canyon Creek- d/s of deep lake ck			15.5	15.0										
Canyon Creek near mouth										15.8				
Clarks Creek - Lower (at diversion)				15.3	14.87	13.39	15.44	15.54	14.9	15.86	15.2		16.13	15.34
Clarks Creek - Upper (at forks)				14.1										
Crater Creek at rd 41N03											12.1			
Crater Creek at Houston Ck											15.1			
Deep Creek at mouth										20.0				
EF Scott River at Callahan						19.4	21.6	21.9	21.8	22.5	21.8	21.4	21	
EF Scott River at Upper Masterson Rd			22.1		20.9		21.4	20.9	21.3	22.7	21.5	21.1	21.2	21.7
EF Scott River d/s Houston Ck										17.0	16.3			
Etna Creek - Lower (d/s of Mill Ck)					15.39	13.67	15.94	15.57	16.0		16.08	15.63	16.73	
Etna Creek at Mouth									22					
Etna Creek d/s Ruffey Ck					13.9	12.15	16.17	13.5	14.0	14.91	14.11	13.84	14.51	13.39
Fox Creek at mouth			14.9											
French Creek - appx 500m u/s Miner's Rd Br.									18.2	18.2		18.4	18.6	
French Creek - Headwaters												15.0	15.66	15.0
French Creek - near Miner's Rd br			18.6		16.2	17.8	18.6							
French Creek - near mouth				20.7	19.7	17.9	21.1		17.1	18.9		19.8	21.5	
French Creek d/s NF						14.8	18.5	17.53	16.68	17.35	17.12	16.82	17.35	17.13
Grouse Creek at Rd 40N03 crossing														18.6
Grouse Creek u/s of Hayes gulch						16.0	18.54	18.51	18.39	18.86	18.52		18.62	
Houston Creek at EF Scott											17.0			
Houston Creek u/s of L. Houston											15.7			
Jackson Creek at Cecilville Rd			14.6											
Kangaroo Creek - at 40N08 xing											12.4			
Kangaroo Creek - EF, u/s of Facey Mine						11.6	12.39	12.64	12.47	12.64	12.44	12.14	12.54	13.0
Kangaroo Creek - EF at rd 40N08 xing											11.7			
Kangaroo Creek - WF, 100m u/s 40N08											10.0			

Location	1992	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Kelsey Creek (295)		14.7												
Kelsey Creek d/s 44N41 bridge			16.8	17.4	16.6					17.8				
Kelsey Creek, Upper SF		9.4	10.9											
Kidder Creek at Scott River										26.1				
Kidder Creek-d/s of FGS ownership				20.1		17.4	18.5							
Kidder Creek-u/s Clendenning Fk				17.2	16.2	14.0	16.9							
Little Houston Creek @ Houston Ck											15.6			
Meamber Creek -FGS				15.6										
Middle Creek at mouth										18.5				
Mill Creek	24.1													
Mill Creek - Lower (near confl w/ shackleford)											20.8	16.4		16.9
Mill Creek - Scott Bar u/s Coats Ck							14.2	15.2	14.7	14.5	14.4	14.2	14.4	14.2
Mill Creek (shack) u/s of Mill Ck ditch				16.6	14.5	15.8	16.1							
Mill Creek at Etna Ck						13.8		15.8		16.86		15.81	16.73	16.17
Mill Creek -Scott Bar d/s new barn gulch			16.2	16.5	16.0	15.1	17.1	17.9	17.4	17.3	17.1	17.4	17.3	16.9
Miners Creek appx 100m u/s of French Ck													17.9	
Moffett Creek -betw Skookum Glch & Spring Br				16.9	16.8	15.8	17.6							
NF French Creek (appx 0.6 km u/s of French Ck)				16.5	16.2	15.4		16.8	18.2	18.5	17.9		18.6	17.5
NF French Creek, Upper (u/s of Meeks Meadow Ck)					15.5	13.8	15.9	15.6	15.6	16.4	15.9	15.6	16.6	15.6
Patterson Creek nr middle Sec 7, R9W, T42N				17.7	17.6	16.4	18.1							
Rail Creek near KNF bndry			16.5		16.0	15.1	17.3	16.7	17.9	18.3	17.3	16.6	17.3	18.2
SF Scott River - u/s of SF Rd					16.3	13.8	17.3	17.8	17.3	17.4	17.2		16.8	17.0
SF Scott River at mouth of Boulder Ck			14.4											
SF Scott River u/s 40N21Y										15.8				
SF ScottRiver u/s Blue Jay Ck			15.4		14.8	13.5	15.4	15.8	15.3	15.9	15.6	15.2	15.9	15.4
Shackleford Creek - Lower											16.6			
Shackleford Creek at Trailhead				14.0	14.0	12.0	14.3			14.9				
Shackleford Creek-near Alder Gulch						14.5	17.2							
Shackleford Creek-Near Shackleford falls				17.0	16.6									
Sissel Gulch near mouth						16.3	18.6							
Sniktaw Creek near 123 deg long				13.5	14.1	13.1	14.1							
Snow Creek	21.3													
Sugar Creek - u/s HW3									16.2	16.9	18.1	17.4	17.0	18.2
Sugar Creek near KNF bndry					15.5	14.0	16.7							
Tompkins Creek at mouth				16.9	17.6					17.6				
Wildcat Creek near KNF bndry					17.2	15.7	17.4							

Table 5: Scott River flows in 1972 and 1973, measured and reported by the State Water Resources Control Board (SWRCB, 1974). Units are ft^3/s.

		1972			1973			
Site	River Mile	7/9/19 72	8/9/19 72	9/8/19 72	7/3/19 73	8/1/19 73	9/5/19 73	10/2/19 73
USGS Gage	21.6	**155**	**61**	**69**	**96**	**44**	**23**	**65**
Meamber Bridge	25.2	**140**	**48**	**54**	**66**	**33**	**13**	**35**
Dunlap Ranch	28.5	**110**	**33**	**44**	**46**	**19**	**11**	**30**
Below SVID Pumps	31.6	**90**	**11**	**25**	**23**	**6.4**	**3.8**	**25**
Island Road	35.1	**68**	**23**	**27**	**30**	**7.2**	**2.3**	**10**
Eller Lane	39.4	**61**	**24**	**19**	**31**	**20**	**1.3**	**10**
Horn Lane	44.4	**44**	**16**	**20**	**17**	**9.7**	**7.4**	**7**
Fay Lane	50.3	**32**	**5**	**3.6**	**24**	**4.8**	**2.3**	**3**
Below Wildcat (Red Bridge)	56	**53**	**11**	**12**	**43**	**9.5**	**3.3**	**10**

Table 6: Scott River flows in 2003, measured and reported by Regional Water Board staff (NCRWQCB, 2005). Units are ft^3/s.

Mainstem	River Mile	7/3 2003	7/16 2003	7/25 2003	7/26 2003	7/28 2003	7/29 2003	7/30 2003	8/25 2003	8/26 2003	8/27 2003	8/28 2003	9/4 2003	9/9 2003	9/10 2003	9/11 2003	9/24 2003	9/25 2003	9/26 2003	10/7 2003	10/8 2003
Scott River at Roxbury bridge	0.6			**155**		139		**123**			62				**81**	81				68	
Scott River at Townsend gulch	10.8			**150**			122	**119**			*57*			79	**79**		81			67	
Scott River u/s of Middle Creek	13.3										*50*						67			62	
Scott River at Jones beach	18.7			**98**			80	**77**			34			47	**47**		54			**43**	44
Scott River at USGS gage, measured	21.6												47							48	
Scott River at USGS gage, rated final	21.6	302	154	135	141	121	110	107	42	43	41	39	46	48	48	48	52	52	52	56	58
Scott River d/s of Meamber bridge	25.1										27										
Scott River u/s of Kidder	32.5	193		**62**				49			21				23		**30**	30		28	
Scott River at Island Road	35.1	195		**61**				49			21				23		**30**				
Scott River at Sweazey's Bridge	41.8	179		**38**				30			*15*				16		**16**	16		13	
Scott River d/s of French Creek	47.7	183		**51**				40			*20*				22		**20**	20		**11**	12
Scott River u/s of Fay lane	50.3			*32*				*26*			**11**	11			14		**13**	13		10	
Scott River at Alexander's	53.2	126																			
Scott River u/s of French Ck	48.1	**175**	67	**59**																	
Scott River d/s of French Ck	47.9	**170**	65	**57**																	
Scott River at Callahan, preliminary	56.9	141	72	95	82	49	48	43	24	23	23	23	27	30	28	27	23.2	22.3	22.2		

Bold values are based on comparison with flows at the gage.

Italic values are based on a ratio of flows at a nearby site to flows at the site measured at some other time.

Table 7: Scott River flows in 2006, measured and reported by Siskiyou RCD staff (Yokel and Yokel, 2007). Units are ft^3/s.

Site	River Mile	7/6/2006	7/18/2006	7/31/2006	8/14/2006	8/25/2006	9/8/2006	9/20/2006	10/4/2006
USGS Gage	21.6	**289**	**174**	**64**	**42**	**31**	**40**	**56**	**64**
Meamber Gulch		**283**	**132**	**68**	**36**		**33**	**42**	**50**
Meamber Bridge	25.2		**116**	**62**	**34**		**24**	**34**	**40**
Old SVID	31.6	**252**	**94**	**47**	**34**		**23**	**27**	**30**
Eller Lane	39.4	**230**	**87**	**41**	**29**	**14**	**18**	**19**	**24**
Above Etna			**65**	**24**	**20**	**13**	**11**	**14**	**19**
Below French			**77**	**45**	**31**	**18**	**16**	**13**	**16**
Above French		**186**	**77**	**39**	**26**		**11**	**10**	**15**
Fay Lane	50.3	**177**	**55**	**26**	**18**	**10**	**7.4**	**6.2**	**7**
Below Wildcat (Red Bridge)	56		**82**	**47**	**29**	**20**	**15**	**16**	**12**

Table 8: Scott River flows in 2007, measured and reported by Siskiyou RCD staff (Yokel and Yokel, 2007). Units are ft^3/s.

Site	River Mile	6/1/07	6/18/07	7/9/07	7/24/07	8/9/07	9/20/07	10/10/2007	10/11/2007	10/12/2007	10/30/2007
USGS gauge	21.6	**290**	**148**	**42**	**35**	**7**	**7**	**14**	**14**	**14**	**79**
Meamber Gulch		**245**	**116**	**32**	**26**	**5**	**7**		**10**		**79**
Meamber Bridge	25.2	**207**	**98**	**28**	**21**	**4**			**5**		**76**
Old SVID	31.6		**76**	**18**	**10**	**0.5**			**6**	**12**	
Eller Lane	39.4	**150**	**59**	**12**	**7**	**0.5**		**4.5**		**14**	**64**
Above Etna		**143**	**52**	**14**	**7**	**3**		**7**		**20**	**67**
Below French		**161**	**59**	**23**	**13**	**7**		**15**	**23**	**28**	**76**
Above French		**126**	**44**	**12**	**7**	**4**			**17**		**69**
Fay Lane	50.3	**105**	**28**	**6**	**6**	**4**			**16**		**59**
Red Bridge	56	**107**	**36**	**11**	**7**	**5**	**4**		**26**		**60**

Figure 1: Scott River Watershed Surface and Subsurface Sediment (McNeil and Pebble Count) Monitoring Sites

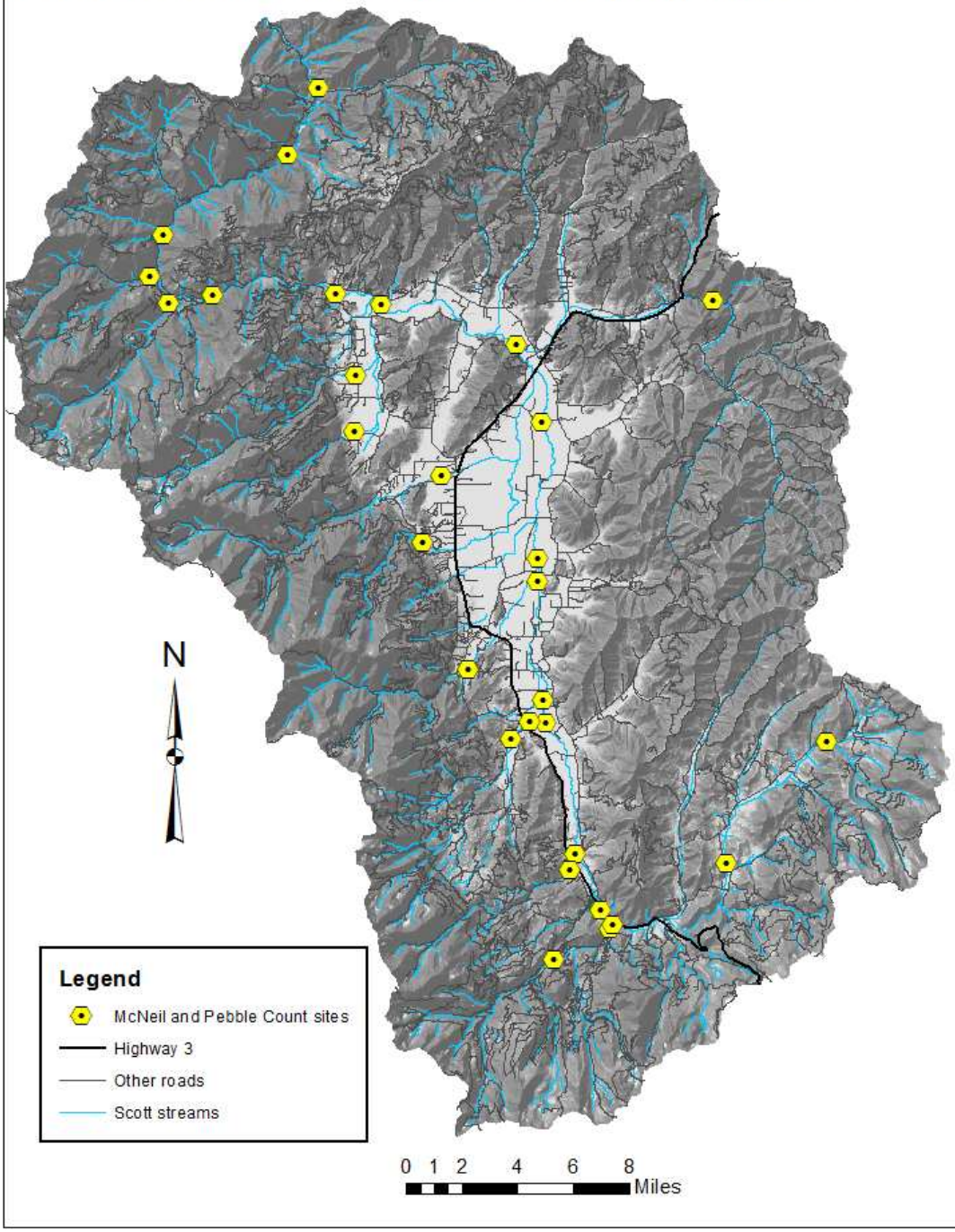


Figure 2: Scott River Watershed V* sampling Sites

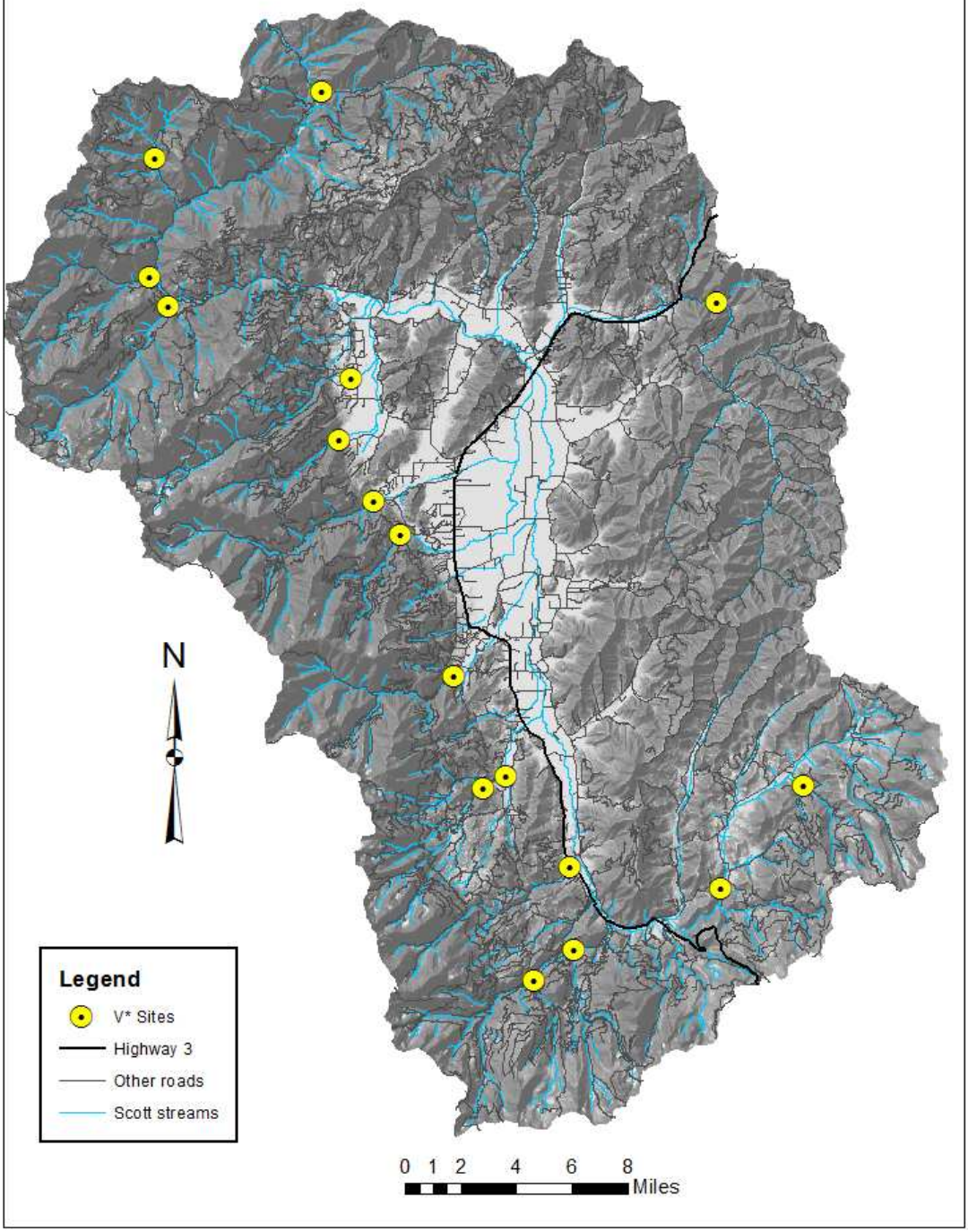


Figure 3: French Creek V* data, 1992-2006

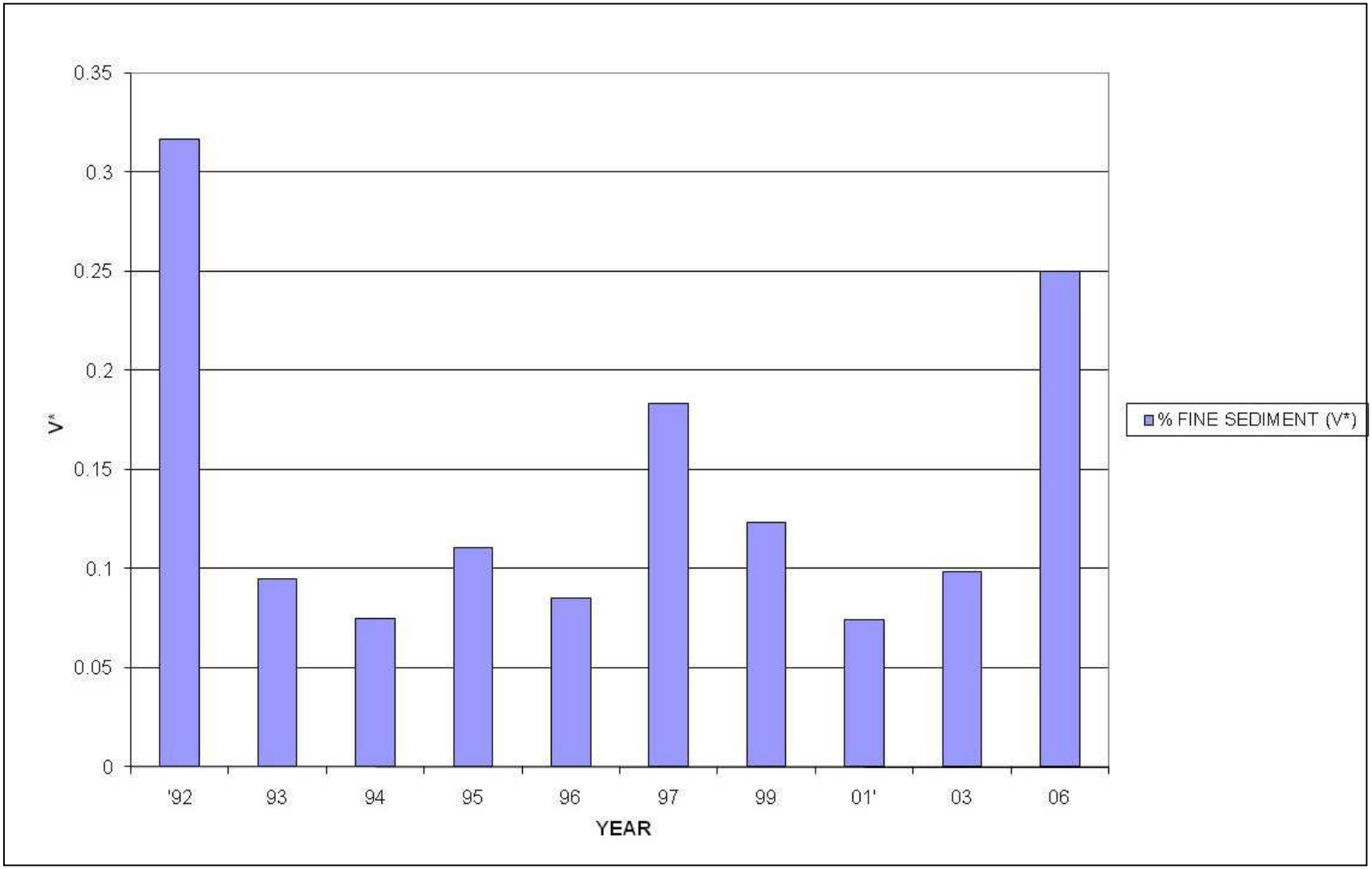


Figure 4: Scott River Watershed Channel Cross-Section Monitoring Sites

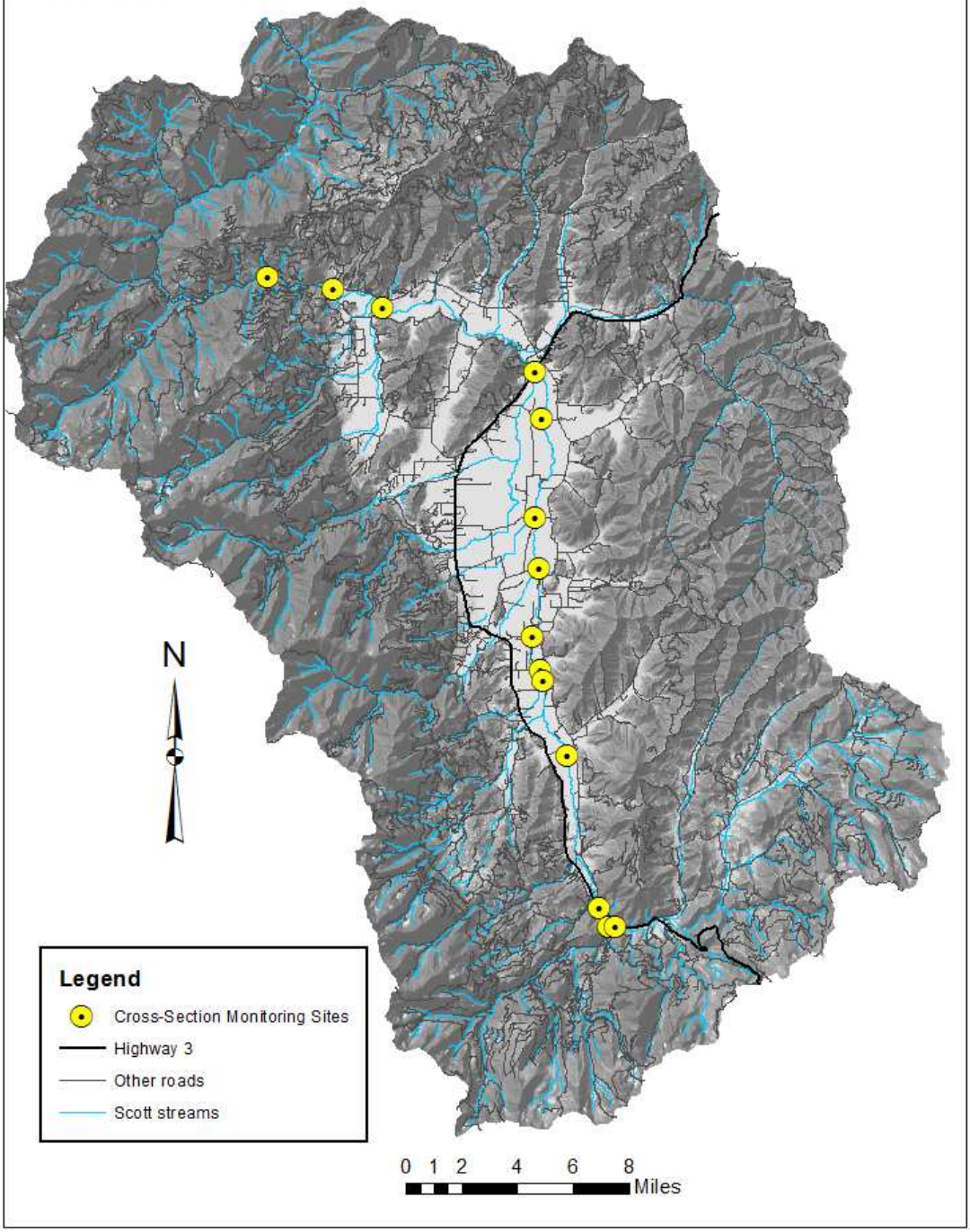


Figure 5: Scott River Watershed Temperature Monitoring Sites

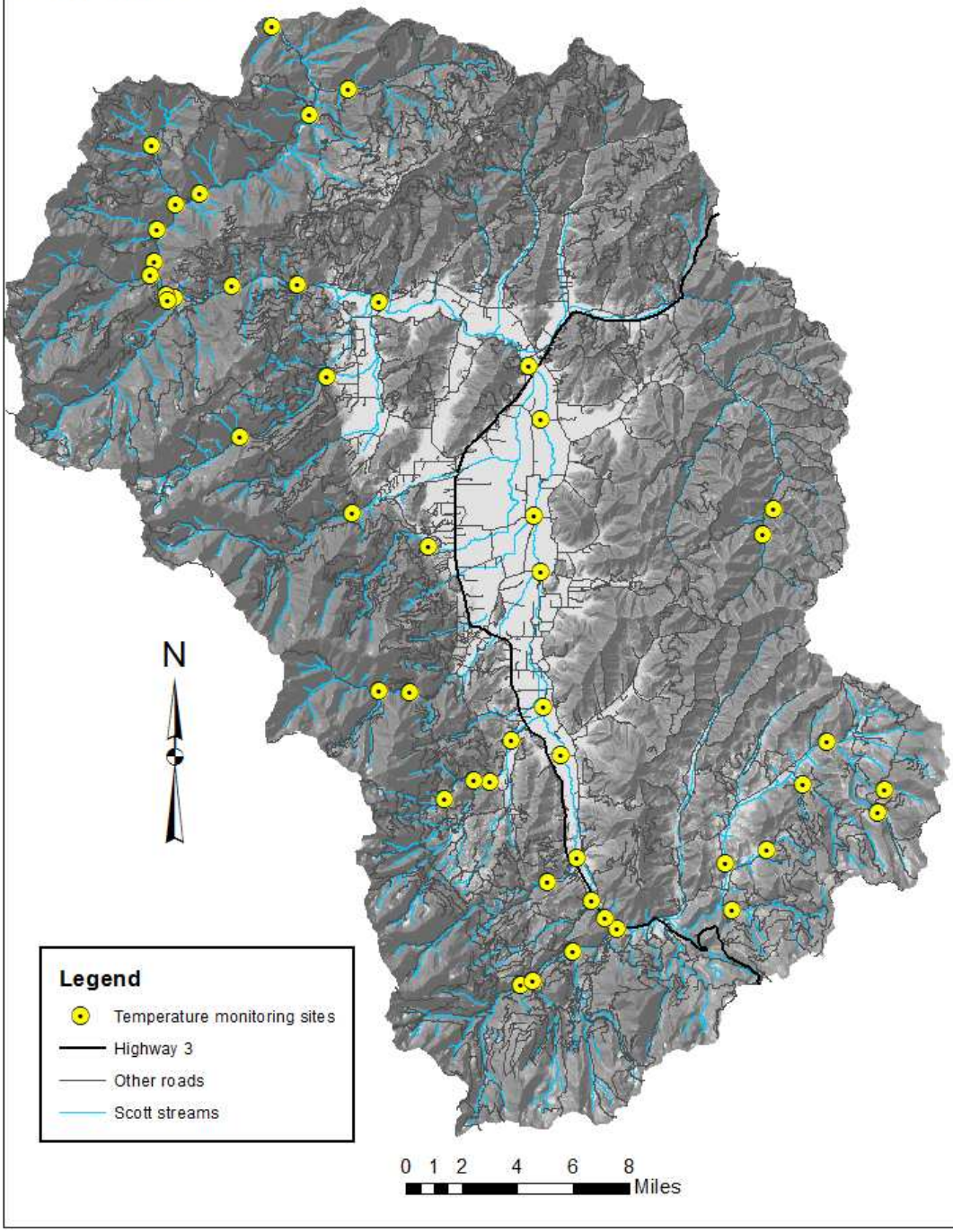


Figure 6: Adjusted Potential Effective Shade estimates, Scott River Watershed

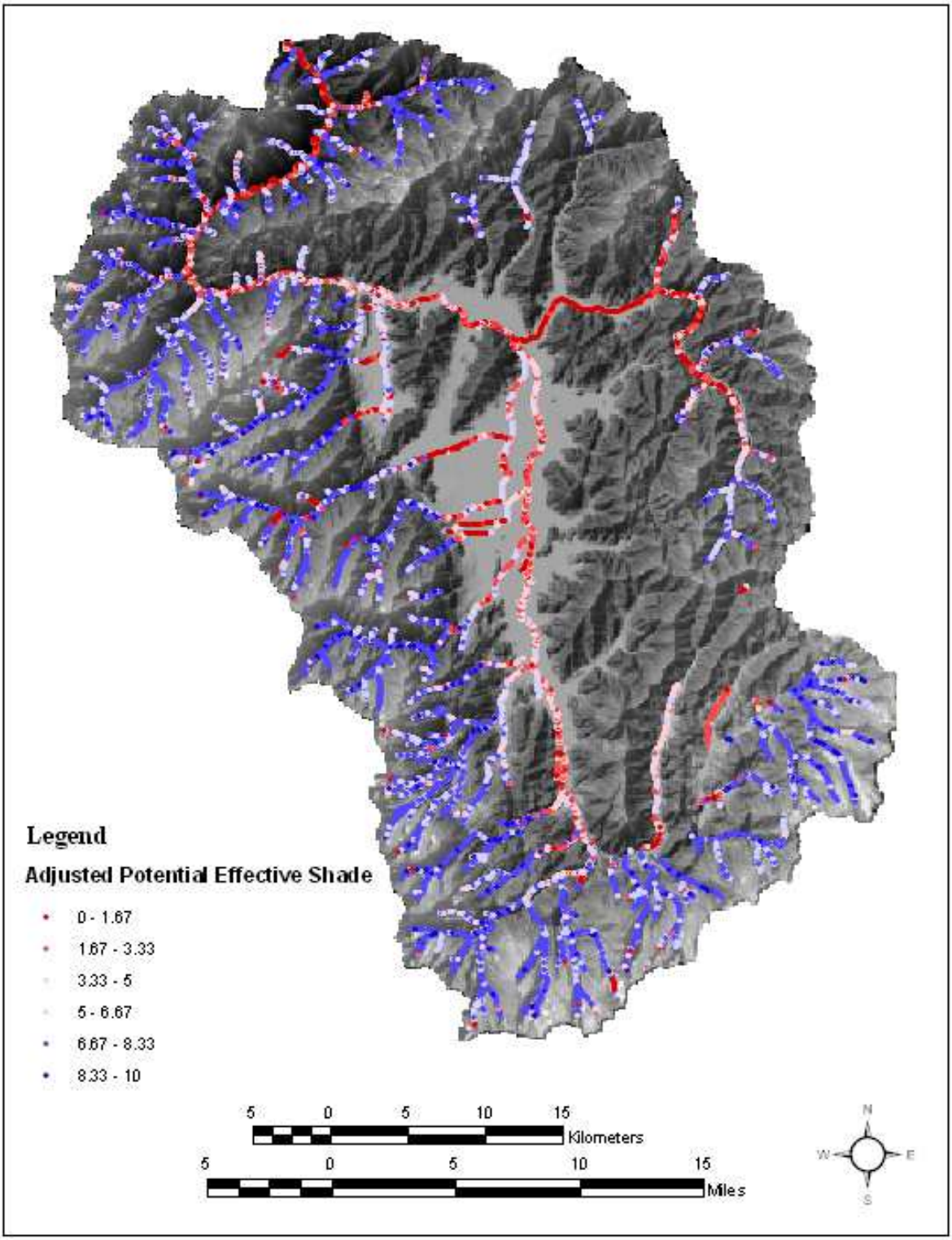


Figure 7: Effective Shade vs. Channel Width, Douglas Fir Forest (DFF) and Mixed Hardwood – Conifer Forest, Buffer Height = 40m

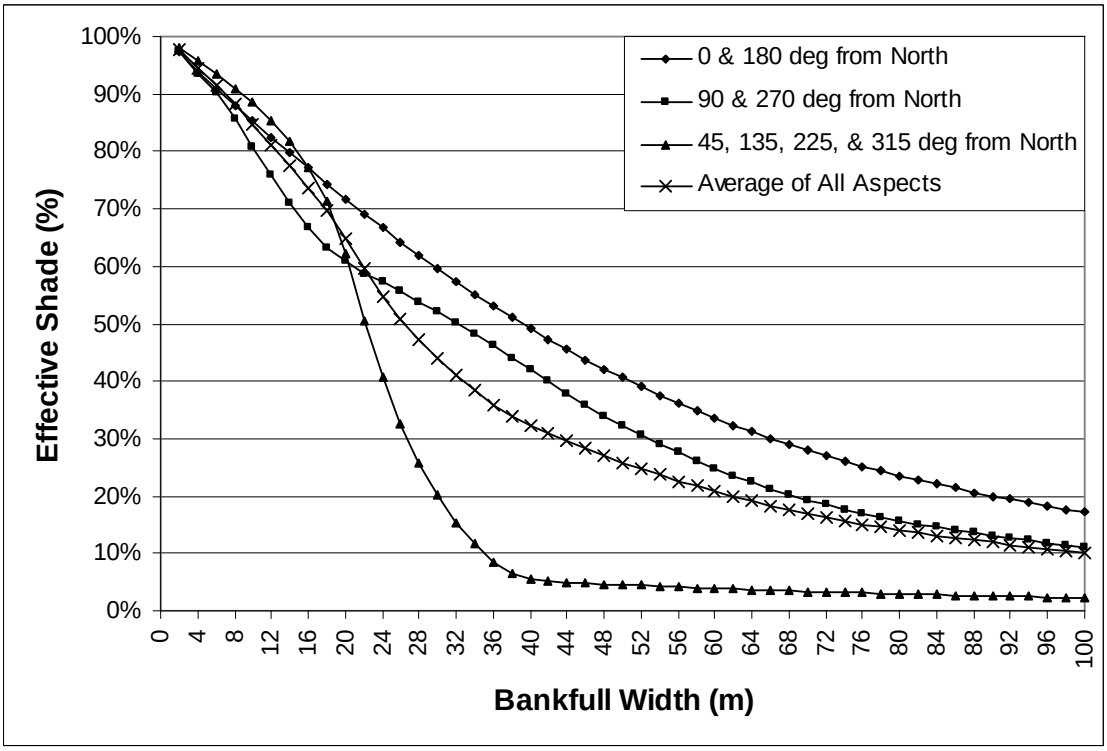


Figure 8: Effective shade vs. channel width, Klamath Mixed Conifer Forest (KMC) and Ponderosa Pine Forest (PPN), buffer height =35m

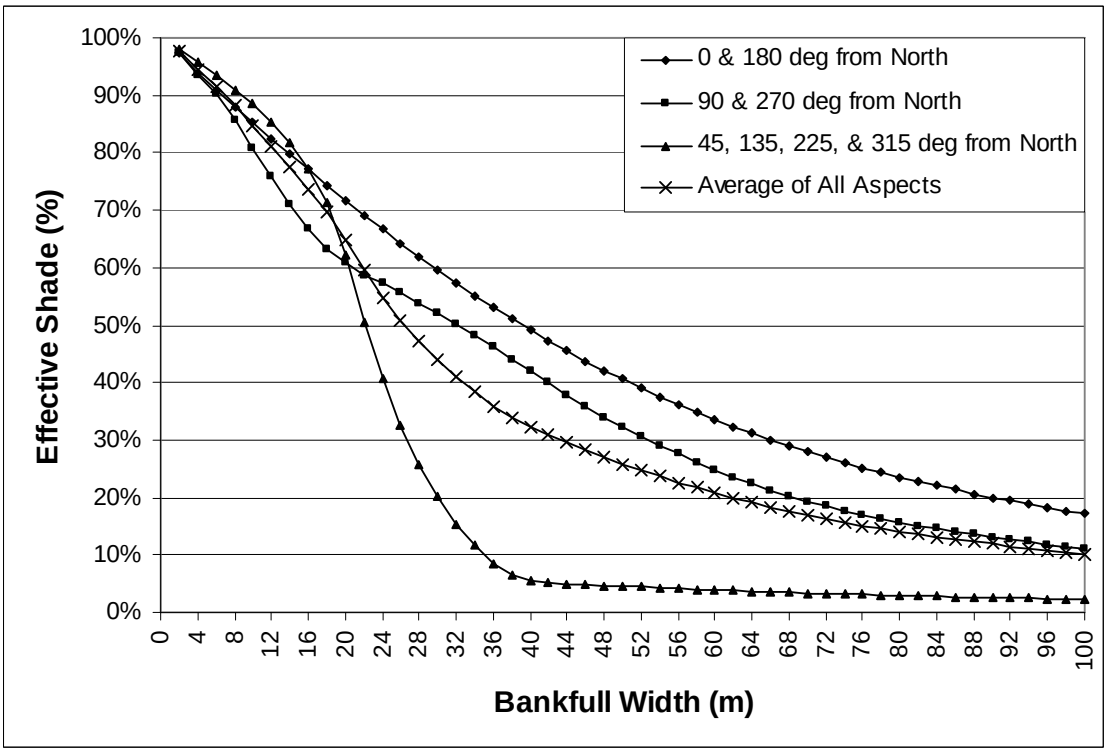


Figure 9: Effective shade vs. channel width, Oak woodland, buffer height =20m

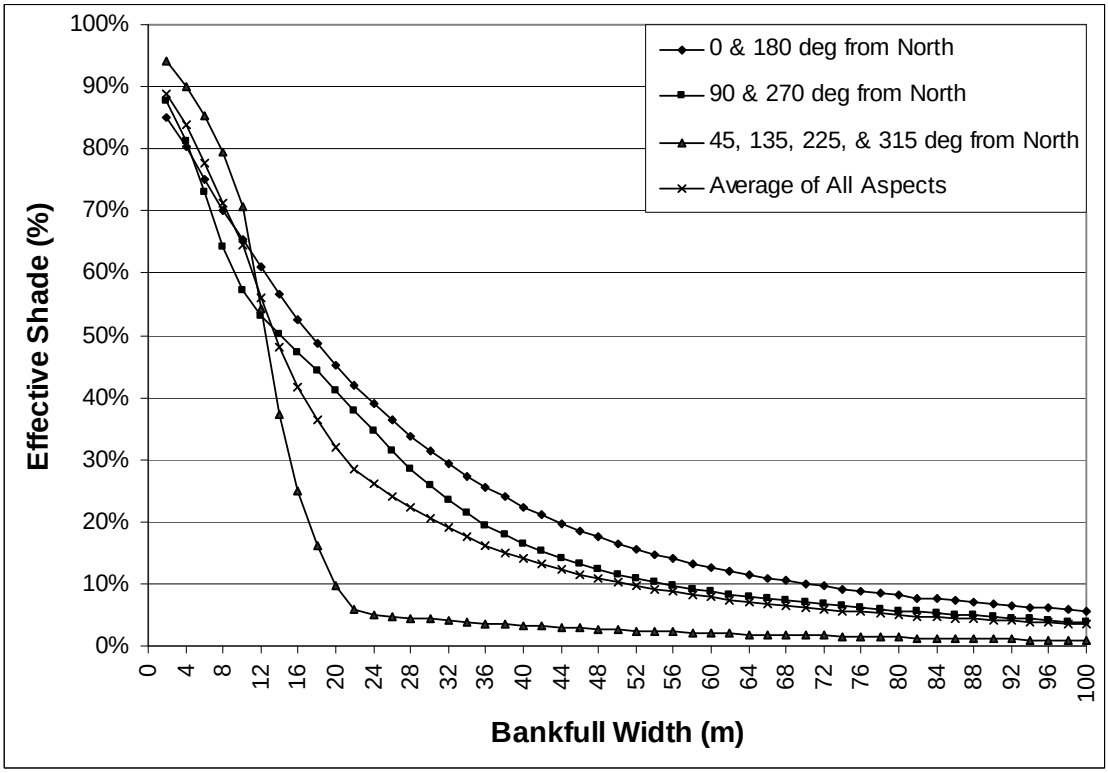


Figure 10: Effective shade vs. channel width, Willow, buffer height = 10 m

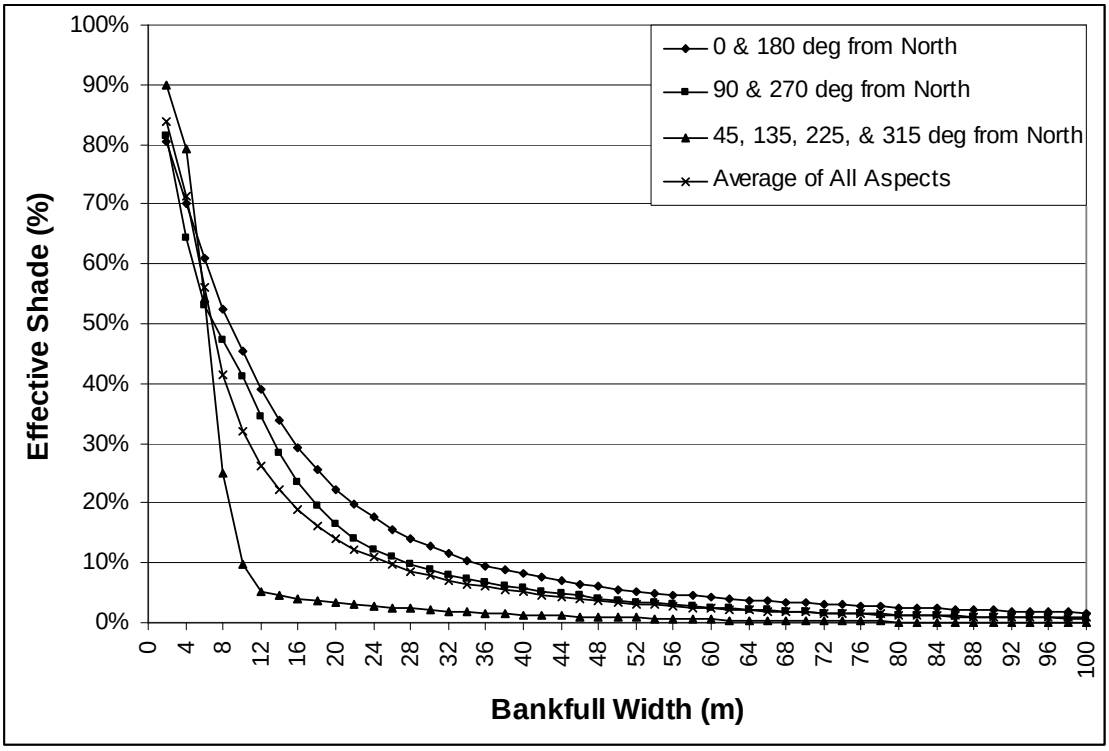
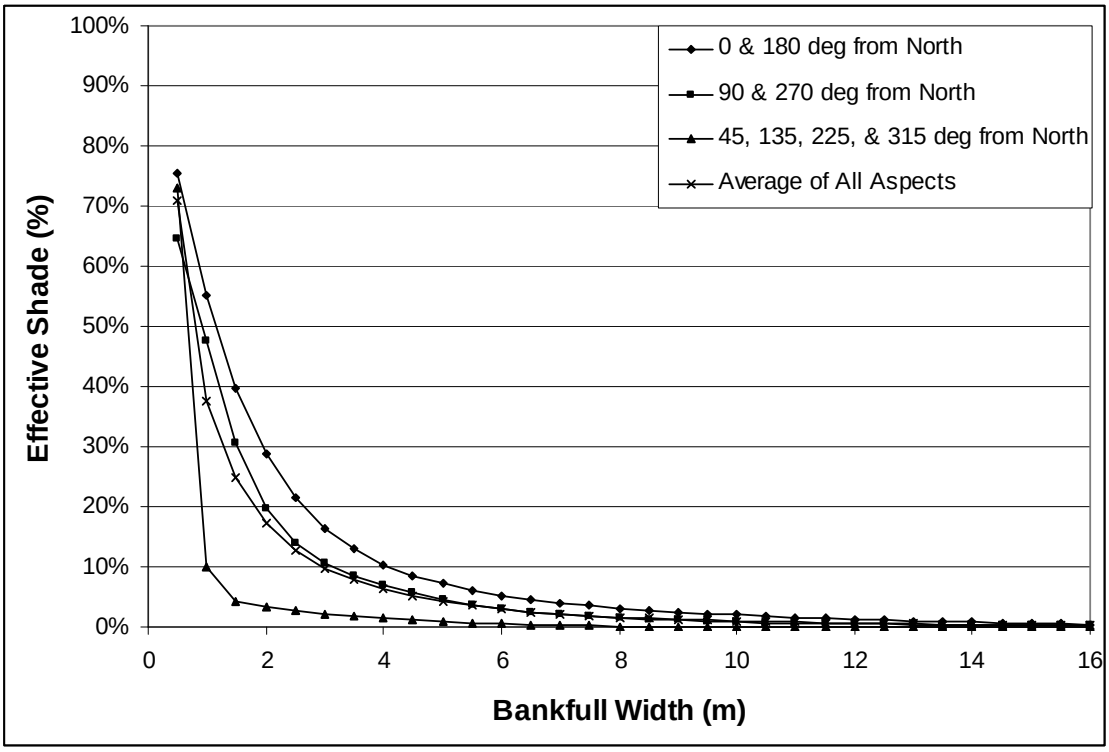


Figure 11: Effective shade vs. channel width, Grass/Sedge, buffer height = 1 m



SOLAR PATHFINDER
QUALITY ASSURANCE PROJECT PLAN

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SOLAR PATHFINDER
QUALITY ASSURANCE PROJECT PLAN

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1 Introduction and Problem Description

Stream temperature is affected by a variety of environmental factors including riparian vegetation, stream morphology, hydrology, climate, and geographic location. These environmental factors influence the heat transfer experienced by a stream and are associated with direct solar radiation, longwave radiation, evaporation of water from the stream surface, convection between the stream and air, and conduction between the stream and its bed. Solar radiation only delivers energy to a stream, while the other processes are capable of either delivering or removing heat from a stream. When a stream surface is exposed to midday solar radiation, large quantities of heat energy can be delivered to the stream (Beschta et al. 1987). The proportion of solar radiation intercepted by local topographic features and riparian vegetation becomes an important parameter in understanding temperature regimes in streams.

The Solar Pathfinder was developed for use in siting solar collectors or photovoltaic panels. Since its development, this tool has found application by natural resource managers and researchers in characterizing the relationships among site (streamside) conditions and solar radiation reaching a stream (Platts et al. 1987). The Solar Pathfinder integrates the effects of azimuth, topographic altitude, vegetation height and position, sunrise and sunset angle, latitude, time of year, and hour angle to estimate the amount of solar radiation reaching a point of interest (Solar Pathfinder 1995).

2 Data Quality Objectives and Record-Keeping

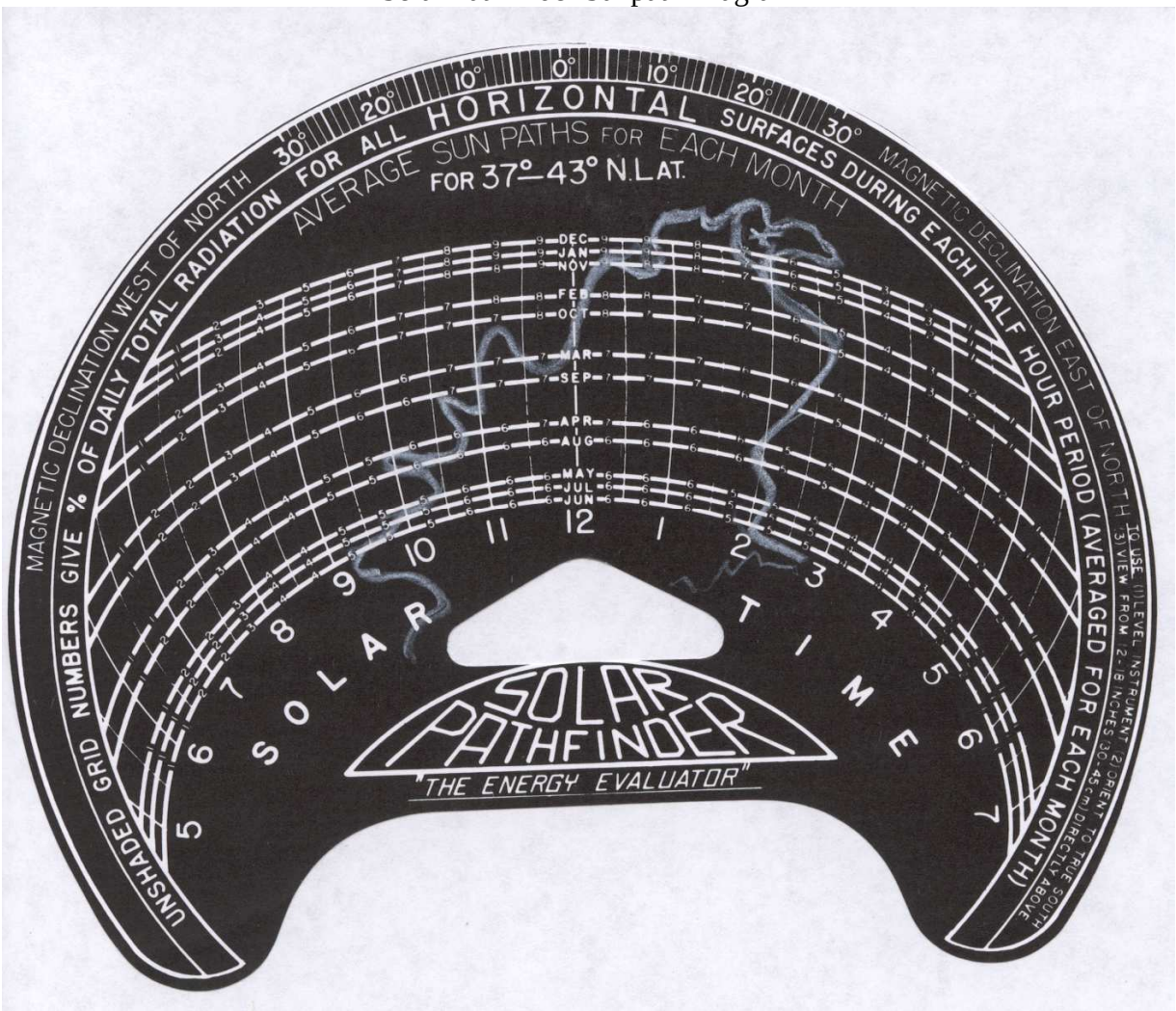
2.1 Data Quality Objectives for Measurement Data

In general, data quality objectives (DQOs) are used to gather data according to the procedure described herein at sites which are representative of the range of salmonid habitat conditions with particular focus on those locations where temperature has been monitored in recent years, and to record the data and site location for comparison with other data. DQOs for the Solar Pathfinder measurements are to measure riparian shade in river and stream reaches upstream and near thermal monitoring locations. A minimum of five and up to ten measurements will be collected in each upstream reach. The multiple samples will not function as replicates. Riparian conditions within a reach may vary considerably. The purpose of obtaining at least five samples from each reach is not to determine a level of accuracy, but to characterize the range of riparian shade conditions on the reach.

2.2 Documentation and Records

Raw data on sun and shade conditions should be recorded on sunpath diagrams provided with the Solar Pathfinder. For each location measured, a sunpath diagram (Figure 1) should be developed and retained as a permanent record of the observation. Additional data should be recorded in field notebooks at the time of measurement and should include site number, location, date, time, and environmental conditions. Sunpath diagrams and field notebooks should be retained for at least five years. All Solar Pathfinder measurements should be recorded in a database and forwarded to the Regional Water Quality Control Board and Klamath Watershed Institute.

Figure 1
Solar Pathfinder Sunpath Diagram



3 Measurement/Data Acquisition

3.1 Sampling Process Design

The primary objective of this sampling design is to develop a characterization of riparian shade at monitoring locations in the watershed, with the highest priority locations being those where related data (temperature, flow, surface particle size distribution, etc.) are measured. The total number of observations made in each reach upstream of an established monitoring location will depend on access and available time. The objective will be to define a reach of an arbitrary length estimated at 500 meters, and to measure riparian shade features at locations at 100-meter increments along this reach. This would result in six measurements for each reach.

3.2 Field Procedure

Much of the information in this section is derived from the Solar Pathfinder Instruction Manual (Solar Pathfinder 1995).

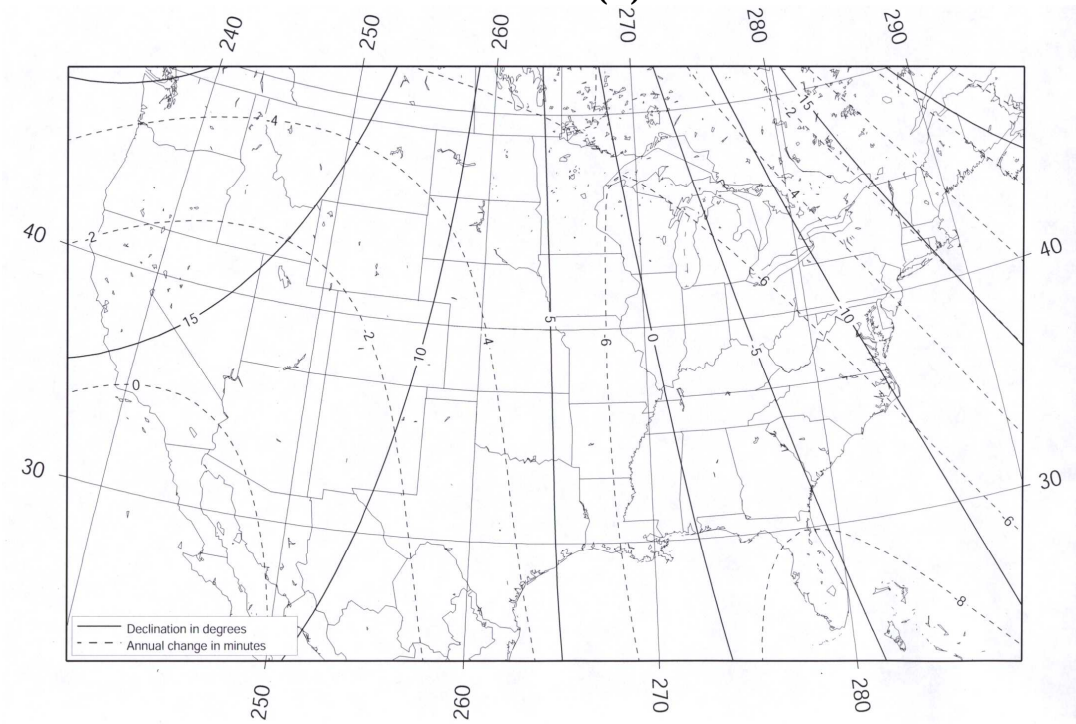
The Solar Pathfinder consists of four parts: the dome assembly, the diagram platform (containing the compass), the base, and the tripod. The following steps should be used to operate the instrument in the field.

1. Attach the base to the tripod by separating the tripod legs and inserting each rounded aluminum end into one of the rubber grommets on the base. Pull on the tripod's rubber leg ends to slide out the inside sections of the legs. Adjust the legs to approximately level the base. The base doesn't need to be precisely level, as the diagram platform and dome assembly both pivot on the base to provide additional leveling and directional orientation.

2. Put a sunpath diagram over the center pivot of the diagram platform. For stream shade measurements, use the diagrams labeled "Horizontal."

3. Orient the diagram to true south using the following directions:
   - Use the magnetic declination map (Figure 2; USGS, 1995) or declination calculator (available at http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp) to find the declination for the location being measured. In Region 1, declinations vary from 16-17.5°East.

Figure 2
The Magnetic Field in the United States, 1995
Declination (D)



- Pull out the brass tab near the compass ¼" to unlock the center triangle and the black disk.
- Rotate the sunpath diagram on the central pivot counterclockwise for east declinations, and clockwise for west declinations, until the small white dot on the rim of the base is opposite the appropriate "Magnetic Declination East (or West)". The declination figures are marked on the outside edge of the sunpath diagram.
- Relock the tab.

4. Set the diagram platform on the base.

5. Put the dome in place on top of the diagram platform.

6. Level the Pathfinder. Use the legs to get the Pathfinder as level as possible. Slide the instrument portion around on the cupped base until the bubble is centered in the circle.

7. Rotate the base until the south end of the compass needle is directly above the "S" on the compass. Make sure the base is still level. Make sure the compass needle is free to rotate.

8. View the Pathfinder from between 12 and 18 inches above the dome, and within ten to fifteen degrees of the vertical centerline of the sunpath diagram. Aligning the Pathfinder

vertically can be assisted by aligning the dimple on the dome with the center triangle on the base. To avoid glare from the sun, take site readings on cloudy days. On sunny days, shade the dome using your hand or orient yourself to block the sun so that you do not stare at the sun's reflection on the dome surface.

9. Using a white grease pencil, trace the shapes of the objects reflected in the dome on the sunpath diagram. To minimize movement of the diagram and dome, trace lightly, then remove the diagram and brighten the tracing. Note any features that are solely topographic in nature and any deciduous trees for use in subsequent interpretation.

3.3 Analytical Methods

Average percentage of monthly total radiation that will fall on the measurement location will be derived by adding the unshaded (unobstructed sky) half-hour numbers across the arc of the selected month or months, or by subtracting the shaded half-hours from 100 percent. Alternatively, average percentage of monthly shade at the location will be derived by adding the shaded (obstructed sky) half-hour numbers across the arc of the selected month or months, or by subtracting the unshaded half-hours from 100 percent. By noting those portions of the obstructed sky attributable to deciduous trees, it will be possible to account for variations in tree density associated with coniferous versus deciduous tree cover.

The results from individual samples collected on a reach will be combined into a single distribution as a means of estimating reach-average conditions. Standard deviations of the mean will also be calculated and reported.

3.4 Quality Control Requirements

The field technician should prepare the Solar Pathfinder for use in the field each day before leaving for the field. Preparation will consist of checking that all necessary components of the instrument are in the carrying case, and that adequate sunpath diagrams are available to complete the number of planned measurements. To provide independent observations at each measurement location, photographs can be taken to show the riparian cover condition recorded on the sunpath diagram.

3.5 Instrument Testing, Inspection, and Maintenance Requirements

No testing is necessary for the Solar Pathfinder. The instrument should be inspected before and after use for visible damage. It should be cleaned immediately after use.

3.6 Instrument Calibration and Frequency

The instrument requires calibration of pathfinder diagram declination and compass headings for each measurement. These calibration steps are included in the Field Procedure (Section 3.2). To check compass accuracy, the compass should be checked against another compass of known reliability prior to going in the field and regularly while in the field.

4 Data Validation and Usability

Field personnel that collect Solar Pathfinder data should discuss these requirements with data reviewers and come to consensus with them on whether to accept, reject, or qualify parts of the resulting data. Once data have been entered into a spreadsheet, the spreadsheet should be printed out and be proofread against the raw data. Errors in data entry shall be corrected. Outliers and inconsistencies will be flagged for further review and discussion. Problems with data quality will be discussed in the technical support document.

As soon as possible after data collection and interpretation, the data should be checked for accuracy and completeness. If DQOs are not met, the cause should be evaluated and a decision made about whether to discard the data or apply correction factors. The cause should be corrected by retraining or by reassessing equipment and methods. Any limitations on data use shall be detailed in the technical support document or appendices.

5 References

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