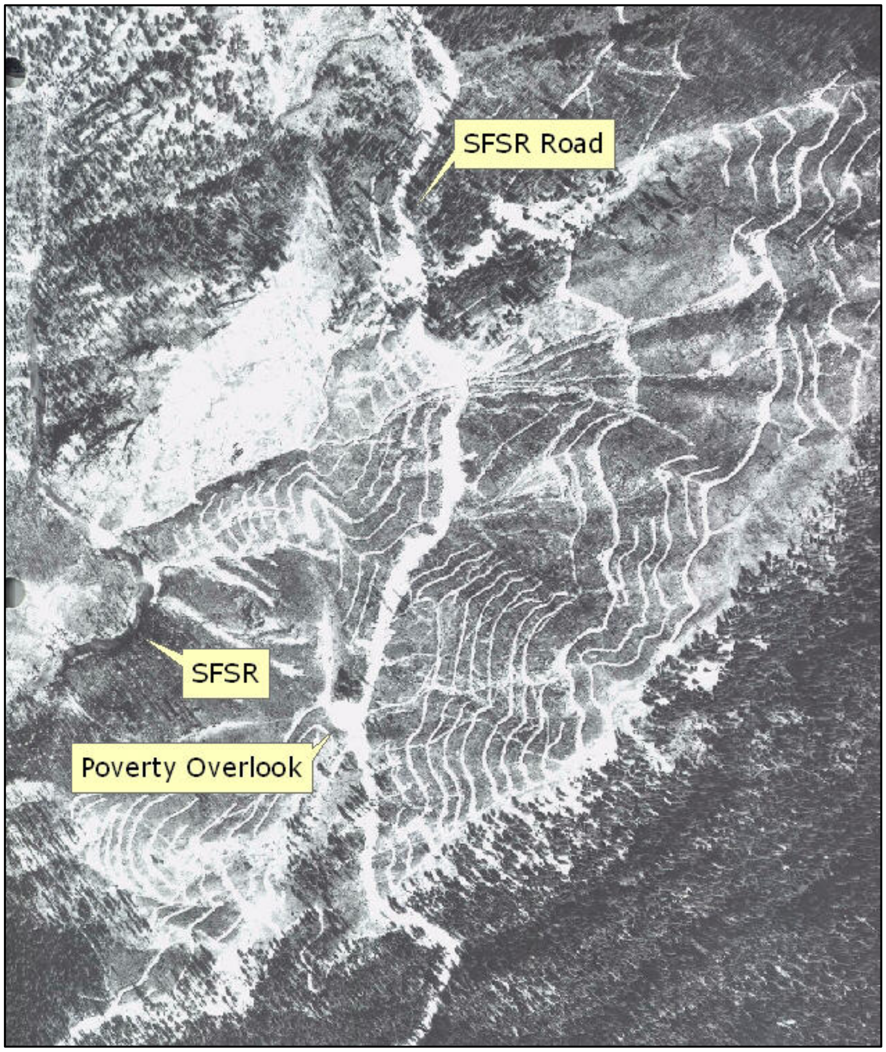
DEPOSITION OF FINE SEDIMENT IN THE SALMON RIVER WATERSHED, PAYETTE AND BOISE NATIONAL FORESTS, IDAHO

STATISTICAL SUMMARY OF INTRAGRAVEL MONITORING, 1975-2007



Aerial View of Poverty Fire Timber Salvage Area on the South Fork Salmon River (SFSR), 1968.

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Abstract

This report conforms to the standard developed with that established by Nelson *et al.* (2004). Statistical analysis of core sampling data collected by the Boise and Payette National Forests from 1975 through 2006 is presented with minimal discussion, except that we support the case for reinitiating consultation on the SFSR Road Reconstruction Project because we are consistently exceeding allowable take of Chinook salmon, and new Biological Assessments (BAs) are being prepared.

The abbreviated report approach has been taken to expedite reporting and to ensure that required analysis and reporting can be accomplished given current budget and time constraints. Information provided here is intended to update the normal Payette National Forest sediment monitoring reports and to provide the information in a form that facilitates use of our recently modified watershed condition indicators for sediment and substrate in the South Fork Salmon River watershed (Nelson and Burns 2005). The companion interactive CD allows readers to examine all recent reports in this series as well as related monitoring reports and other monitoring information, including time series imagery that provides visual support for our interpretations.

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Introduction

Sediment monitoring in the South Fork Salmon River (SFSR) watershed began in response to severe flooding caused by rain on snow in the winter of 1964-65 that inundated important habitat for anadromous fish (Nelson *et al.* 2002; Platts *et al.* 1989). Monitoring was begun with core sampling using techniques modified from McNeil (1964), and Platts *et al.* (1989) present trend analyses dating back to 1966. Formal sediment monitoring by the Boise National Forest (BNF), however, began in 1975 (Corley 1976). The effort was begun using a 6-inch core sampler at 5 permanent locations in known spawning areas on the SFSR and in one such location on Johnson Creek, a major tributary to the East Fork South Fork Salmon River (EFSFSR), which is a parallel watershed located one drainage to the east of the SFSR. The Johnson Creek sampling was used to obtain control (*i.e.*, largely unaffected by the floods) data for comparison with the SFSR data. At that time, Corley also established several permanent photopoints for photographic monitoring of streambed changes over time. This monitoring has been continued (with some interruption) up to the present time.

The Payette National Forest (PNF) began additional sediment monitoring using similar core sampling techniques[1] in 1981 in the Secesh River watershed, a major tributary to the SFSR that is of generally somewhat lower relief, and in 1989 in the Chamberlain Creek watershed[2] in the Frank Church River Of No Return Wilderness (FCRONRW), a largely undisturbed area of granitic geology similar to that of the SFSR watershed. For the past decade, the PNF has reported annually or biennially on the results of this monitoring and the SFSR monitoring. Our monitoring and reporting has served to satisfy requirements of the original PNF Land and Resource Management Plan (LRMP) (USFS 1988) and terms and conditions of ongoing actions and individual project consultations pursuant to the listing of Snake River Spring/Summer and Fall Chinook salmon (*Oncorhynchus tshawytscha*), Snake River steelhead (*O. mykiss*) and Columbia River bull trout (*Salvelinus confluentus*) as threatened under the Endangered Species Act of 1973 (ESA) as amended (16 USC 1531 *et seq*.). In addition, the original LRMP specified certain conditions pertaining to streambed sediment levels in the SFSR prior to initiation of certain new projects and anticipated establishment of standards and guidelines based partly on this monitoring related for management actions in the SFSR. More recently, the PNF's revised LRMP (USFS 2003) specifies watershed condition indicators (WCIs) based on intragravel sediment conditions that have been revised (Nelson and Burns 2005) as required by the Biological Opinion (BO) issued by the National Marine Fisheries Service (NMFS, now informally referred to as NOAA Fisheries) as a result of formal ESA consultation on the revised plan (NMFS 2003).

The purpose of this report is to summarize the sediment core data collected in the SFSR watershed (after 1975 only) as required by the LRMP Biological Opinion (BO) (NMFS 2003) and the BO issued pursuant to the consultation on the SFSR road (NMFS 1993), the Secesh River watershed, and the Chamberlain Creek watershed, and to present the images obtained from photographic monitoring in the SFSR. We believe that the best way to interpret the condition and trend of sediment conditions in these watersheds and to determine appropriate standards for habitat condition is to look objectively at multiple lines of evidence, including numeric habitat attribute data and statistical methods for making comparisons among sites and modeling trends, current

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[1] Minor differences have been described previously (*e.g.*, Nelson *et al.* 1996).
[2] Although a core sample was taken in Chamberlain Creek in 1981, additional sampling was discontinued until 1989.

and historical photographs, and historical documentation of conditions where available. To this end, our previous report (Nelson *et al.* 2004) was coupled with an interactive interface that allowed users to view all of the information we have compiled since monitoring began to provide the most comprehensive presentation of information of various types so far assembled in one product. This report updates the text portion of the previous report with data collected in 2006; the companion interactive CD-ROM updates the time series photography as well.

Methods

Methods are thoroughly described in Nelson *et al*. (2002), with a minor modification described in Nelson *et al.* (2004); information presented in those reports is not reiterated here. The core sampling on the SFSR has been conducted by the BNF, sometimes with the assistance of PNF crews, and had used a slightly different sampling protocol than the PNF sampling in the other two watersheds; the precise methods and the differences between the PNF and BNF protocols are well described in several other reports in this series and have been shown to produce comparable results (Nelson *et al*. 2002; Newberry 1988). Beginning in 2007, however, the PNF was responsible for sampling using the normal PNF protocol.

As in Nelson *et al.* (2007), we display multiple comparisons among spawning areas within watersheds to supplement the interbasin comparisons. The use of ANOVA and the *post hoc* Tukey's HSD test are described in the previous reports mentioned above, but it should be noted that for Chamberlain Basin, where we have only two sites, ANOVA is equivalent to a simple t-test. Summary data are displayed as in Nelson *et al.* (2007)[3]: light green for "Functioning Appropriately" (FA), light turquoise for "Functioning At Risk" (FR), and rose for "Functioning At Unacceptable Risk" (FUR). This report also provides time series analyses covering all years (overall or long-term models) and for 1992-2006 (recent or short-term models) to facilitate application to the revised WCIs presented in Nelson and Burns (2005); trends that would be considered to indicate improvement are highlighted in light green, those that would be considered to indicate deteriorating conditions are shown in rose.

Streamflow data were obtained from the U.S. Geological Survey on-line surface water database (http://waterdata.usgs.gov/nwis/sw), with perhaps some older data from the older style annual handbooks, and we have added 2007 data from the Johnson Creek gage for this report; 2007 data were not available for the SFSR gage at Krassel. The existing record for the Krassel gage includes water years 1967 to 2005, but with data for 1983 to 1989, and 2007 were missing; the missing data were estimated from the nearby Yellow Pine gage on Johnson Creek, which has a period of record of 1929 to 2007. Mean discharge at these two gages is highly correlated, and regression analysis provided a linear model with a coefficient of determination (R^2) of 0.99 (which we calculated using the regression analysis plug-in to Microsoft® Excel; we used the model developed for Nelson *et al*. (2006) and did not re-estimate missing values The linear model used was:

$$\text{SFSR Discharge} = 1.55 * \text{Johnson Creek Discharge} - 8.76 \qquad (1)$$

Although it is generally inappropriate to extrapolate outside the range of the data, we have also estimated a mean discharge for the SFSR for water years 1964 to 1966 to fill out the record and to highlight water year 1965 (the year of the "Christmas Floods") for reference, and we have estimated the 2007 SFSR mean annual discharge because it the data were not available during preparation of this report[4].

All statistical tables have been placed in Appendix 1 (summaries, trends, and intrabasin comparisons) and Appendix 2 (interbasin comparisons), all time series graphs have been placed in Appendix 3, all intragravel quality graphs have been placed in

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[3] However, in Nelson et al. (2006), some of the tables inadvertently highlighted data in light orange instead of rose.

[4] In Nelson *et al.* (2007) the 2006 discharge for Krassel was also estimated, but the data are now available and our database has been updated with the measured discharge for this report.

Appendix 4, and all streamflow graphs have been placed in Appendix 5. A final appendix (Appendix 6) identifies the meanings of acronyms and abbreviations used in the report.

Study Areas

A brief description of study area locations is presented here; refer Nelson *et al.* (2002) and to previous reports listed therein for additional information.

South Fork Salmon River

Study areas for sediment monitoring are located in important Chinook and steelhead spawning areas of the SFSR at Stolle Meadows (UTM 11T, 604,270N, 4,938,290E)[5], immediately upstream of the mouth of Dollar Creek (UTM 11T, 603,486E 4,952,650N), Poverty Flat (UTM 11T, 60,2467E 4,964,162N), immediately upstream of the Oxbow breach (UTM 11T, 615,600E 4,971,562N), and immediately downstream of the Glory Hole near Krassel Guard Station (UTM 11T, 60,2467E 4,978,865N); the Johnson Creek site is at the spawning area located in the vicinity of the Ice Hole Campground (UTM 11T, 618,379E 4,971,040N).

Secesh River

Study areas are located in important Chinook spawning areas of Lake Creek upstream of Corduroy Junction (UTM 11T, 582,627E 5,021,358N), near the mouth of Threemile Creek (UTM 583,577E 5,016,783N), and downstream of Burgdorf, Idaho (UTM 11T, 585,331E 5,013,400N) and of the Secesh River in the Secesh Meadows subdivision (UTM 11T, 593,387E 5,009,270N) and at Chinook Campground (UTM 11T, 593,638E 5,007,590N).

Chamberlain Basin

Study areas are located at one known Chinook spawning area downstream of the mouth of Flossie Creek (UTM 11T, 640,801E 5,025,572N) and one on West Fork Chamberlain Creek downstream of the mouth of Game Creek (UTM 11T, 641498E 5,028,540N).

[5] Previously reported as UTM 604287E, 4938304N; however, the locations were changed slightly in 2006.

Results and Discussion

South Fork Salmon River

In general, all size classes of fine particles were somewhat less than reported in Nelson *et al*. (2007), except that they were higher at the Poverty Flat (E084) spawning area, and the Oxbow spawning area was higher than in 2005 (Tables 1-6). None of the spawning areas in the mainstem SFSR would be considered FA according to the intragravel sediment WCI of a five-year mean level of 28% fine particles smaller than 6mm in particle diameter and no more than two samples in excess of 28%, and conditions at Poverty Flat place it in the FUR category with a five-year mean of 34.3% large fines. This level of fines would be expected to contribute to very low embryo survival of either Chinook salmon or steelhead if actual redds had similar concentrations of large fines (Figures 105 and 106).

Nelson *et al.* (2006) pointed out that current levels of large fines were excessive with respect to conditions established prior to reconstruction of the SFSR road. Consultation on the road reconstruction project established specific intragravel fine sediment thresholds for incidental take permit compliance:

> The incidental take for both long-term and short-term sediment effects is set as no increase in mean percent fines above the highest level reported during the 1986 through 1990 base period in the four major spawning areas located along the project area. During the base period, the highest level in mean percent fines in the major spawning areas of the SFSR were as follows: Glory Hole - 28.77%, Dollar - 30.96%, Poverty - 34.01%, and Oxbow - 35.57% (Newberry 1992). This mean is based on 40 samples per spawning site per year. (NMFS 1993).

Consultation has been informally reinitiated with the Fisheries Program with the Fisheries Program biological assessment (BA) package recently provided to NMFS, which contains volume 28 in the SFSR series of BAs (Faurot and Burns 2007).

In general, long-term trends were not similar to recent trends; however, the Ice Hole site (B152) showed significant improving trends in some sediment indices with no declining trends in both the short- and long-term (Tables 7 and 8). The Oxbow and Stolle spawning areas had some evidence of improving conditions overall, but show some trend toward deteriorating streambed quality in the short term. The Poverty Flat area showed a significant improving long-term trend in geometric mean particle diameter and no trend in small fine particles (smaller than 0.85mm) which were previously thought to be declining (Nelson *et al*. 1996 *et seq*.); in fact, in the recent model, this class of particles showed a highly significant increasing trend. Graphic displays of time trends are provided in Figures 3-50.

The intrabasin comparisons (Tables 9-13) revealed that the Poverty Flat spawning area stood alone in 2007 with respect to intragravel conditions, having the highest concentrations of fine particles of all size classes; in fact, small fine sediments, which had seemed to be decreasing, were at the highest concentration observed since 1979. Lowest intragravel quality for either Chinook or steelhead was observed at Poverty Flat; high intragravel quality for Chinook embryo survival and moderate to high quality for steelhead was observed at all other spawning areas (Figures 105 and 106).

Secesh River

Fine sediments have consistently been lower in the Lake Creek and Secesh River spawning areas (Tables 13-19) than in the mainstem upper SFSR spawning areas, except for the anomalous Threemile Creek site (E033) that continues to be influenced by unconsolidated mine spoils nearby (Nelson *et al*. 2001 *et seq.*). Fine sediment concentrations were generally similar to their long-term mean levels, and some were lower, and all of these sites except the Threemile Creek site would currently receive a rating of FA under the revised WCI guidelines; in fact, even the Threemile Creek site was lower in intragravel fines in 2007 than in any of the preceding 10 years. These sites, excluding the Threemile creek site, were used as reference sites for generating the revised ratings because they usually exhibit sediment conditions similar to those of the wilderness Chamberlain Basin sites (Nelson and Burns 2005)[6]. The Threemile Creek site, however, is clearly functioning at risk (FR) and is not far from the FUR category for intragravel fine sediments.

Few long-term trends in fine sediments (Table 18) were observed with the addition of the 2007 data; however, apparent downward trends in large and small fine sediment were modeled at the Threemile Creek site. Over the short term, there were also few statistically significant trends (Table 19), but all sites except the Threemile Creek site displayed increasing trends in small fine sediments. The short term trends are intended to help determine the correct rating for the intragravel quality WCI, but are less reliable than the long term models for understanding actual trends in intragravel conditions. The most reasonable conclusion from our monitoring is that the Threemile Creek site is starting to improve while the others are more or less stable. We should point out, however, that initial modeling of sediment trends in the Secesh River system tentatively identified increasing trend in fine sediments before implementation of the first PNF Land and Resource Management Plan (LRMP) and a decreasing trend thereafter (Nelson *et al*. 1996), and these two trends were subsequently statistically identified (Nelson *et al*. 1999). More recently, we reported that this post-LRMP may be reversing itself (Nelson *et al*. 2004, 2006), which may still be the case and may also contribute to the apparent differences between short-term and long-term models. Graphic displays of time trends are provided in Figures 51-90.

Statistical comparison of watersheds (Tables 20-24) showed that intragravel conditions at all sites were more or less similar in the Secesh River watershed except for the problematic Threemile Creek site and, interestingly, unusually low fines at the Burgdorf site (E048). All sites except the Threemile Creek site appeared generally to provide habitat with the potential for high salmon and steelhead embryo survival (Figures 109 and 110).

Chamberlain Basin

These spawning areas were selected to serve as comparison sites for the SFSR and Secesh River spawning areas in 1981 (Lund 1982) because there has been less human influence in the Frank Church River Of No Return Wilderness (FCRONW), so essentially natural disturbances dominate the ecosystem. Both sites were near their long-term mean sediment levels (Tables 24 and 25), with the Chamberlain Creek (E032) site in the FA

[6] This is not strictly correct; the Secesh sites were not reference sites in an analytical comparison of developed and reference sites, but the were of sufficient intragravel quality compared to true reference sites to be used for determining expected natural intragravel conditions in the SFSR watershed.

range and the West Fork Chamberlain Creek site (E136) in the FR class. We have consistently documented relatively high levels of intragravel fine sediments similar to the SFSR sites in the West Fork Chamberlain Creek spawning area that we have tentatively attributed to domestic livestock grazing that has occurred in that area (Nelson *et al.* 1996, 1999).

Long-term sediment time trends at both Chamberlain Basin spawning areas (Table 26) were similar to those reported in Nelson *et al.* (2007). The Chamberlain creek site appeared to show a reversal in sign from decreasing fines to increasing fines in about 1998, but we have not attempted to model this. The apparent upward trend in large fine sediments increasing trend in small fines at the West Fork Chamberlain Creek site that we first reported last year (Nelson *et al.* 2007) continued to be evident. Statistically detectable short-term time trends reflecting deterioration of intragravel quality dominated in this season's analysis at both sites (Table 27), consistent with the speculation that the trend at the Chamberlain Creek site reversed itself in about 1998. Graphic displays of time trends are provided in Figures 91-105.

The intrabasin comparison between the two Chamberlain Basin spawning areas is trivial because differences in all sediment indicators have consistently been significantly different between these sites (Tables 28-31).

Interbasin Comparison

The Chamberlain Basin spawning areas were intended to serve as comparison sites for geologically similar watersheds regularly or formerly managed for more development. Although such activities have declined in both the SFSR and Secesh River watersheds in recent years, both do have a legacy of effects from land disturbance.

The interbasin comparisons (Tables 32-35) show that fine sediment concentrations in the Chamberlain Basin watershed have generally been intermediate between the SFSR and Secesh River spawning areas, though small fines sediments have recently been similar in all three watersheds. Geometric mean particle diameter has tended to be somewhat higher statistically in the Chamberlain Basin, with the Secesh River sites in intermediate position in 2004 and 2005, but it was slightly higher in the Secesh River sites in 2006 and 2007. Although this seems to be somewhat counterintuitive, it should be remembered that we only look at two sites in the Chamberlain Basin, and that one of them (West Fork Chamberlain Creek) has intragravel conditions that are similar to the SFSR sites. Inspection of the intragravel quality graphs (Figures 111-112) illustrate the disparity between the Chamberlain Basin sites.

Conclusions

This report summarizes the results of long-term sediment monitoring in three large watersheds and shows that such long-term studies are very valuable for understanding watershed processes. Annual variation is large and periodic events can dramatically influence trends; monitoring at biennial or longer scales would preclude accurate interpretations in a reasonable time frame.

What we can conclude from this monitoring in the SFSR is that the major spawning areas, while relatively favorable for salmon and steelhead spawning, are probably somewhat worse than they were before the floods of 1964-65 and have not improved as anticipated by implementation of the SFSR Road Reconstruction Project BO:

> The net effect of the SFSR road project cannot be quantified. However, it is expected to reduce the level of human-induced mortality to Snake River spring/summer chinook salmon and Snake River fall chinook salmon (if present) and to result in an improvement from the base period of 1986-1990. The level of improvement is considered to be consistent with the estimate of reduced mortality assumed in the combined effects analysis. (NMFS 1993).

In fact, Nelson *et al.* (2007) reported that the five-year mean concentration of large fine sediments for the mainstem SFSR spawning areas cited for reference in the BO (NMFS 1993), excluding the aberrant Oxbow site, for the 1986 to 1990 base period was 28.1%, significantly less than the five-year mean for 2002 to 2006 of 31.3%. Why this is true is unclear, but fines appear to have started increasing at these sites in the mid-1990s. This seems to coincide with changes in streamflow pattern that occurred at about the same time (Figure 113), the most memorable event associated with that pattern shift being the floods of early 1997. Despite considerable annual variation in large fine sediment concentration at all areas, the index does tend to correspond loosely with annual variation in mean annual discharge (Figures 113 and 114) such that lower sediment concentrations are more likely than high ones during low flow periods and *vice versa*. For example, the very low sediment levels between 1984 and 1994 correspond to a period of sustained drought in this area, with generally higher flows subsequently. Consultation on the SFSR Road is being reinitiated this year with our consultation on ongoing Forest actions (Faurot and Burns 2007).

In the summer of 2006, fires comprising about 34,000 acres burned in the upper SFSR, but primarily under a strong weather inversion that maintained relatively cool temperatures and little wind. The result was that much of the area burned at relatively low intensity and there were few concerns related to damage to fish habitat from increased water yield and destabilized slopes (R.L. Nelson, personal observation as fisheries specialist for Burned Area Emergency Response [BAER] analysis). This conclusion appears to have been justified because 3 of the 5 upper SFSR spawning areas appeared to have a lower concentration of fine sediments in 2007 compared with 2006, and the two sites that seemed to increase were actually little different in 2007 than in 2006. In 2007, however, there was considerably more wildfire in the upper SFSR and these fires burned with much greater intensity than in 2006 (R.L. Nelson, personal observation as fisheries specialist for Burned Area Emergency Response [BAER] analysis). Included in this area was the Poverty Fire Timber Salvage area (frontispiece) that was responsible for much of the spawning area damage following the 1964-65 flood events. In the fall of 2007, extensive slope stabilization efforts, including mulching and aerial application of straw, were undertaken to help stabilize these exposed areas to help reduce the likelihood of additional failures of the legacy road system and plantation contour trenches in the Poverty area. Additional monitoring may help assess the efficacy of these overall treatments for protecting fisheries resources. Additional information on the extent and intensity of these fires and recommendation for protecting the fisheries resource can be found in Nelson (2007a,b).

Overall, we have consistently found that intragravel conditions tend to be similar in both the Secesh River and Chamberlain Creek watersheds, though both contain sites that probably do not reflect overall conditions. This allowed us to use our long-term data set to rigorously determine expected fine sediment concentrations under reference conditions and propose sediment-based functional condition indicator values to support analyses of potential effects in project planning. We have presented data here in such a way as to facilitate use of the revised WCIs, which show that most SFSR sites would receive ratings of FR while the Secesh River and Chamberlain Creek sites would receive predominantly FA ratings (the Threemile Creek and West Fork Chamberlain Creek sites, the anomalous ones, however, would be considered FR). As with the SFSR, rehabilitation measures may be less effective than desired, as evidenced by continuing suboptimal conditions at the Threemile Creek spawning area because of unstable areas that were mined historically.

References

FAUROT, M.; Burns, D.C. 2007. Biological assessment for the potential effects of managing the Payette National Forest in the South Fork Salmon River Section 7 watershed on Snake River spring/summer Chinook salmon, Snake River steelhead, and Columbia River bull trout and biological evaluation for westslope cutthroat trout. Volume 28. Ongoing and new actions. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 300p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/biological_assessments/SFSR_BA28.pdf

LUND, J. 1982. Core sample analyses of fine sediment in spawning sites, Lake Creek-Secesh River – 1981. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 13p (plus appendix).

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/Secesh_Core_Sampling_Report_1982

MCNEIL, W.J. 1964. A method of measuring mortality of pink salmon eggs and larvae. USDI-Fish and Wildlife Service, Fish Bull. 63(3):575-578.

NELSON, R.L.; 2007a. Fisheries Technical Report. Cascade Fire Complex, Payette National Forest Portion. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 46p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/baer_reports/Cascade_Fisheries Technical Report.pdf

NELSON, R.L.; 2007b. Fisheries Technical Report. East Zone Fire Complex, Payette National Forest Portion. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 41p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/baer_reports/EZ_Fisheries Technical Report.pdf

NELSON, R.L.; Burns, D.C.; Newberry, D.D. 2007. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Statistical summary of intragravel monitoring, 1975-2006. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 92p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_2007.pdf

NELSON, R.L.; Burns, D.C.; Zurstadt, C.; Newberry, D.D. 2006. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Statistical summary of intragravel monitoring, 1975-2006. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 88p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_2006.pdf

NELSON, R.L.; Burns, D.C. 2005. Developing appropriate sediment–related watershed condition indicators for national environmental policy act analyses and biological assessments in the South Fork Salmon River basin. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 101p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/white_papers/sediment_wci_final.pdf

Nelson, R.L.; Burns, D.C.; Newberry, D.D; Ketchu, K.L. 2004. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Statistical summary of intragravel monitoring, 1975-2003, and photographic summary of South Fork Salmon River changes since 1966. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 173p.

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_2004.pdf

Nelson, R.L.; Burns, D.C.; Kethcu, K.L.; Newberry, D.D. 2002. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Intragravel conditions in Salmon River tributaries. Report of sediment trends from core sampling, 1966-2001. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 69p.

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_2002.pdf

Errata Sheet:

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/pnf_core_sampling_report_2002_errata.pdf

Nelson, R.L.; Burns, D.C.; Newberry, D.D. 2001. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Report of sediment trends from core sampling, 1966-2000. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 76p.

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_2001.pdf

Nelson, R.L.; Burns, D.C.; Newberry, D.D; Faurot, M. 1999. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Report of sediment trends from core sampling, 1966-1998. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 70p.

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_1999.pdf

Nelson, R.L.; Burns, D.C.; Wagoner, L.; Armstrong, R.; Olson, D. 1996. Deposition of fine sediment in the Salmon River watershed. Payette and Boise National Forests, Idaho. Report of sediment trends from core sampling, 1966-1995. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 134p.

FSWEB:
http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/PNF_Core_Sampling_Report_1996.pdf

Newberry, D. 1992. South Fork Salmon River fisheries accomplishment and monitoring report (draft). Cascade ID: U.S. Department of Agriculture, Forest Service, Boise National Forest. Unnumbered pages.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/BNF_Core_Sampling_Report_1992.pdf

Newberry, D.D. 1988. South Fork Salmon River monitoring committee fisheries accomplishment and monitoring report. Unpublished report. Cascade, ID: U.S. Department of Agriculture, Forest Service, Boise National Forest. Unnumbered pages.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/sediment_reports/EF.15.0034.pdf

NMFS. 2003. Endangered Species Act Section 7 consultation biological opinion and Magnuson-Stevens Fishery Conservation and Management Act essential fish Habitat consultation. Boise, Payette, and Sawtooth National Forest land and resource management plan revisions, Southwest Idaho Ecogroup. Portland, OR: US Department of Commerce, National Marine Fisheries Service (NOAA Fisheries), Northwest Regional Office. 102p (plus attachments).

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/biological_opinions/BO_NOAA_060903.pdf

NMFS. 1993. Endangered Species Act – Section 7 consultation. Biological opinion. Reconstructing, paving, and snowplowing the South Fork Salmon River Road. Portland, OR: US Department of Commerce, National Marine Fisheries Service, Northwest Regional Office. 26p.

FSWEB: http://fsweb.payette.r4.fs.fed.us/units/fish.web/documents/SFSR_Road_BO.pdf

Platts, W.S.; Torquemada, R.J.; McHenry, M.L.; Graham, C.K. 1989. Changes in salmon spawning and rearing habitat from increased delivery of fine sediment to the South Fork Salmon River, Idaho. Transactions of the American Fisheries Society. 118:274-283.

Tappel, P.D.; Bjornn, T.C. 1983. A new method of relating size of spawning gravel to salmonid embryo survival. North American Journal of Fisheries Management. 3:123-135.

USFS. 2003. Payette National Forest land and resource management plan. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 363p (plus appendices).

Appendix 1. Statistical Summary Tables

South Fork Salmon River

Statistical Summaries

Table 1.—Mean[a] annual percentages of fine sediments from core sampling in the Stolle Meadows spawning area (B081), South Fork Salmon River, 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	22.2	1.1	30.0	18.5	0.9	32.2	4.5	0.3	44.8	19.2	0.6	20.1
1978	40	19.9	0.9	28.5	17.1	0.8	28.5	5.8	0.3	34.1	20.3	0.5	17.0
1979	40	23.0	1.1	30.2	19.2	0.9	29.2	6.4	0.4	41.5	19.1	0.6	19.3
1980	40	20.7	1.4	43.9	16.2	1.2	46.0	3.6	0.2	43.0	44.8	3.3	46.8
1981	40	22.7	1.0	28.2	18.0	0.9	31.9	5.3	0.4	46.1	38.1	2.0	32.7
1982	40	17.5	1.0	37.0	14.0	0.9	41.4	4.5	0.4	53.7	48.4	2.7	35.6
1983	40	22.4	1.3	36.0	18.8	1.1	37.4	4.7	0.4	48.7	35.9	2.6	46.1
1984	40	25.0	1.0	25.5	20.8	0.9	28.2	4.4	0.2	35.4	29.9	1.4	28.7
1985	40	22.7	0.7	20.5	18.8	0.7	22.9	4.5	0.3	37.2	33.6	1.2	21.9
1986	40	26.3	1.1	27.6	21.5	1.1	32.3	5.4	0.3	36.9	31.3	2.2	43.5
1987	40	27.0	1.6	37.7	21.5	1.3	39.1	5.1	0.4	55.0	35.1	2.3	42.2
1988	40	20.4	1.3	39.1	16.3	1.1	43.2	4.1	0.3	40.7	45.1	3.7	52.3
1989	40	22.7	1.1	30.7	17.9	0.9	31.5	4.6	0.2	33.8	39.0	1.9	31.3
1990	40	25.8	1.4	35.1	20.7	1.3	39.7	5.5	0.4	45.2	32.6	1.8	35.3
1991	40	26.2	1.8	43.9	21.0	1.7	51.4	5.0	0.4	53.1	35.1	2.4	43.1
1992	35	24.5	1.2	28.1	20.4	1.2	34.9	5.1	0.3	36.3	37.9	2.4	37.0
1993	20	23.4	1.3	24.7	19.0	1.2	28.0	4.6	0.4	35.5	36.5	2.1	25.4
1994	40	18.9	1.2	40.2	13.4	1.1	49.8	2.7	0.5	112.0	54.1	3.9	45.7
1995	40	26.7	1.1	25.7	21.8	0.9	26.9	5.9	0.5	55.0	28.2	1.5	32.8
1996	40	32.8	2.2	41.9	28.1	2.1	47.6	6.0	0.5	52.9	25.8	2.7	65.3
1997	40	25.5	1.7	41.8	20.4	1.5	47.8	5.6	0.5	53.3	35.6	2.8	49.6
1998	40	24.3	1.4	37.0	19.7	1.2	38.2	5.4	0.4	49.0	36.6	2.9	50.6
1999	40	28.6	1.5	33.4	24.3	1.5	38.3	5.3	0.3	41.9	30.0	2.7	57.8
2000	40	26.9	1.3	29.7	21.2	1.2	35.7	6.3	0.4	43.3	30.7	1.9	38.6
2001	40	28.9	1.4	29.9	23.0	1.0	28.8	6.4	0.4	41.5	20.9	1.2	35.8
2002	40	30.4	1.4	29.7	25.4	1.4	33.7	6.8	0.5	44.8	25.0	1.8	44.4
T1	-----	**24.4**	**1.3**	**33.2**	**19.2**	**1.1**	**36.7**	**4.9**	**0.4**	**47.3**	**34.6**	**2.1**	**36.7**
2003	40	31.2	1.4	27.7	25.6	1.3	32.0	7.5	0.4	36.3	23.4	2.0	54.9
2004	40	31.3	2.2	45.3	26.5	2.1	49.5	7.9	0.5	42.3	27.4	2.5	56.7
2005	25	32.8	2.0	29.9	28.1	1.8	32.8	8.0	0.7	40.9	22.1	1.9	42.6
2006	40	27.0	1.2	27.1	22.8	1.1	29.8	7.5	0.4	34.5	29.3	1.7	36.1
2007	40	23.5	1.5	39.6	13.8	0.8	37.8	7.1	0.7	66.4	27.3	2.2	50.0
T2	-----	**29.2**	**1.5**	**32.9**	**23.0**	**1.3**	**35.7**	**6.8**	**0.5**	**44.1**	**27.3**	**2.1**	**46.8**
T3	-----	**25.2**	**1.3**	**33.1**	**20.4**	**1.2**	**36.3**	**5.5**	**0.4**	**46.3**	**32.2**	**2.1**	**40.0**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2002 time period; T2 – 2003-2007 time period; T3 – 1977-2007 time period.

Table 2.—Mean[a] annual percentages of fine sediments from core sampling in the Dollar Creek spawning area (B082), South Fork Salmon River, 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	29.0	1.0	22.5	25.6	1.0	24.8	5.5	0.3	34.4	15.8	0.5	19.9
1978	40	31.1	1.0	20.5	27.8	1.0	21.6	6.7	0.3	32.5	14.7	0.4	19.1
1979	40	28.1	1.1	24.3	25.3	1.0	25.7	8.5	0.4	26.7	16.0	0.5	20.4
1980	40	27.7	1.2	27.4	24.3	1.1	29.7	4.9	0.3	38.5	28.3	1.4	30.9
1981	40	26.2	1.0	23.3	22.6	0.9	24.3	7.0	0.4	33.4	30.9	1.7	35.1
1982	40	27.5	1.0	23.6	23.8	0.9	24.2	6.3	0.3	30.6	29.2	1.3	27.3
1983	40	27.8	1.0	23.6	24.5	1.0	24.8	4.1	0.1	20.9	30.3	2.1	44.6
1984	40	26.5	1.1	25.4	23.0	1.0	26.5	3.6	0.2	41.1	29.1	1.4	31.4
1985	40	29.7	0.8	16.4	26.1	0.7	17.7	4.3	0.1	20.4	25.0	0.9	22.9
1986	40	28.7	0.9	20.4	24.4	0.9	22.5	4.5	0.2	29.1	28.2	1.3	28.9
1987	40	28.6	0.8	17.4	24.3	0.7	19.3	4.1	0.2	31.1	30.0	1.5	31.7
1988	40	26.8	1.1	25.2	22.3	0.9	26.0	4.2	0.2	34.0	29.6	1.4	29.7
1989	40	30.9	1.2	24.6	26.7	1.2	27.3	4.0	0.2	35.8	25.5	1.3	31.6
1990	40	30.2	1.0	21.5	24.7	0.8	19.8	4.7	0.3	38.7	23.2	1.0	27.9
1991	40	26.6	0.8	17.9	21.8	0.7	19.9	3.3	0.2	32.0	29.2	1.1	23.2
1992	40	26.4	1.0	25.0	22.8	0.9	25.4	4.0	0.2	37.2	31.0	2.0	40.7
1993	40	29.5	1.5	31.4	24.6	1.4	35.6	4.1	0.2	34.3	26.9	1.5	35.5
1994	40	26.0	1.4	35.2	19.9	1.5	47.0	2.5	0.4	108.2	39.6	3.0	47.5
1995	40	25.6	1.2	29.2	21.5	1.0	30.0	4.6	0.3	34.2	29.6	1.9	40.5
1996	40	27.8	0.7	16.6	23.9	0.7	17.7	5.3	0.2	27.6	28.3	1.1	25.2
1997	40	28.9	0.9	18.9	23.8	0.8	20.5	4.6	0.2	28.5	26.3	1.2	29.5
1998	40	42.7	1.8	26.0	37.2	1.8	30.6	9.6	0.5	31.0	15.6	1.0	40.2
1999	40	26.3	1.3	31.8	22.0	1.2	34.6	3.7	0.2	40.9	28.6	1.4	30.5
2000	40	30.5	1.2	24.0	25.8	1.2	29.3	4.1	0.2	33.8	24.1	1.0	26.8
2001	40	29.3	1.3	28.2	23.9	1.2	31.1	5.7	0.9	101.1	22.3	1.5	42.9
2002	40	29.0	1.0	22.5	25.6	1.0	24.8	5.5	0.3	34.4	15.8	0.5	19.9
T1	**-----**	**28.7**	**1.0**	**23.3**	**24.0**	**1.0**	**25.3**	**4.8**	**0.2**	**35.7**	**27.0**	**1.4**	**30.6**
2003	40	31.1	1.0	20.5	27.8	1.0	21.6	6.7	0.3	32.5	14.7	0.4	19.1
2004	40	28.1	1.1	24.3	25.3	1.0	25.7	8.5	0.4	26.7	16.0	0.5	20.4
2005	40	27.7	1.2	27.4	24.3	1.1	29.7	4.9	0.3	38.5	28.3	1.4	30.9
2006	40	26.2	1.0	23.3	22.6	0.9	24.3	7.0	0.4	33.4	30.9	1.7	35.1
2007	40	24.2	1.2	30.6	17.1	0.8	29.8	4.7	0.5	62.9	27.1	1.8	43.0
T2	**-----**	**30.0**	**1.3**	**25.8**	**25.6**	**1.2**	**28.7**	**6.0**	**0.4**	**45.8**	**23.3**	**1.3**	**36.4**
T3	**-----**	**28.9**	**1.1**	**24.1**	**24.5**	**1.0**	**26.4**	**5.2**	**0.3**	**38.9**	**25.8**	**1.4**	**32.5**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2002 time period; T2 – 2003-2007 time period; T3 – 1977-2007 time period.

Table 3.—Mean annual percentages of fine sediments from core sampling in the Poverty Flat spawning area (E084), South Fork Salmon River, 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	35.9	1.1	19.4	31.3	1.1	21.7	13.2	0.9	45.4	11.9	0.4	19.9
1978	40	33.7	1.2	22.1	29.2	1.1	24.8	11.1	0.8	47.6	12.5	0.4	21.4
1979	40	32.4	0.9	17.4	28.9	0.8	17.8	11.8	0.7	35.7	13.6	0.4	17.2
1980	40	29.3	0.9	18.4	26.4	0.8	19.7	6.0	0.4	41.3	23.2	1.1	29.7
1981	40	30.1	1.1	23.9	26.6	1.1	26.3	8.7	0.6	42.1	23.7	1.3	35.6
1982	40	30.4	1.3	26.1	26.7	1.2	28.5	7.5	0.4	37.1	23.1	1.8	49.7
1983	40	35.5	0.8	14.0	31.5	0.8	15.7	5.5	0.3	31.2	17.8	0.7	25.6
1984	40	28.9	1.0	22.2	25.3	1.0	24.2	4.7	0.4	49.9	25.2	1.4	35.8
1985	40	36.0	1.3	23.5	32.3	1.3	26.3	5.5	0.3	39.5	17.9	1.1	38.4
1986	40	34.1	0.9	17.0	29.4	0.9	19.5	6.0	0.4	46.7	22.0	1.6	46.6
1987	40	33.8	1.0	19.4	28.6	1.1	24.9	7.5	0.4	29.7	18.4	1.1	37.0
1988	40	30.2	1.1	23.2	25.2	1.0	25.2	4.7	0.3	39.2	26.6	2.0	47.0
1989	40	28.3	1.3	28.4	24.3	1.2	32.4	4.4	0.3	39.0	27.3	1.6	37.7
1990	40	29.8	1.1	24.2	25.5	1.2	28.7	5.4	0.3	37.7	25.2	1.5	38.0
1991	40	31.2	1.2	24.2	26.9	1.1	27.1	4.8	0.4	56.7	23.6	1.4	38.4
1992	40	31.2	0.9	18.6	27.1	0.9	21.5	7.4	0.4	38.1	22.1	1.4	40.5
1993	40	35.1	1.3	23.4	30.7	1.3	26.4	5.5	0.4	41.3	18.6	1.1	37.7
1994	40	33.4	1.3	25.2	26.2	1.7	40.3	4.3	0.8	113.0	25.5	2.1	52.7
1995	40	29.8	1.6	34.7	25.5	1.5	36.5	5.9	0.5	50.4	25.0	1.5	37.8
1996	40	35.3	1.5	26.9	29.7	1.5	32.9	5.9	0.5	47.9	18.2	1.2	40.1
1997	40	36.8	1.2	20.5	31.7	1.2	23.1	9.0	0.4	28.7	18.3	1.3	43.2
1998	40	28.0	1.1	25.3	23.4	1.0	26.9	4.2	0.2	33.1	26.6	1.4	34.4
1999	38	37.8	1.3	21.4	31.6	1.3	26.0	7.8	0.5	38.9	17.7	1.2	41.4
2000	40	31.5	2.3	45.8	27.7	2.1	47.9	4.5	0.3	41.3	33.0	3.4	65.4
2001	40	30.4	1.8	37.7	24.4	1.6	40.6	4.3	0.5	68.8	28.0	3.0	68.2
2002	40	40.6	2.9	45.0	24.8	2.1	53.3	12.5	1.0	51.3	16.7	1.8	68.1
T1	-----	**32.6**	**1.1**	**22.5**	**28.0**	**1.1**	**25.9**	**6.9**	**0.5**	**44.7**	**20.9**	**1.3**	**36.7**
2003	40	37.4	1.6	27.4	32.6	1.6	31.6	6.6	0.6	58.1	18.9	1.4	46.3
2004	40	30.5	1.4	28.1	26.6	1.3	31.9	8.0	0.5	40.7	29.9	2.4	50.1
2005	40	27.7	1.9	42.6	23.9	1.8	47.9	8.1	1.1	84.1	28.9	2.7	57.9
2006	40	38.5	1.3	20.5	33.3	1.4	25.8	9.3	0.5	33.8	16.9	0.9	31.9
2007	40	40.6	2.9	45.0	24.8	2.1	53.3	12.5	1.0	51.3	16.7	1.8	68.1
T2	-----	**34.9**	**1.7**	**32.0**	**28.1**	**1.6**	**36.6**	**7.2**	**0.6**	**49.8**	**23.3**	**1.9**	**49.5**
T3	-----	**32.9**	**1.3**	**25.6**	**28.1**	**1.3**	**29.3**	**7.0**	**0.5**	**46.3**	**21.7**	**1.5**	**40.8**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2002 time period; T2 – 2003-2007 time period; T3 – 1977-2007 time period.

Table 4.—Mean annual percentages of fine sediments from core sampling in the Glory spawning area (E085), South Fork Salmon River, 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	31.8	1.0	19.1	28.0	1.0	21.5	7.0	0.5	42.8	13.6	0.3	15.9
1978	40	31.7	1.2	24.6	28.4	1.1	23.8	11.0	0.3	19.9	13.2	0.6	27.3
1979	40	32.8	1.2	23.1	28.8	1.1	23.4	6.1	0.2	22.9	14.1	0.5	21.4
1980	40	30.6	1.1	23.6	25.0	0.9	24.0	6.1	0.4	39.4	23.9	1.4	36.5
1981	40	27.2	0.9	21.4	24.1	0.9	23.4	5.0	0.4	51.3	25.2	1.3	33.5
1982	40	24.5	1.3	34.1	20.7	1.2	36.6	5.2	0.3	33.9	28.5	1.6	34.8
1983	40	24.5	1.0	25.7	21.4	0.9	26.5	4.2	0.2	26.9	30.1	1.5	30.9
1984	40	22.1	1.1	30.6	19.1	1.0	32.8	3.1	0.2	41.7	33.7	1.5	28.5
1985	40	28.9	1.3	29.0	25.8	1.3	31.1	4.0	0.2	37.7	25.8	1.4	33.9
1986	40	22.5	1.1	30.4	19.1	1.1	35.3	3.2	0.2	38.2	34.0	1.5	27.5
1987	40	28.8	1.1	23.2	24.2	0.9	23.6	5.2	0.5	57.4	25.6	1.2	30.8
1988	40	25.2	1.0	25.8	21.7	0.9	27.3	3.8	0.1	24.6	31.1	1.5	30.9
1989	40	24.1	1.1	29.3	19.6	1.0	32.9	3.7	0.2	30.6	30.0	1.5	30.7
1990	40	28.6	1.1	24.3	24.9	1.1	27.5	3.5	0.2	32.5	25.9	1.3	32.5
1991	40	23.6	1.0	27.7	19.9	0.9	27.3	3.8	0.4	60.1	31.8	1.3	26.9
1992	40	27.4	1.0	23.9	24.0	1.0	25.9	5.2	0.3	35.0	28.1	1.6	35.6
1993	40	22.8	1.1	30.2	18.8	1.0	32.0	3.8	0.2	39.0	32.4	2.0	40.0
1994	39	22.5	1.2	34.6	17.2	1.1	38.9	1.5	0.2	100.1	41.8	3.2	47.6
1995	40	34.9	1.7	30.8	30.7	1.7	34.5	5.1	0.3	43.3	17.5	1.2	42.3
1996	40	34.3	1.0	17.8	30.3	1.0	20.2	5.8	0.6	63.7	20.0	0.9	28.9
1997	40	34.2	1.0	18.5	29.2	1.0	21.9	5.9	0.3	32.8	19.6	0.9	29.9
1998	40	38.7	1.2	20.1	33.4	1.1	21.7	7.2	0.4	39.3	16.8	1.0	35.9
1999	40	35.2	1.5	27.7	30.7	1.6	32.4	6.5	0.7	64.1	18.9	1.0	34.4
2000	40	30.7	1.4	28.7	26.3	1.4	33.1	4.7	0.5	61.7	24.1	1.4	36.2
2001	40	23.1	0.9	24.1	19.3	0.8	26.5	3.4	0.3	52.9	32.5	1.4	27.4
2002	40	27.7	1.1	24.8	23.9	1.1	27.8	5.4	0.4	47.7	25.1	1.0	25.1
T1	-----	**28.4**	**1.1**	**26.1**	**23.9**	**1.1**	**28.1**	**4.9**	**0.3**	**41.6**	**26.0**	**1.3**	**31.7**
2003	40	31.8	2.0	40.5	28.2	2.0	44.5	5.4	0.6	72.6	24.6	1.7	44.4
2004	40	30.7	1.4	28.9	26.2	1.3	31.6	6.3	0.5	52.0	23.5	1.5	39.3
2005	40	26.2	1.3	30.7	22.2	1.1	32.3	5.7	0.5	58.5	26.3	1.3	32.5
2006	40	40.0	1.4	22.9	35.9	1.5	25.6	11.7	0.7	40.4	15.4	1.2	49.8
2007	40	30.5	1.3	26.3	19.4	0.9	29.4	8.7	0.5	35.8	19.6	1.1	35.3
T2	-----	**31.8**	**1.4**	**27.5**	**26.6**	**1.3**	**30.5**	**6.5**	**0.5**	**52.5**	**22.7**	**1.3**	**36.0**
T3	-----	**29.0**	**1.2**	**26.5**	**24.7**	**1.1**	**28.9**	**5.4**	**0.4**	**45.1**	**24.9**	**1.3**	**33.1**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2002 time period; T2 – 2003-2007 time period; T3 – 1977-2007 time period.

Table 5.—Mean annual percentages of fine sediments from core sampling in the Oxbow spawning area, South Fork Salmon River (E083), 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	35.0	1.1	19.0	31.4	1.0	20.0	7.3	0.4	36.5	12.7	0.4	20.7
1978	40	36.4	0.6	10.6	32.7	0.6	11.3	11.6	0.6	32.2	11.8	0.2	12.6
1979	40	34.9	1.0	17.5	31.2	1.0	19.5	10.1	0.5	32.1	12.7	0.3	15.3
1980	40	32.0	1.3	25.9	27.7	1.2	27.8	7.2	0.3	29.2	22.0	1.1	31.1
1981	40	31.4	0.7	14.8	27.5	0.7	15.3	8.3	0.4	27.3	22.0	1.0	27.4
1982	40	30.5	1.3	26.4	26.8	1.2	29.0	6.8	0.4	37.9	24.1	1.8	47.5
1983	40	36.2	0.9	16.5	31.9	0.9	16.9	6.3	0.3	33.9	19.0	1.0	32.9
1984	40	33.5	0.7	13.2	29.4	0.7	14.8	5.0	0.3	43.1	20.0	0.8	26.4
1985	40	36.6	0.9	14.8	32.4	0.8	16.1	5.4	0.3	35.9	17.0	0.7	26.9
1986	40	35.6	0.7	12.6	29.8	0.6	13.7	5.7	0.4	44.7	18.3	0.7	23.4
1987	40	35.5	0.7	13.2	30.3	0.7	13.7	6.6	0.3	25.4	18.8	0.6	19.0
1988	40	29.7	1.3	27.6	24.6	1.2	29.8	4.4	0.2	31.1	25.4	1.6	38.9
1989	40	30.0	1.2	24.8	24.9	1.1	27.0	5.2	0.3	33.5	25.6	1.5	37.2
1990	40	31.7	1.4	27.1	26.2	1.3	31.6	5.5	0.3	37.2	23.2	1.6	44.6
1991	40	27.1	1.1	25.8	21.9	0.9	26.6	4.6	0.3	41.3	26.6	1.6	37.6
1992	40	28.3	1.3	28.5	23.7	1.3	33.6	5.9	0.4	42.6	27.8	2.0	46.4
1993	20	21.8	1.4	28.5	16.7	1.1	30.2	3.4	0.2	29.8	38.0	3.2	37.6
1994	40	33.2	1.1	20.1	24.3	1.1	27.8	3.0	0.5	100.0	26.4	1.6	37.8
1995	40	34.1	1.2	22.8	27.4	1.1	26.3	6.1	0.3	32.3	19.5	1.0	32.9
1996	40	32.2	1.3	25.9	26.7	1.2	28.0	5.9	0.4	40.7	22.2	1.3	36.2
1997	40	36.3	0.7	12.9	31.6	0.7	14.2	7.6	0.3	29.1	17.1	0.5	19.2
1998	40	29.2	1.1	23.5	23.2	1.0	28.3	5.9	0.4	39.0	23.6	1.0	25.5
1999	40	31.3	1.5	29.8	25.6	1.5	37.5	6.8	0.5	50.6	22.2	1.4	38.9
2000	40	29.4	1.1	24.1	23.4	1.1	30.7	5.7	0.5	56.4	23.2	1.1	31.1
2001	40	27.6	1.1	25.8	21.4	1.1	32.8	4.6	0.4	52.0	22.8	1.0	27.5
T1	-----	**32.0**	**1.0**	**20.4**	**27.6**	**1.0**	**22.5**	**6.3**	**0.4**	**37.9**	**21.4**	**1.2**	**31.0**
2002	40	29.5	1.4	29.7	25.0	1.4	34.4	6.4	0.8	81.8	26.0	1.6	38.4
2003	40	33.5	1.4	27.1	28.5	1.5	33.6	7.1	0.5	43.6	20.0	1.0	31.8
2004	40	31.3	0.9	18.2	26.4	0.9	21.0	7.9	0.5	39.4	20.4	0.7	20.9
2005	40	27.1	1.2	27.4	22.3	1.0	28.9	6.3	0.6	59.2	24.9	1.4	35.9
2006	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2007	40	29.4	1.1	23.1	17.6	0.7	24.2	8.2	0.7	50.5	18.4	0.9	29.6
T2	-----	**30.2**	**1.2**	**25.4**	**23.7**	**1.1**	**30.2**	**6.5**	**0.5**	**52.5**	**22.4**	**1.1**	**31.1**
T3	-----	**31.7**	**1.1**	**21.9**	**26.4**	**1.0**	**24.8**	**6.4**	**0.4**	**42.3**	**21.7**	**1.2**	**31.0**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2001 time period; T2 – 2002-2007 time period; T3 – 1977-2007 time period.

Table 6.—Mean annual percentages of fine sediments from core sampling in the Ice Hole area (B152), Johnson Creek, 1977-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1977	40	24.4	0.8	20.9	21.8	0.8	22.3	4.8	0.3	41.6	17.2	0.5	16.5
1978	40	25.5	0.7	16.6	23.1	0.7	18.2	6.5	0.3	33.5	16.4	0.4	13.6
1979	40	23.1	0.7	19.6	19.5	0.6	18.5	6.0	0.2	25.0	18.3	0.3	11.8
1980	40	25.4	1.2	29.2	22.3	1.1	30.3	5.5	0.3	37.7	29.5	1.6	34.2
1981	40	25.9	0.8	19.4	22.8	0.8	21.7	4.6	0.2	24.5	26.3	1.0	23.3
1982	40	27.3	1.0	23.3	24.4	1.0	25.6	4.7	0.3	41.2	25.4	0.9	22.7
1983	40	27.9	1.1	24.4	24.9	1.0	26.5	4.2	0.3	46.9	25.5	1.2	28.5
1984	40	27.9	0.9	20.3	25.0	0.9	22.5	3.3	0.2	36.3	23.7	0.7	19.7
1985	40	32.3	0.9	18.0	29.4	0.9	18.8	3.6	0.2	41.2	20.7	1.1	34.0
1986	40	31.6	1.0	19.0	28.4	0.9	20.3	4.2	0.3	39.6	21.5	1.0	28.6
1987	40	27.9	1.0	23.4	24.6	1.1	28.1	5.2	0.2	25.1	26.7	1.8	43.7
1988	40	26.1	1.2	28.6	22.7	1.2	33.5	4.8	0.3	43.6	31.7	2.4	48.9
1989	40	25.7	0.7	16.6	21.9	0.7	19.4	4.2	0.2	24.2	28.5	1.2	26.6
1990	40	23.7	0.9	24.2	20.9	0.9	27.1	3.4	0.2	33.5	29.9	1.8	38.3
1991	40	28.3	1.1	24.7	25.1	1.1	27.9	4.3	0.2	31.8	26.9	1.8	42.5
1992	40	26.2	1.4	33.7	23.4	1.3	34.2	3.5	0.3	46.0	32.5	2.9	55.8
1993	40	30.4	1.0	21.8	26.2	0.9	22.6	4.2	0.2	36.3	23.4	1.4	38.4
1994	40	30.7	0.9	19.2	26.8	1.0	22.9	2.9	0.4	96.6	28.0	1.8	40.8
1995	40	33.3	0.8	15.7	29.2	0.8	17.7	5.4	0.3	36.1	18.8	0.7	24.5
1996	40	28.5	1.4	31.6	24.3	1.2	32.0	3.7	0.2	38.4	29.5	2.8	60.5
1997	40	27.8	0.6	14.7	23.6	0.6	16.2	5.3	0.2	21.1	26.1	0.9	22.7
1998	40	26.9	1.0	23.9	22.9	0.9	25.0	5.6	0.3	32.8	27.5	1.8	40.6
1999	40	26.9	0.9	22.2	23.0	0.9	23.5	4.6	0.3	35.8	27.4	1.4	32.1
2000	39	23.7	1.3	35.4	20.2	1.4	42.2	4.9	1.3	164.3	38.6	2.0	32.8
2001	40	30.5	1.2	25.2	26.5	1.2	28.0	3.8	0.2	27.9	25.8	1.8	43.4
2002	40	30.1	1.1	23.4	26.5	1.1	27.0	4.3	0.2	29.7	26.4	1.7	41.0
T1	-----	**27.6**	**1.0**	**22.1**	**24.3**	**0.9**	**24.1**	**4.5**	**0.3**	**38.1**	**25.1**	**1.3**	**32.2**
2003	40	24.4	1.3	34.7	20.5	1.4	42.5	5.2	0.4	46.5	34.1	2.9	52.8
2004	40	22.0	0.9	26.0	18.9	0.9	29.1	4.6	0.4	52.9	38.0	1.6	26.3
2005	40	25.5	1.1	27.2	22.3	1.1	31.3	5.7	0.3	28.5	29.8	1.8	38.3
2006	40	22.0	1.3	38.6	19.1	1.2	39.4	5.6	0.4	42.8	35.2	2.7	48.4
2007	40	19.1	1.0	31.7	12.1	0.7	38.1	5.3	0.4	49.3	34.7	2.3	41.8
T2	-----	**22.6**	**1.1**	**28.8**	**21.2**	**1.1**	**32.6**	**5.0**	**0.4**	**51.1**	**31.8**	**2.0**	**39.8**
T3	-----	**26.8**	**1.0**	**24.3**	**23.3**	**1.0**	**26.9**	**4.6**	**0.3**	**42.3**	**27.2**	**1.6**	**34.6**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1977-2002 time period; T2 – 2003-2007 time period; T3 – 1977-2007 time period.

Time Series Analyses

Overall Models

Table 7.—Overall regression models (y = bx + a) for percent fine sediments and geometric mean particle diameter from core sampling, SFSR spawning areas, 1977-2007.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Stolle Meadows (B081)							
LF	-552.79	0.29**	0.08	1.22**	-548.41	0.29**	0.26
CF	-404.60	0.21**	0.05	1.11**	-396.43	0.21**	0.29
SF	-172.13	0.09**	0.08	1.13**	-171.72	0.09**	0.27
GM	408.97	-0.19**	0.01	0.93**	418.12	-0.19	0.33
Dollar Creek (B082)							
LF	-114.97	0.07**	0.01	1.29**	-112.85	0.07†	0.15
CF	25.52	0.00	0.00	1.25**	28.65	0.00	0.17
SF	-19.77	0.01	0.00	0.96**	-18.71	0.01	0.31
GM	14.15	0.01	0.00	1.07**	13.83	0.01	0.28
Poverty Flat (E084)							
LF	-163.76	0.10**	0.01	1.05**	-157.22	0.10	0.25
CF	45.93	-0.01	0.00	1.08**	53.94	-0.01	0.23
SF	69.87	-0.03*	0.00	0.79**	70.95	-0.03	0.42
GM	-321.95	0.17**	0.02	0.83**	-329.41	0.18*	0.39
Glory Hole (E085)							
LF	-271.54	0.15**	0.02	1.08**	-260.61	0.15*	0.28
CF	-149.07	0.09**	0.01	1.02**	-133.96	0.08	0.29
SF	-72.12	0.04**	0.01	0.84**	-78.03	0.04	0.42
GM	67.54	-0.02	0.00	0.89**	43.50	-0.01	0.36
Oxbow (E083)							
LF	373.21	-0.17**	0.04	1.25**	367.64	-0.17**	0.20
CF	577.08	-0.28**	0.10	1.14**	575.81	-0.28**	0.30
SF	95.92	-0.05**	0.01	1.00**	91.12	-0.04†	0.30
GM	-157.98	0.09**	0.01	0.95**	-162.71	0.09	0.31
Ice Hole (B152)							
LF	151.54	-0.06**	0.01	0.87**	150.59	-0.06	0.36
CF	243.25	-0.11**	0.02	0.83**	243.38	-0.11*	0.40
SF	-0.73	0.00	0.00	1.36**	-0.47	0.00	0.12
GM	-798.38	0.41**	0.09	0.84**	-790.99	0.41**	0.42

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Recent Models

Table 8.—Recent regression models (y = bx + a) for percent fine sediments and geometric mean particle diameter from core sampling, SFSR spawning areas, 1997-2006.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Stolle Meadows (B081)							
LF	-105.88	0.07	0.00	1.29**	-150.00	0.09	0.19
CF	385.21	-0.18	0.00	1.13**	370.19	-0.17	0.27
SF	-522.56	0.26**	0.06	1.19**	-525.42	0.27**	0.22
GM	1322.00	-0.65**	0.02	1.22**	1467.00	-0.72	0.20
Dollar Creek (B082)							
LF	1266.00	-0.62**	0.04	1.24**	1212.00	-0.59*	0.19
CF	1508.00	-0.74**	0.06	1.19**	1446.00	-0.71**	0.23
SF	-69.16	0.04	0.00	1.07**	-71.85	0.04	0.24
GM	-388.07	0.21	0.00	1.45**	-351.85	0.19	0.10
Poverty Flat (E084)							
LF	-1201.00	0.62**	0.02	0.81**	-1056.00	0.54	0.38
CF	-143.07	0.09	0.00	0.87**	-20.06	0.02	0.33
SF	-1393.00	0.70**	0.19	0.95**	-1346.00	0.68**	0.44
GM	1349.00	-0.66**	0.02	0.74**	702.40	-0.34	0.45
Glory Hole (E085)							
LF	454.74	-0.21	0.00	1.24**	508.45	-0.24	0.19
CF	1058.00	-0.52**	0.02	1.17**	1117.00	-0.54†	0.23
SF	-757.07	0.38**	0.08	1.18**	-762.23	0.38**	0.28
GM	211.49	-0.09	0.00	1.20**	176.79	-0.08	0.21
Oxbow (E083)[c]							
LF	106.68	-0.04	0.00	1.30**	56.38	-0.01	0.13
CF	750.54	-0.36*	0.02	1.08**	666.91	-0.32	0.24
SF	-460.53	0.23**	0.03	1.33**	-486.98	0.25*	0.17
GM	1463.00	-0.72**	0.07	1.21**	1465.00	-0.72**	0.23
Ice Hole (B152)							
LF	1560.00	-0.77**	0.08	0.96**	1340.00	-0.66*	0.37
CF	1757.00	-0.87**	0.10	0.85**	1448.00	-0.71*	0.44
SF	-138.90	0.07	0.00	1.72**	-138.17	0.07	0.03
GM	-1441.00	0.74**	0.02	0.98**	-1178.00	0.60	0.29

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.
[c] Trend is for 1997-2007, without 2006 data.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Intrabasin Comparisons

Table 9.—Multiple comparisons[a] of mean percent large fines among SFSR spawning areas by year.

Year	Stolle (B081)	Dollar (B082)	Oxbow (E083)	Poverty (E084)	Glory (E085)	Johnson (B152)
1977	22.2D	29.0C	35.0BA	35.9A	31.8BC	24.4D
1978	19.9D	31.1B	36.4A	33.7BA	31.7B	25.5C
1979	23.0C	28.1B	34.9A	32.4A	32.8A	23.1C
1980	20.7C	27.7BA	32.0A	29.3BA	30.6A	25.4B
1981	22.7D	26.2C	31.4A	30.1BA	27.2BC	25.9DC
1982	17.5C	27.5BA	30.5A	30.4A	24.4B	27.3BA
1983	22.4C	27.8B	36.1A	35.5A	24.5CB	27.9B
1984	25.0CD	26.5CB	33.5A	28.9B	22.1D	27.9CB
1985	22.7D	29.7C	36.6A	36.0BA	28.9C	32.3BC
1986	26.3D	28.7DC	35.6A	34.1BA	22.5E	31.6BC
1987	27.0B	28.6B	35.5A	33.8A	28.8B	27.9B
1988	20.4C	26.8BA	29.7A	30.2A	25.2B	26.0BA
1989	22.6C	30.9A	30.0A	28.3BA	24.1C	25.7BC
1990	25.8BC	30.2A	31.7A	29.8BA	28.6BA	23.7C
1991	26.2BC	26.6BC	27.1BAC	31.2A	23.6C	28.3BA
1992	24.5B	26.4B	28.3BA	31.2A	27.4BA	26.1B
1993	23.4C	29.5B	21.8C	35.1A	22.8C	30.4BA
1994	18.9C	26.0B	33.1A	33.4A	22.5CB	30.7A
1995	26.7C	25.6C	34.0BA	29.8BC	34.9A	33.3BA
1996	32.8BA	27.8B	32.2BA	35.3A	34.3A	28.5B
1997	25.5B	28.9B	36.3A	36.8A	34.2A	27.8B
1998	24.3C	42.7A	29.2B	28.0CB	38.6A	26.9CB
1999	28.6C	26.3C	31.3BC	37.8A	35.2BA	26.9C
2000	26.9BA	30.5A	29.4A	31.5A	30.7A	23.7B
2001	28.9A	29.3A	27.6BA	30.4A	23.1B	30.5A
2002	30.4B	27.8B	29.5B	37.6A	27.7B	30.1B
2003	31.2B	30.2B	33.5BA	37.4A	31.8BA	24.4C
2004	31.3A	29.7A	31.3A	30.5A	30.7A	21.9B
2005	32.8A	32.4A	27.1B	27.7BA	26.2B	25.5B
2006	27.0C	33.6B	27.1B	38.5A	40.0A	22.0D
2007	23.5CD	24.2CD	29.4CB	40.6A	30.5B	19.1D

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 10.—Multiple comparisons[a] of mean percent coarse fines among SFSR spawning areas by year.

Year	Stolle (B081)	Dollar (B082)	Oxbow (E083)	Poverty (E084)	Glory (E085)	Johnson (B152)
1977	18.5C	25.6B	31.4A	31.3A	28.0BA	21.8C
1978	17.1D	27.8B	32.7A	29.2B	28.4B	23.1C
1979	19.2C	25.3B	31.2A	28.9A	28.8A	19.5C
1980	16.1C	24.3BA	27.7A	26.4A	25.0BA	22.3B
1981	18.0D	22.6C	27.5A	26.6BA	24.1BC	22.8C
1982	14.0C	23.8BA	26.8A	26.7A	20.7B	24.4BA
1983	18.8C	24.5B	31.8A	31.5A	21.4CB	24.9B
1984	20.8CD	23.0CB	29.4A	25.3B	19.1D	25.0B
1985	18.8C	26.1B	32.4A	32.3A	25.8B	29.4BA
1986	21.5CB	24.4B	29.8A	29.4A	19.1C	28.4A
1987	21.5B	24.3B	30.3A	28.6A	24.2B	24.6B
1988	16.3B	22.3A	24.6A	25.2A	21.7A	22.7A
1989	17.9D	26.7A	24.9BA	24.3BA	19.6DC	21.9BC
1990	20.7C	24.7BAC	26.2A	25.5A	24.9BA	20.9BC
1991	21.0BC	21.8BC	21.9BC	26.9A	19.9C	25.1BA
1992	20.4B	22.8B	23.7BA	27.1A	24.0BA	23.4BA
1993	19.0C	24.6B	16.7C	30.7A	18.8C	26.1BA
1994	13.4D	19.9BC	24.3BA	26.2A	17.2DC	26.8A
1995	21.8C	21.5C	27.4BA	25.5BC	30.7A	29.2BA
1996	28.1BA	23.9B	26.7BA	29.7A	30.3A	24.3B
1997	20.4B	23.8B	31.6A	31.7A	29.2A	23.6B
1998	19.7B	37.2A	23.2B	23.4B	33.4A	22.9B
1999	24.3B	22.0B	25.6B	31.6A	30.7A	23.0B
2000	21.2BC	25.8BA	23.4BAC	27.7A	26.3BA	20.2C
2001	23.0BAC	23.9BA	21.4BC	24.4BA	19.3C	26.5A
2002	25.4B	23.5B	25.0B	32.3A	23.9B	26.5B
2003	25.6BC	25.7BC	28.5BA	32.6A	28.1BA	20.5C
2004	26.5A	25.0A	26.4A	26.6A	26.2A	18.9B
2005	28.1A	27.4BA	22.3BC	23.9BAC	22.2C	22.3BC
2006	22.8C	28.6B	22.3BC	33.3A	35.9A	19.1C
2007	13.8CD	17.1CB	17.6CB	24.8A	19.4B	12.1D

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 11.—Multiple comparisons[a] of mean percent small fines among SFSR spawning areas by year.

Year	Stolle (B081)	Dollar (B082)	Oxbow (E083)	Poverty (E084)	Glory (E085)	Johnson (B152)
1977	4.5C	5.5CB	7.3B	13.2A	7.0B	4.8C
1978	5.8B	6.7B	11.6A	11.1A	11.0A	6.5B
1979	6.4D	8.5C	10.1B	11.8A	6.1D	6.0D
1980	3.6C	4.9B	7.2A	6.0B	6.1BA	5.5B
1981	5.3C	7.0B	8.3BA	8.7A	5.0C	4.6C
1982	4.5C	6.3BA	6.8A	7.5A	5.2BC	4.7C
1983	4.7BC	4.1C	6.2A	5.5BA	4.2C	4.2C
1984	4.4BA	3.6BC	5.0A	4.7A	3.1C	3.3C
1985	4.5BC	4.3C	5.4BA	5.5A	4.0C	3.6C
1986	5.4BA	4.5B	5.7A	6.0A	3.2C	4.2BC
1987	5.1B	4.1B	6.6A	7.5A	5.2B	5.2B
1988	4.1A	4.2A	4.4A	4.7A	3.8A	4.8A
1989	4.6BA	4.0B	5.2A	4.4BA	3.7B	4.2B
1990	5.5A	4.7A	5.5A	5.4A	3.5B	3.4B
1991	5.0A	3.3C	4.6BA	4.8BA	3.8BC	4.3BAC
1992	5.1CB	4.0CD	5.9B	7.4A	5.2CB	3.5D
1993	4.6BA	4.1BC	3.4C	5.5A	3.8BC	4.2BC
1994	2.7BA	2.5BA	3.0BA	4.3A	1.5B	2.9BA
1995	5.9BA	4.6B	6.1A	5.9BA	5.1BA	5.4BA
1996	6.0A	5.3A	5.9A	5.9A	5.8A	3.7B
1997	5.6DC	4.6D	7.6B	9.0A	5.9C	5.3DC
1998	5.4CD	9.6A	5.9CB	4.2D	7.2B	5.6C
1999	5.3BC	3.7C	6.8BA	7.8A	6.5BA	4.6C
2000	6.3A	4.1A	5.7A	4.5A	4.7A	4.9A
2001	6.4A	5.7BA	4.6BAC	4.3BC	3.4C	3.8C
2002	6.8A	4.7BC	6.4BA	7.1A	5.4BAC	4.3C
2003	7.5A	5.6BC	7.1BA	6.6BAC	5.4BC	5.2C
2004	7.9A	7.0A	7.9A	8.0A	6.3BA	4.6B
2005	8.0A	7.2A	6.3A	8.1A	5.7A	5.7A
2006	7.5C	7.9CB	6.3A	9.3B	1.7A	5.6D
2007	7.1CB	4.7C	8.2B	12.5A	8.7B	5.3C

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 12.—Multiple comparisons[a] of mean geometric mean particle diameter among SFSR spawning areas by year.

Year	Stolle (B081)	Dollar (B082)	Oxbow (E083)	Poverty (E084)	Glory (E085)	Johnson (B152)
1977	19.2A	15.8B	12.7C	11.9C	13.6C	17.2B
1978	20.3A	14.7C	11.8D	12.5D	13.2DC	16.4B
1979	19.1A	16.0B	12.7C	13.6C	14.1C	18.3A
1980	44.8A	28.3CB	21.9C	23.2CB	23.9CB	29.6B
1981	38.0A	30.9B	22.0C	23.7C	25.2C	26.3CB
1982	48.4A	29.2B	24.1B	23.1B	28.5B	25.4B
1983	35.9A	30.3BA	18.9C	17.8C	30.1BA	25.5B
1984	29.9A	29.1BA	20.0D	25.2BC	33.7A	23.7DC
1985	33.6A	25.0B	17.0C	17.9C	25.8B	20.7C
1986	31.3BA	28.2B	18.3C	22.0C	34.0A	21.5C
1987	35.1A	30.0BA	18.8C	18.4C	25.6B	26.7B
1988	45.1A	29.6B	25.4B	26.6B	31.1B	31.7B
1989	39.0A	25.5B	25.6B	27.3B	30.0B	28.5B
1990	32.6A	23.1C	23.2C	25.2BC	25.8BC	29.9BA
1991	35.1A	29.2BAC	26.6BC	23.6C	31.8BA	26.9BC
1992	37.9A	31.0BA	27.8BC	22.1C	28.1BC	32.5BA
1993	36.5A	26.8BC	38.0A	18.6D	32.4BA	23.4DC
1994	54.1A	39.6B	26.4C	25.5C	41.8B	28.0C
1995	28.2A	29.6A	19.5B	25.0A	17.5B	18.8B
1996	25.8BAC	28.3BA	22.2BDC	18.2D	20.0DC	29.5A
1997	35.6A	26.3B	17.1C	18.3C	19.6C	26.1B
1998	36.6A	15.6C	23.6B	26.6B	16.8C	27.5B
1999	30.0A	28.6A	22.2BC	17.7C	18.9C	27.4BA
2000	30.7BC	24.1DC	23.2D	33.0BA	24.1DC	38.6A
2001	20.9C	22.3BC	22.8BC	28.0BA	32.4A	25.8BC
2002	25.0A	26.4A	26.0A	16.4B	25.1A	26.4A
2003	23.4B	24.5B	20.0B	18.9B	24.6B	34.1A
2004	27.4CB	22.7CD	20.4D	29.9B	23.5CBD	38.0A
2005	22.1B	20.7B	24.9BA	28.9A	26.3BA	29.8A
2006	29.3B	21.3C	24.9BA	16.9DC	15.4D	35.2A
2007	27.3B	27.1B	18.4C	16.7C	19.6C	34.7A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Statistical Summaries

Table 13.—Mean annual percentages of fine sediments from core sampling in the Corduroy Junction spawning area (E034), Lake Creek, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	16.3	1.1	44.2	9.4	0.6	43.3	5.4	0.6	66.8	48.0	3.4	45.2
1982	40	14.1	0.9	39.1	9.2	0.6	39.0	2.9	0.3	59.9	47.2	3.3	44.2
1983	40	16.8	0.9	35.0	11.0	0.7	38.5	3.9	0.2	38.1	47.7	3.3	43.7
1984	40	19.5	1.3	43.4	12.9	1.0	49.6	4.3	0.3	43.3	37.6	3.6	59.9
1985	40	22.2	1.1	30.1	14.4	0.8	34.2	5.7	0.4	40.3	32.8	1.9	37.0
1986	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1987	40	22.3	1.6	45.6	14.9	1.0	43.5	5.2	0.8	91.1	37.7	4.3	71.7
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	38	33.1	1.4	25.4	21.9	1.4	39.0	8.5	0.5	33.2	19.4	1.2	37.5
1990	40	23.7	1.5	40.6	16.1	1.3	49.2	5.1	0.3	38.0	28.6	2.1	45.9
1991	37	28.2	1.3	28.2	19.6	1.1	32.8	6.2	0.3	32.9	25.0	1.7	41.6
1992	40	28.5	1.2	25.9	18.1	0.9	30.1	7.4	0.9	77.8	24.4	1.7	43.9
1993	40	26.8	1.6	36.9	18.5	1.5	51.1	6.5	0.4	40.3	26.8	1.8	43.0
1994	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1995	40	17.7	1.9	67.0	12.6	1.6	82.2	3.2	0.3	54.3	43.2	3.7	54.4
1996	40	21.9	1.6	47.6	13.9	0.8	35.7	5.6	0.8	94.7	34.3	3.1	58.0
1997	40	23.9	1.7	44.8	16.8	1.1	42.0	4.8	0.6	80.1	30.2	2.4	49.4
1998	40	20.9	1.4	43.0	14.0	1.0	46.1	4.7	0.4	54.8	35.7	3.8	67.4
1999	40	19.4	1.3	41.8	13.8	1.0	45.2	3.6	0.3	53.6	39.6	3.9	62.0
2000	38	23.1	1.6	42.7	16.1	1.4	53.5	5.0	0.3	42.2	35.0	3.4	59.8
2001	40	26.5	1.2	27.4	18.3	1.0	35.2	5.8	0.5	53.9	25.4	1.5	37.8
2002	40	23.2	1.1	29.3	15.3	0.8	34.5	5.6	0.3	38.0	28.7	1.7	38.3
T1	**-----**	**22.5**	**1.4**	**39.6**	**15.0**	**1.0**	**43.6**	**5.3**	**0.5**	**56.5**	**34.5**	**2.7**	**48.2**
2003	40	25.8	1.6	38.3	17.0	0.9	33.4	6.2	1.1	107.3	27.7	1.9	42.3
2004	40	21.6	1.2	35.4	14.3	0.8	34.6	5.0	0.4	56.1	32.6	2.5	48.1
2005	40	20.4	1.0	32.6	13.4	0.7	32.9	4.9	0.5	63.7	31.9	1.7	34.6
2006	40	25.0	1.7	43.7	15.1	0.8	33.8	7.7	1.6	127.7	30.1	2.2	46.5
2007	40	21.6	1.1	30.9	14.5	0.8	33.7	5.0	0.4	48.9	31.9	2.3	45.8
T2	**-----**	**22.9**	**1.3**	**36.5**	**15.2**	**0.9**	**38.3**	**5.4**	**0.6**	**64.6**	**31.9**	**2.5**	**48.3**
T3	**-----**	**22.6**	**1.3**	**38.3**	**15.0**	**1.0**	**41.4**	**5.3**	**0.5**	**59.9**	**33.4**	**2.6**	**48.3**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Table 14.—Mean annual percentages of fine sediments from core sampling in the Burgdorf spawning area (E048), Lake Creek, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	19.4	1.0	32.9	12.8	0.7	34.5	4.5	0.3	37.7	39.5	2.6	42.0
1982	40	20.4	1.1	32.6	13.4	0.7	34.6	4.9	0.3	37.9	38.3	2.9	47.7
1983	40	20.8	1.1	33.5	13.4	0.8	36.7	5.4	0.3	33.4	41.1	3.3	51.1
1984	40	19.2	1.1	34.8	12.3	0.8	42.7	4.4	0.3	41.5	38.0	2.5	41.8
1985	40	22.0	0.9	26.7	13.9	0.7	30.0	5.6	0.3	35.7	33.3	2.1	40.5
1986	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1987	40	21.6	1.4	40.1	14.2	1.1	49.5	4.7	0.4	48.3	39.1	3.6	58.0
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	38	29.4	1.2	26.1	23.1	1.3	34.0	7.3	0.8	45.6	22.7	2.8	53.0
1990	40	19.6	1.5	47.3	12.7	1.2	59.7	4.3	0.4	66.2	39.4	3.2	51.1
1991	39	20.4	1.4	42.0	13.5	1.1	50.8	4.5	0.3	48.1	40.1	3.2	49.5
1992	40	19.8	1.1	34.2	13.6	0.9	42.3	4.4	0.3	41.5	41.5	2.4	36.0
1993	30	21.5	1.2	30.9	15.7	1.1	37.4	3.6	0.3	42.0	38.3	3.1	44.5
1994	30	21.0	1.3	33.8	14.4	0.9	36.2	3.7	0.4	54.9	37.9	2.8	41.1
1995	40	14.2	1.3	59.0	9.3	1.0	65.6	3.0	0.3	62.5	55.3	5.6	63.7
1996	40	16.8	1.0	38.1	10.3	0.7	40.9	3.8	0.3	55.6	40.7	3.4	53.4
1997	40	18.5	0.9	31.4	12.3	0.7	35.8	3.8	0.2	36.9	36.1	2.3	40.9
1998	40	16.7	1.4	52.9	11.2	1.0	56.7	3.3	0.4	71.0	54.1	5.9	68.6
1999	40	18.5	1.5	50.4	12.7	1.1	55.3	3.8	0.3	55.8	47.4	4.5	59.4
2000	40	19.6	1.0	32.7	13.0	0.8	39.8	4.2	0.2	37.4	40.1	2.6	41.0
2001	40	21.1	1.3	39.1	14.4	1.0	45.0	4.0	0.4	55.8	39.1	3.0	48.4
2002	40	20.2	1.5	48.0	14.0	1.2	52.7	3.9	0.3	55.7	41.5	4.0	60.6
T1	-----	**20.0**	**1.2**	**36.2**	**13.7**	**0.9**	**42.0**	**4.5**	**0.3**	**45.9**	**38.8**	**3.1**	**47.6**
2003	40	21.1	1.5	45.9	13.8	1.1	50.4	5.3	0.4	48.4	42.7	4.5	66.3
2004	40	21.2	1.5	43.3	13.8	1.0	47.5	5.3	0.4	49.9	37.1	2.7	45.7
2005	40	24.1	1.3	34.9	15.7	1.0	39.8	6.0	0.5	50.5	31.0	2.5	51.9
2006	40	21.2	1.3	39.6	13.6	0.9	41.8	5.4	0.4	52.3	39.2	3.3	53.3
2007	40	15.7	1.0	39.9	10.6	0.7	44.1	3.5	0.3	52.8	51.0	2.7	33.5
T2	-----	**20.7**	**1.3**	**42.7**	**13.3**	**1.0**	**47.3**	**4.5**	**0.4**	**53.0**	**42.3**	**3.6**	**52.9**
T3	-----	**20.2**	**1.2**	**38.8**	**13.5**	**0.9**	**44.2**	**4.5**	**0.4**	**48.7**	**40.2**	**3.3**	**49.7**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Table 15.—Mean annual percentages of fine sediments from core sampling in the Threemile Creek spawning area (E033), Lake Creek, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	25.8	1.1	28.0	13.8	0.6	27.6	9.4	0.6	37.7	22.9	2.2	60.5
1982	40	24.7	1.0	26.3	13.1	0.6	30.7	9.0	0.7	46.0	23.0	1.5	40.9
1983	40	28.9	1.2	25.5	17.1	0.9	31.7	9.1	0.5	32.1	19.8	1.2	38.2
1984	40	28.8	1.0	22.7	15.7	0.6	23.3	9.7	0.6	39.3	17.7	0.9	32.0
1985	40	28.0	1.5	33.1	15.0	0.9	39.7	10.0	0.6	35.9	19.7	1.6	51.0
1986	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1987	30	29.2	1.6	29.9	16.7	1.1	35.7	9.3	0.6	38.3	19.4	1.7	46.7
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	39	32.1	1.3	24.8	19.6	1.1	33.5	9.2	0.4	27.4	17.2	1.4	51.6
1990	40	27.2	1.4	32.9	14.8	0.9	36.8	9.6	0.8	52.5	18.0	0.9	33.3
1991	39	30.8	0.9	18.5	17.1	0.8	29.1	10.8	0.6	36.7	15.8	0.6	24.7
1992	40	34.9	1.5	27.7	21.6	1.1	31.4	10.1	0.8	47.2	13.8	0.7	32.0
1993	40	32.6	1.3	25.4	20.0	1.4	44.0	10.2	0.6	36.1	15.8	0.8	30.8
1994	10	57.5	4.4	24.1	43.9	4.9	35.0	11.1	1.5	43.5	7.3	1.0	42.9
1995	40	23.2	1.8	49.2	12.4	1.2	58.7	8.6	0.8	62.4	30.7	3.4	69.7
1996	40	30.0	2.1	44.1	13.6	0.9	40.1	12.8	1.5	75.0	18.9	1.8	59.3
1997	40	35.9	2.6	45.4	19.1	1.4	46.3	13.1	1.5	72.7	16.1	1.5	60.4
1998	40	31.4	1.9	38.4	17.3	1.0	36.3	10.9	1.0	57.9	18.2	1.6	56.1
1999	40	28.8	1.8	39.7	17.7	1.2	43.4	7.8	0.6	51.6	20.8	1.9	56.3
2000	40	30.4	1.3	26.6	19.8	1.1	34.3	7.9	0.4	35.5	18.9	1.1	35.3
2001	40	31.9	2.2	44.6	18.5	1.1	39.2	10.8	1.6	93.5	18.4	1.4	49.0
2002	40	34.3	1.8	33.3	19.5	1.2	37.8	12.0	1.0	52.1	16.2	1.5	59.6
T1	-----	**31.3**	**1.6**	**30.5**	**18.2**	**1.2**	**36.2**	**10.1**	**0.8**	**45.5**	**18.4**	**1.4**	**44.9**
2003	40	32.3	1.2	23.9	19.9	1.0	30.7	9.4	0.5	31.8	16.8	1.1	41.0
2004	40	34.7	2.1	38.4	20.2	1.3	40.3	11.5	1.0	56.7	16.3	1.3	51.6
2005	40	35.4	2.2	38.9	17.9	1.1	39.7	14.8	1.1	48.3	14.7	1.5	65.5
2006	40	30.0	1.5	32.6	16.7	1.0	36.1	10.4	0.8	50.8	18.7	1.5	52.0
2007	40	27.8	1.4	31.2	15.6	1.0	40.6	9.6	0.7	43.2	19.0	1.2	39.4
T2	-----	**32.0**	**1.7**	**34.8**	**18.3**	**1.1**	**37.8**	**10.5**	**0.9**	**52.1**	**17.8**	**1.4**	**50.6**
T3	-----	**31.5**	**1.7**	**32.2**	**18.3**	**1.2**	**36.9**	**10.3**	**0.8**	**48.2**	**18.2**	**1.4**	**47.2**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Table 16.—Mean annual percentages of fine sediments from core sampling in the Secesh Meadows spawning area (E096), Lake Creek, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	14.2	0.6	26.8	8.6	0.5	33.4	4.1	0.2	35.5	48.9	2.4	31.0
1982	40	17.9	0.9	32.3	11.8	0.6	33.6	4.4	0.2	31.8	38.2	2.8	46.2
1983	40	18.9	0.8	28.3	12.6	0.6	29.7	4.4	0.3	36.2	40.7	2.3	35.9
1984	40	18.6	1.1	36.7	12.6	0.7	37.4	4.0	0.3	43.2	36.4	2.9	51.1
1985	40	21.2	1.2	35.1	14.3	0.9	40.6	4.8	0.3	38.8	36.5	2.5	42.9
1986	40	20.6	1.0	30.5	13.8	0.8	34.6	4.9	0.3	32.7	38.6	2.6	42.9
1987	40	21.2	1.1	33.3	14.4	0.8	36.5	4.9	0.3	44.4	40.4	2.7	41.5
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	40	27.2	1.0	23.4	19.3	0.9	28.4	5.6	0.4	43.2	26.8	1.4	32.8
1990	40	22.7	1.1	30.4	15.7	0.8	30.7	4.9	0.4	49.4	33.7	2.0	37.5
1991	40	23.0	1.0	28.1	16.4	0.8	32.4	4.8	0.3	41.7	32.5	2.1	41.3
1992	40	25.2	1.0	26.0	17.0	0.8	30.2	4.6	0.3	45.5	29.3	1.9	41.7
1993	40	24.0	0.9	25.0	17.1	0.8	29.5	4.6	0.2	32.5	30.5	1.6	32.4
1994	40	24.2	0.9	23.5	17.6	0.8	29.1	3.9	0.3	45.0	32.8	1.9	36.9
1995	23	16.8	1.5	43.5	11.4	1.2	49.7	3.4	0.4	63.5	43.7	4.4	48.8
1996	20	28.0	1.1	17.9	19.5	1.0	21.8	6.4	0.4	29.7	25.7	1.6	28.6
1997	40	15.5	0.8	34.4	11.1	0.6	37.0	2.7	0.2	49.6	47.2	2.0	26.5
1998	20	19.3	1.5	35.1	13.0	1.1	39.4	4.5	0.4	43.3	43.3	4.4	45.6
1999	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2000	19	18.0	1.5	37.2	12.8	1.2	41.1	3.8	0.4	43.4	43.3	4.0	40.6
2001	40	20.6	0.8	25.8	13.3	0.6	26.7	5.3	0.3	34.3	36.3	2.4	41.6
2002	40	25.1	1.1	26.9	17.5	0.9	31.7	5.5	0.3	29.7	29.3	2.2	47.5
T1	-----	**21.1**	**1.0**	**29.7**	**14.6**	**0.8**	**33.4**	**4.5**	**0.3**	**41.4**	**36.4**	**2.3**	**38.6**
2003	20	20.6	1.6	34.2	13.3	1.3	43.5	5.9	0.4	32.0	40.2	3.8	42.8
2004	38	24.2	0.9	21.7	15.6	0.7	27.9	6.8	0.3	25.6	33.8	1.9	34.5
2005	40	21.9	0.9	26.2	12.8	0.7	33.4	7.1	0.4	31.7	35.2	2.0	35.1
2006	40	16.2	1.0	37.6	8.8	0.5	39.4	5.9	0.4	40.2	51.1	2.9	36.3
2007	40	18.5	0.7	25.5	10.9	0.5	27.0	5.9	0.3	30.7	45.4	2.3	32.4
T2	-----	**20.3**	**1.1**	**30.0**	**13.1**	**0.8**	**34.5**	**5.6**	**0.4**	**34.5**	**39.8**	**2.9**	**39.6**
T3	-----	**20.9**	**1.0**	**29.8**	**14.0**	**0.8**	**33.8**	**4.9**	**0.3**	**38.9**	**37.6**	**2.5**	**39.0**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Table 17.—Mean annual percentages of fine sediments from core sampling in the Chinook Campground spawning area (E046), Lake Creek, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	15.5	0.7	26.9	10.0	0.5	29.9	3.7	0.2	29.8	40.3	1.8	28.7
1982	40	15.1	0.5	23.1	9.8	0.4	27.3	3.6	0.1	26.3	46.4	2.0	27.0
1983	40	18.4	0.9	29.4	12.6	0.7	34.7	4.1	0.3	40.3	40.9	2.2	33.4
1984	40	19.8	0.8	26.9	13.7	0.8	35.7	4.1	0.2	29.2	36.8	2.0	34.3
1985	40	19.7	0.8	24.2	13.5	0.6	29.1	4.1	0.1	22.5	37.7	1.7	28.3
1986	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1987	40	21.2	1.3	38.9	15.2	1.0	43.5	3.9	0.3	49.5	38.5	3.9	63.3
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	38	31.1	1.1	21.2	21.5	1.0	29.0	6.9	0.2	19.3	21.6	1.3	37.2
1990	40	24.7	1.0	26.5	19.1	0.9	31.2	3.6	0.2	34.3	29.6	1.6	34.0
1991	40	20.8	1.1	32.9	14.1	0.8	35.5	4.4	0.3	44.1	36.3	2.0	34.7
1992	40	19.4	1.1	35.0	12.9	0.8	38.4	4.4	0.3	41.7	44.5	2.8	40.1
1993	40	21.0	0.9	26.2	15.0	0.7	29.0	3.5	0.2	44.4	35.9	2.3	40.8
1994	40	23.2	1.1	29.4	16.2	1.0	40.3	4.3	0.2	30.3	34.2	2.7	49.3
1995	40	18.6	1.7	58.5	13.3	1.4	64.9	3.6	0.3	58.6	50.6	5.2	64.4
1996	40	23.1	1.3	36.1	17.7	1.1	39.1	3.2	0.2	45.5	37.2	2.9	49.8
1997	40	20.5	1.2	37.9	14.2	1.0	46.6	3.8	0.2	40.2	40.6	2.8	43.8
1998	40	20.6	1.4	43.8	13.9	1.2	55.1	4.4	0.3	42.6	44.0	3.5	50.5
1999	40	19.2	1.6	51.2	13.7	1.3	60.2	3.7	0.3	54.2	45.8	4.3	58.7
2000	40	19.2	1.2	39.2	13.3	1.1	50.0	4.1	0.3	44.6	43.4	3.1	45.8
2001	40	22.6	1.1	30.6	15.3	0.8	33.0	4.7	0.4	50.1	34.9	2.5	45.2
2002	40	21.6	1.6	45.8	15.8	1.3	52.8	3.8	0.2	37.7	39.1	3.5	57.2
T1	-----	**20.8**	**1.0**	**31.5**	**14.6**	**0.8**	**36.9**	**4.1**	**0.2**	**37.1**	**38.1**	**2.5**	**40.6**
2003	40	23.9	1.3	35.6	16.7	1.1	42.7	5.0	0.3	36.9	31.7	2.3	45.2
2004	40	22.6	1.0	29.1	15.2	0.8	33.1	5.5	0.3	32.8	34.1	2.1	38.1
2005	38	23.3	0.9	24.9	15.4	0.8	31.8	5.4	0.3	32.7	33.5	2.0	36.7
2006	40	20.2	1.0	32.2	13.1	0.7	35.1	5.1	0.3	34.6	40.1	2.9	46.3
2007	40	16.6	0.9	33.6	10.8	0.6	37.2	4.2	0.3	39.7	49.1	3.0	38.4
T2	-----	**21.3**	**1.2**	**36.6**	**14.3**	**1.0**	**43.1**	**4.6**	**0.3**	**40.6**	**39.6**	**2.9**	**46.2**
T3	-----	**20.9**	**1.1**	**33.6**	**14.5**	**0.9**	**39.4**	**4.3**	**0.3**	**38.5**	**38.7**	**2.7**	**42.8**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Time Series Analyses

Overall Models

Table 18.—Overall regression models (y = bx + a) for percent fine sediments and geometric mean particle diameter from core sampling, Secesh River spawning areas, 1989-2007.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Corduroy Junction (E034)							
LF	7.38	0.01	0.00	1.34**	12.00	0.01	0.11
CF	12.72	0.00	0.00	1.40**	16.41	0.00	0.09
SF	-13.40	0.01	0.00	1.56**	-13.06	0.01	0.05
GM	413.17	-0.19*	0.01	1.18**	396.93	-0.18	0.18
Burgdorf (E048)							
LF	166.52	-0.07†	0.00	1.04**	140.93	-0.06	0.26
CF	125.77	-0.06†	0.00	0.99**	102.72	-0.05	0.31
SF	6.41	0.00	0.00	1.16**	1.90	0.00	0.19
GM	-439.53	0.24*	0.01	1.16**	-383.84	0.21	0.19
Threemile Creek (E033)							
LF	-249.94	0.14**	0.01	1.10**	-297.49	0.16†	0.24
CF	-130.99	0.07*	0.01	1.23**	-153.85	0.09	0.19
SF	-134.70	0.07**	0.01	1.28**	-146.09	0.08†	0.16
GM	115.51	-0.05	0.00	1.05**	143.56	-0.06	0.26
Secesh Meadows (E096)							
LF	123.69	-0.05	0.00	1.41**	110.04	-0.04	0.14
CF	218.67	-0.10**	0.02	1.37**	207.35	-0.10*	0.17
SF	-131.42	0.07**	0.06	1.45**	-132.08	0.07**	0.15
GM	-322.22	0.18*	0.01	1.15**	-269.72	0.15	0.23
Chinook Campground (E046)							
LF	66.03	-0.02	0.00	0.99**	2.99	0.01	0.29
CF	103.14	-0.04	0.00	0.90**	37.35	-0.01	0.34
SF	-42.46	0.02**	0.01	1.27**	-45.54	0.03	0.17
GM	-308.75	0.17*	0.00	1.09**	-176.50	0.11	0.25

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Recent Models

Table 19.—Recent regression models (y = bx + a) for fine sediments and geometric mean particle diameter from core sampling, Secesh River spawning areas, 1990-2007.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Corduroy Junction (E034)							
LF	-209.25	0.12	0.00	1.64**	-203.48	0.11	0.04
CF	133.29	-0.06	0.00	1.66**	146.24	-0.07	0.04
SF	-357.75	0.18*	0.01	1.74**	-358.41	0.18*	0.03
GM	1192.00	-0.58*	0.01	1.37**	1129.00	-0.55	0.12
Burgdorf (E048)							
LF	-399.69	0.21	0.00	1.01**	-556.62	0.29	0.29
CF	-142.63	0.08	0.00	0.97**	-250.60	0.13	0.32
SF	-317.80	0.16**	0.03	1.09**	-347.66	0.18*	0.25
GM	1685.00	-0.82†	0.01	1.34**	1831.00	-0.89	0.13
Threemile Creek (E033)							
LF	-56.22	0.04	0.00	1.14**	-171.77	0.10	0.21
CF	331.22	-0.16	0.00	1.21**	264.93	-0.12	0.19
SF	-472.49	0.24*	0.01	1.30**	-500.11	0.26	0.17
GM	427.09	-0.20	0.00	1.36**	440.83	-0.21	0.13
Secesh Meadows (E096)							
LF	-340.64	0.18	0.01	1.61**	-331.29	0.18	0.13
CF	312.51	-0.15†	0.01	1.58**	307.36	-0.15	0.15
SF	-677.69	0.34**	0.23	1.64**	-665.01	0.34**	0.29
GM	34.37	0.00	0.00	1.58**	70.38	-0.02	0.11
Chinook Campground (E046)							
LF	102.63	-0.04	0.00	1.14**	-109.16	0.07	0.22
CF	283.96	-0.14	0.00	1.01**	6.19	0.00	0.29
SF	-209.72	0.11**	0.03	1.47**	-214.47	0.11*	0.11
GM	688.96	-0.32	0.00	1.39**	965.57	-0.46	0.13

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Intrabasin Comparisons

Table 20.—Multiple comparisons[a] of mean percent large fines among Secesh River spawning areas by year.

Year	Corduroy Junction (E034)	Burgdorf (E048)	Threemile Creek (E033)	Secesh Meadows (E096)	Chinook Campground (E046)
1981	16.3CB	19.4B	25.8A	14.2C	15.5C
1982	14.1D	20.4B	24.7A	17.9CB	15.1CD
1983	16.8C	20.8B	28.9A	18.9CB	18.4CB
1984	19.5B	19.2B	28.8A	18.6B	19.8B
1985	22.2B	22.0B	28.0A	21.2B	19.7B
1986	-----	-----	-----	-----	-----
1987	22.3B	21.6B	29.2A	21.2B	21.2B
1988	-----	-----	-----	-----	-----
1989	33.1A	29.4BA	32.1A	27.2B	31.1BA
1990	23.7BA	19.6B	27.2A	22.7BA	24.7A
1991	28.2A	20.4B	30.8A	23.0B	20.8B
1992	28.5B	19.8C	34.9A	25.2B	19.4C
1993	26.8B	21.5C	32.6A	24.0CB	21.0C
1994	-----	21.0B	57.5A	24.2B	23.2B
1995	17.7BA	14.2B	23.2A	16.8B	18.6BA
1996	21.9DC	16.8D	30.0A	28.0BA	23.1BC
1997	23.9B	18.5CB	35.9A	15.5C	20.5CB
1998	20.9B	16.7B	31.4A	19.3B	20.6B
1999	19.4B	18.5B	28.8A	-----	19.2B
2000	23.1B	19.6CB	30.4A	18.0C	19.2CB
2001	26.5B	21.1C	31.9A	20.6C	22.6CB
2002	23.2B	20.2B	34.3A	25.1B	21.6B
2003	25.8B	21.1B	32.3A	20.6B	23.9B
2004	21.6B	21.2B	34.7A	24.2B	22.6B
2005	20.4B	24.1B	35.4A	21.9B	23.3B
2006	25.0B	21.2CB	30.0A	16.2D	20.2CD
2007	21.6B	15.7C	27.8A	18.5CB	16.6C

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 21.—Multiple comparisons[a] of mean percent coarse fines among Secesh River spawning areas by year.

Year	Corduroy Junction (E034)	Burgdorf (E048)	Threemile Creek (E033)	Secesh Meadows (E096)	Chinook Campground (E046)
1981	9.4B	2.8A	3.8A	8.6B	10.0B
1982	9.2C	3.4A	3.1A	1.8BA	9.8BC
1983	11.0B	13.4B	17.1A	12.6B	12.6B
1984	12.9B	12.3B	15.7A	12.6B	13.7BA
1985	14.4A	13.9A	15.0A	14.3A	13.5A
1986	-----	-----	-----	-----	-----
1987	14.9A	14.2A	16.7A	14.4A	15.2A
1988	-----	-----	-----	-----	-----
1989	21.9A	23.1A	19.6A	19.3A	21.5A
1990	16.1BA	12.7B	14.8B	15.7BA	19.1A
1991	19.6A	13.5C	17.1BA	16.4BAC	14.1BC
1992	18.1B	13.6C	21.6A	17.0B	12.9C
1993	18.5BA	15.7B	20.0A	17.1BA	15.0B
1994	-----	14.4B	43.9A	17.6B	16.2B
1995	12.6A	9.3A	12.4A	11.4A	13.3A
1996	13.9B	10.3C	13.6B	19.5A	17.7A
1997	16.8BA	12.3C	19.1A	11.1C	14.2BC
1998	14.0BA	11.2B	17.3A	13.0B	13.9BA
1999	13.8B	12.7B	17.7A	-----	13.7B
2000	16.1BA	13.0B	19.8A	12.8B	13.3B
2001	18.3A	14.4B	18.5A	13.3B	15.3BA
2002	15.3B	14.0B	19.5A	17.5BA	15.8BA
2003	17.0BA	13.8B	19.9A	13.3B	16.7BA
2004	14.3B	13.8B	20.2A	15.6B	15.2B
2005	13.4B	15.7BA	17.9A	12.8B	15.4BA
2006	15.1BA	13.6B	16.7A	8.8C	13.1B
2007	14.5A	10.6B	15.6A	10.9B	10.8B

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 22.—Multiple comparisons[a] of mean percent small fines among Secesh River spawning areas by year.

Year	Corduroy Junction (E034)	Burgdorf (E048)	Threemile Creek (E033)	Secesh Meadows (E096)	Chinook Campground (E046)
1981	5.4B	4.5CB	9.4A	4.1CB	3.7C
1982	2.9D	4.9B	9.0A	4.4CB	3.6CD
1983	3.9C	5.4B	9.1A	4.4CB	4.1C
1984	4.3B	4.4B	9.7A	4.0B	4.1B
1985	5.7B	5.6B	10.0A	4.8CB	4.1C
1986	-----	-----	-----	-----	-----
1987	5.2B	4.7B	9.3A	4.9B	3.9B
1988	-----	-----	-----	-----	-----
1989	8.5BA	7.3BC	9.2A	5.6D	6.9DC
1990	5.1B	4.3B	9.6A	4.9B	3.6B
1991	6.2B	4.5C	0.8A	4.8CB	4.4C
1992	7.4B	4.4C	0.1A	4.6C	4.4C
1993	6.5B	3.6C	0.2A	4.6C	3.5C
1994	-----	3.7B	1.1A	3.9B	4.3B
1995	3.2B	3.0B	8.6A	3.4B	3.6B
1996	5.6B	3.8B	12.8A	6.4B	3.2B
1997	4.8B	3.8B	13.1A	2.7B	3.8B
1998	4.7B	3.3B	0.9A	4.5B	4.4B
1999	3.6B	3.8B	7.8A	-----	3.7B
2000	5.0B	4.2B	7.9A	3.8B	4.1B
2001	5.8B	4.0B	10.8A	5.3B	4.7B
2002	5.6B	3.9B	2.0A	5.5B	3.8B
2003	6.2B	5.3B	9.4A	5.9B	5.0B
2004	5.0B	5.3B	1.5A	6.8B	5.5B
2005	4.9B	6.0B	4.8A	7.1B	5.4B
2006	7.7BA	5.4B	10.4A	5.9B	5.1B
2007	5.0CB	3.5D	9.6A	5.9B	4.2CD

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 23.—Multiple comparisons[a] of mean geometric mean particle diameter among Secesh River spawning areas by year.

Year	Corduroy Junction (E034)	Burgdorf (E048)	Threemile Creek (E033)	Secesh Meadows (E096)	Chinook Campground (E046)
1981	48.0BA	39.5B	22.9C	48.9A	40.3BA
1982	47.2A	38.3A	23.0B	38.2A	46.4A
1983	47.7A	41.1A	19.8B	40.7A	40.9A
1984	37.6A	38.0A	17.7B	36.4A	36.8A
1985	32.8A	33.3A	19.7B	36.5A	37.7A
1986	-----	-----	-----	-----	-----
1987	37.7A	39.1A	19.4B	40.4A	38.5A
1988	-----	-----	-----	-----	-----
1989	19.4BC	22.7BA	17.2C	26.8A	21.6BAC
1990	28.6B	39.4A	18.0C	33.7BA	29.6B
1991	25.0C	40.1A	15.8D	32.5B	36.3BA
1992	24.4B	41.5A	13.8C	29.3B	44.5A
1993	26.8C	38.3A	15.8D	30.5BC	35.9BA
1994	-----	37.9A	7.3B	32.8A	34.2A
1995	43.2BA	55.3A	30.7B	43.7BA	50.6A
1996	34.3BA	40.7A	18.9C	25.7BC	37.2A
1997	30.2C	36.1BC	16.1D	47.2A	40.6BA
1998	35.7B	54.1A	18.2C	43.3BA	44.0BA
1999	39.6A	47.4A	20.8B	-----	45.8A
2000	35.0A	40.1A	18.9B	43.3A	43.4A
2001	25.4B	39.1A	18.4B	36.3A	34.9A
2002	28.7B	41.5A	16.2C	29.3B	39.1A
2003	27.7C	42.7A	16.8D	40.2BA	31.7BC
2004	32.6A	37.1A	16.3B	33.8A	34.1A
2005	31.9A	31.0A	14.7B	35.2A	33.5A
2006	30.1C	39.2CB	18.7D	51.1A	40.1B
2007	31.9B	51.0A	19.0C	45.4A	49.1A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Chamberlain Basin

Statistical Summaries

Table 24.—Mean annual percentages of fine sediments from core sampling in the Chamberlain Creek spawning area (E032), Chamberlain Basin, 1981-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1981	40	24.7	1.5	37.2	14.9	0.9	39.3	7.2	0.5	41.6	30.3	2.5	52.0
1982	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1983	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1984	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1985	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1986	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1987	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1988	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1989	36	31.9	1.0	19.4	22.9	0.8	21.5	5.8	0.3	28.7	23.2	1.2	29.8
1990	40	28.6	1.0	21.1	20.8	0.7	22.1	4.7	0.2	26.2	28.4	1.4	31.7
1991	40	26.4	1.0	23.8	18.4	0.8	27.2	5.1	0.2	30.9	33.5	1.9	36.4
1992	40	28.5	1.3	29.4	19.9	0.9	30.0	5.7	0.3	36.2	28.7	2.0	45.0
1993	40	21.9	0.9	25.4	17.1	0.8	29.0	2.8	0.3	59.1	42.2	2.0	29.7
1994	40	22.4	1.5	42.1	15.5	1.0	40.9	4.4	0.5	76.7	41.3	3.5	53.4
1995	40	16.9	1.4	51.6	12.8	1.1	56.1	2.3	0.2	58.8	61.5	5.1	52.2
1996	40	23.9	1.2	31.1	18.5	1.0	34.3	3.0	0.1	29.5	39.6	2.6	42.2
1997	40	15.7	1.1	45.5	11.3	0.9	50.0	2.3	0.2	44.1	55.6	4.1	46.3
1998	40	13.9	1.2	53.8	9.6	0.9	57.5	2.6	0.2	53.4	68.8	6.2	57.4
1999	40	17.2	1.3	47.9	12.4	1.0	53.1	2.7	0.2	50.9	60.0	4.6	48.1
2000	40	19.8	1.3	42.7	15.0	1.0	44.2	3.1	0.2	46.6	52.4	4.4	53.6
2001	40	24.0	1.4	37.4	17.8	1.2	41.8	4.0	0.3	40.7	41.4	3.5	53.5
2002	40	15.0	1.4	58.9	11.5	1.1	62.0	2.3	0.2	64.0	80.9	6.5	51.1
T1	-----	**22.1**	**1.2**	**32.7**	**17.2**	**0.9**	**35.0**	**4.3**	**0.3**	**43.2**	**38.4**	**2.6**	**41.9**
2003	40	15.3	1.2	47.9	10.8	0.9	51.0	3.0	0.2	52.4	75.1	4.5	37.6
2004	40	23.0	1.3	34.7	16.3	0.9	35.6	4.7	0.3	36.7	46.6	3.6	48.6
2005	40	23.3	1.5	39.7	16.4	1.1	41.9	5.0	0.4	45.0	46.3	4.6	62.8
2006	40	24.4	1.6	40.4	16.8	1.1	40.3	5.4	0.5	63.9	42.3	3.6	53.2
2007	40	20.8	1.2	37.4	14.5	0.9	39.2	4.3	0.3	46.9	49.9	3.7	47.0
T2	-----	**21.4**	**1.3**	**44.1**	**14.1**	**1.0**	**46.7**	**3.7**	**0.3**	**50.1**	**56.4**	**4.5**	**51.3**
T3	-----	**21.9**	**1.3**	**38.4**	**15.7**	**1.0**	**40.9**	**4.0**	**0.3**	**46.6**	**47.4**	**3.6**	**46.6**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1981-2002 time period; T2 – 2003-2007 time period; T3 – 1981-2007 time period.

Table 25.—Mean annual percentages of fine sediments from core sampling in the West Fork Chamberlain Creek spawning area (E136), Chamberlain Basin, 1991-2007.

Year	N	Large Fines			Coarse Fines			Small Fines			GMPD		
		M	SE	CV	M	SE	CV	M	SE	CV	M	SE	CV
1991	38	29.0	1.3	27.5	17.9	0.9	31.0	8.4	0.4	30.6	23.2	1.5	40.7
1992	40	31.9	1.1	22.1	21.0	0.9	26.5	8.3	0.4	28.4	19.5	1.1	34.4
1993	40	31.4	1.3	25.8	21.3	1.1	31.7	6.9	0.5	42.7	20.9	1.2	35.2
1994	40	25.9	1.0	25.4	18.1	0.9	32.4	5.4	0.3	34.7	23.3	1.1	29.8
1995	40	25.1	1.3	32.2	16.5	0.9	35.9	6.0	0.3	36.0	26.0	2.0	47.7
1996	40	34.2	0.9	16.2	24.6	0.7	18.5	6.6	0.4	33.8	18.4	0.8	28.0
1997	40	28.7	1.1	23.5	19.3	0.9	30.0	6.3	0.2	23.2	22.6	1.3	36.7
1998	40	30.6	0.8	17.3	21.9	0.7	19.4	5.4	0.2	28.3	20.4	1.0	31.8
1999	40	31.5	1.2	24.1	22.5	1.0	27.3	6.1	0.3	33.4	20.3	1.3	40.7
2000	40	33.4	0.8	16.0	23.1	0.8	21.0	7.4	0.4	38.4	18.6	0.9	31.2
2001	40	28.0	1.1	25.5	20.5	0.9	28.3	4.9	0.3	35.7	23.2	1.3	35.4
2002	40	34.9	1.1	19.8	23.6	0.9	24.0	8.3	0.4	30.2	18.8	1.2	40.4
T1	-----	**30.4**	**1.1**	**24.7**	**19.8**	**0.9**	**29.4**	**6.8**	**0.4**	**32.8**	**22.0**	**1.3**	**36.1**
2003	24	33.0	1.4	20.3	21.3	1.1	26.0	8.9	0.6	31.8	19.6	1.3	31.5
2004	40	33.8	1.2	22.6	20.8	0.8	23.7	10.1	0.6	36.0	18.6	1.1	38.6
2005	40	32.8	1.2	23.0	20.0	0.8	26.0	10.1	0.5	32.4	19.9	1.6	50.6
2006	40	32.5	1.1	21.0	19.7	0.8	24.9	10.0	0.5	31.1	19.9	1.0	33.3
2007	40	33.1	1.0	19.0	20.3	0.7	22.9	10.5	0.6	34.1	18.4	1.0	35.4
T2	-----	**33.0**	**1.1**	**20.9**	**21.4**	**0.9**	**24.4**	**8.2**	**0.4**	**33.1**	**19.8**	**1.2**	**36.9**
T3	-----	**31.2**	**1.1**	**22.4**	**20.7**	**0.9**	**26.4**	**7.6**	**0.4**	**33.0**	**20.7**	**1.2**	**36.6**

Abbreviations: GMPD – Geometric Mean Particle Diameter; N – Sample Size; M – Mean; SE – Standard Error of the Mean; CV – Coefficient of Variation (%); T – Time Period.

[a] T1 – 1991-2002 time period; T2 – 2003-2007 time period; T3 – 1991-2007 time period.

Time Series Analyses

Overall Models

Table 26.—Overall regression models (y = bx + a) for percent fine sediments and geometric mean particle diameter from core sampling, Chamberlain Basin spawning areas, 1981-2007.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Chamberlain Creek (E032)							
LF	828.25	-0.40**	0.06	1.24**	831.29	-0.41**	0.24
CF	637.39	-0.31**	0.06	1.26**	642.08	-0.31**	0.23
SF	51.62	-0.02	0.00	1.32**	54.39	-0.03	0.17
GM	-2864.00	1.46**	0.08	1.32**	-2886.00	1.47**	0.22
West Fork Chamberlain Creek (E136)							
LF	-549.30	0.29**	0.04	1.44**	-526.67	0.28**	0.16
CF	-149.38	0.09†	0.01	1.48**	-166.32	0.09	0.11
SF	-422.08	0.22**	0.11	1.13**	-335.87	0.17**	0.37
GM	457.45	-0.22**	0.02	1.53**	462.21	-0.22*	0.09

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Recent Models

Table 27.—Recent regression models (y = bx + a) for fine sediments and geometric mean particle diameter from core sampling, Chamberlain Basin spawning areas, 1991-2005.

Substrate Class[a]	Ordinary Least Squares				Autoregression		
	a	b	r^2	Dw[b]	a	b	r^2
Chamberlain Creek (E032)							
LF	-1526.00	0.77**	0.06	1.64**	-1437.00	0.73**	0.12
CF	-921.42	0.47**	0.04	1.59**	-854.35	0.43*	0.11
SF	-571.29	0.29**	0.14	1.84*	-554.77	0.28**	0.17
GM	3875.00	-1.91**	0.03	1.62**	3522.00	-1.73*	0.09
West Fork Chamberlain Creek (E136)							
LF	-479.73	0.26*	0.01	1.53**	-454.07	0.24	0.09
CF	636.37	-0.31**	0.03	1.64**	615.50	-0.30*	0.08
SF	-1239.00	0.62**	0.28	1.34**	-1186.00	0.60**	0.42
GM	345.79	-0.16	0.00	1.65**	337.32	-0.16	0.04

[a] LF – Large Fines (≤6.3mm). CF – Coarse Fines (≤4.75mm).
SF – Small Fines (≤0.85mm). GM – Geometric Mean Particle Diameter.
[b] DW - First order Durbin-Watson statistic.

Significance:
†Moderately significant (P<0.10).
*Significant (P<0.05).
**Highly significant (P<0.01).

Intrabasin Comparisons

Table 28.—Multiple comparisons[a] of mean percent large fines between Chamberlain Basin spawning areas by year.

Year	Chamberlain (E032)	WF Chamberlain (E136)
1992	28.5B	31.9A
1993	21.9B	31.4A
1994	22.4B	25.9A
1995	16.9B	25.1A
1996	23.9B	34.2A
1997	15.7B	28.7A
1998	13.9B	30.6A
1999	17.2B	31.5A
2000	19.8B	33.4A
2001	24.0B	28.0A
2002	15.0B	34.9A
2003	15.3B	33.0A
2004	23.0B	33.8A
2005	23.3B	32.8A
2006	24.4B	32.5A
2007	20.8B	33.1A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 29.—Multiple comparisons[a] of mean percent coarse fines between Chamberlain Basin spawning areas by year.

Year	Chamberlain (E032)	WF Chamberlain (E136)
1992	19.9A	21.0A
1993	17.1B	21.3A
1994	15.5B	18.1A
1995	12.8B	16.5A
1996	18.5B	24.6A
1997	11.3B	19.3A
1998	9.6B	21.9A
1999	12.4B	22.5A
2000	14.9B	23.1A
2001	17.8B	20.5A
2002	11.5B	23.6A
2003	10.8B	21.3A
2004	16.3B	20.8A
2005	16.4B	20.0A
2006	16.8B	19.7A
2007	14.5B	20.3A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 30.—Multiple comparisons[a] of mean percent small fines between Chamberlain Basin spawning areas by year.

Year	Chamberlain (E032)	WF Chamberlain (E136)
1992	5.7B	8.3A
1993	2.8B	6.9A
1994	4.4A	5.4A
1995	2.3B	6.0A
1996	3.0B	6.6A
1997	2.3B	6.3A
1998	2.6B	5.4A
1999	2.7B	6.1A
2000	3.1B	7.4A
2001	4.0B	4.9A
2002	2.3B	8.3A
2003	3.0B	8.9A
2004	4.7B	10.1A[b]
2005	5.0B	10.1A[b]
2006	5.4B	10.0A
2007	4.3B	10.5A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.
[b] These were incorrect in Nelson et al. (2007); the leading digit was missing, rendering them "0.1A."

Table 31.—Multiple comparisons[a] of mean geometric mean particle diameters between Chamberlain Basin spawning areas by year.

Year	Chamberlain (E032)	WF Chamberlain (E136)
1992	28.7A	19.5B
1993	42.2A	20.9B
1994	41.3A	23.3B
1995	61.5A	26.0B
1996	39.6A	18.4B
1997	55.6A	22.6B
1998	68.8A	20.4B
1999	60.0A	20.3B
2000	52.4A	18.6B
2001	41.4A	23.2B
2002	80.9A	18.8B
2003	75.1A	19.6B
2004	46.6A	18.6B
2005	46.3A	19.9B
2006	42.3A	19.9B
2007	49.9A	18.4B

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Appendix 2. Interbasin Comparisons Tables

Table 32.—Multiple comparisons[a] of mean large fines among basins by year.

Year	SFSR	Secesh	Chamberlain
1989	26.9B	30.5A	31.9A
1990	28.3A	23.6B	28.6A
1991	27.2A	24.6B	27.7A
1992	27.4B	25.6B	30.2A
1993	28.1A	25.4B	26.6BA
1994	27.5A	25.8BA	24.1B
1995	30.7A	18.2C	21.0B
1996	31.8A	23.5C	29.1B
1997	31.6A	22.8B	22.2B
1998	31.6A	22.1B	22.2B
1999	31.0A	21.5C	24.3B
2000	28.8A	22.5B	26.6A
2001	28.3A	24.6B	26.0B
2002	30.5A	24.9B	25.0B
2003	31.4A	25.2B	21.9C
2004	29.2A	24.8B	28.4A
2005	28.4A	25.0B	28.1A
2006	32.2A	22.5C	28.4B
2007	27.9A	20.0B	26.9A

[a] Mean values in a row with different letters are significantly different ($P<0.10$) by Tukey's HSD test.

Table 33.—Multiple comparisons[a] of mean coarse fines among basins by year.

Year	SFSR	Secesh	Chamberlain
1989	22.6A	21.0A	22.9A
1990	23.8A	15.7C	20.8B
1991	22.8A	16.1C	18.2B
1992	23.6A	16.6C	20.5B
1993	23.6A	17.3B	19.2B
1994	21.3A	18.5B	16.8B
1995	26.0A	11.8C	14.6B
1996	27.2A	14.5C	21.5B
1997	26.7A	14.7B	15.3B
1998	26.6A	14.0B	15.8B
1999	26.2A	14.5C	17.5B
2000	24.1A	15.2C	19.0B
2001	23.1A	16.0C	19.2B
2002	26.1A	16.4B	17.6B
2003	26.8A	16.5B	14.8B
2004	25.0A	15.8C	18.6B
2005	24.1A	15.0C	18.2B
2006	27.9A	13.5C	18.3B
2007	17.5A	12.5B	17.4A

[a] Mean values in a row with different letters are significantly different ($P<0.10$) by Tukey's HSD test.

Table 34.—Multiple comparisons[a] of mean small fines among basins by year.

Year	SFSR	Secesh	Chamberlain
1989	4.3C	7.5A	5.8B
1990	4.6B	5.5A	4.7BA
1991	4.3B	6.1A	6.7A
1992	5.2C	6.2B	7.0A
1993	4.3B	5.8A	4.9B
1994	2.8B	4.6A	4.9A
1995	5.5A	4.4B	4.2B
1996	5.4BA	6.3A	4.8B
1997	6.3A	5.6A	4.3B
1998	6.3A	5.7A	4.0B
1999	5.8A	4.7B	4.4B
2000	5.0A	5.1A	5.3A
2001	4.7B	6.1A	4.4B
2002	5.8A	6.2A	5.3A
2003	6.2A	6.4A	5.2B
2004	7.0A	6.8A	7.4A
2005	6.7A	7.7A	7.6A
2006	8.4A	6.9B	7.7BA
2007	7.8A	5.6B	7.4A

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Table 35.—Multiple comparisons[a] of mean geometric mean particle diameters among basins by year.

Year	SFSR	Secesh	Chamberlain
1989	29.3A	21.4B	23.2B
1990	26.7A	29.9A	28.4A
1991	28.9A	30.0A	28.5A
1992	29.7A	30.7A	24.1B
1993	27.7B	29.0BA	31.6A
1994	35.9A	32.4A	32.3A
1995	23.1B	44.8A	43.7A
1996	24.0B	32.0A	29.0A
1997	23.8C	34.0B	39.1A
1998	24.5C	38.6B	44.6A
1999	24.2B	38.4A	40.2A
2000	28.9B	35.3A	35.5A
2001	25.4B	30.8A	32.3A
2002	24.2C	31.0B	49.8A
2003	24.2C	30.9B	54.3A
2004	27.0B	30.8BA	32.6A
2005	25.7B	29.2B	33.1A
2006	23.6C	35.9A	31.1B
2007	24.0C	39.3A	34.1B

[a] Mean values in a row with different letters are significantly different (P<0.10) by Tukey's HSD test.

Appendix 3. Time Series Graphs

South Fork Salmon River

Overall Models

Stolle Meadows (B081)

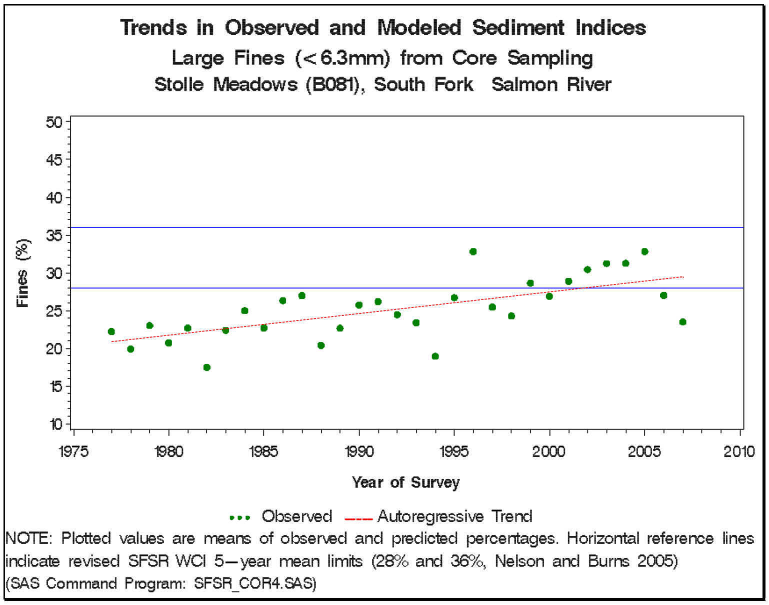

Figure 1.—Time trends in the large fine sediments in the Stolle Meadows spawning area, upper SFSR, 1977-2007.

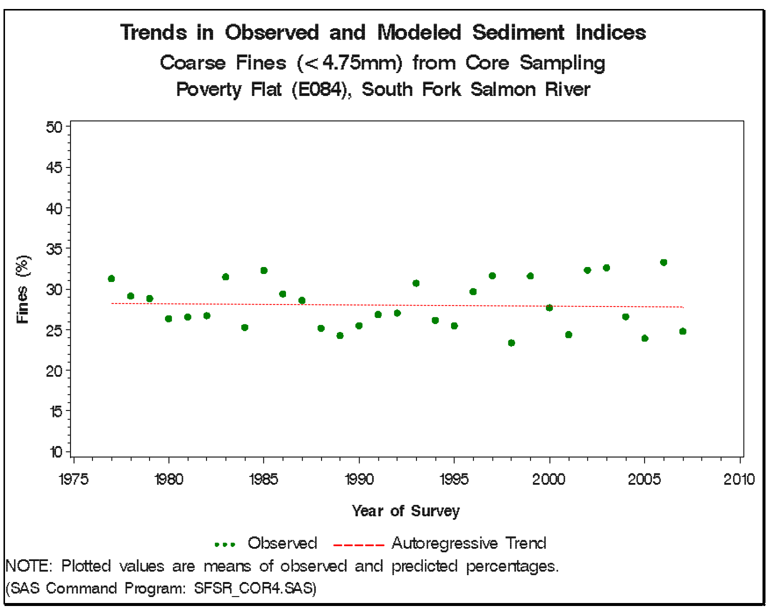

Figure 2.—Time trends in coarse fine sediments in the Stolle Meadows spawning area, upper SFSR, 1977-2007.

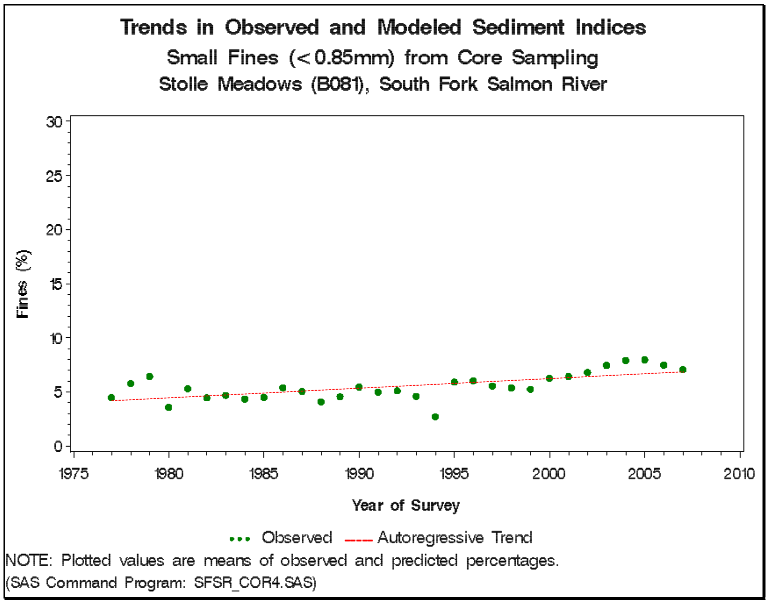

Figure 3.—Time trends in the small fine sediments in the Stolle Meadows spawning area, upper SFSR, 1977-2007.

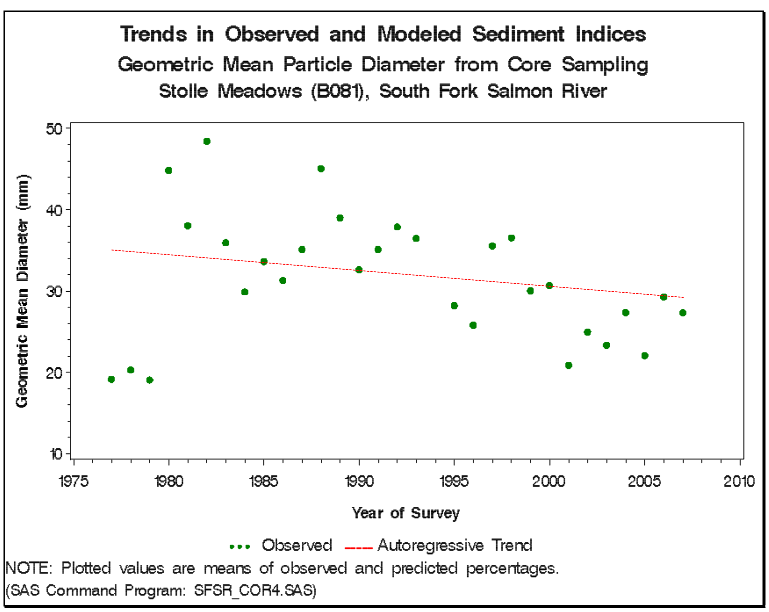

Figure 4.—Time trends in geometric mean particle diameter in the Stolle Meadows spawning area, upper SFSR, 1977-2007.

Dollar Creek (B082)

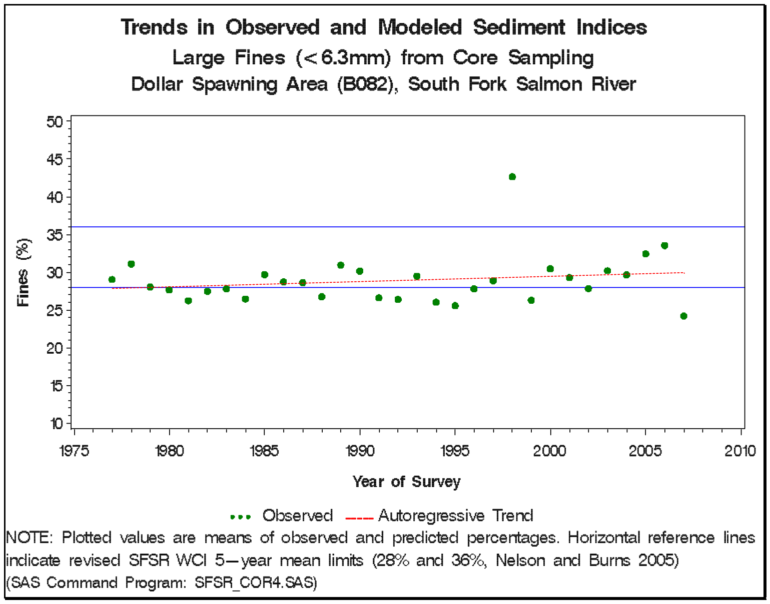

Figure 5.—Time trends in the large fine sediments in the Dollar Creek spawning area, upper SFSR, 1977-2007.

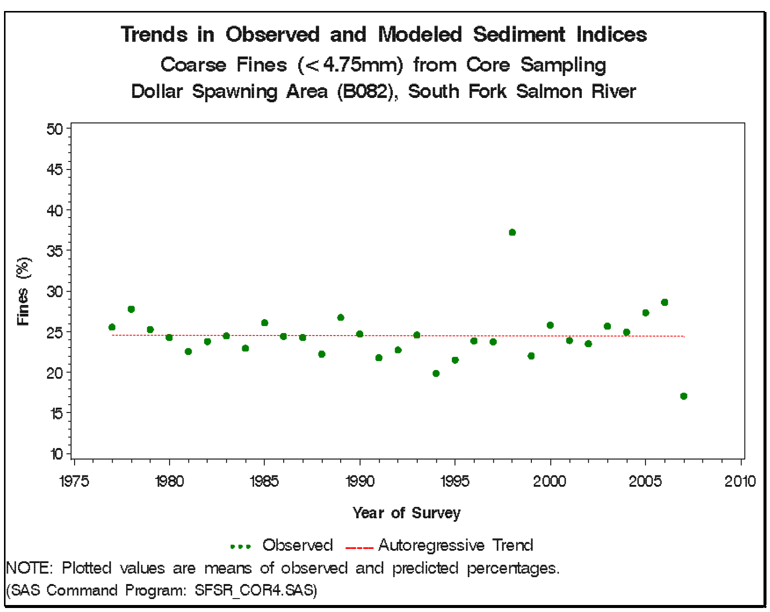

Figure 6.—Time trends in coarse fine sediments in the Dollar Creek spawning area, upper SFSR, 1977-2007.

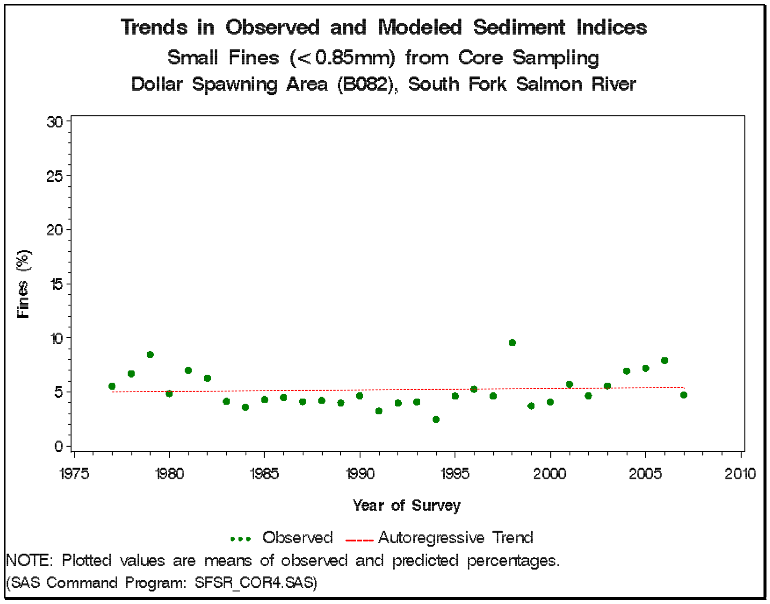

Figure 7.—Time trends in the small fine sediments in the Dollar Creek spawning area, upper SFSR, 1977-2007.

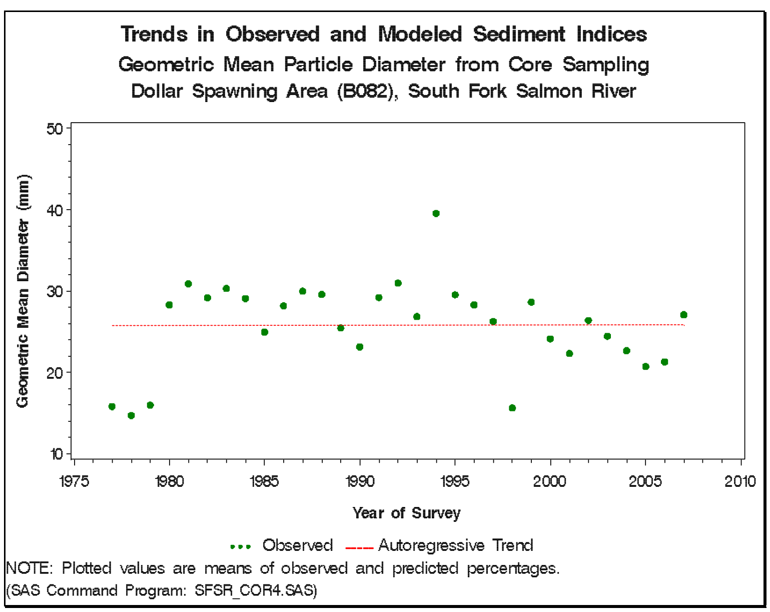

Figure 8.—Time trends in geometric mean particle diameter in the Dollar Creek spawning area, upper SFSR, 1977-2007.

Poverty Flat (E084)

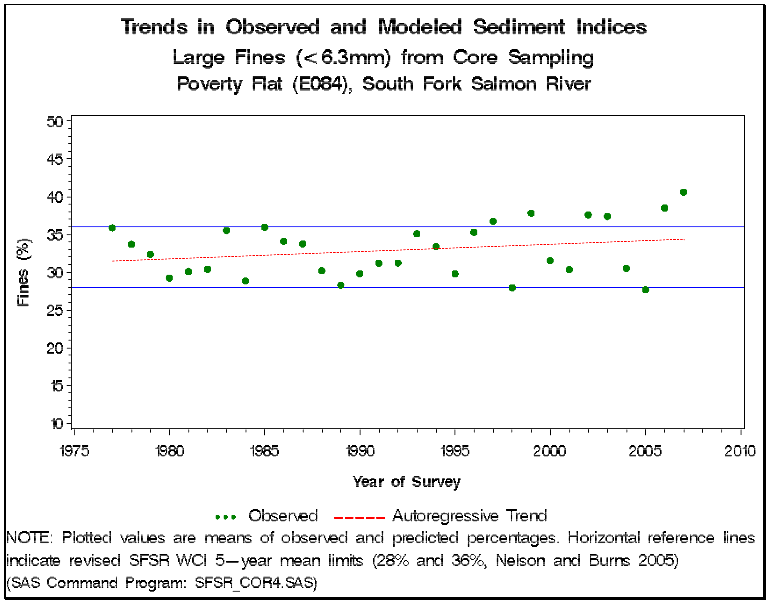

Figure 9.—Time trends in the large fine sediments in the Poverty Flat spawning area, upper SFSR, 1977-2007.

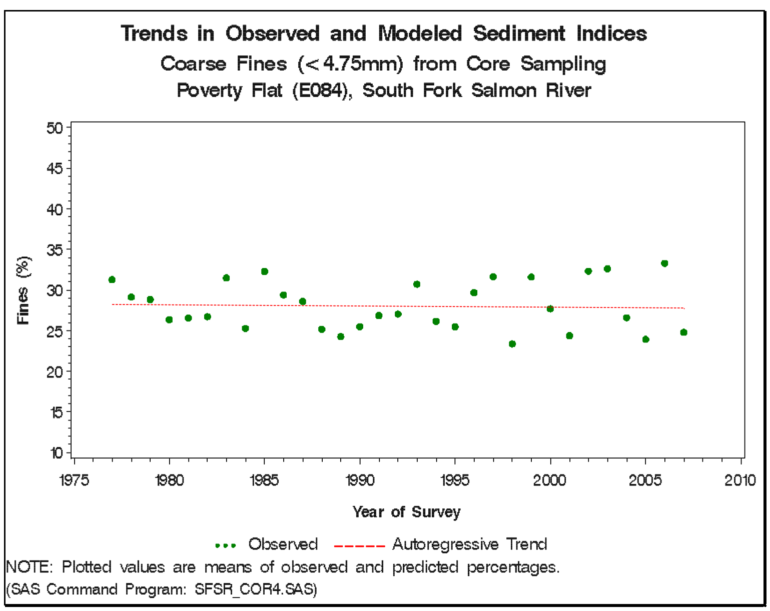

Figure 10.—Time trends in coarse fine sediments in the Poverty Flat spawning area, upper SFSR, 1977-2007.

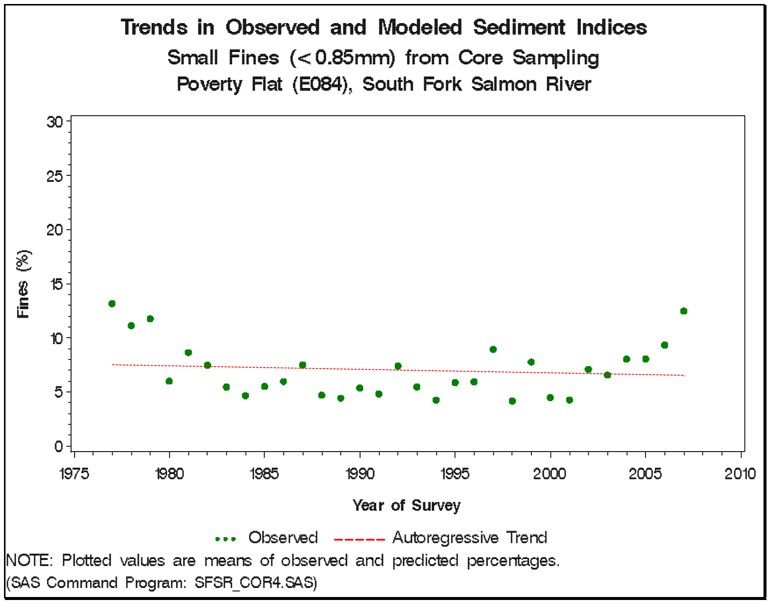

Figure 11.—Time trends in the small fine sediments in the Poverty Flat spawning area, upper SFSR, 1977-2007.

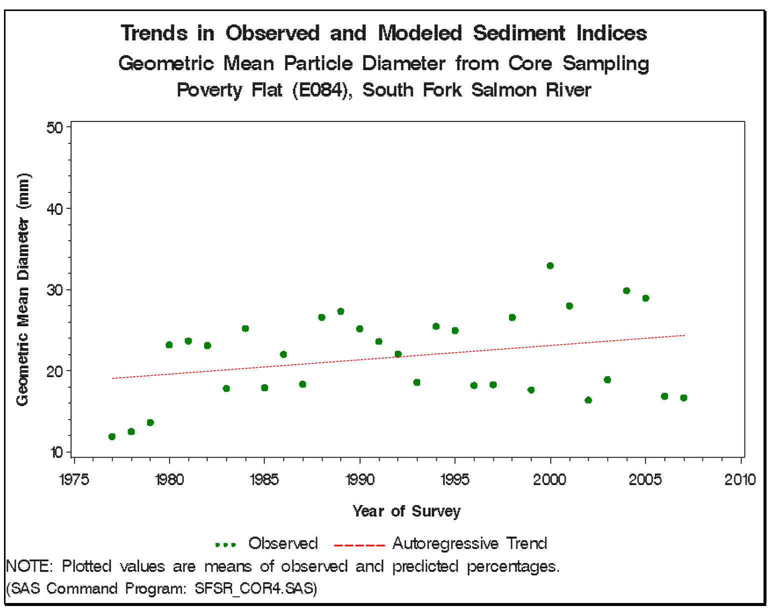

Figure 12.—Time trends in geometric mean particle diameter in the Poverty Flat spawning area, upper SFSR, 1977-2007.

Glory Hole (E085)

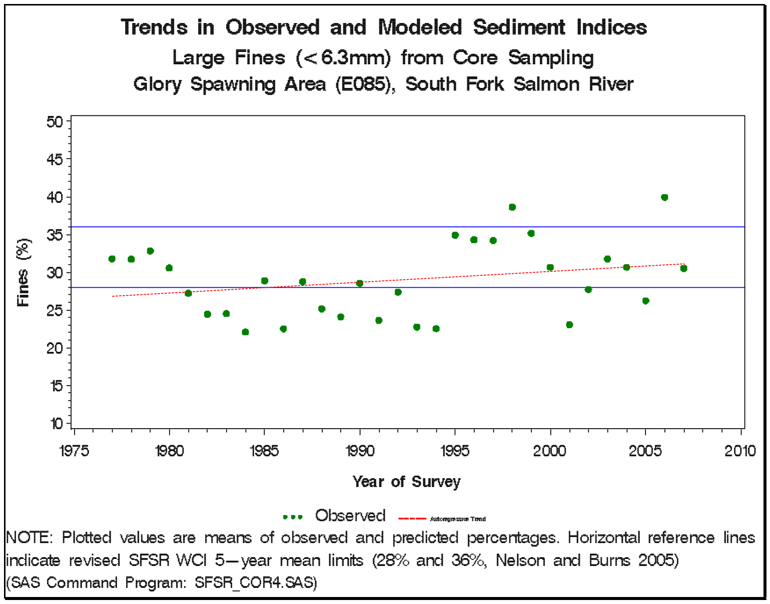

Figure 13.—Time trends in the large fine sediments in the Glory Hole spawning area, upper SFSR, 1977-2007.

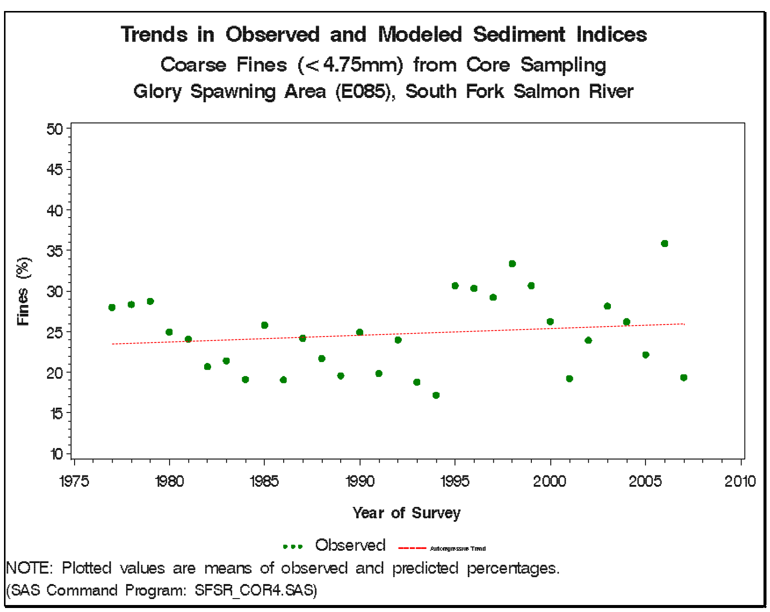

Figure 14.—Time trends in coarse fine sediments in the Glory Hole spawning area, upper SFSR, 1977-2007.

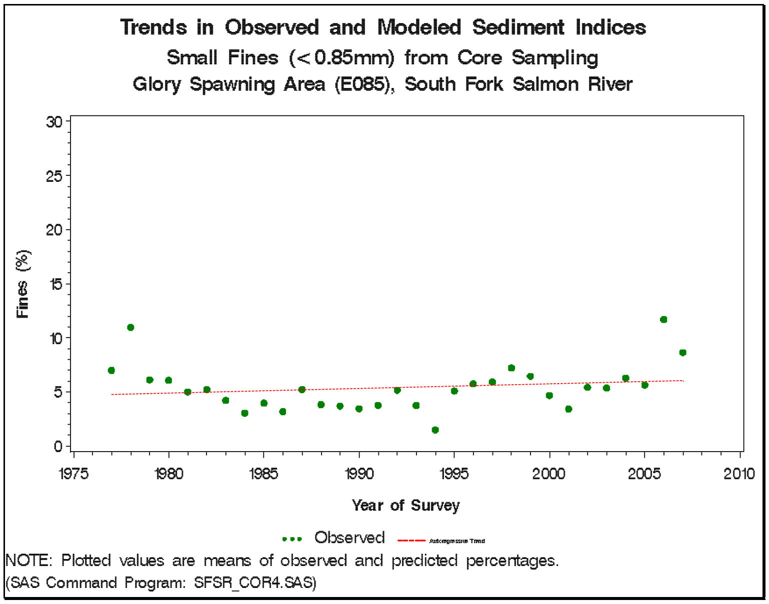

Figure 15.—Time trends in the small fine sediments in the Glory Hole spawning area, upper SFSR, 1977-2007.

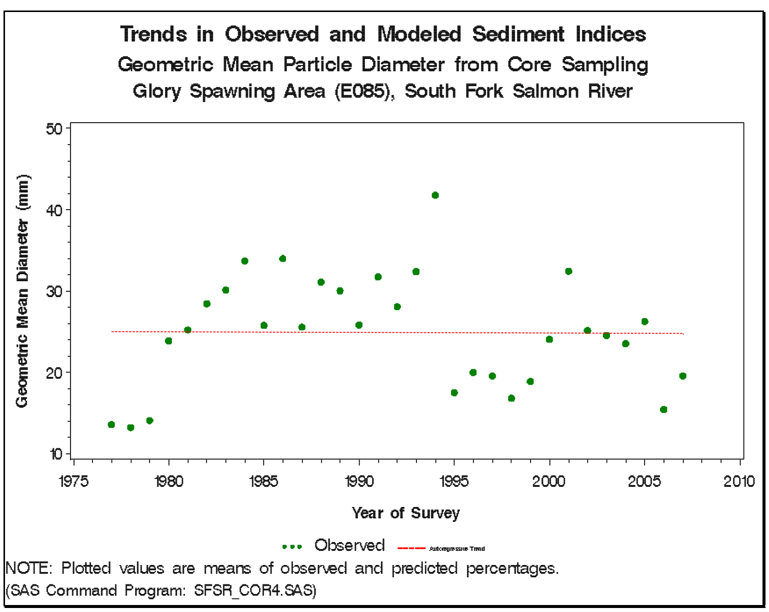

Figure 16.—Time trends in geometric mean particle diameter in the Glory Hole spawning area, upper SFSR, 1977-2007.

Oxbow (E083)

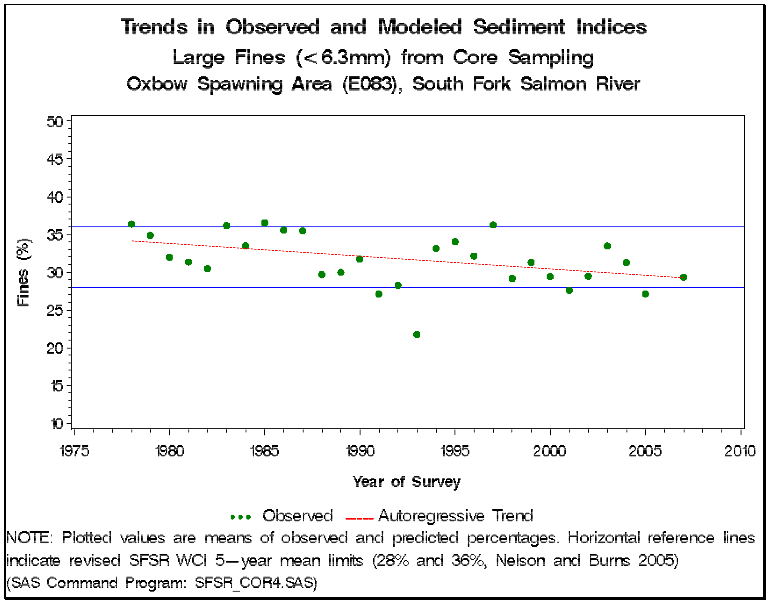

Figure 17.—Time trends in the large fine sediments in the Oxbow spawning area, upper SFSR, 1977-2007 (NOTE: no data collected here in 2006).

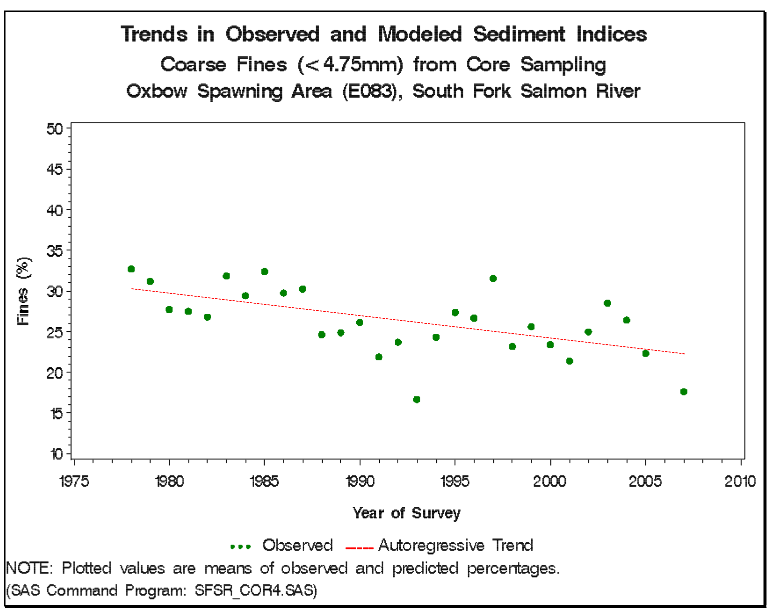

Figure 18.—Time trends in coarse fine sediments in the Oxbow spawning area, upper SFSR, 1977-2007 (NOTE: no data collected here in 2006).

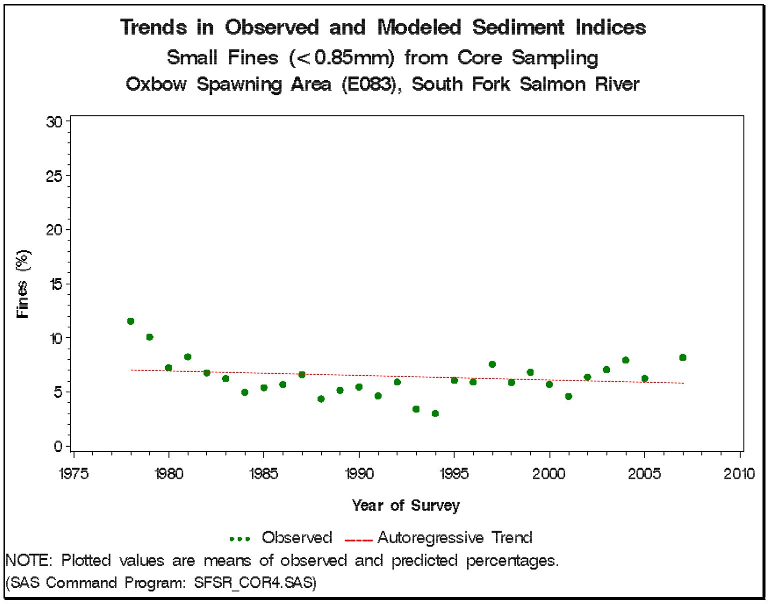

Figure 19.—Time trends in the small fine sediments in the Oxbow spawning area, upper SFSR, 1977-2007 (NOTE: no data collected here in 2006).

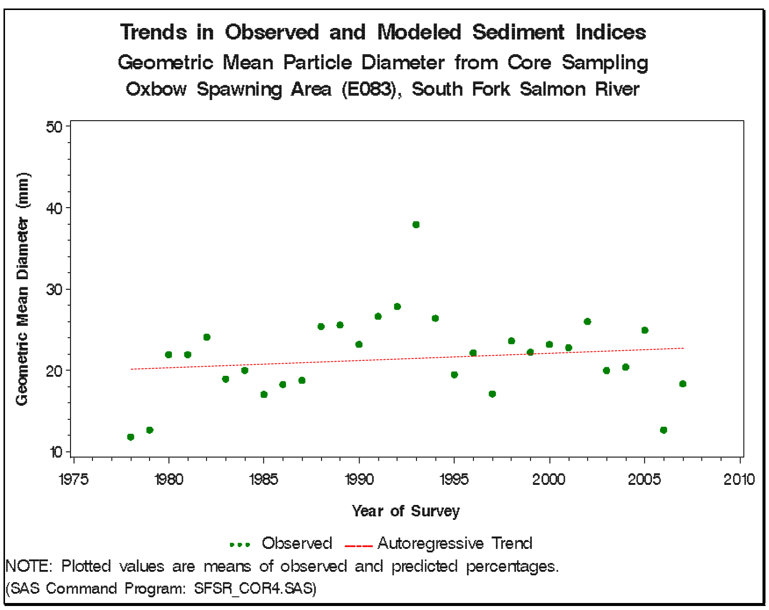

Figure 20.—Time trends in geometric mean particle diameter in the Oxbow spawning area, upper SFSR, 1977-2007 (NOTE: no data collected here in 2006).

Ice Hole (B152)

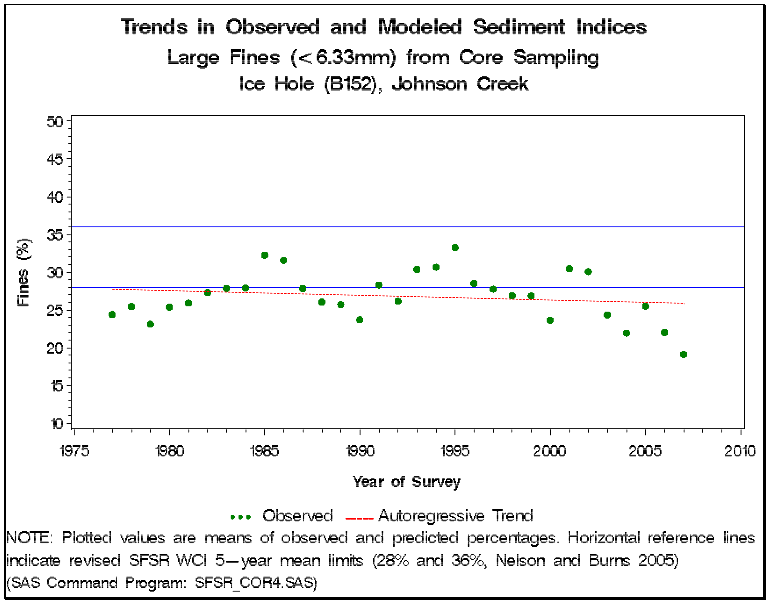

Figure 21.—Time trends in the large fine sediments in the Ice Hole spawning area, upper SFSR, 1977-2007.

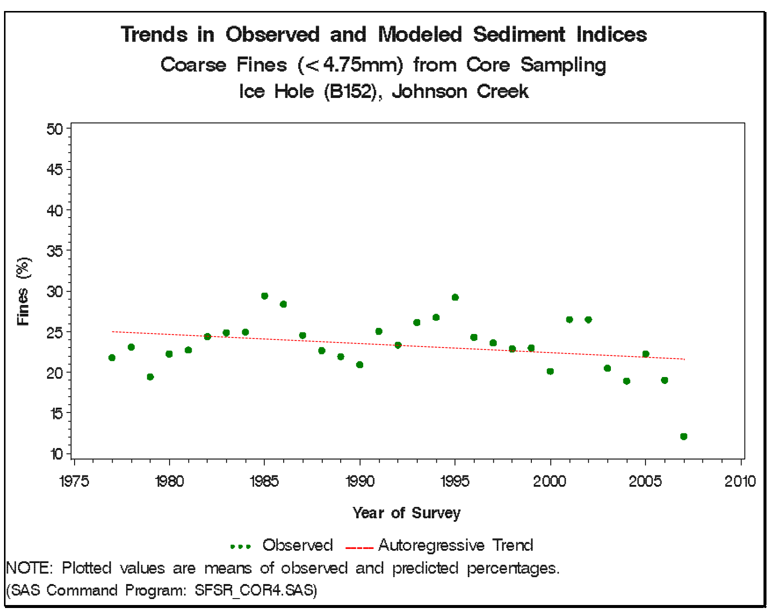

Figure 22.—Time trends in coarse fine sediments in the Ice Hole spawning area, upper SFSR, 1977-2007.

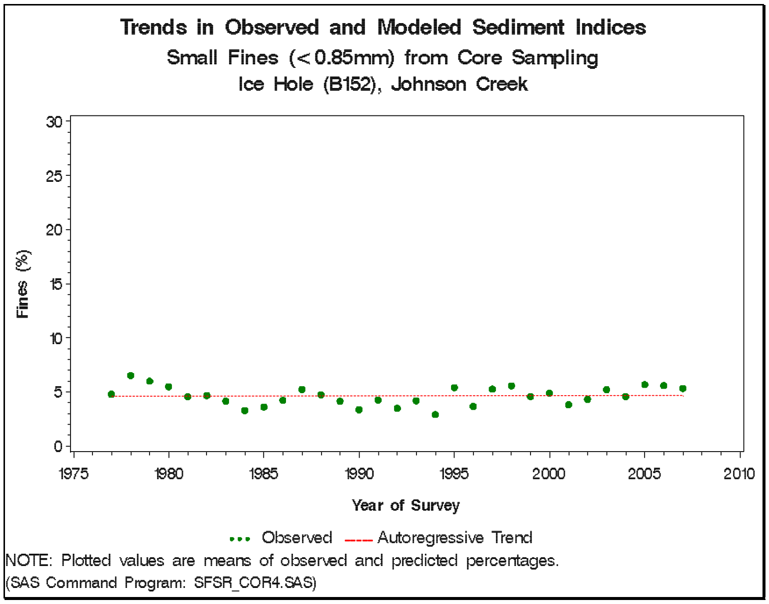

Figure 23.—Time trends in the small fine sediments in the Ice Hole spawning area, upper SFSR, 1977-2007.

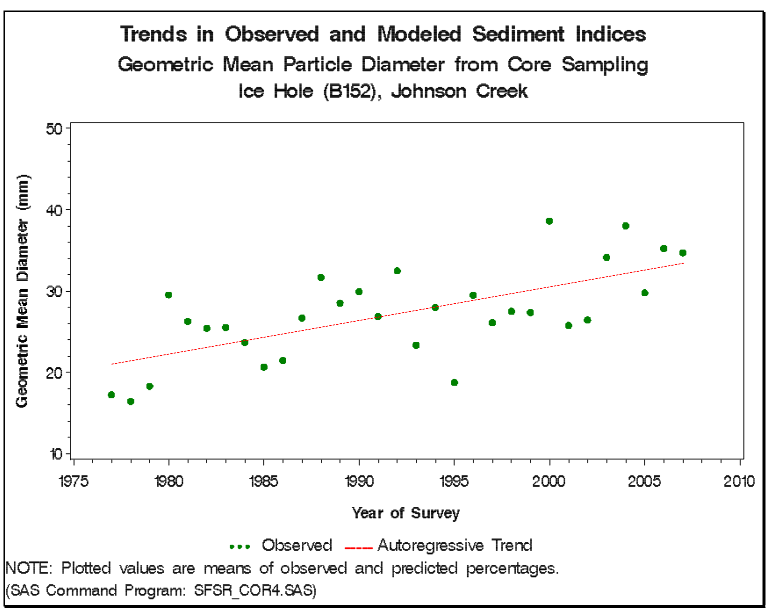

Figure 24.—Time trends in geometric mean particle diameter in the Ice Hole spawning area, upper SFSR, 1977-2007.

Recent Models

Stolle Meadows (B081)

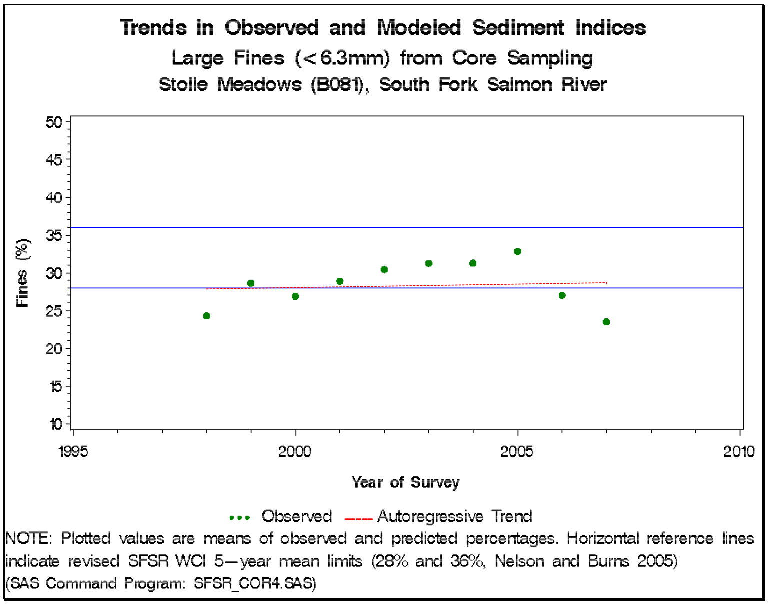

Figure 25.—Time trends in the large fine sediments in the Stolle Meadows spawning area, upper SFSR, 1998-2007.

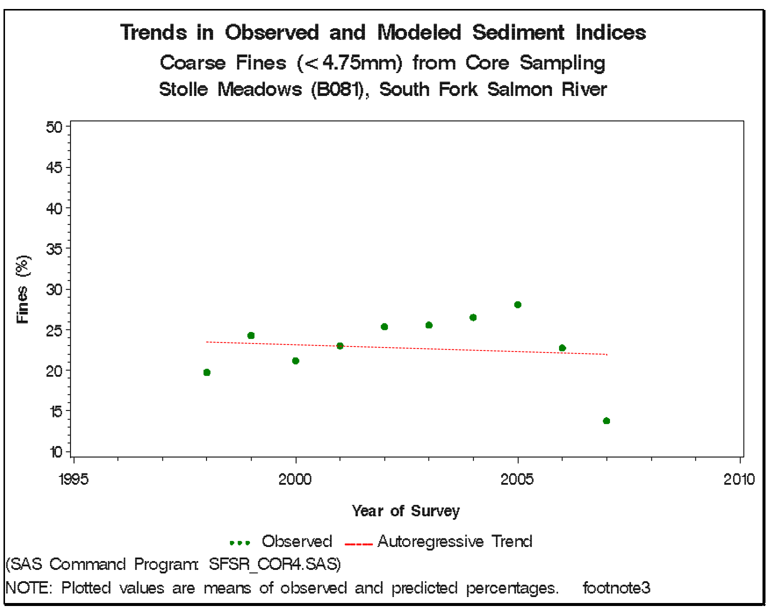

Figure 26.—Time trends in coarse fine sediments in the Stolle Meadows spawning area, upper SFSR, 1998-2007.

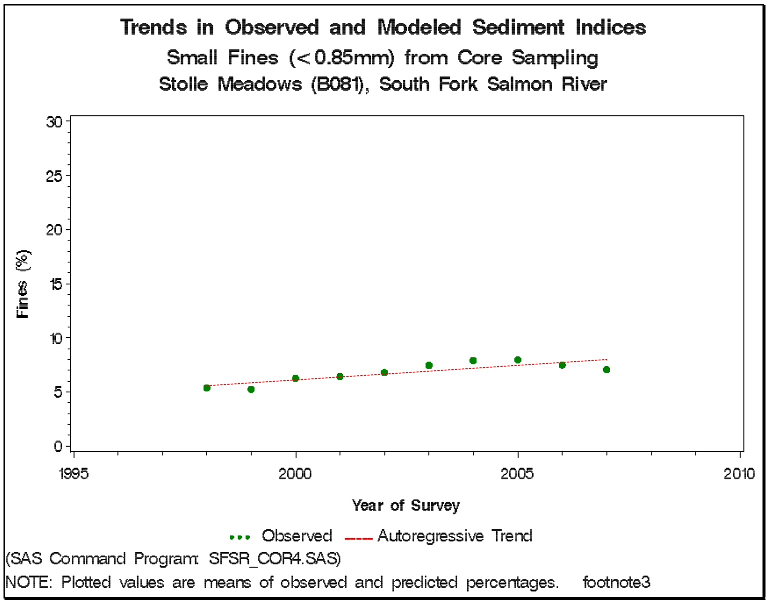

Figure 27.—Time trends in the small fine sediments in the Stolle Meadows spawning area, upper SFSR, 1998-2007.

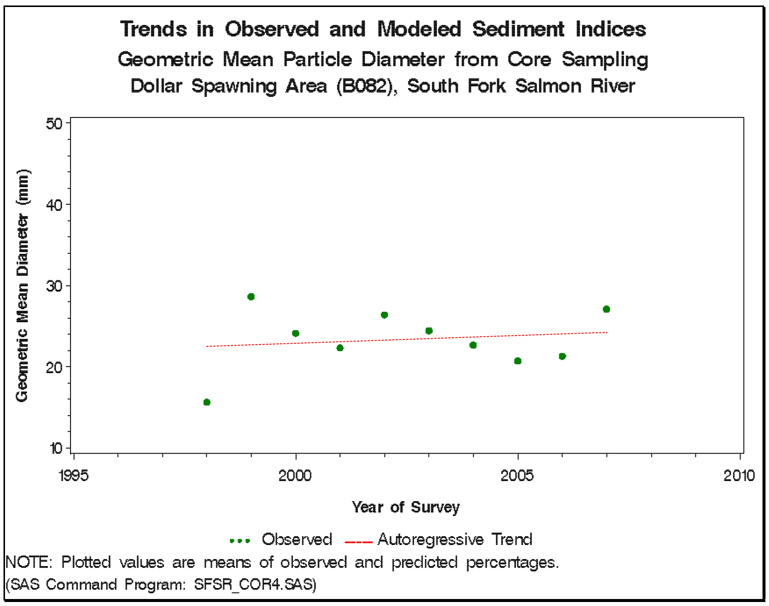

Figure 28.—Time trends in geometric mean particle diameter in the Stolle Meadows spawning area, upper SFSR, 1998-2007.

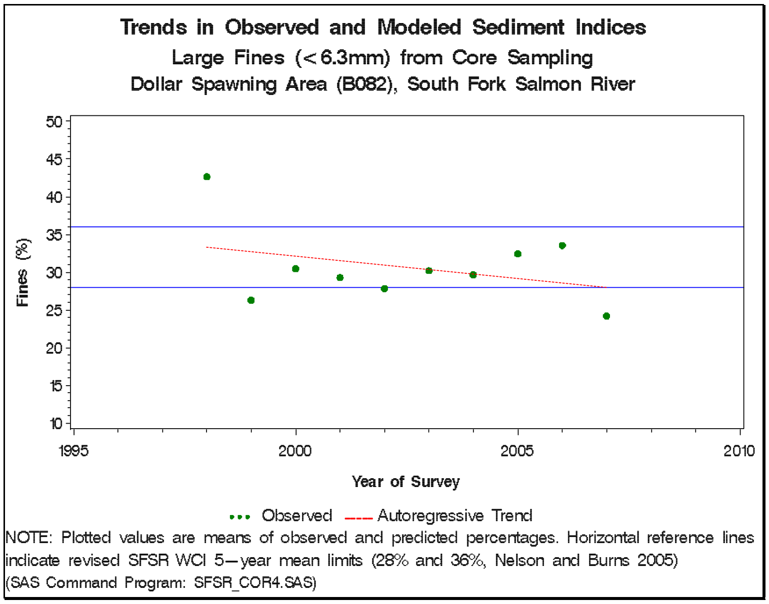

Figure 29.—Time trends in the large fine sediments in the Dollar Creek spawning area, upper SFSR, 1998-2007.

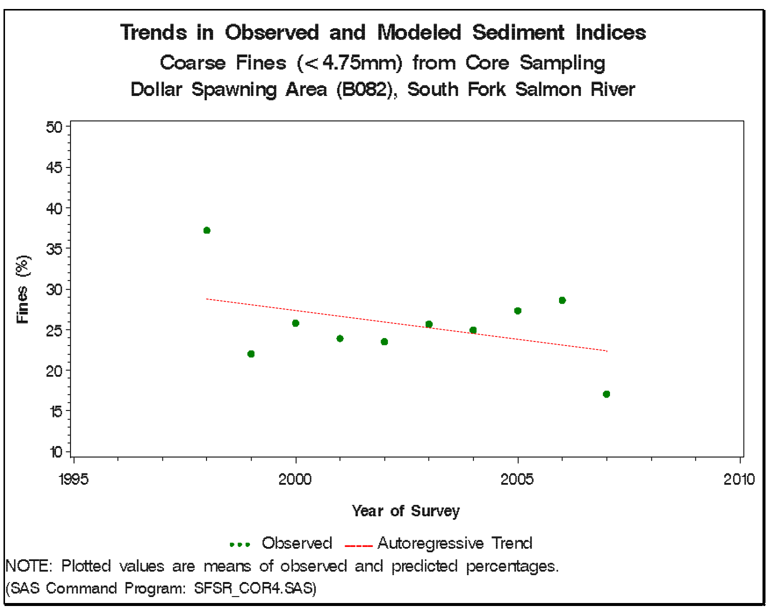

Figure 30.—Time trends in coarse fine sediments in the Dollar Creek spawning area, upper SFSR, 1997-2007.

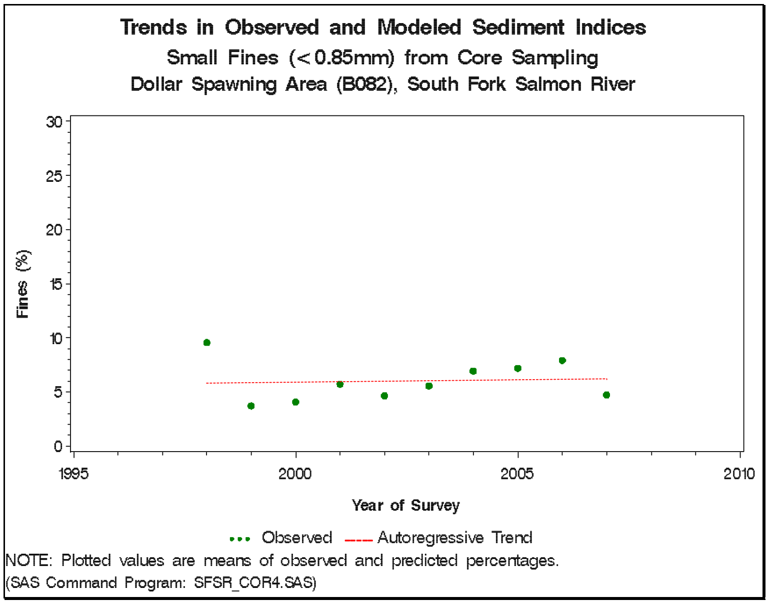

Figure 31.—Time trends in the small fine sediments in the Dollar Creek spawning area, upper SFSR, 1998-2007.

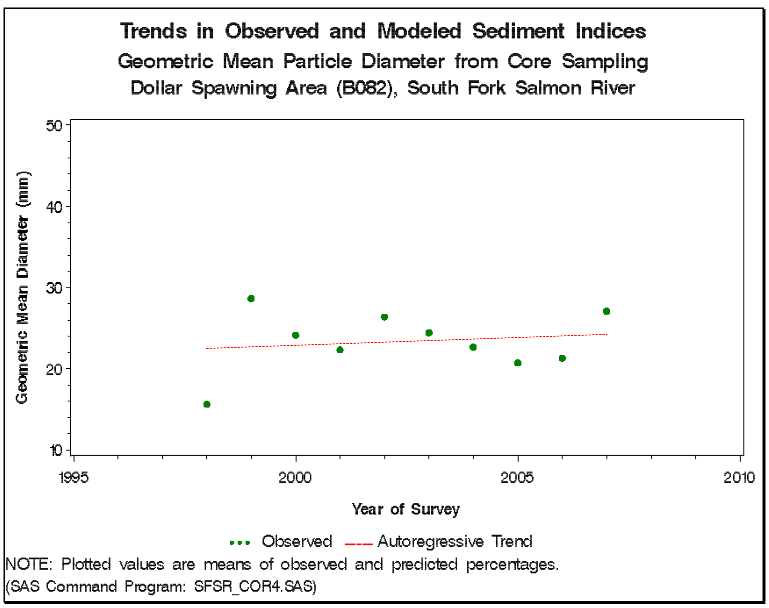

Figure 32.—Time trends in geometric mean particle diameter in the Dollar Creek spawning area, upper SFSR, 1997-2007.

Poverty Flat (E084)

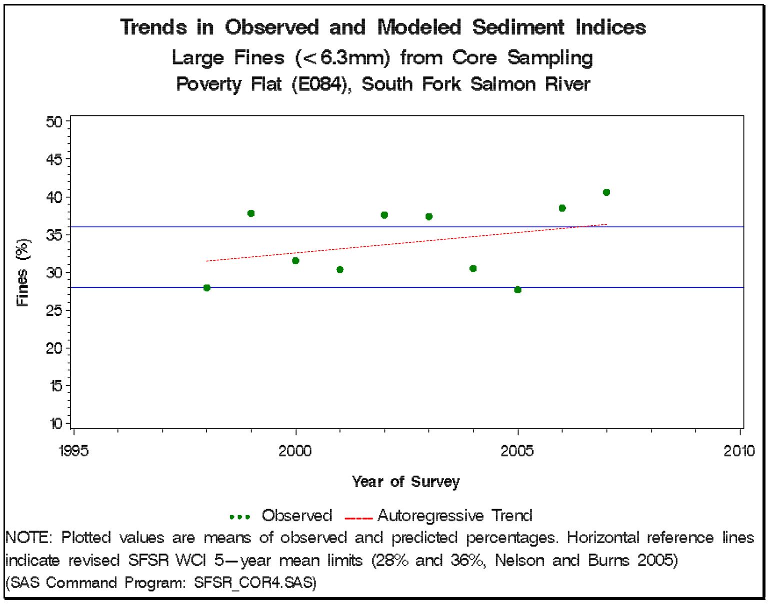

Figure 33.—Time trends in the large fine sediments in the Poverty Flat spawning area, upper SFSR, 1998-2007.

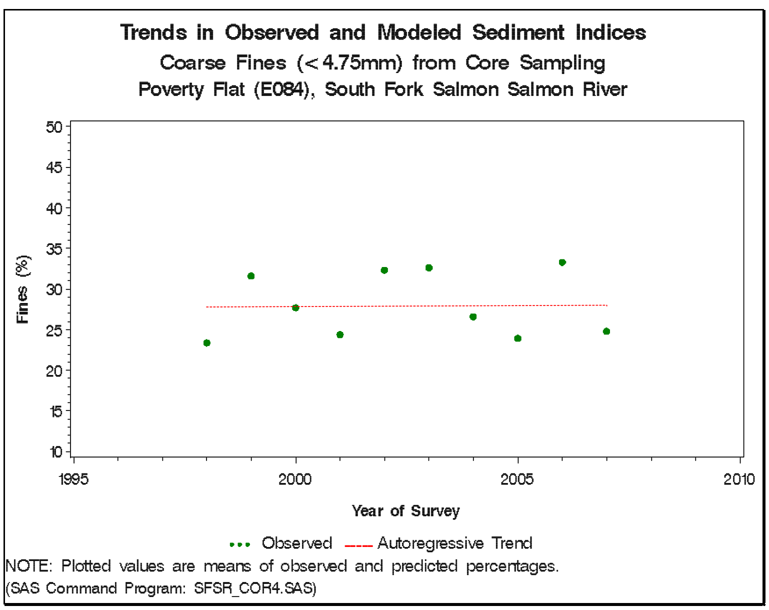

Figure 34.—Time trends in coarse fine sediments in the Poverty Flat spawning area, upper SFSR, 1998-2007.

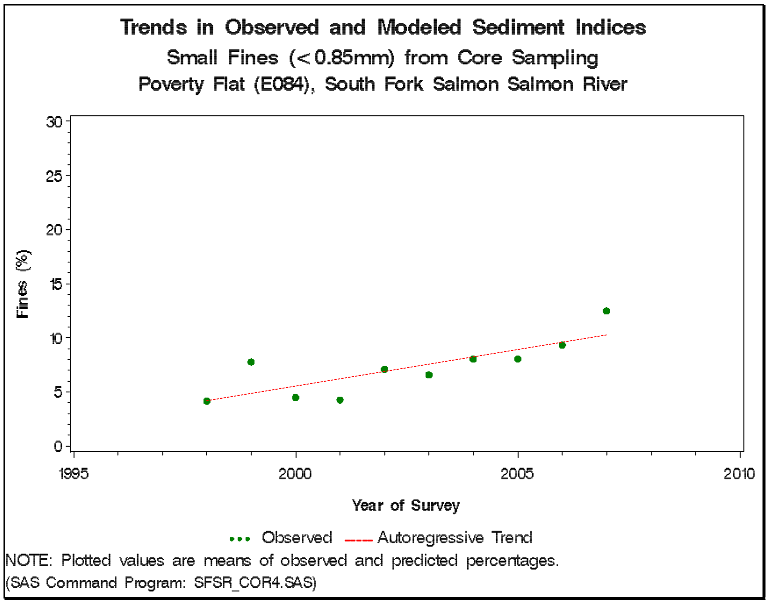

Figure 35.—Time trends in the small fine sediments in the Poverty Flat spawning area, upper SFSR, 1998-2007.

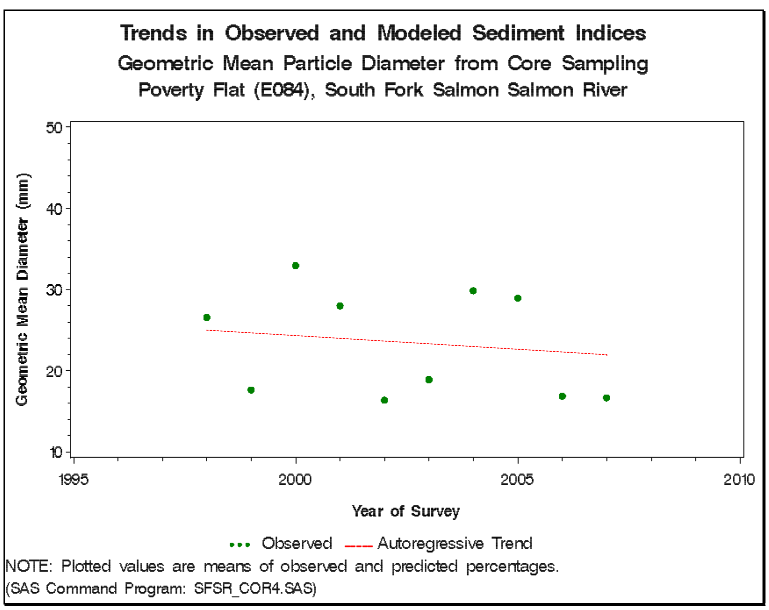

Figure 36.—Time trends in geometric mean particle diameter in the Poverty Flat spawning area, upper SFSR, 1998-2007.

Glory Hole (E085)

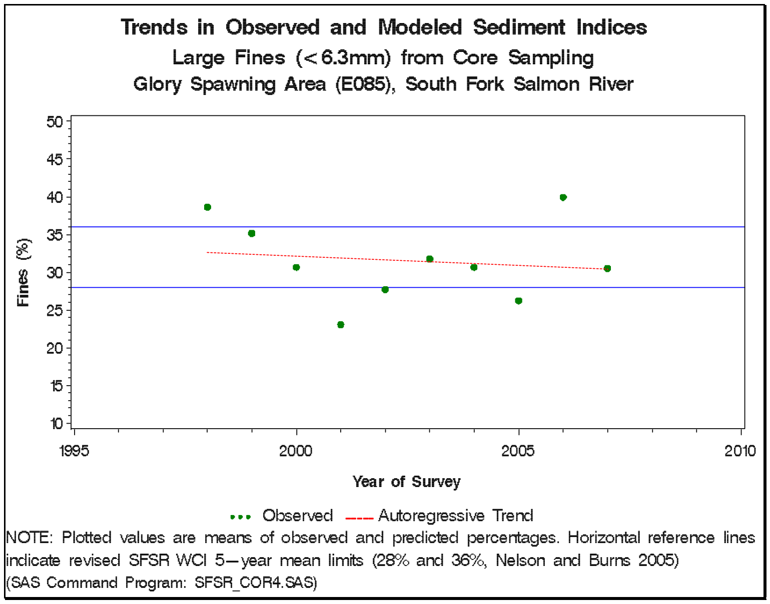

Figure 37.—Time trends in the large fine sediments in the Glory Hole spawning area, upper SFSR, 1998-2007.

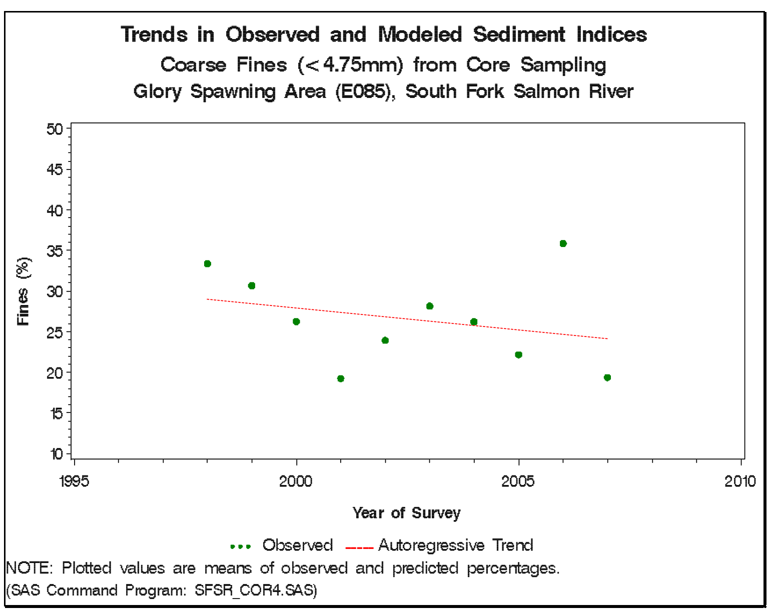

Figure 38.—Time trends in coarse fine sediments in the Glory Hole spawning area, upper SFSR, 1998-2007.

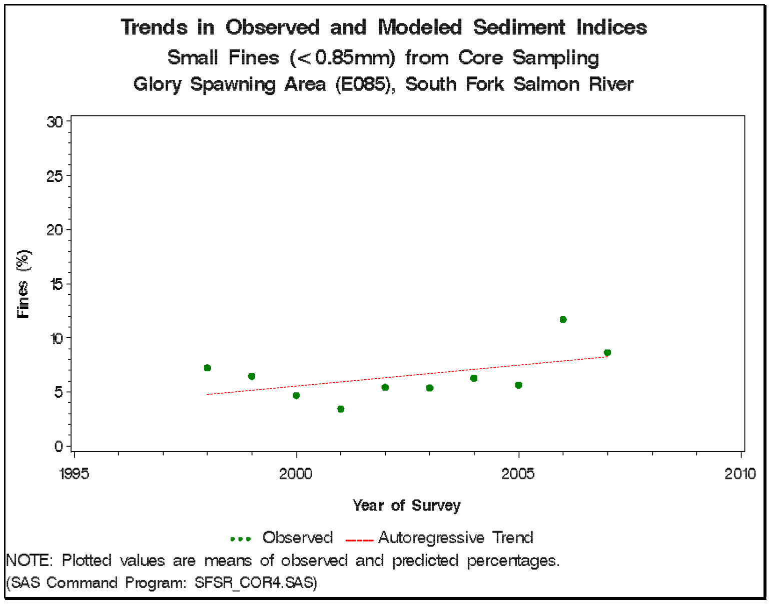

Figure 39.—Time trends in the small fine sediments in the Glory Hole spawning area, upper SFSR, 1998-2007.

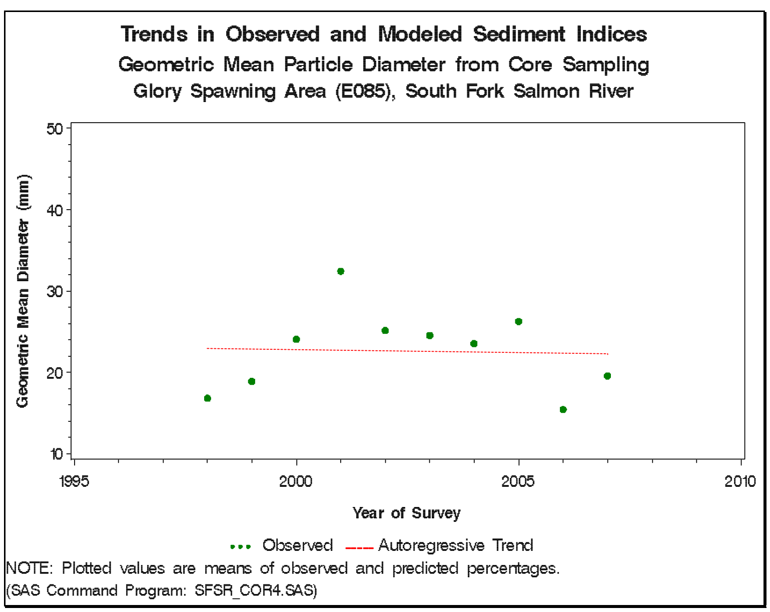

Figure 40.—Time trends in geometric mean particle diameter in the Glory Hole spawning area, upper SFSR, 1998-2007.

Oxbow (E083)

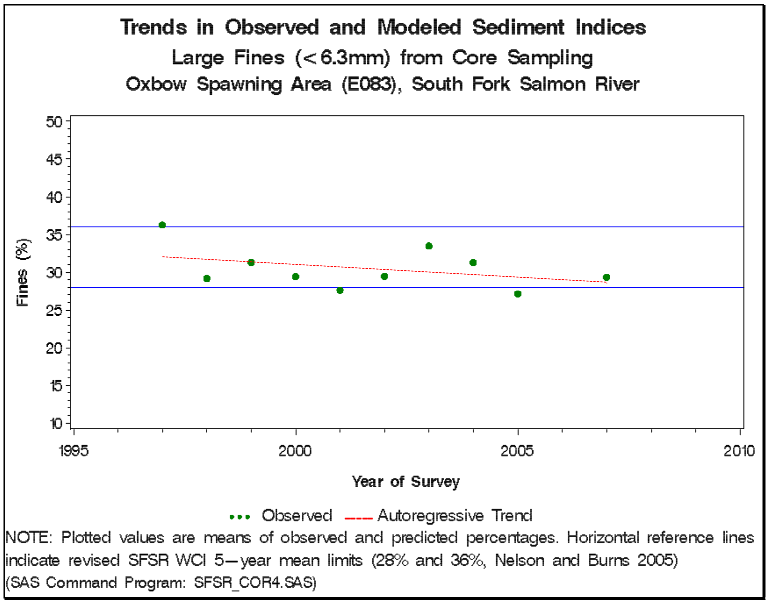

Figure 41.—Time trends in the large fine sediments in the Oxbow spawning area, upper SFSR, 1997-2007 (NOTE: no data were collected here in 2006).

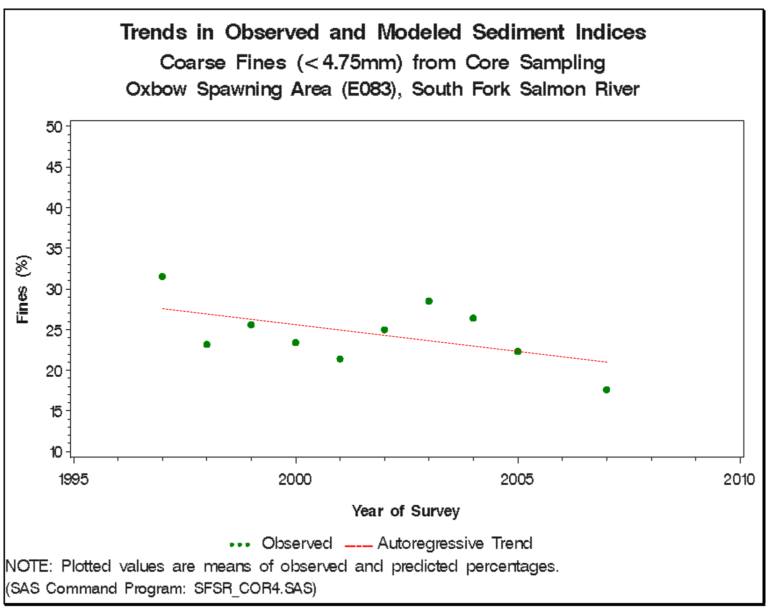

Figure 42.—Time trends in coarse fine sediments in the Oxbow spawning area, upper SFSR, 1997-2007 (NOTE: no data were collected here in 2006).

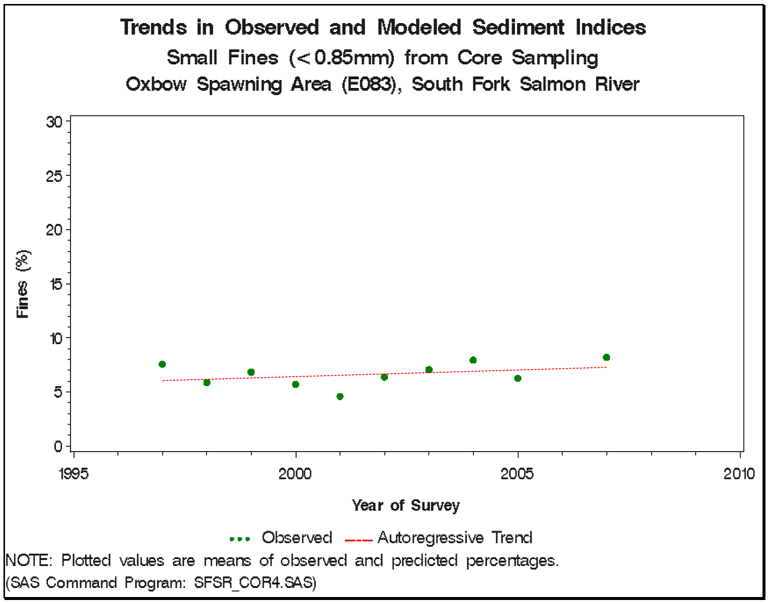

Figure 43.—Time trends in the small fine sediments in the Oxbow spawning area, upper SFSR, 1997-2007 (NOTE: no data were collected here in 2006).

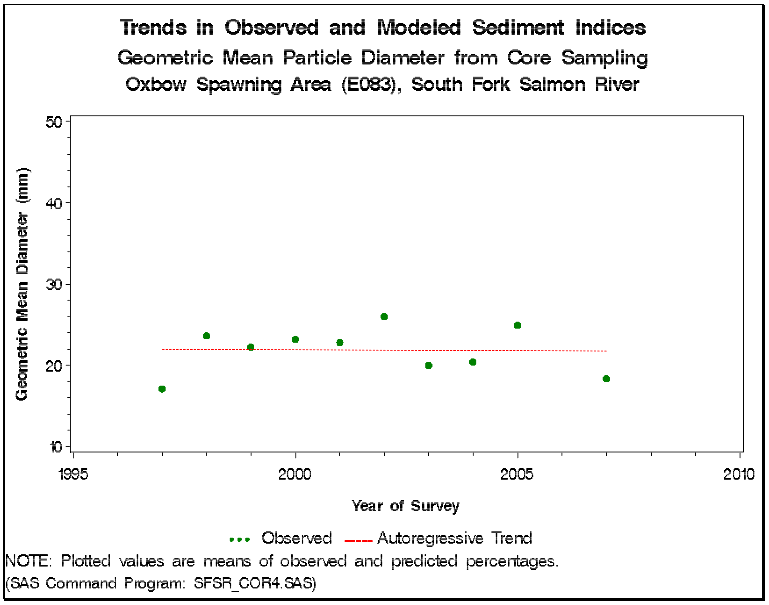

Figure 44.—Time trends in geometric mean particle diameter in the Oxbow spawning area, upper SFSR, 1997-2007 (NOTE: no data were collected here in 2006).

Ice Hole (B152)

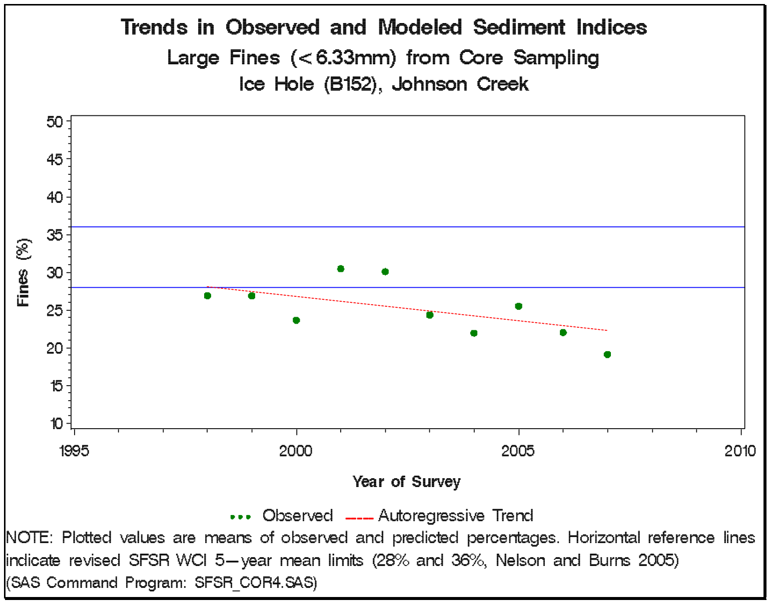

Figure 45.—Time trends in the large fine sediments in the Ice Hole spawning area, upper SFSR, 1998-2007.

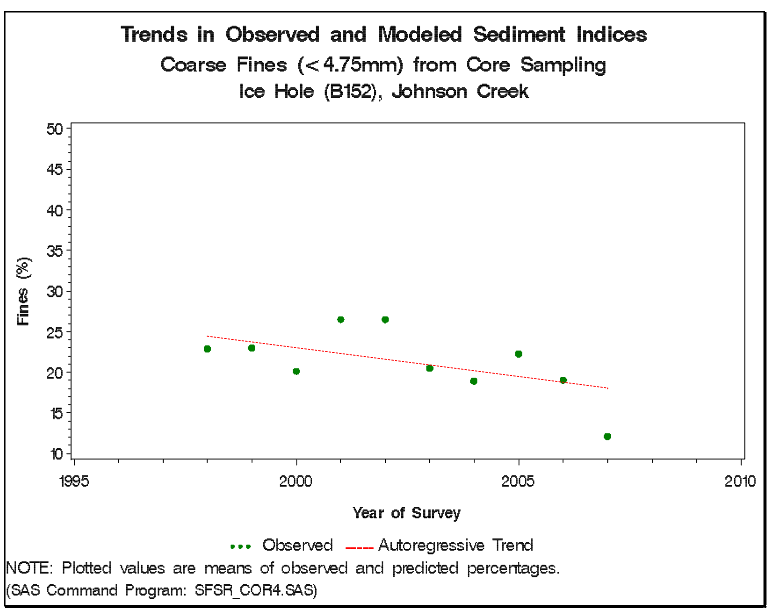

Figure 46.—Time trends in coarse fine sediments in the Ice Hole spawning area, upper SFSR, 1998-2007.

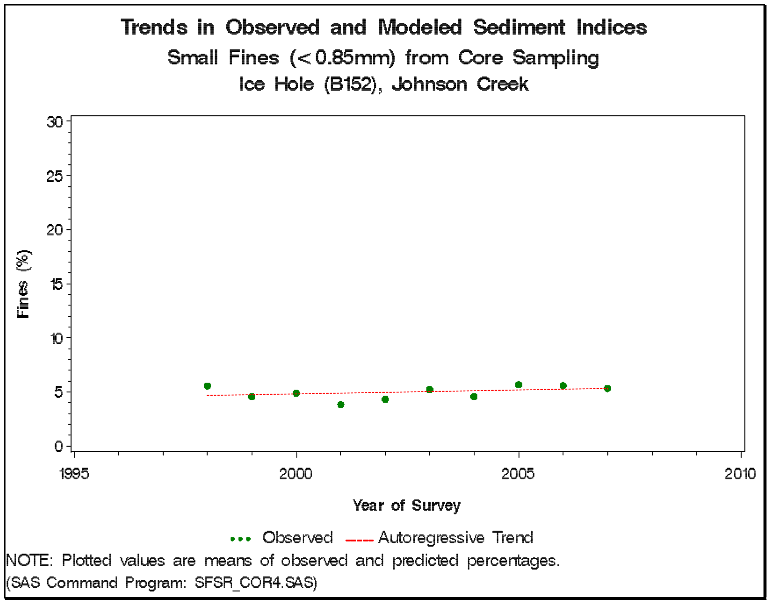

Figure 47.—Time trends in the small fine sediments in the Ice Hole spawning area, upper SFSR, 1998-2007.

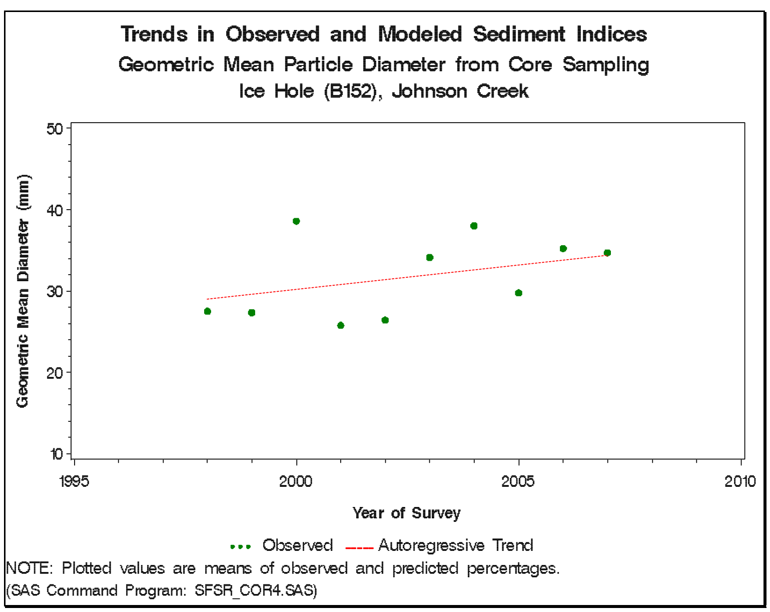

Figure 48.—Time trends in geometric mean particle diameter in the Ice Hole spawning area, upper SFSR, 1998-2007.

Overall Models

Corduroy Junction (E034)

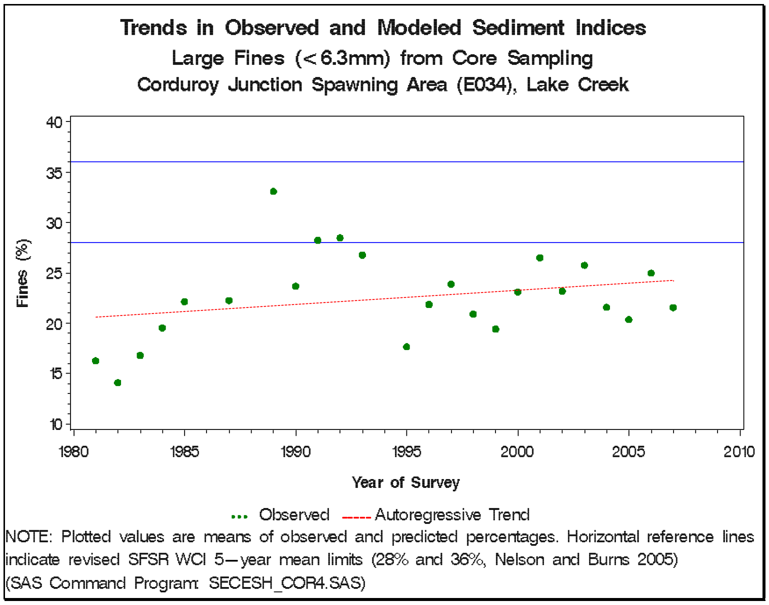

Figure 49.—Time trends in the large fine sediments in the Corduroy Junction spawning area, Lake Creek, 1981-2007.

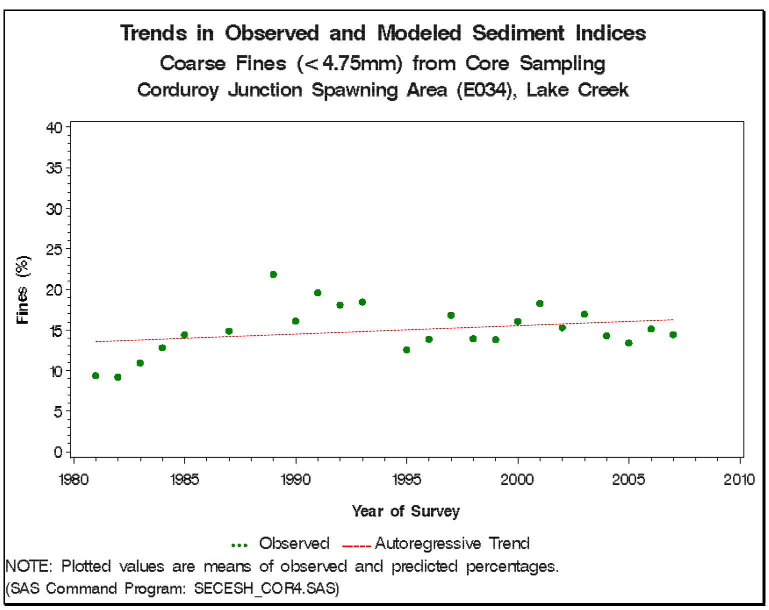

Figure 50.—Time trends in coarse fine sediments in the Corduroy Junction spawning area, Lake Creek, 1981-2007.

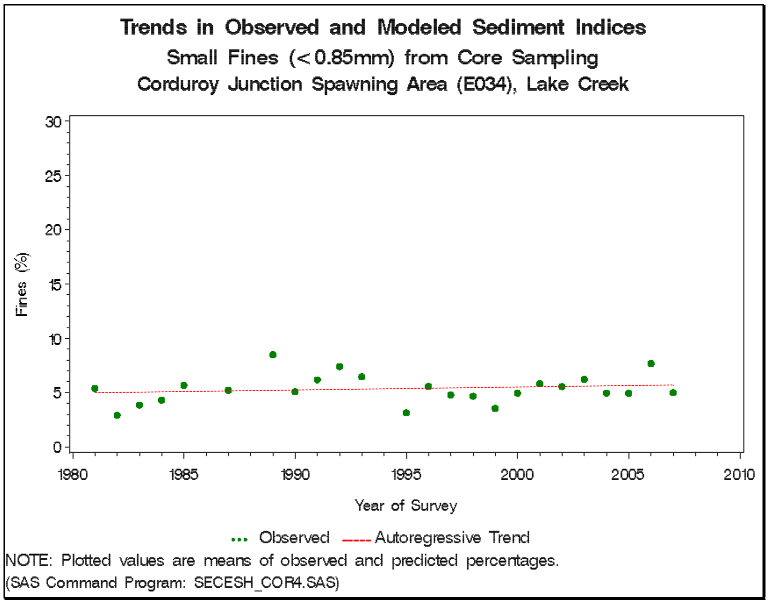

Figure 51.—Time trends in the small fine sediments in the Corduroy Junction spawning area, Lake Creek, 1981-2007.

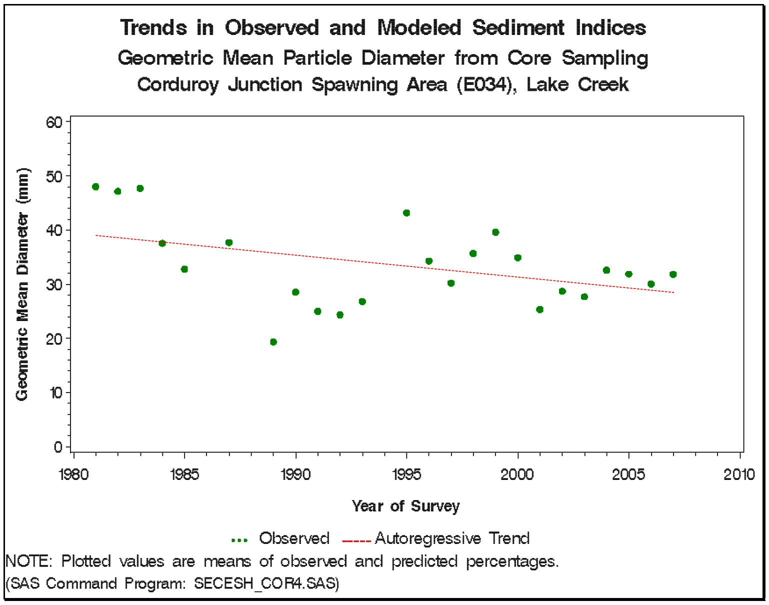

Figure 52.—Time trends in geometric mean particle diameter in the Corduroy Junction spawning area, Lake Creek, 1981-2007.

Burgdorf (E048)

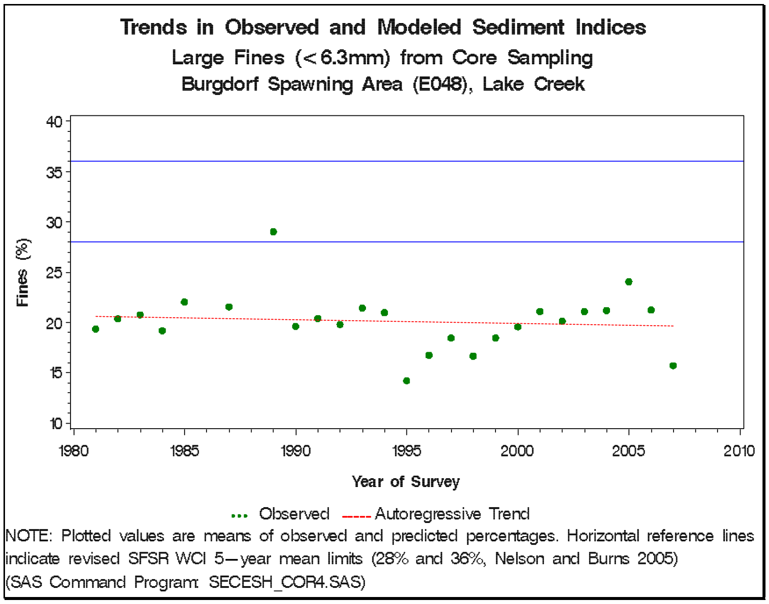

Figure 53.—Time trends in the large fine sediments in the Burgdorf spawning area, Lake Creek, 1981-2007.

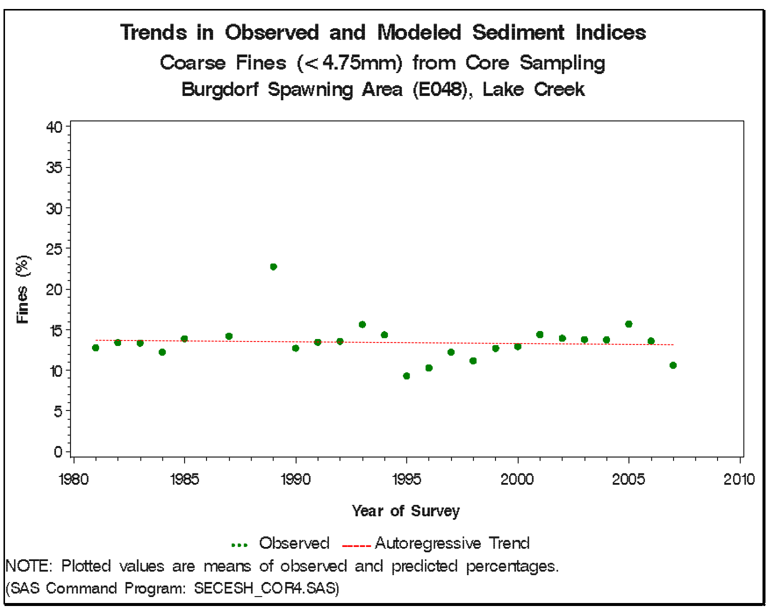

Figure 54.—Time trends in coarse fine sediments in the Burgdorf spawning area, Lake Creek, 1981-2007.

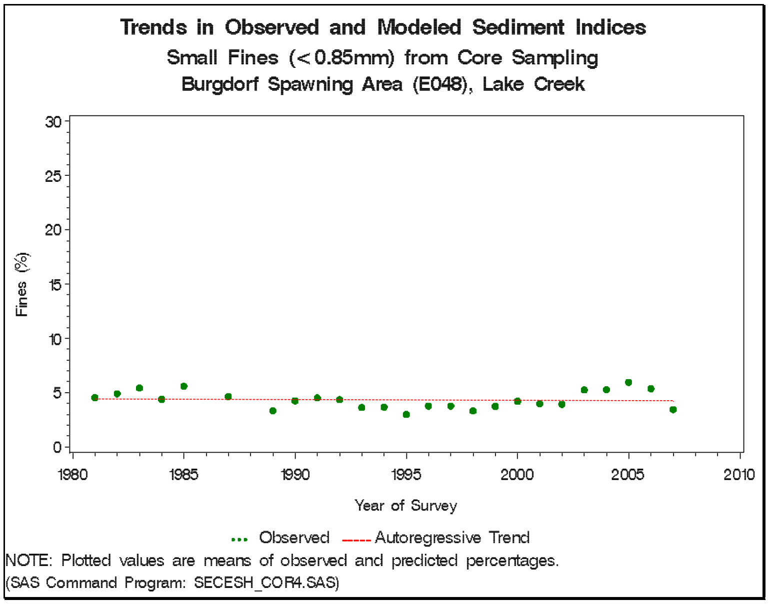

Figure 55.—Time trends in the small fine sediments in the Burgdorf spawning area, Lake Creek, 1981-2007.

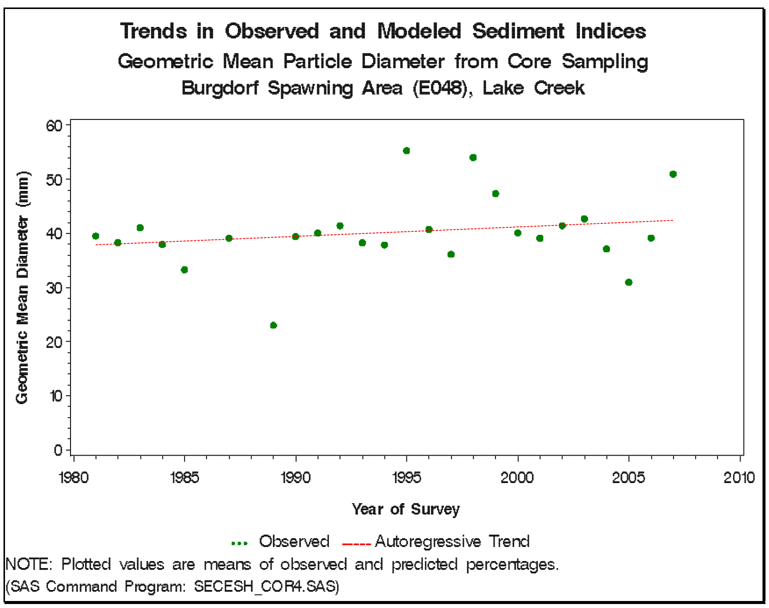

Figure 56.—Time trends in geometric mean particle diameter in the Burgdorf spawning area, Lake Creek, 1981-2007.

Threemile Creek (E033)

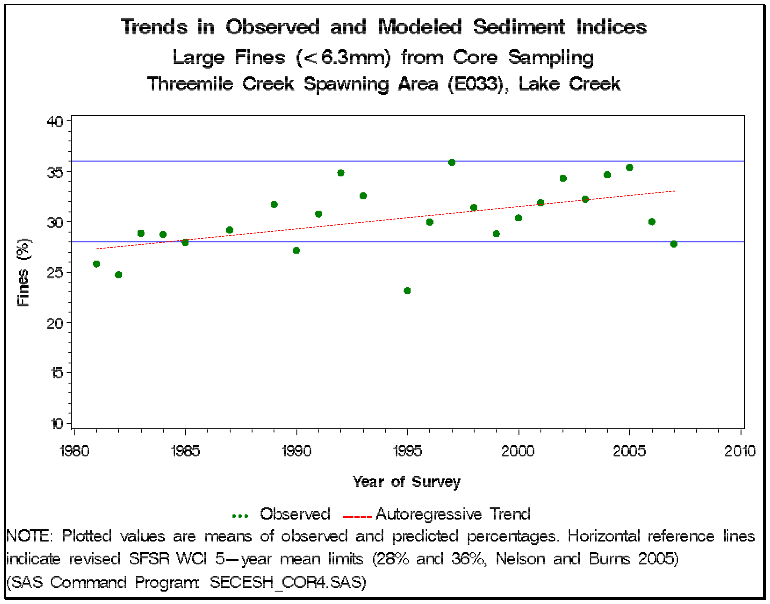

Figure 57.—Time trends in the large fine sediments in the Threemile Creek spawning area, Lake Creek, 1981-2007.

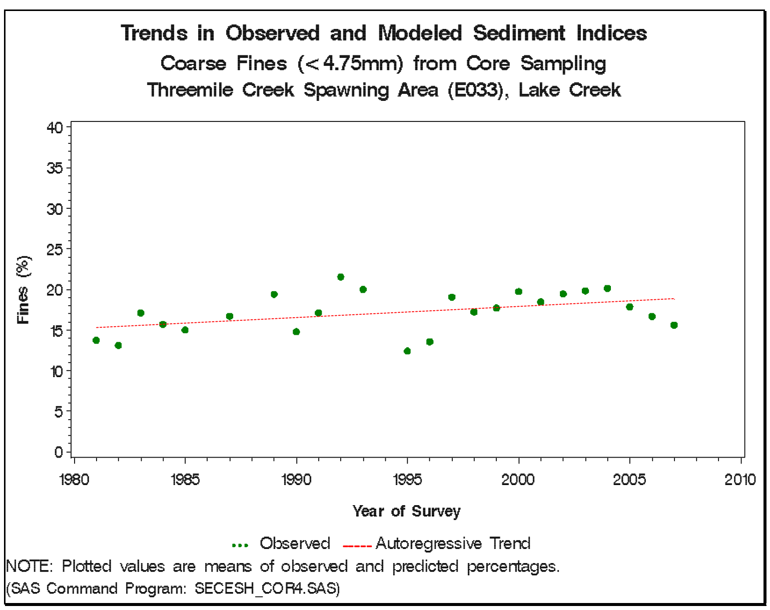

Figure 58.—Time trends in coarse fine sediments in the Threemile Creek spawning area, Lake Creek, 1981-2007.

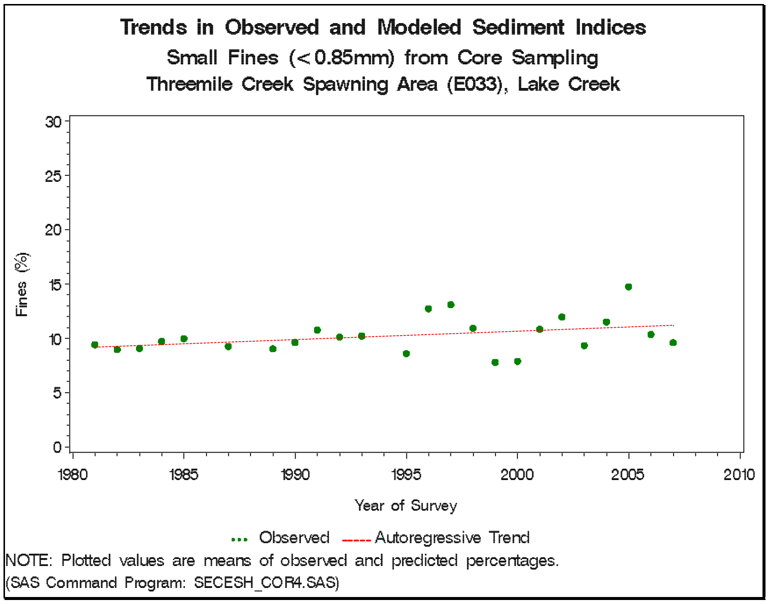

Figure 59.—Time trends in the small fine sediments in the Threemile Creek spawning area, Lake Creek, 1981-2007.

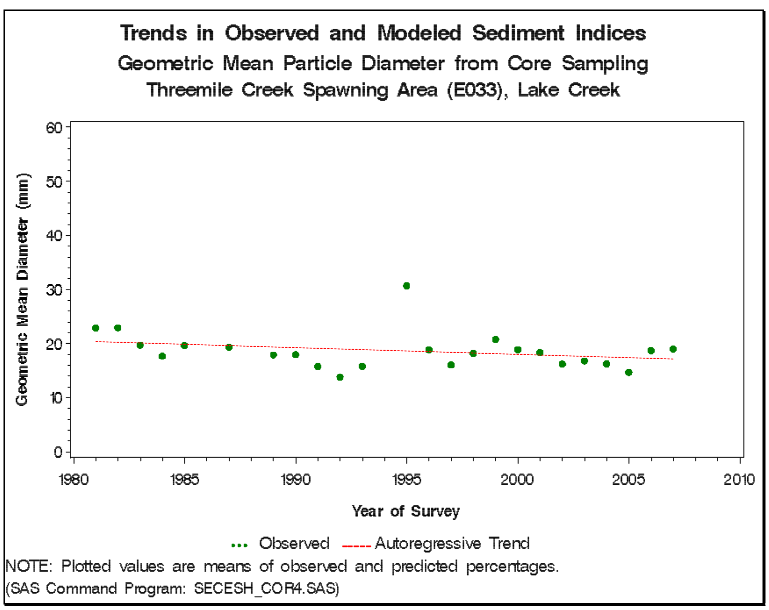

Figure 60.—Time trends in geometric mean particle diameter in the Threemile Creek spawning area, Lake Creek, 1981-2007.

Secesh Meadows (E096)

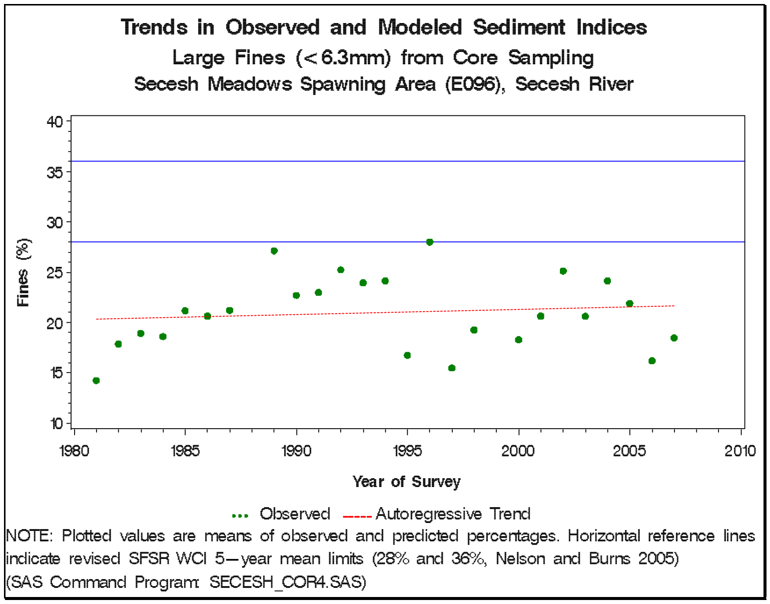

Figure 61.—Time trends in the large fine sediments in the Secesh Meadows spawning area, Secesh River, 1981-2007.

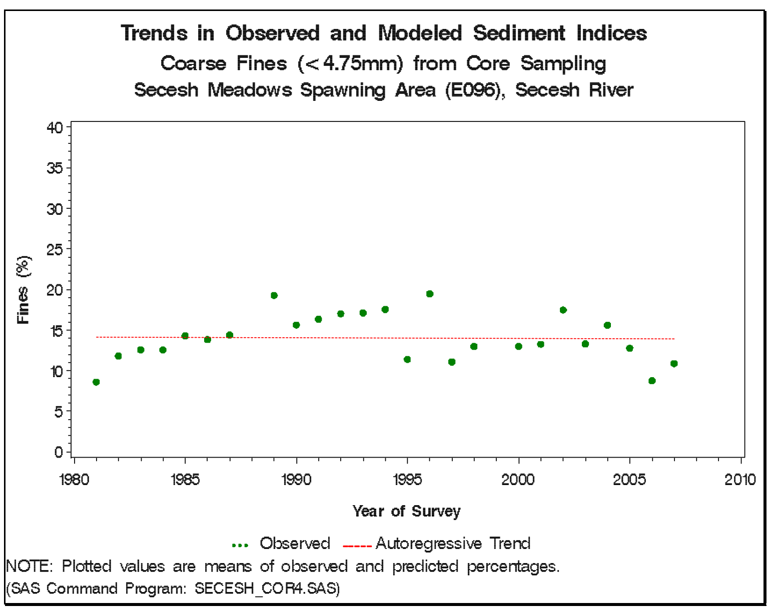

Figure 62.—Time trends in coarse fine sediments in the Secesh Meadows spawning area, Secesh River, 1981-2007.

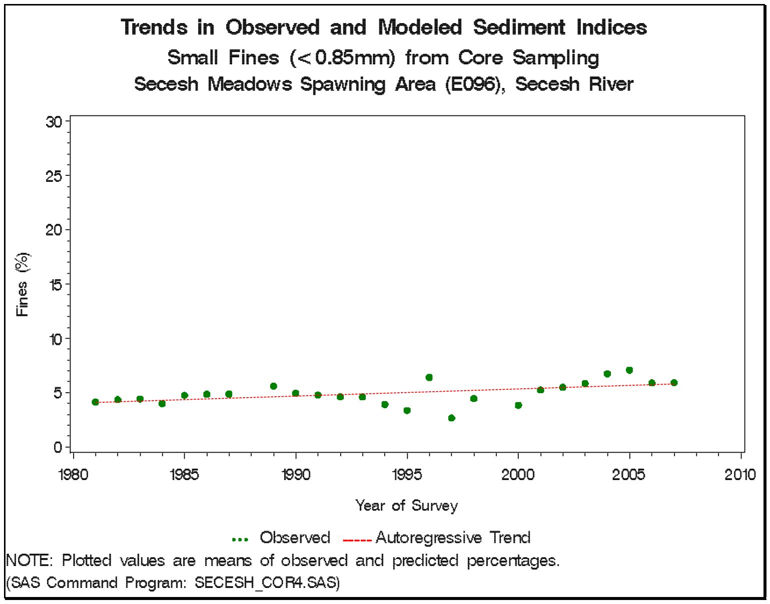

Figure 63.—Time trends in the small fine sediments in the Secesh Meadows spawning area, Secesh River, 1981-2007.

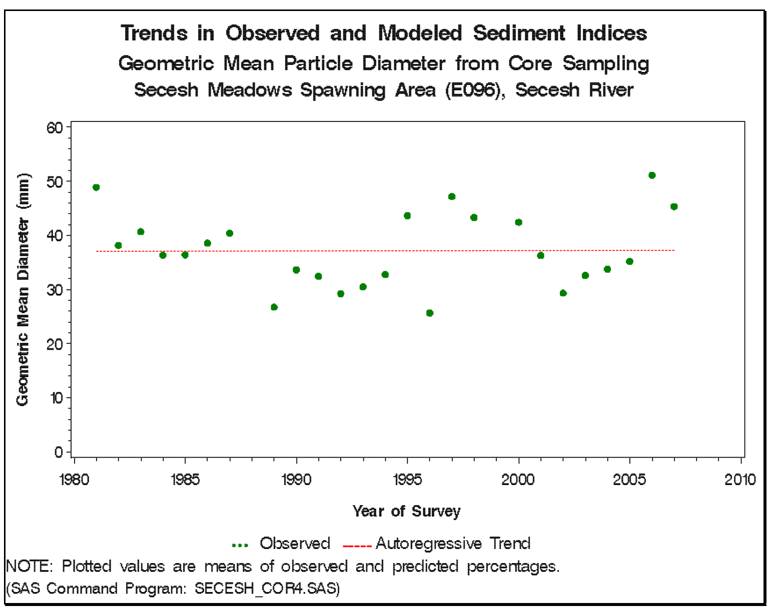

Figure 64.—Time trends in geometric mean particle diameter in the Secesh Meadows spawning area, Secesh River, 1981-2007.

Chinook Campground (E046)

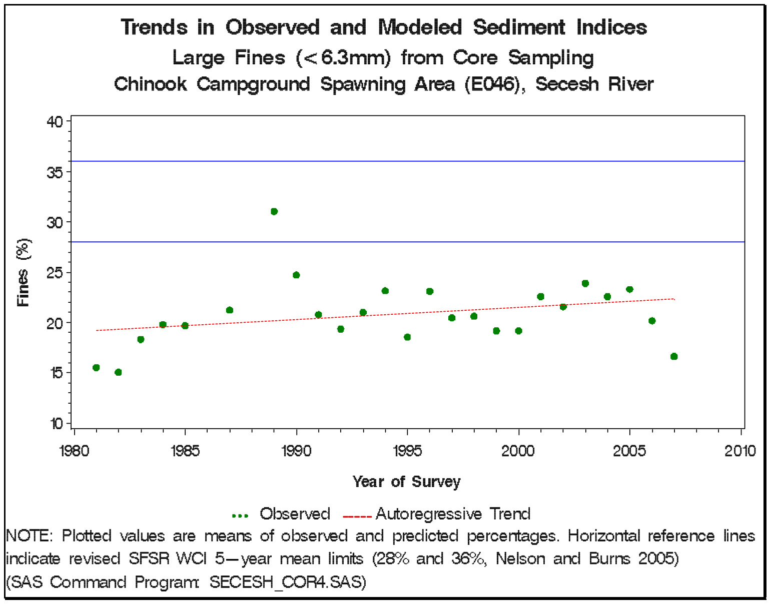

Figure 65.—Time trends in the large fine sediments in the Chinook Campground spawning area, Secesh River, 1981-2007.

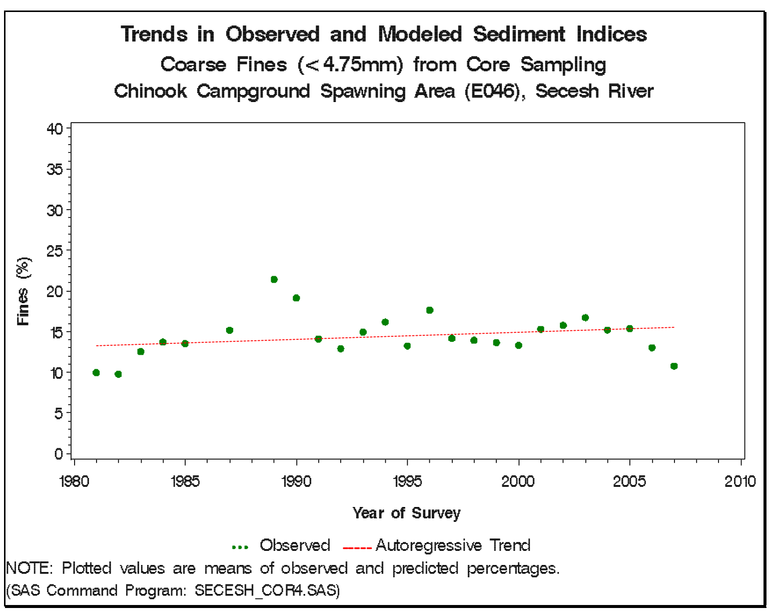

Figure 66.—Time trends in coarse fine sediments in the Chinook Campground spawning area, Secesh River, 1981-2007.

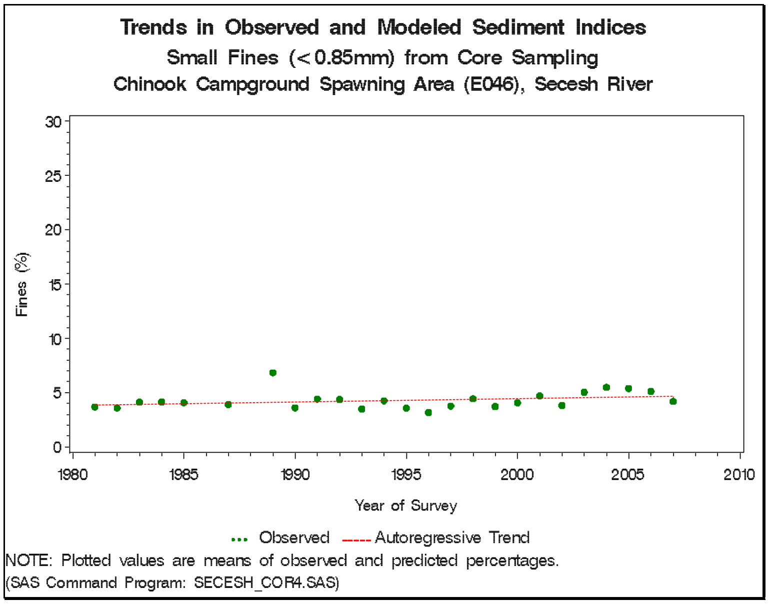

Figure 67.—Time trends in the small fine sediments in the Chinook Campground spawning area, Secesh River, 1981-2007.

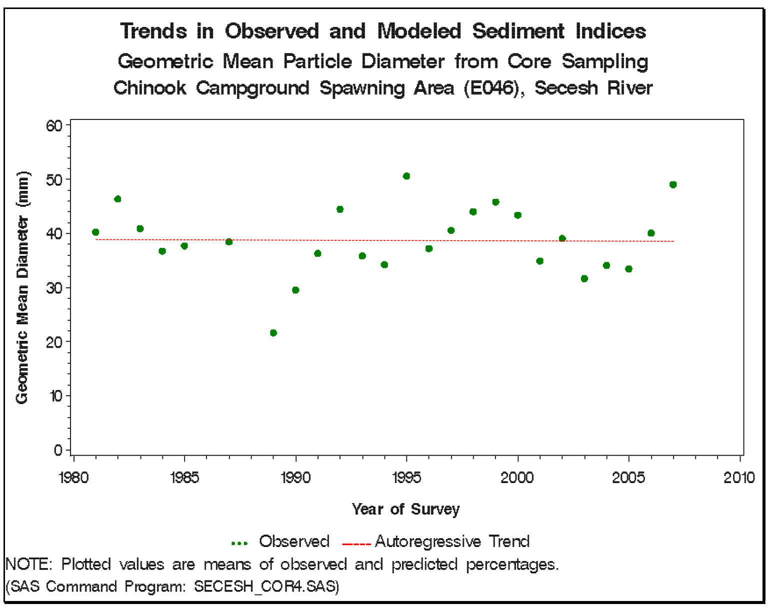

Figure 68.—Time trends in geometric mean particle diameter in the Chinook Campground spawning area, Secesh River, 1981-2007.

Recent Models

Corduroy Junction (E034)

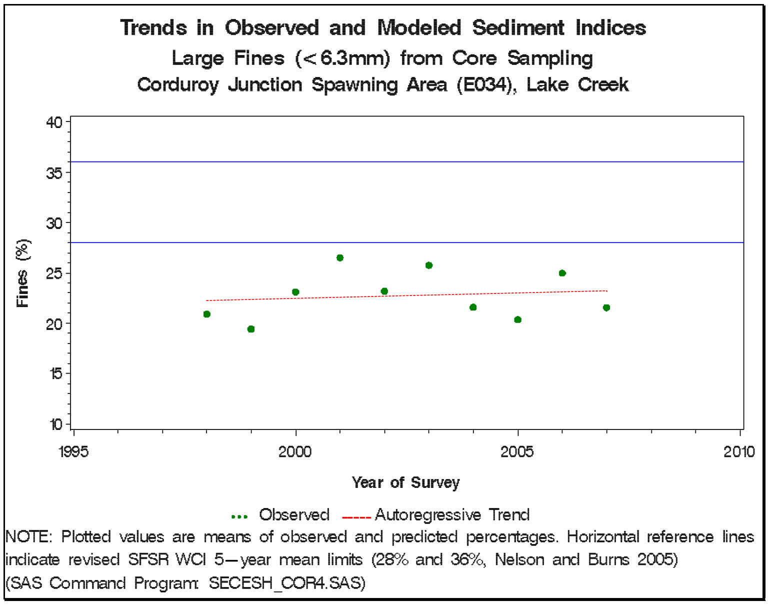

Figure 69.—Time trends in the large fine sediments in the Corduroy Junction spawning area, Lake Creek, 1998-2007.

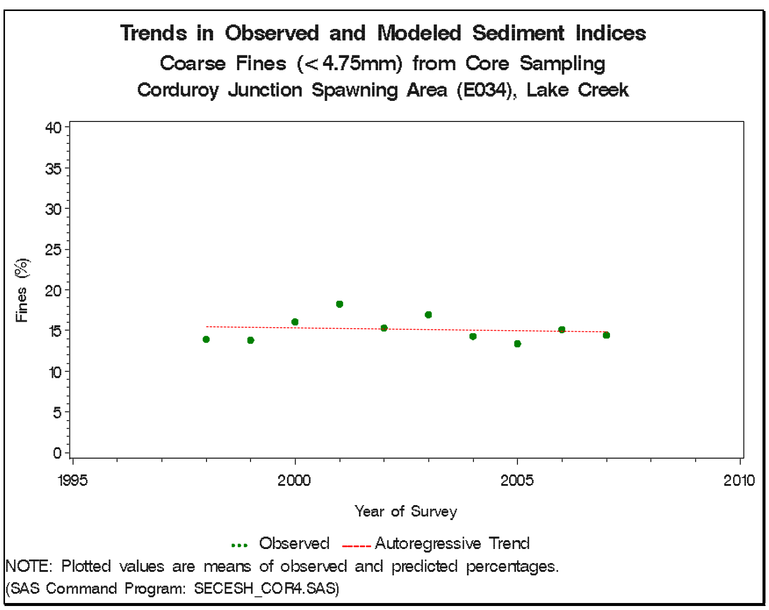

Figure 70.—Time trends in coarse fine sediments in the Corduroy Junction spawning area, Lake Creek, 1998-2007.

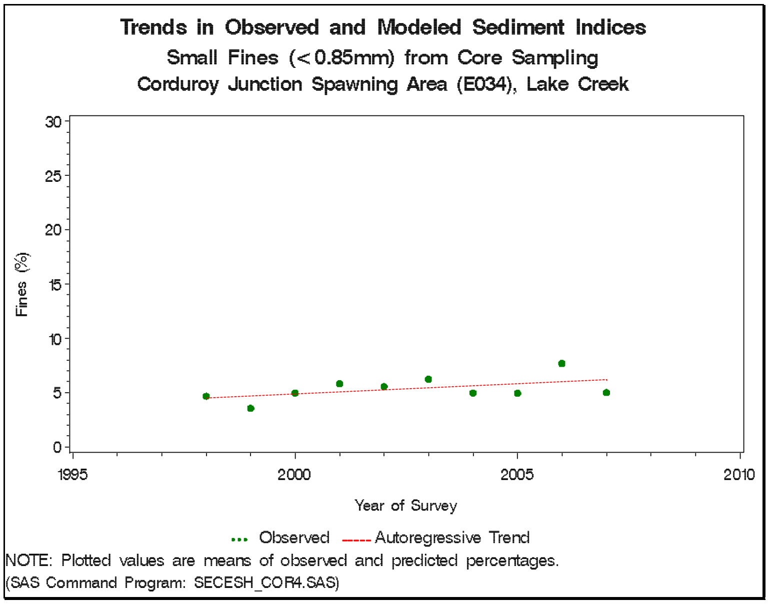

Figure 71.—Time trends in the small fine sediments in the Corduroy Junction spawning area, Lake Creek, 1998-2007.

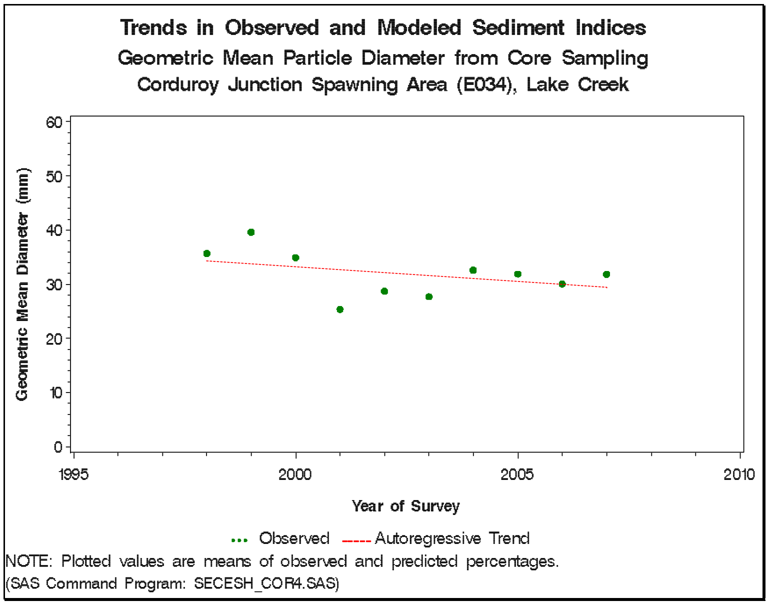

Figure 72.—Time trends in geometric mean particle diameter in the Corduroy Junction spawning area, Lake Creek, 1998-2007.

Burgdorf (E048)

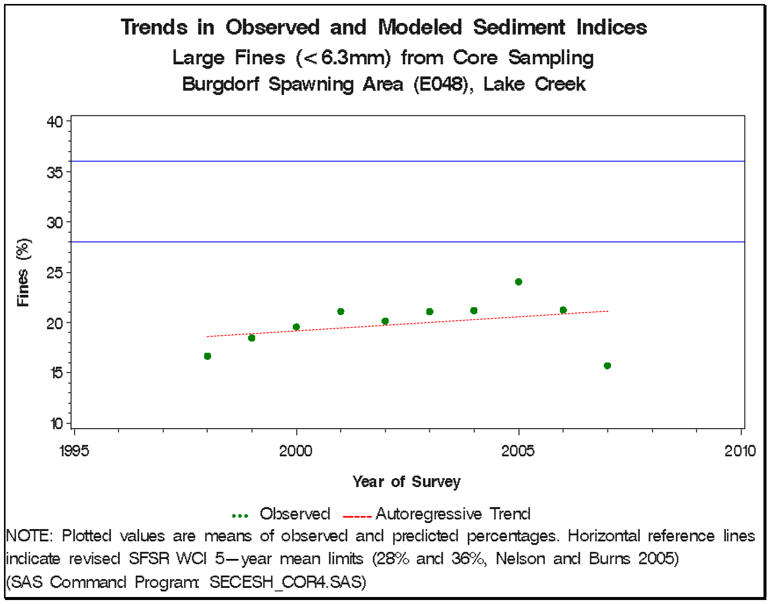

Figure 73.—Time trends in the large fine sediments in the Burgdorf spawning area, Lake Creek, 1998-2007.

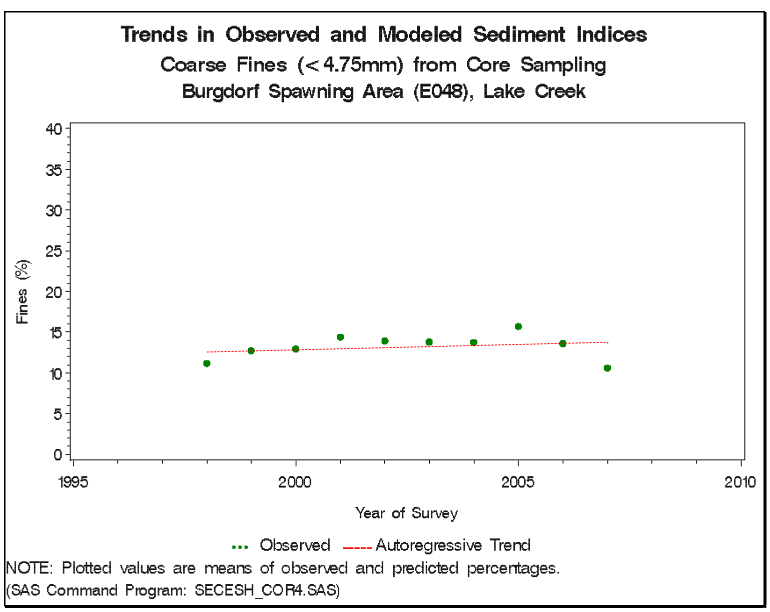

Figure 74.—Time trends in coarse fine sediments in the Burgdorf spawning area, Lake Creek, 1998-2007.

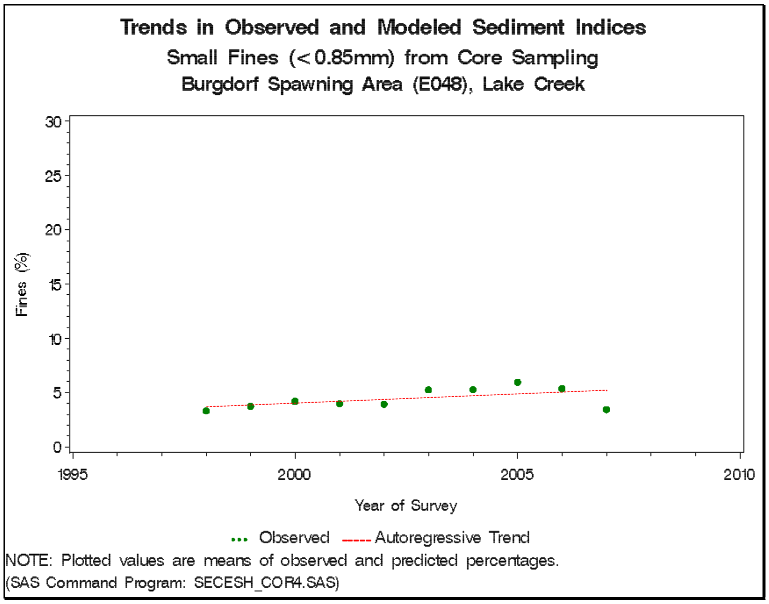

Figure 75.—Time trends in the small fine sediments in the Burgdorf spawning area, Lake Creek, 1998-2007.

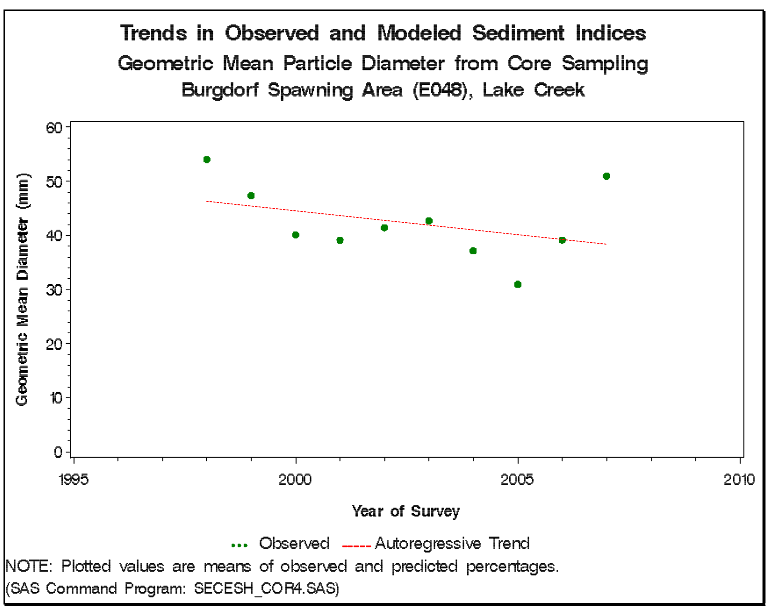

Figure 76.—Time trends in geometric mean particle diameter in the Burgdorf spawning area, Lake Creek, 1998-2007.

Threemile Creek (E033)

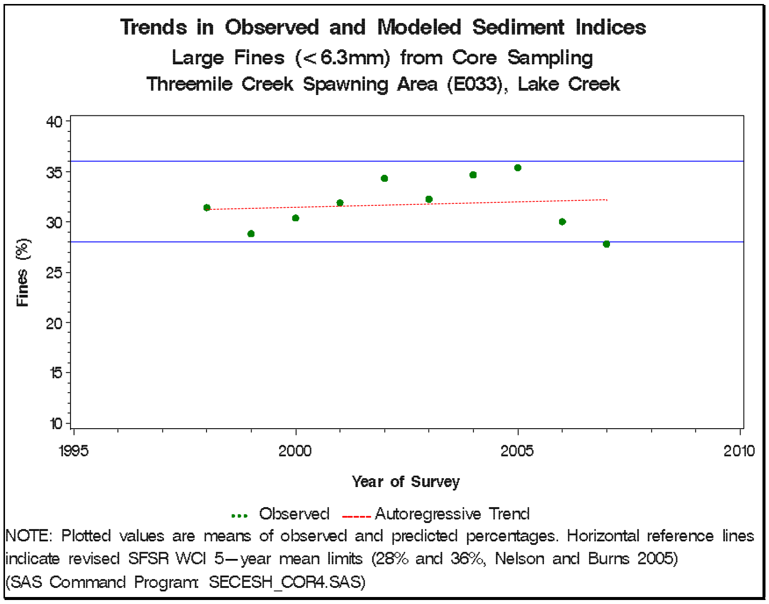

Figure 77.—Time trends in the large fine sediments in the Threemile Creek spawning area, Lake Creek, 1998-2007.

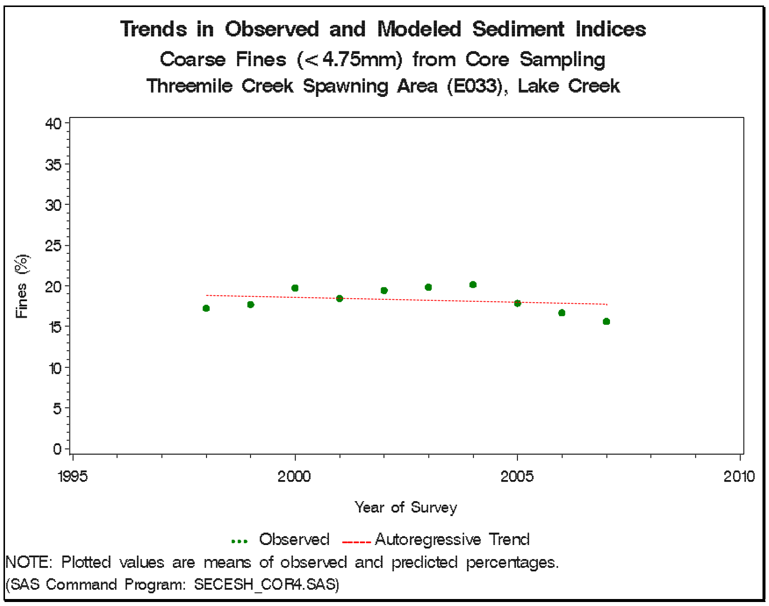

Figure 78.—Time trends in coarse fine sediments in the Threemile Creek spawning area, Lake Creek, 1998-2007.

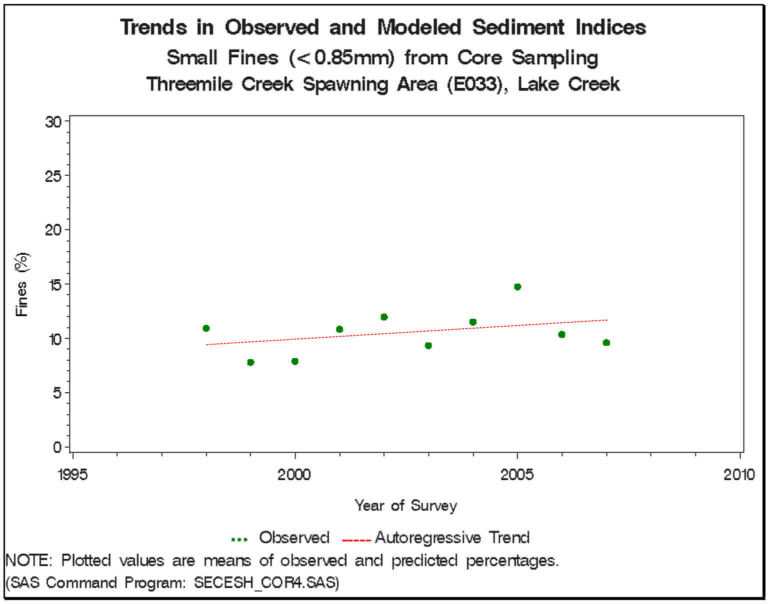

Figure 79.—Time trends in the small fine sediments in the Threemile Creek spawning area, Lake Creek, 1998-2007.

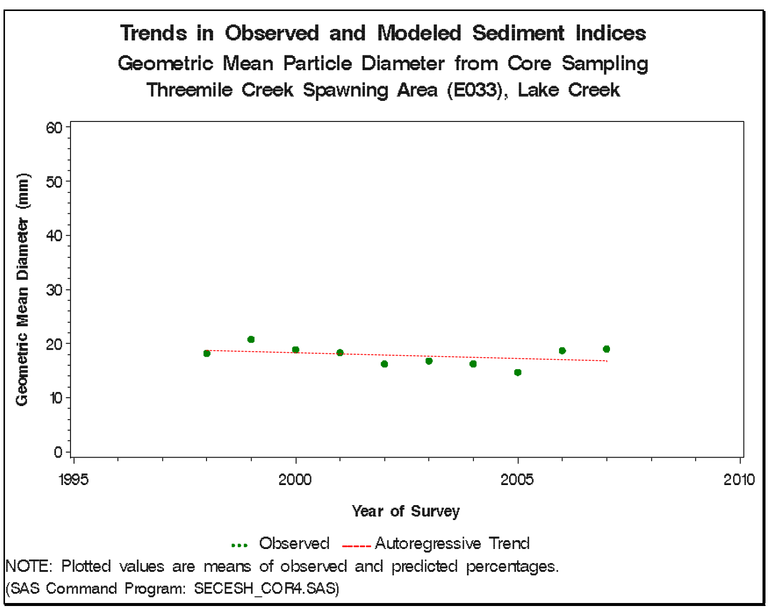

Figure 80.—Time trends in geometric mean particle diameter in the Threemile Creek spawning area, Lake Creek, 1998-2007.

Secesh Meadows (E096)

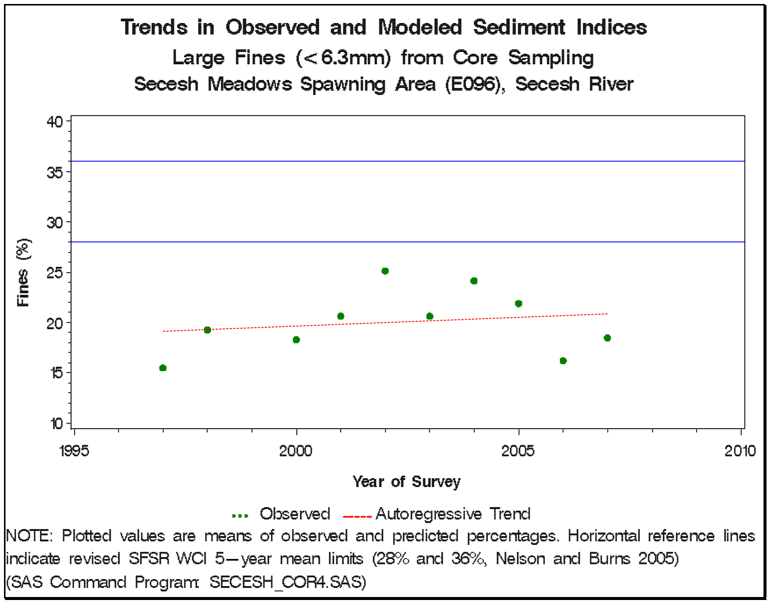

Figure 81.—Time trends in the large fine sediments in the Secesh Meadows spawning area, Secesh River, 1997-2007 (NOTE: no data were collected in 1999).

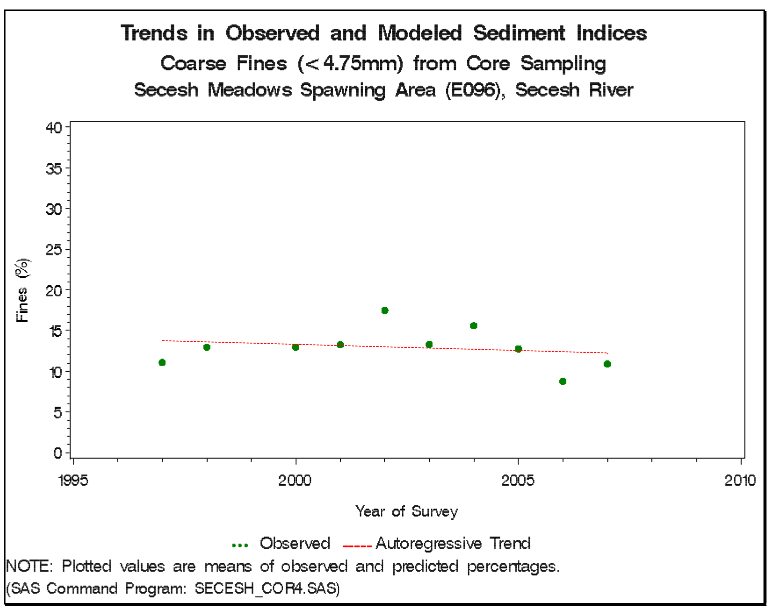

Figure 82.—Time trends in coarse fine sediments in the Secesh Meadows spawning area, Secesh River, 1997-2007 (NOTE: no data were collected in 1999).

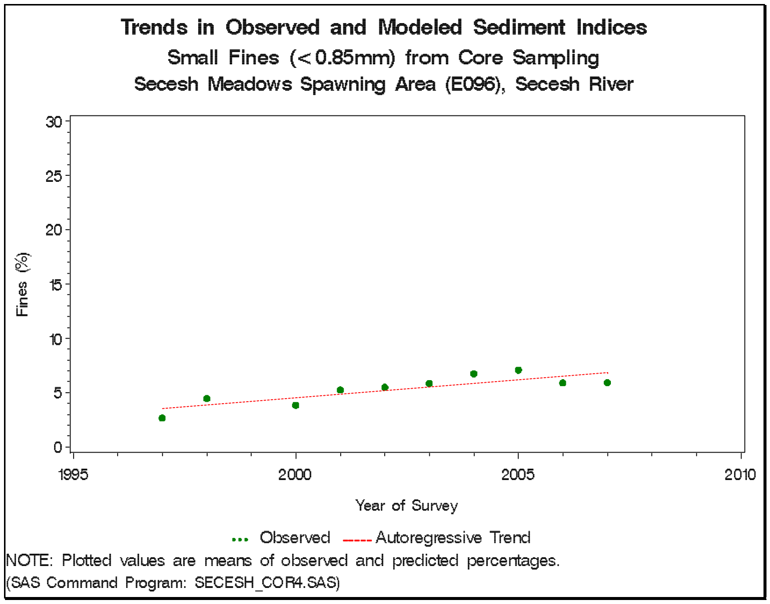

Figure 83.—Time trends in the small fine sediments in the Secesh Meadows spawning area, Secesh River, 1997-2007 (NOTE: no data were collected in 1999).

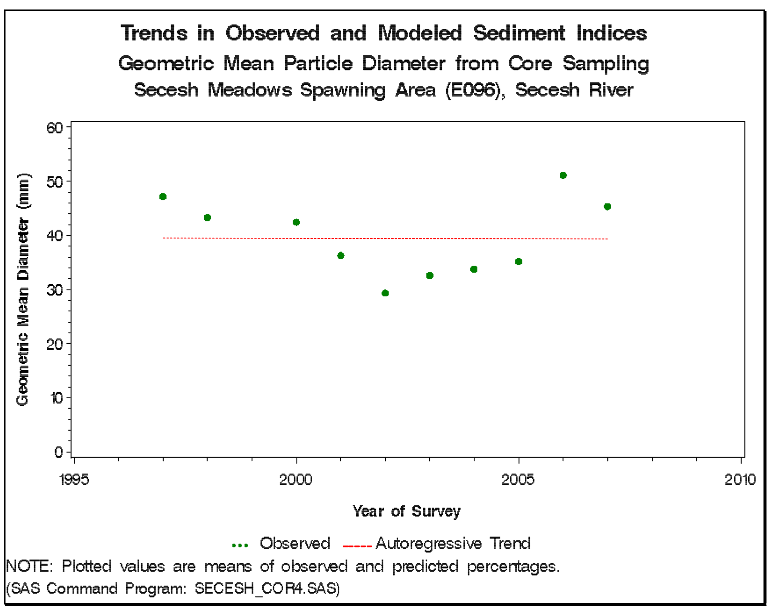

Figure 84.—Time trends in geometric mean particle diameter in the Secesh Meadows spawning area, Secesh River, 1997-2007 (NOTE: no data were collected in 1999).

Chinook Campground (E046)

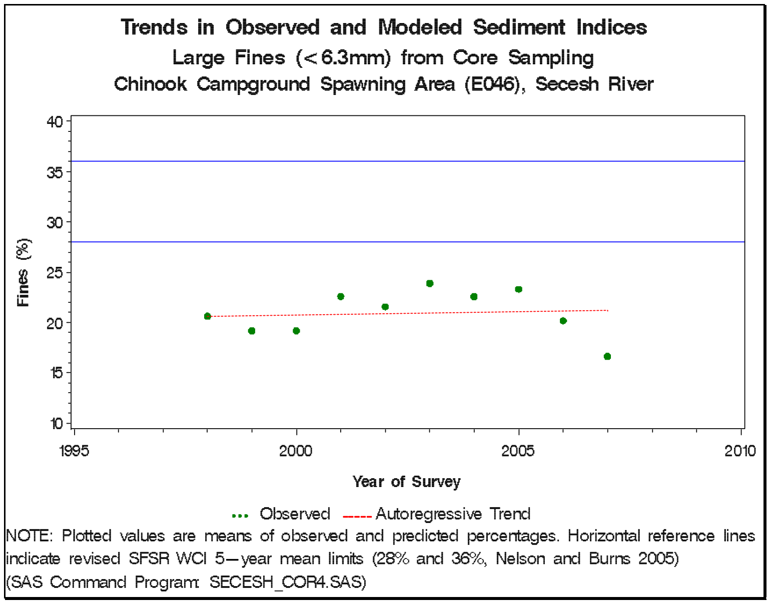

Figure 85.—Time trends in the large fine sediments in the Chinook Campground spawning area, Secesh River, 1998-2007.

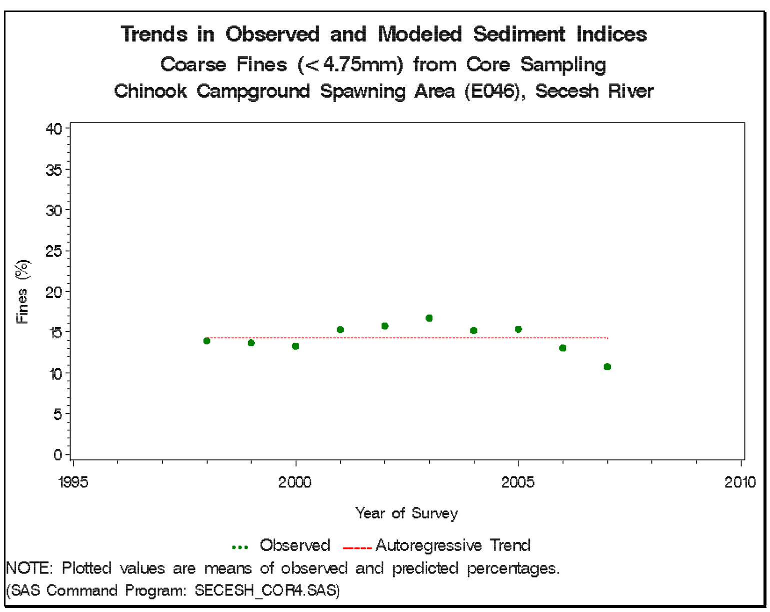

Figure 86.—Time trends in coarse fine sediments in the Chinook Campground spawning area, Secesh River, 1998-2007.

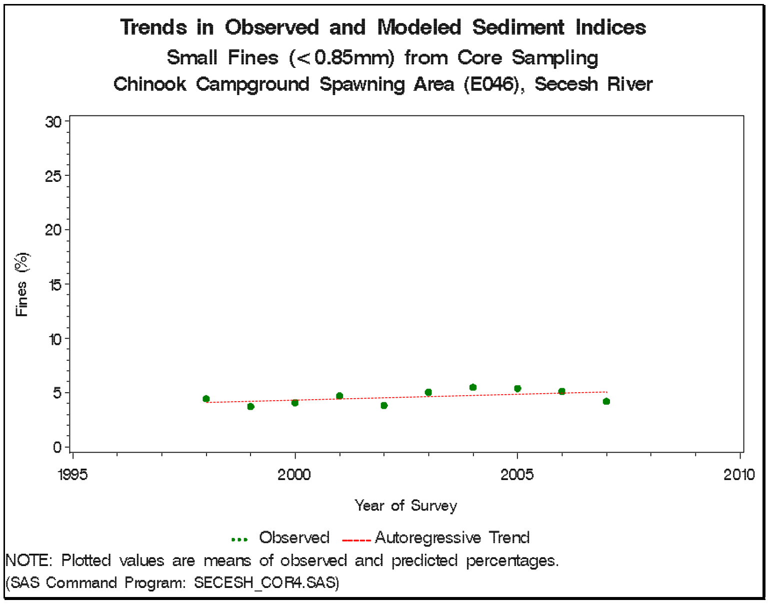

Figure 87.—Time trends in the small fine sediments in the Chinook Campground spawning area, Secesh River, 1998-2006.

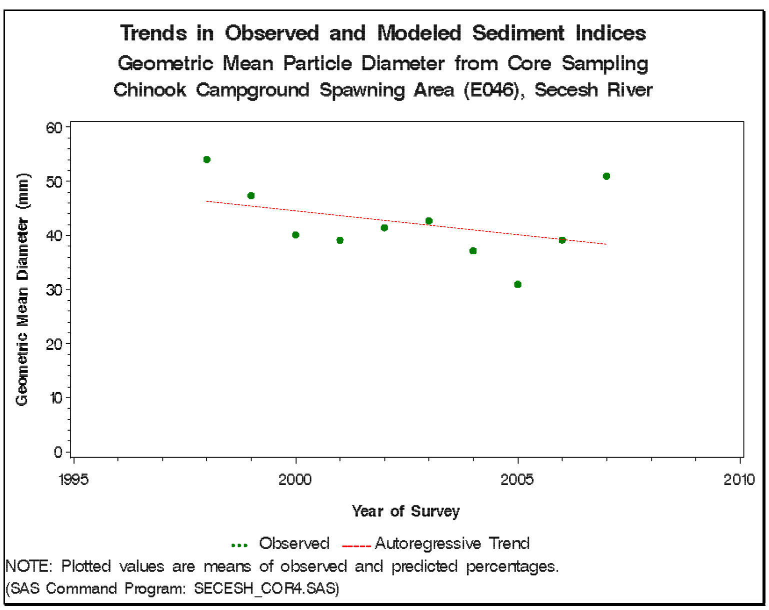

Figure 88.—Time trends in geometric mean particle diameter in the Chinook Campground spawning area, Secesh River, 1998-2006.

Chamberlain Basin

Overall Models

Chamberlain Creek (E032)

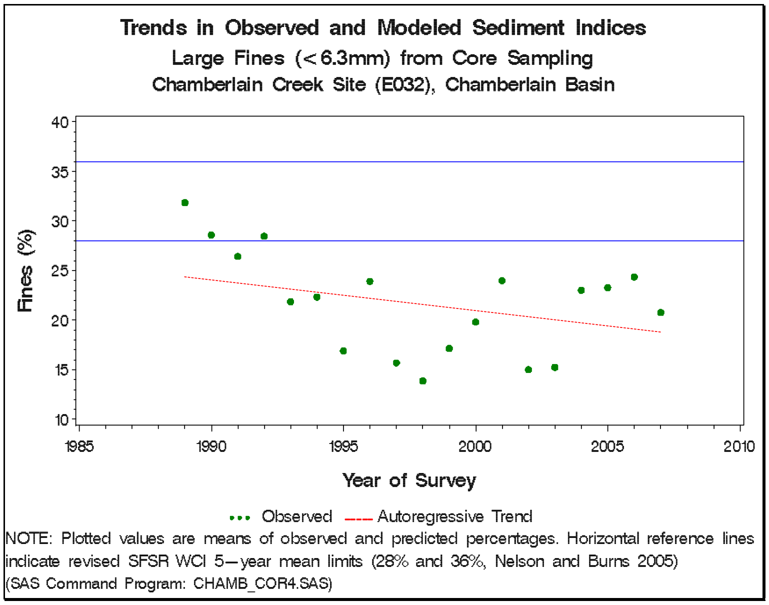

Figure 89.—Time trends in the large fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1989-2007.

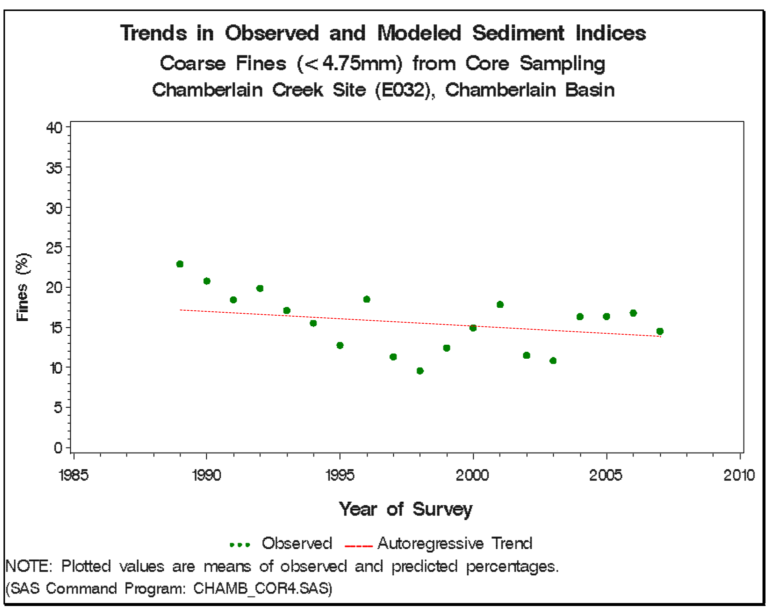

Figure 90.—Time trends in coarse fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1989-2007.

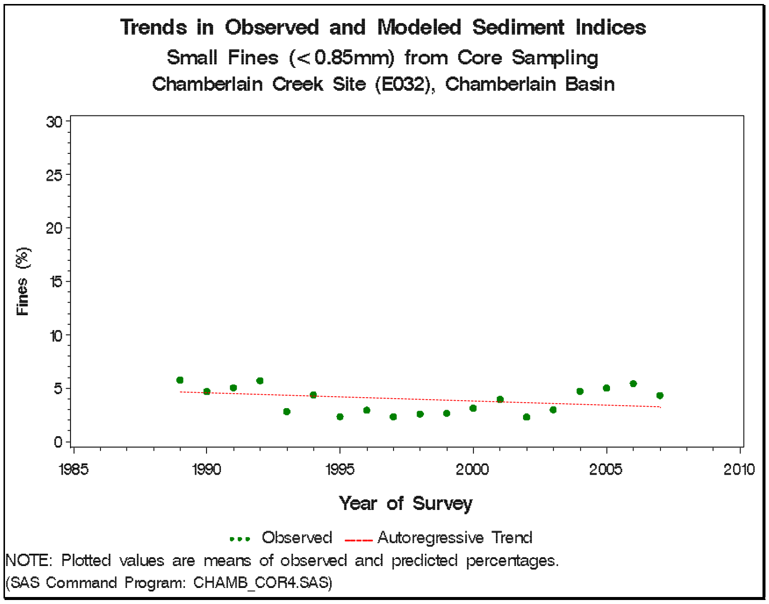

Figure 92.—Time trends in the small fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1989-2007.

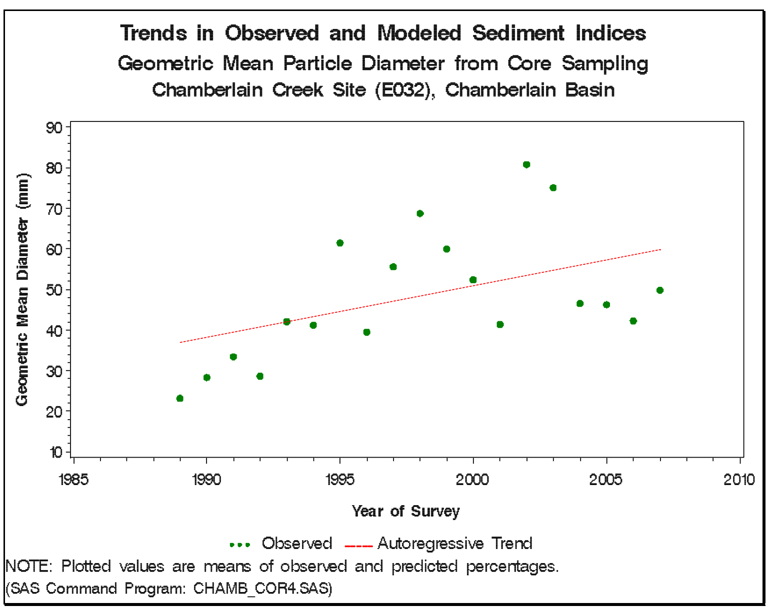

Figure 91.—Time trends in geometric mean particle diameter in the Chamberlain Creek spawning area, Chamberlain Basin, 1989-2007.

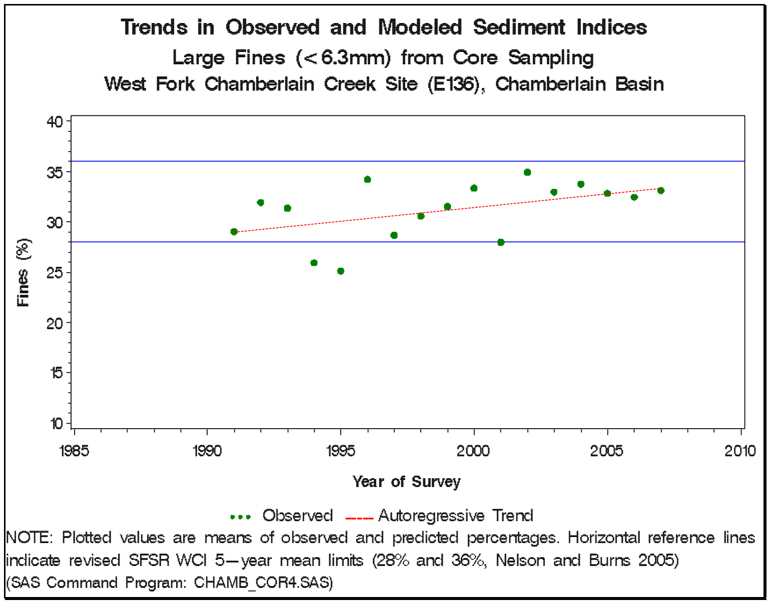

Figure 93.—Time trends in the large fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1991-2007.

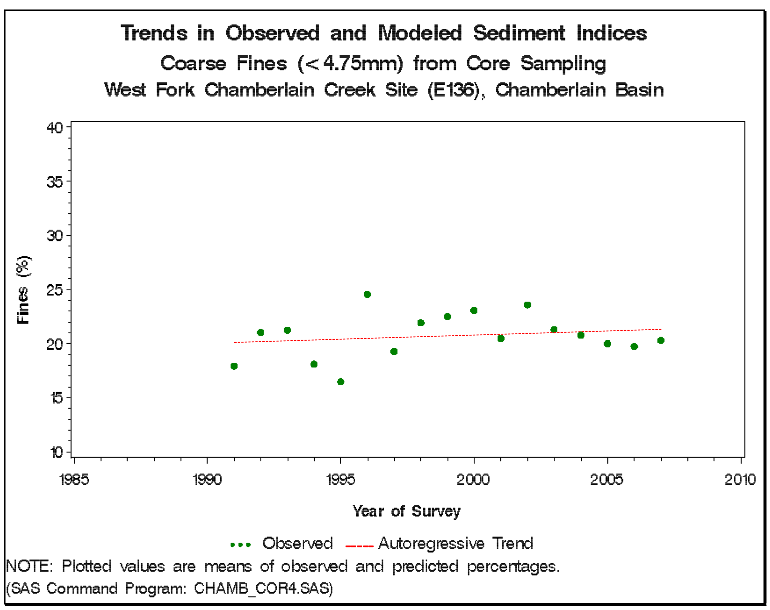

Figure 94.—Time trends in coarse fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1991-2007.

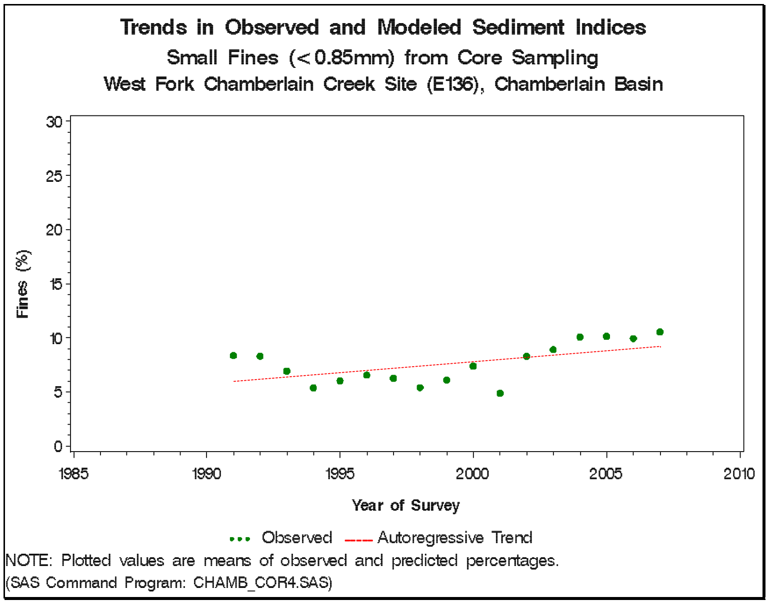

Figure 95.—Time trends in the small fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1991-2007.

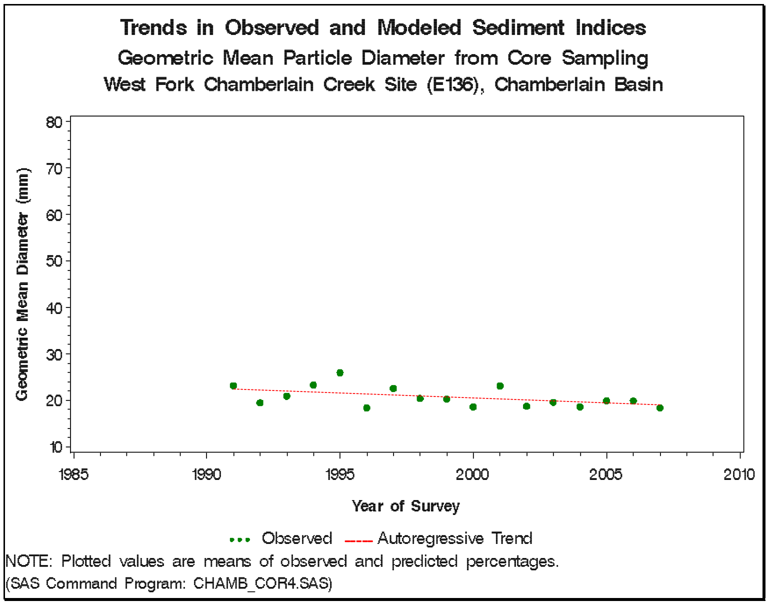

Figure 96.—Time trends in geometric mean particle diameter in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1991-2007.

Recent Models

Chamberlain Creek (E032)

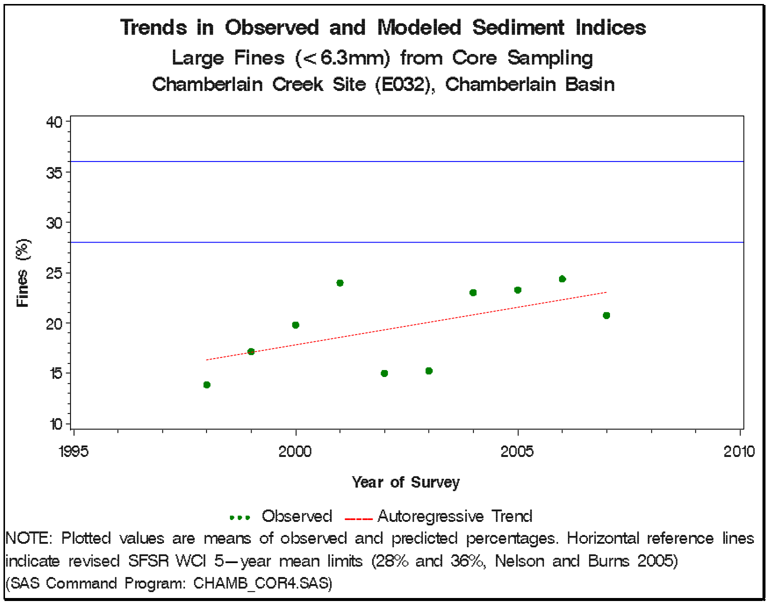

Figure 97.—Time trends in the large fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

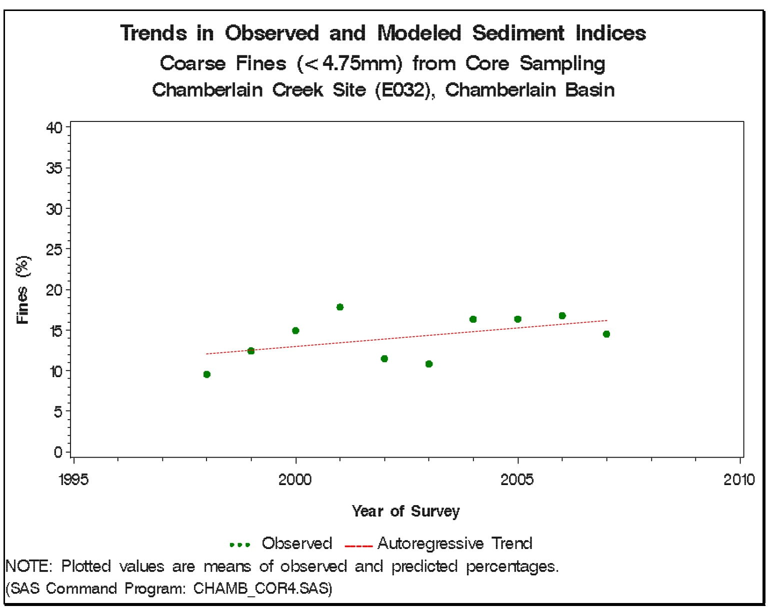

Figure 98.—Time trends in coarse fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

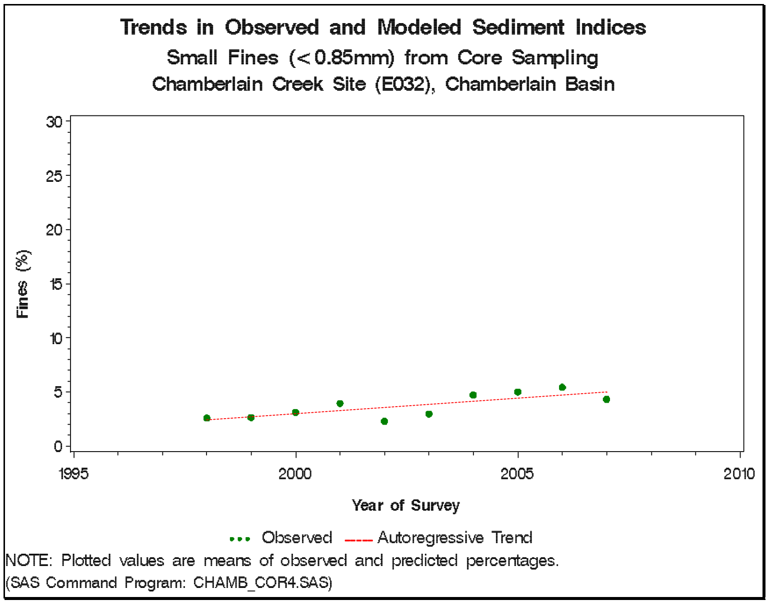

Figure 99.—Time trends in small fine sediments in the Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

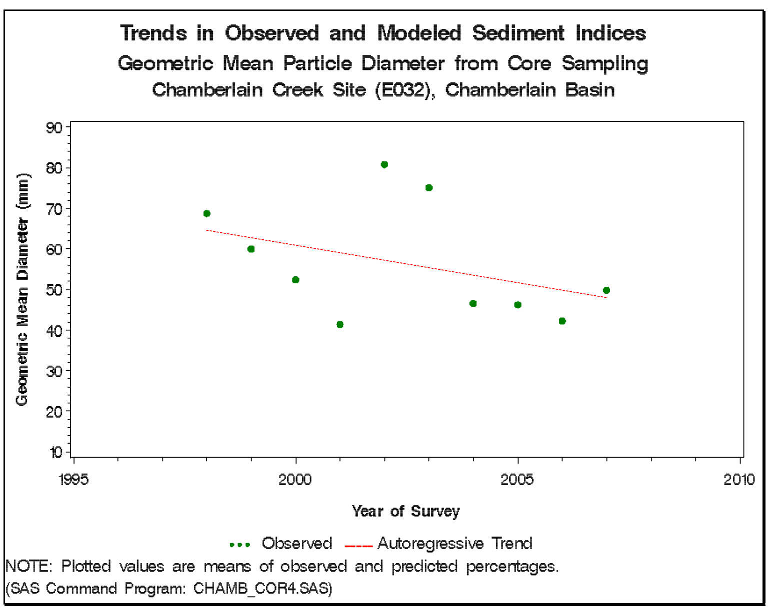

Figure 100.—Time trends in geometric mean particle diameter in the Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

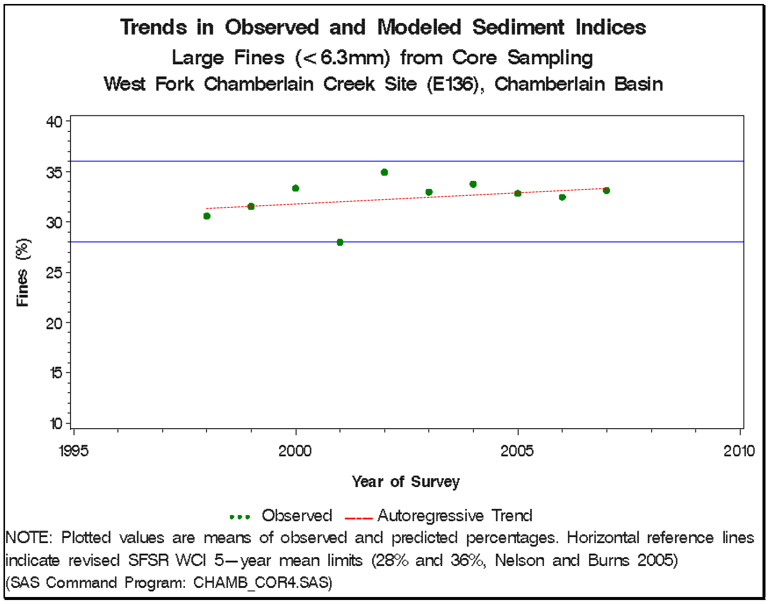

Figure 101.—Time trends in the large fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

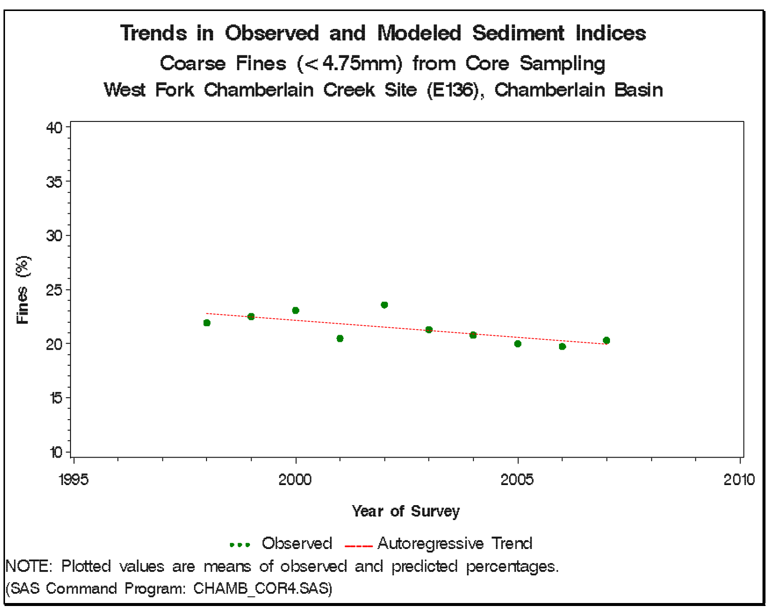

Figure 102.—Time trends in coarse fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

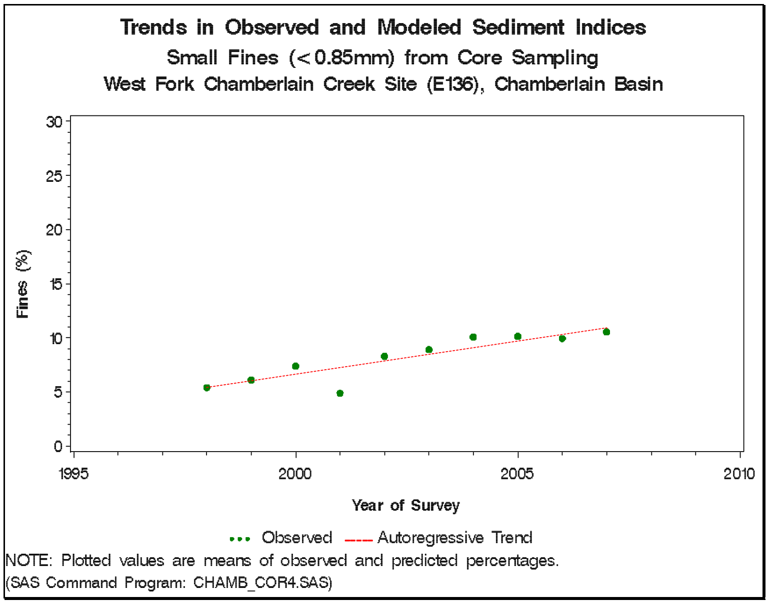

Figure 103.—Time trends in the small fine sediments in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

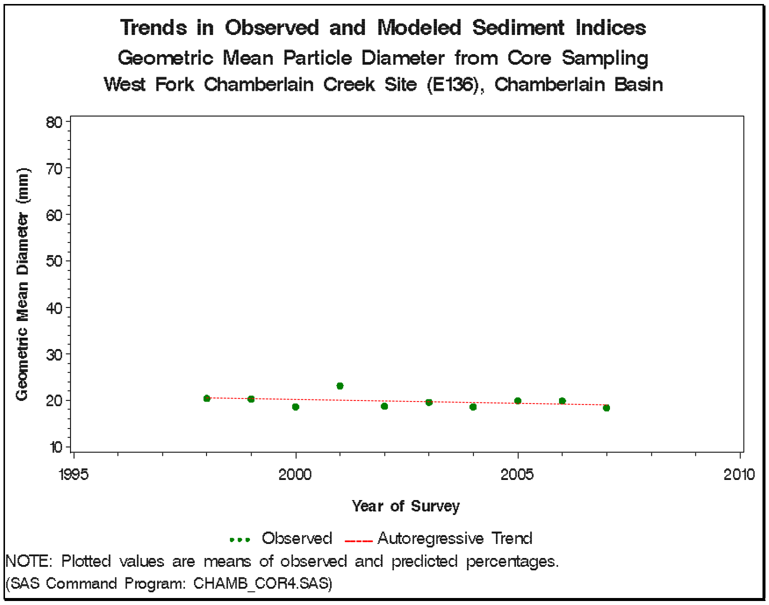

Figure 104.—Time trends in geometric mean particle diameter in the West Fork Chamberlain Creek spawning area, Chamberlain Basin, 1998-2007.

Appendix 4. Intragravel Quality Graphs

South Fork Salmon River

2007 Sampling

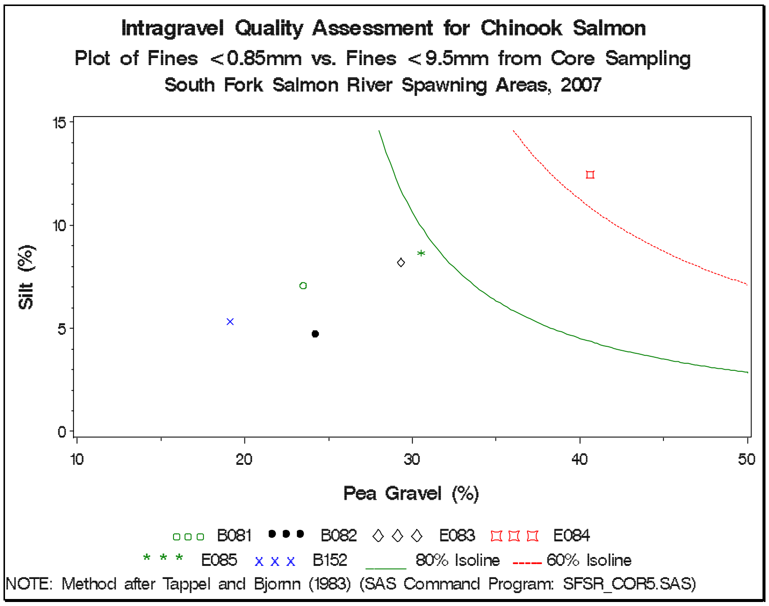

Figure 105.—Egg survival potential for Chinook salmon, upper SFSR spawning areas, 2007.

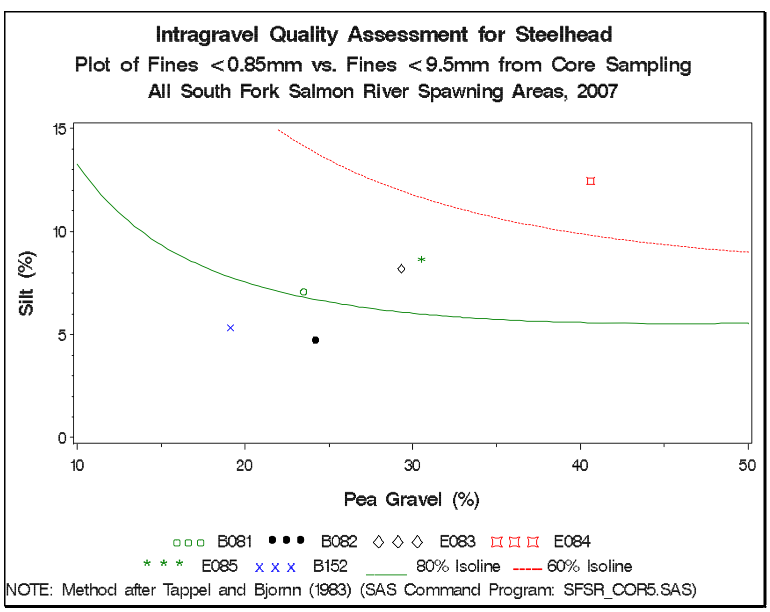

Figure 106.—Egg survival potential for steelhead, upper SFSR spawning areas, 2007.

Secesh River

2007 Sampling

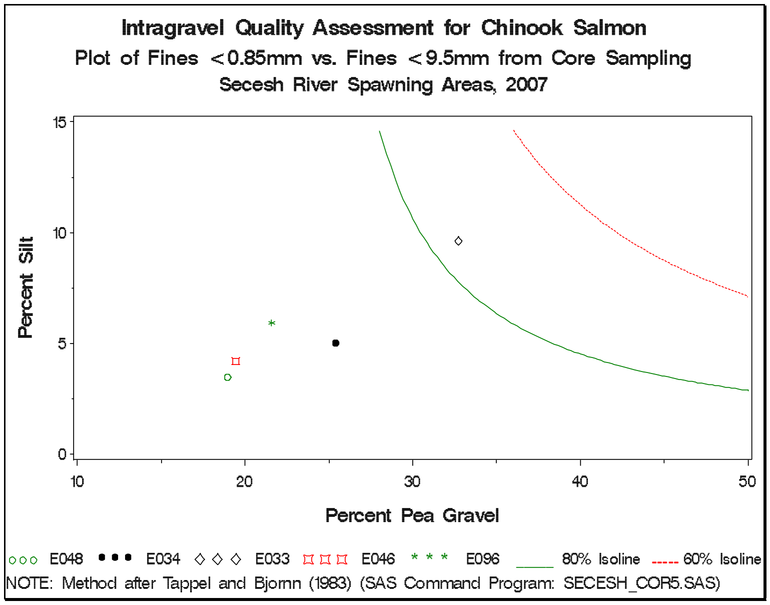

Figure 107.—Egg survival potential for Chinook salmon, Lake Creek and Secesh River spawning areas, 2006.

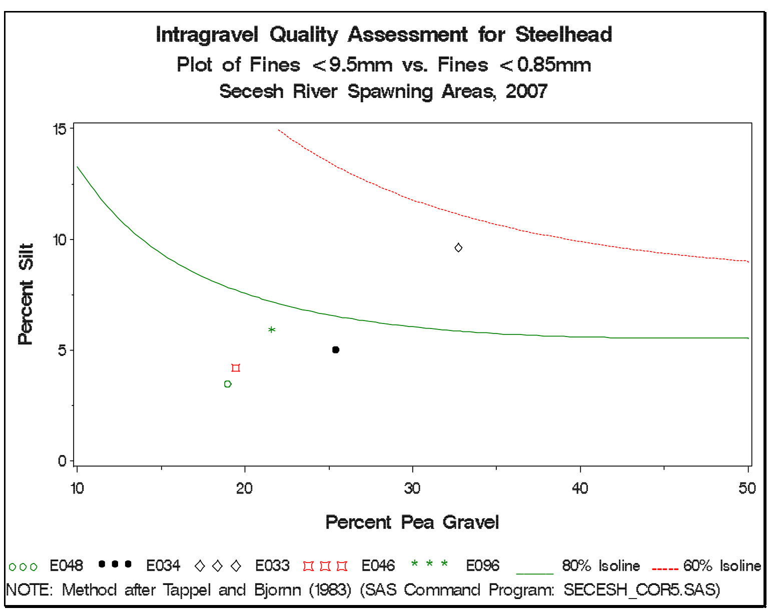

Figure 108.—Egg survival potential for steelhead, Lake Creek and Secesh River spawning areas, 2006.

Chamberlain Basin

2007 Sampling

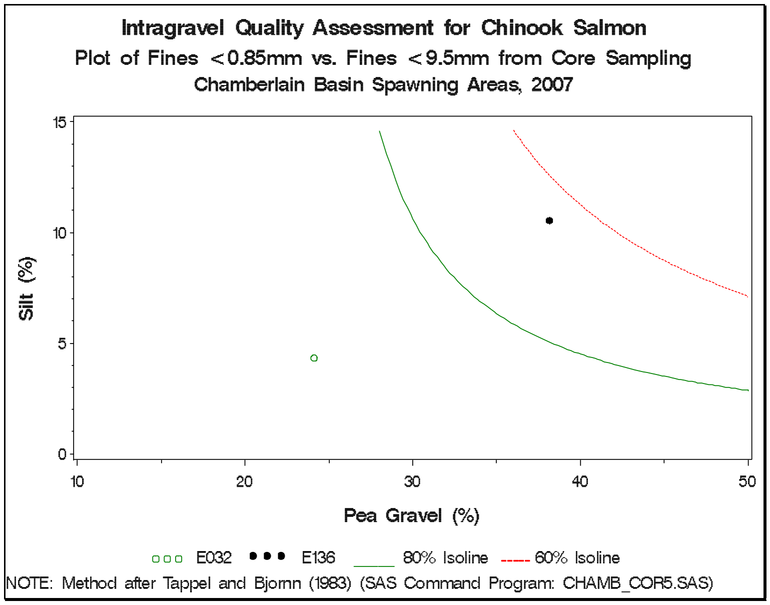

Figure 109.—Egg survival potential for Chinook salmon, Chamberlain Basin spawning areas, 2007.

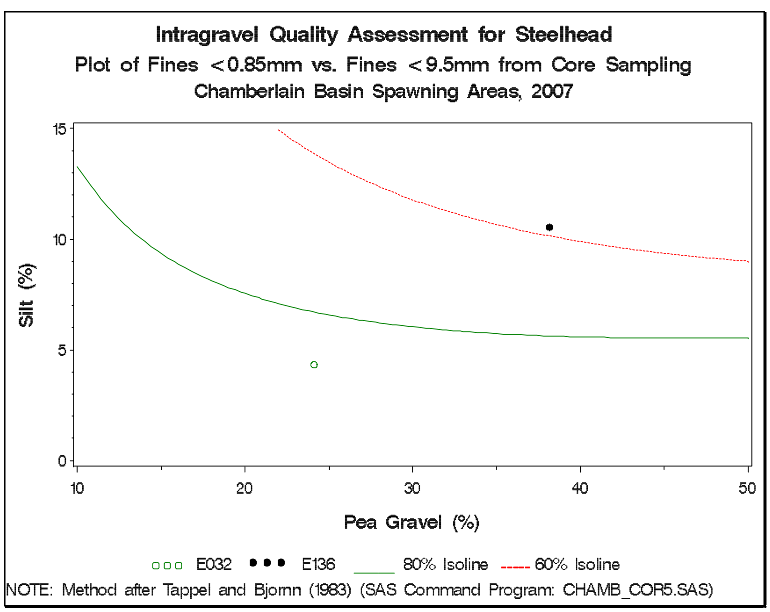

Figure 110.—Egg survival potential for steelhead, Chamberlain Basin spawning areas, 2007.

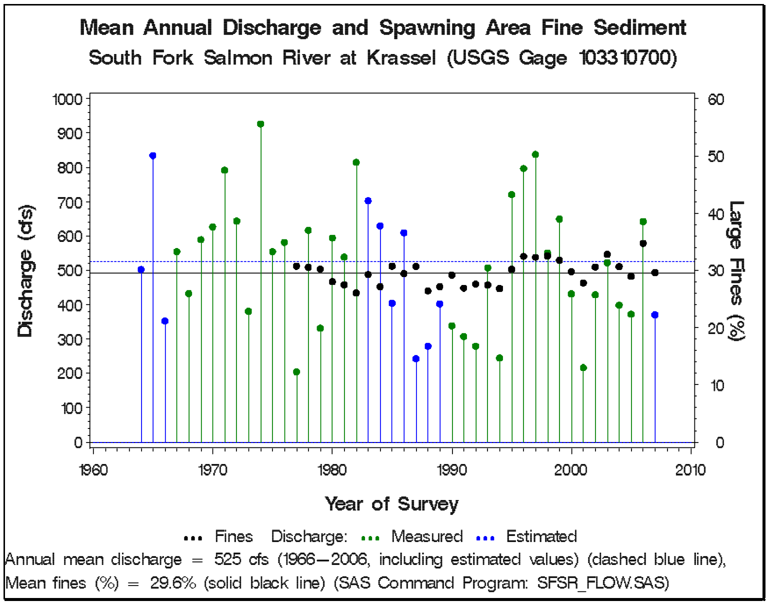

Figure 111.—Mean annual discharge in the South Fork Salmon River, 1964-2007 and mean large fine sediments in all monitored mainstem spawning areas.

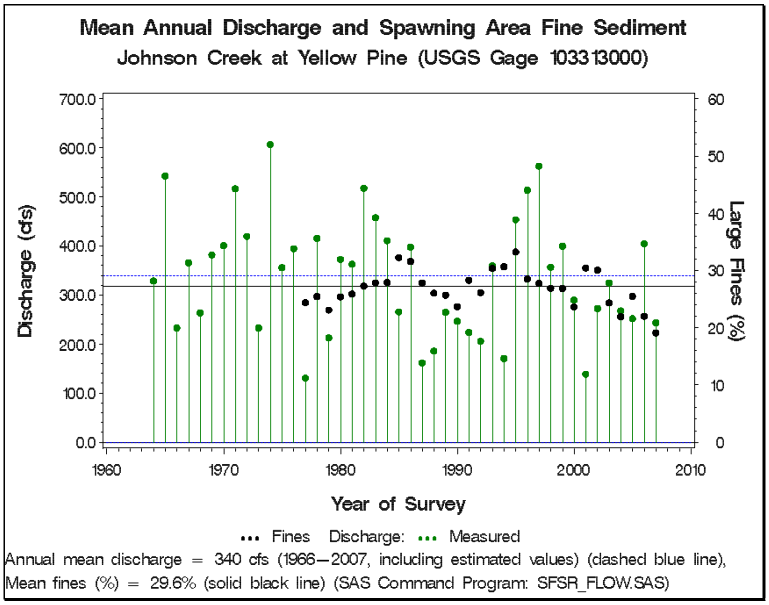

Figure 112.—Mean annual discharge in Johnson Creek, 1964-2007 and mean large fine sediments in the Ice Hole spawning area.

Appendix 6. Acronyms and Abbreviations

11T	UTM Zone 11T.
ANOVA	Analysis Of Varaiance.
BA	Biological Assessment.
BNF	Boise National Forest.
BO	Biological Opinion.
E	Easting.
EFSFSR	East Fork South Fork Salmon River.
ESA	Endangered Species Act of 1973 (PL 93-205, 16 USC 1531 *et seq*.).
FA	Functioning Appropriately.
FCRONRW	Frank Church River Of No Return Wilderness.
FR	Functioning At Risk.
FUR	Functioning At Unacceptable Risk.
HSD	Tukey's "Honestly Significant Difference" Test.
LRMP	Land and Resource Management Plan (also called Forest Plan).
N	Northing.
NMFS	National Marine Fisheries Service (also NOAA Fisheries Service).
NOAA	National Oceanic And Atmospheric Administration.
P	Probability.
PNF	Payette National Forest.
R^2	Coefficient Of Determination.
SFSR	South Fork Salmon River.
USC	United States Code.
USFS	United States Forest Service.
UTM	Universal Transverse Mercator.
WCI	Watershed Condition Indicator.