**Table 1. Number of grid cells and basin area by stratum and terrain type (geology), Middle Main Stem Eel River TMDL study area**

| Watershed | Stratum | Terrain/ Geology Type | # grid cells | Area of grid cells (mi2) | Proposed grid cell sample | PWA # of grid cells sampled |
|---|---|---|---|---|---|---|
| Middle Main Eel watershed study area | 1 | Old & Strong | 1808 | 118.06 | 9 | 9 |
| | 2 | Melange | 4862 | 317.49 | 16 | 17 |
| | 3 | Alluvium | 157 | 10.26 | 3 | 2 |
| | 4 | Argillite | 216 | 14.1 | 4 | 5 |
| | 5 | Young & Weak | 456 | 29.78 | 4 | 4 |
| | 6 | Resistant Blocks | 477 | 31.15 | 4 | 2 |
| | Total | | 7,976 | 520.84 | 40 | 39 |
| Spy Rock CALWAA | 1 | Old & Strong | 1,272 | 83.06 | -- | 4 |
| | 2 | Melange | 3,336 | 217.84 | -- | 8 |
| | 3 | Alluvium | 50 | 3.27 | -- | 0 |
| | 4 | Argillite | 0 | 0 | -- | 0 |
| | 5 | Young & Weak | 0 | 0 | -- | 0 |
| | 6 | Resistant Blocks | 456 | 29.78 | -- | 2 |
| | Total | | 5,114 | 333.95 | -- | 14 |
| Seqouia CALWAA | 1 | Old & Strong | 536 | 35 | -- | 5 |
| | 2 | Melange | 1,526 | 99.65 | -- | 9 |
| | 3 | Alluvium | 107 | 6.99 | -- | 2 |
| | 4 | Argillite | 216 | 14.11 | -- | 5 |
| | 5 | Young & Weak | 456 | 29.78 | -- | 4 |
| | 6 | Resistant Blocks | 21 | 1.37 | -- | 0 |
| | Total | | 2,862 | 186.9 | -- | 25 |

Table 2 illustrates the distribution of erosion feature types by ownership and geology type for plot features <3,000 yds$^3$. These numbers reflect actual plot data. The erosion and delivery volumes have not been extrapolated to the entire basin.

**Table 2. Total measured erosion and sediment delivery within the 39 field sample plots by ownership, terrain type and erosional feature type, Middle Main Stem Eel River watershed study area.**

| Erosional Feature Type | Number of Field Measured Features by Terrain Type (#) | | | | | | Total measured erosion (yds$^3$) | Total estimated sediment delivery (yds$^3$) |
|---|---|---|---|---|---|---|---|---|
| | 1. Old & Strong | 2. Melange | 3. Alluvium | 4. Argillite | 5. Young & Weak | 5. Resistant Blocks | | |
| ***Spy Rock*** *(plots/mi$^2$)* | *4/83.06* | *8/217.84* | *0/3.27* | *0/0* | *0/0* | *2/29.78* | *14/333.95* | *14/333.95* |
| **Debris Slide (DL)** | 4 | 71 | 0 | 0 | 0 | 0 | 20,261 | 12,109 |
| **Earthflow (EF)** | 0 | 1 | 0 | 0 | 0 | 0 | 500 | 500 |
| **Bank Erosion (BE)** | 7 | 91 | 0 | 0 | 0 | 1 | 2,806 | 2,619 |
| **Road related gully (GU)** | 0 | 5 | 0 | 0 | 0 | 0 | 173 | 151 |
| **Non road related gully (GU)** | 0 | 9 | 0 | 0 | 0 | 1 | 644 | 623 |
| **Stream Crossing (XI)** | 0 | 8 | 0 | 0 | 0 | 0 | 1,463 | 1,463 |
| **Channel Incision (CI)** | 1 | 21 | 0 | 0 | 0 | 1 | 469 | 469 |
| **Surface Erosion (SE)** | 0 | 5 | 0 | 0 | 0 | 1 | 370 | 286 |
| **Subtotals** | **12** | **211** | **0** | **0** | **0** | **4** | **26,686** | **18,220** |
| ***Seqouia*** *(plots/mi$^2$)* | *5/35* | *9/99.65* | *2/6.99* | *5/14.11* | *4/29.78* | *0/1.37* | *25/186.9* | *25/186.9* |
| **Debris Slide (DL)** | 18 | 42 | 6 | 10 | 2 | 0 | 10,116 | 5,951 |
| **Earthflow (EF)** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bank Erosion (BE)** | 13 | 32 | 5 | 10 | 11 | 0 | 1,241 | 1,173 |

**Table 2. Total measured erosion and sediment delivery within the 39 field sample plots by ownership, terrain type and erosional feature type, Middle Main Stem Eel River watershed study area.**

| Erosional Feature Type | Number of Field Measured Features by Terrain Type (#) | | | | | | Total measured erosion ($yds^3$) | Total estimated sediment delivery ($yds^3$) |
|---|---|---|---|---|---|---|---|---|
| | 1. Old & Strong | 2. Melange | 3. Alluvium | 4. Argillite | 5. Young & Weak | 5. Resistant Blocks | | |
| **Road related gully (GU)** | 2 | 3 | 0 | 2 | 0 | 0 | 423 | 412 |
| **Non road related gully (GU)** | 2 | 6 | 0 | 1 | 2 | 0 | 593 | 417 |
| **Stream Crossing (XI)** | 5 | 3 | 0 | 0 | 2 | 0 | 389 | 389 |
| **Surface Erosion (SE)** | 0 | 2 | 0 | 0 | 0 | 0 | 193 | 185 |
| **Channel Incision (CI)** | 7 | 7 | 5 | 4 | 3 | 0 | 355 | 355 |
| **Subtotals** | **47** | **95** | **16** | **27** | **20** | **0** | **13,310** | **8,882** |
| **Total # of features, erosion and delivery volumes for all domains** | **59** | **306** | **16** | **27** | **20** | **4** | **39,996** | **27,102** |
| **Total # of plots/terrain type area in $mi^2$** | **9/118.06** | **17/317.49** | **2/10.26** | **5/14.11** | **4/29.78** | **2/31.15** | **39/520.84** | **39/520.84** |

APPENDIX B: Middle Main Eel River TMDL for Sediment
Sediment Source Analysis by PWA
Table 3 outlines the erosion and sediment delivery by geology for plot features <3,000 $yds^3$ and PWA air photo identified landslides >3,000 $yds^3$ by CALWAA and TMDL study area. The erosion and sediment delivery from plot features <3,000 $yds^3$ were extrapolated to the entire Middle Main Eel River study area using the stratified random sampling method. Volume estimates for geology type. Erosion and sediment delivery for >3,000 $yds^3$ are from actual measurements from the air photo analysis.

**Table 3. Total past erosion and sediment delivery from plot features <3,000 $yds^3$ and PWA identified landslides >3000, by terrain type, to each of the two CalWAAs in the Middle MainStem Eel River watershed study area.**

| Watershed/ CALWAA | Terrain Type/ Geology | Feature <3,000 $yds^3$ (plots)[2] | | | Feature >3,000 $yds^3$ (PWA air photo identified)[3] | | |
|---|---|---|---|---|---|---|---|
| | | Non earthflow Erosion ($yds^3$) | Non earthflow Sediment Delivery ($yds^3$) | Earthflow Erosion ($yds^3$) | Non earthflow erosion ($yds^3$) | Non earthflow sediment Delivery ($yds^3$) | Earthflow erosion ($yds^3$) |
| **Entire Middle Main Eel River study area** | 1 | 634,407 | 493,383 | 0 | 2,490,446 | 2,025,484 | 65,484 |
| | 2 | 9,006,712 | 5,947,942 | 143,000 | 3,916,823 | 3,151,910 | 784,763 |
| | 3 | 139,573 | 92,551 | 0 | 86,007 | 63,219 | 2,709 |
| | 4 | 119,405 | 82,944 | 0 | 2,581,932 | 1,836,748 | 4,977 |
| | 5 | 20,748 | 16,986 | 0 | 548,215 | 431,333 | 0 |
| | 6 | 29,097 | 24,089 | 0 | 336,188 | 297,296 | 7,287 |
| | Totals | 9,949,942 | 6,657,895 | 143,000 | 9,959,611 | 7,805,990 | 865,220 |
| **Spy Rock** | 1 | 446,331 | 347,115 | 0 | 1,630,988 | 1,328,889 | 56,154 |
| | 2 | 6,179,842 | 4,081,105 | 98,118 | 2,800,208 | 2,215,747 | 421,239 |
| | 3 | 44,450 | 29,475 | 0 | 50,064 | 42,595 | 0 |
| | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 27,816 | 23,028 | 0 | 315,961 | 277,537 | 3,003 |
| | Totals | 6,698,438 | 4,480,723 | 98,118 | 4,797,221 | 3,864,768 | 480,396 |
| **Seqouia** | 1 | 188,076 | 146,268 | 0 | 859,458 | 696,595 | 9,330 |
| | 2 | 2,826,870 | 1,866,837 | 44,882 | 1,116,615 | 936,163 | 363,524 |
| | 3 | 95,123 | 63,076 | 0 | 35,943 | 20,624 | 2,709 |
| | 4 | 119,405 | 82,944 | 0 | 2,581,932 | 1,836,748 | 4,977 |
| | 5 | 20,748 | 16,986 | 0 | 548,215 | 431,333 | 0 |
| | 6 | 1,281 | 1,061 | 0 | 20,227 | 19,759 | 4,284 |
| | Totals | 3,251,504 | 2,177,172 | 44,882 | 5,162,390 | 3,941,222 | 384,824 |

**Table 4. Sediment yield (in yds$^3$/mi$^2$/year, tons/mi$^2$/year and %) by domain and primary land use association, Middle Main Stem Eel River watershed.**

| CALWAA | | | Non Earthflow | | | | | Earthflow | | | | | Total sediment yield (non EF+ EF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No land use | Field Measured Road Related | Timber Harvest | Graze/ Homestead Activity | Total non EF sediment yield | No land use | Road Related | Timber harvest | Graze/ Homestead Activity | Total EF sediment yield | |
| Spy Rock | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 159 | 37 | 8 | 2 | 206 | 5 | 0 | 0 | 0 | 5 | 211 |
| | | tons/ mi$^2$/yr | 245 | 57 | 13 | 3 | 318 | 7 | 0 | 0 | 0 | 7 | 325 |
| | AP >3,000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 113 | 46 | 17 | 2 | 178 | 22 | 0 | 0 | 0 | 22 | 200 |
| | | tons/ mi$^2$/yr | 174 | 71 | 27 | 3 | 275 | 34 | 0 | 0 | 0 | 34 | 309 |
| | **Sub-total/ %** | **yds$^3$/ mi$^2$/yr** | **272** | **83** | **25** | **4** | **384** | **27** | **0** | **0** | **0** | **27** | **411** |
| | | **tons/ mi$^2$/yr** | **419** | **128** | **40** | **6** | **593** | **41** | **0** | **0** | **0** | **41** | **434** |
| Seqouia | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 137 | 33 | 7 | 3 | 180 | 4 | 0 | 0 | 0 | 4 | 184 |
| | | tons/ mi$^2$/yr | 210 | 51 | 11 | 4 | 276 | 6 | 0 | 0 | 0 | 6 | 282 |
| | AP >3000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 227 | 63 | 34 | 0.3 | 324 | 31 | 0 | 0.5 | 0 | 31 | 355 |
| | | tons/ mi$^2$/yr | 349 | 97 | 53 | 1 | 500 | 48 | 0 | 0.7 | 0 | 48 | 548 |
| | **Sub-total/ %** | **yds$^3$/ mi$^2$/yr** | **364** | **96** | **41** | **3** | **504** | **35** | **0** | **0.5** | **0** | **35** | **539** |

**Table 4. Sediment yield (in yds$^3$/mi$^2$/year, tons/mi$^2$/year and %) by domain and primary land use association, Middle Main Stem Eel River watershed.**

| CALWAA | | | Non Earthflow | | | | | Earthflow | | | | | Total sediment yield (non EF+ EF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No land use | Field Measured Road Related | Timber Harvest | Graze/ Homestead Activity | Total non EF sediment yield | No land use | Road Related | Timber harvest | Graze/ Homestead Activity | Total EF sediment yield | |
| | | **tons/ mi$^2$/yr** | **559** | **148** | **64** | **5** | **776** | **54** | **0** | **0.7** | **0** | **55** | **831** |
| **Total for the Middle Main Stem Eel River study area** | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 151 | 36 | 8 | 2 | 197 | 4 | 0 | 0 | 0 | 4 | 201 |
| | | tons/ mi$^2$/yr | 233 | 55 | 12 | 3 | 303 | 7 | 0 | 0 | 0 | 7 | 310 |
| | | % | 77 | 18 | 4 | 1 | 100 | 100 | 0 | 0 | 0 | 100 | 100 |
| | AP >3,000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 154 | 52 | 24 | 1 | 231 | 25 | 0 | 0.16 | 0 | 25 | 256 |
| | | tons/ mi$^2$/yr | 237 | 80 | 36 | 2 | 355 | 39 | 0 | 0.25 | 0 | 39 | 394 |
| | | % | 66 | 23 | 10 | 1 | 100 | 99 | 0 | 1 | 0 | 100 | 100 |
| | **Sub-total/ %** | **yds$^3$/ mi$^2$/yr** | **305** | **88** | **32** | **3** | **428** | **29** | **0** | **0.16** | **0** | **29** | **457** |
| | | **tons/ mi$^2$/yr** | **470** | **135** | **48** | **5** | **658** | **46** | **0** | **0.25** | **0** | **46** | **704** |
| | | **%** | **71** | **21** | **7** | **1** | **100** | **100** | **0** | **0** | **0** | **100** | **100** |

Table 5 outlines the sediment yield rates by time period for <3000 $yds^3$ plot features and PWA identified >3000 $yds^3$ landslides. The sediment delivery from plot features <3,000 $yds^3$ was extrapolated to the entire Middle Main Stem Eel River basin using the stratified random sampling method. The time period reflects the approximate time of changes to the Forest Practice Rules.

**Table 5. Sediment yield (in $yds^3/mi^2$/year, tons/$mi^2$/year and %) by calwaa and time frames, for plot features <3,000 $yds^3$ and PWA identified landslides >3,000 $yds^3$, Middle Main Stem Eel River watershed study area.**

| Watershed | Sediment Delivery Rate | Pre -1970 | | | | | Post-1970 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Plot features <3,000 $yds^3$ | | Feature >3,000 $yds^3$ ( air photo identified)$^3$ | | Total | Plot features <3,000 $yds^3$ | | Feature >3,000 $yds^3$ (air photo identified )$^3$ | | Total |
| | | nonEf | EF | non Ef | EF | | non Ef | EF | nonEf | EF | |
| Entire Middle Main Stem Eel River watershed study area | $yds^3/mi^2/yr$ | 342 | 9 | 311 | 50 | 712 | 73 | 0 | 162 | 4 | 239 |
| | $tons/mi^2/yr$ | 526 | 14 | 478 | 77 | 1,095 | 112 | 0 | 250 | 7 | 369 |
| Spy Rock | $yds^3/mi^2/yr$ | 363 | 10 | 287 | 41 | 701 | 72 | 0 | 85 | 6 | 163 |
| | $tons/mi^2/yr$ | 559 | 15 | 441 | 64 | 1,079 | 111 | 0 | 131 | 9 | 251 |
| Seqouia | $yds^3/mi^2/yr$ | 303 | 8 | 353 | 66 | 730 | 73 | 0 | 300 | 2 | 375 |
| | $tons/mi^2/yr$ | 467 | 12 | 544 | 102 | 1,125 | 113 | 0 | 462 | 3 | 578 |

Table 6 outlines the sediment yield from field plot data for features <3,000 $yds^3$ and PWA air photo identified >3,000 $yds^3$ landslides. The table compares the pre-1970 and post 1970 time frames to management versus non management land use association.

**Table 6. Total PWA sample plot and aerial photograph determined sediment delivery by time frames and potential controllability.**

| CALWAA/Basin | | Total Yield by Time Period for Management Sediment Yield ($yds^3$ & %) | | Total Yield by Time Period for Non-Management Sediment Yield ($yds^3$ & %) | |
|---|---|---|---|---|---|
| | | Non Earthflow | Earthflow | Non Earthflow | Earthflow |
| Spy Rock | Pre-1970 (30 years) | 2,074,384 | 5,439 | 4,433,568 | 512,574 |
| | Post-1970 (35 years) | 364,672 | 0 | 1,472,868 | 65,940 |
| | Subtotals | 2,439,056 | 5,439 | 5,906,436 | 578,514 |
| Sequoia | Pre-1970 (30 years) | 1,417,964 | 0 | 2,260,310 | 410,051 |
| | Post-1970 (35 years) | 287,698 | 0 | 2,152,421 | 14,216 |
| | Subtotals | 1,705,662 | 0 | 4,412,731 | 424,267 |
| Totals for the whole basin | Pre-1970 (30 years) | 3,492,348 | 5,439 | 6,693,878 | 922,625 |
| | Post-1970 (35 years) | 652,370 | 0 | 3,625,289 | 80,156 |
| | Total | 4,144,718 | 5,439 | 10,319,167 | 1,002,781 |

**Table 7 (Note this is old table 3) Total past erosion and sediment delivery from plot features <3,000 yds$^3$ and PWA identified features >3000, by terrain type for the 2 CALWAAs and the entire Middle Main Stem Eel River study area (includes SEDMODL road-related sediment delivery)**

| Ownership | Terrain Type/ Geology | Feature <3,000 yds$^3$ (plots)$^2$ | | | | Landslides >3,000 yds$^3$ (PWA air photo identified) | | |
|---|---|---|---|---|---|---|---|---|
| | | Non earthflow Erosion (yds$^3$) | Non earthflow Sediment Delivery (yds$^3$) | SEDMODL Road Related Sediment Delivery (yds$^3$) | Earthflow Erosion (yds$^3$) | Non earthflow erosion (yds$^3$) | Non earthflow sediment Delivery (yds$^3$) | Earthflow erosion (yds$^3$) |
| **Entire Upper Eel River study area** | 1 | 634,407 | 493,383 | 144,011 | 0 | 2,490,446 | 2,025,484 | 65,484 |
| | 2 | 9,006,712 | 5,947,942 | 880,293 | 143,000 | 3,916,823 | 3,151,910 | 784,763 |
| | 3 | 139,573 | 92,551 | 61,293 | 0 | 86,007 | 63,219 | 2,709 |
| | 4 | 119,405 | 82,944 | 33,222 | 0 | 2,581,932 | 1,836,748 | 4,977 |
| | 5 | 20,748 | 16,986 | 102,363 | 0 | 548,215 | 431,333 | 0 |
| | 6 | 29,097 | 24,089 | 20,077 | 0 | 336,188 | 297,296 | 7,287 |
| | **Totals** | 9,949,942 | 6,657,895 | 1,241,259 | 143,000 | 9,959,611 | 7,805,990 | 865,220 |
| **Spy Rock** | 1 | 446,331 | 347,115 | 103,230 | 0 | 1,630,988 | 1,328,889 | 56,154 |
| | 2 | 6,179,842 | 4,081,105 | 519,278 | 98,118 | 2,800,208 | 2,215,747 | 421,239 |
| | 3 | 44,450 | 29,475 | 18,441 | 0 | 50,064 | 42,595 | 0 |
| | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 27,816 | 23,028 | 18,633 | 0 | 315,961 | 277,537 | 3,003 |
| | **Totals** | 6,698,438 | 4,480,723 | 659,581 | 98,118 | 4,797,221 | 3,864,768 | 480,396 |
| **Sequoia** | 1 | 188,076 | 146,268 | 40,781 | 0 | 859,458 | 696,595 | 9,330 |
| | 2 | 2,826,870 | 1,866,837 | 361,015 | 44,882 | 1,116,615 | 936,163 | 363,524 |
| | 3 | 95,123 | 63,076 | 42,852 | 0 | 35,943 | 20,624 | 2,709 |
| | 4 | 119,405 | 82,944 | 33,222 | 0 | 2,581,932 | 1,836,748 | 4,977 |
| | 5 | 20,748 | 16,986 | 102,363 | 0 | 548,215 | 431,333 | 0 |
| | 6 | 1,281 | 1,061 | 1,444 | 0 | 20,227 | 19,759 | 4,284 |
| | **Totals** | 3,251,504 | 2,177,172 | 581,678 | 44,882 | 5,162,390 | 3,941,222 | 384,824 |

**Table 8 (note this is old table 4). Sediment Delivery Rates (in yds$^3$/mi$^2$/year, tons/mi$^2$/year) by primary land use association for the 2 CALWAAs and the entire Middle Main Stem Eel River TMDL study area (includes SEDMODL road-related sediment delivery).**

| CALWAA | | | Non Earthflow | | | | | | Earthflow | | | | | Total sediment yield (non EF+ EF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No land use | Field Measured Road Related | SED MODL Input Road-related | Timber Harvest | Graze/ Homestead Activity | Total non EF sediment yield | No land use | Road Related | Timber harvest | Graze/ Homestead Activity | Total EF sediment yield | |
| Spy Rock | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 159 | 37 | 30 | 8 | 2 | 236 | 5 | 0 | 0 | 0 | 5 | 241 |
| | | tons/ mi$^2$/yr | 245 | 57 | 41 | 13 | 3 | 359 | 7 | 0 | 0 | 0 | 7 | 366 |
| | AP >3,000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 113 | 46 | 0 | 17 | 2 | 178 | 22 | 0 | 0 | 0 | 22 | 200 |
| | | tons/ mi$^2$/yr | 174 | 71 | 0 | 27 | 3 | 275 | 34 | 0 | 0 | 0 | 34 | 309 |
| | | **yds$^3$/ mi$^2$/yr** | **272** | **83** | **30** | **25** | **4** | **414** | **27** | **0** | **0** | **0** | **27** | **441** |
| | **Sub-total/ %** | **tons/ mi$^2$/yr** | **419** | **128** | **41** | **40** | **6** | **634** | **41** | **0** | **0** | **0** | **41** | **675** |
| Sequoia | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 137 | 33 | 48 | 7 | 3 | 228 | 4 | 0 | 0 | 0 | 4 | 232 |
| | | tons/ mi$^2$/yr | 210 | 51 | 65 | 11 | 4 | 341 | 6 | 0 | 0 | 0 | 6 | 347 |
| | AP >3000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 227 | 63 | 0 | 34 | 0.3 | 324 | 31 | 0 | 0.5 | 0 | 31 | 355 |
| | | tons/ mi$^2$/yr | 349 | 97 | 0 | 53 | 1 | 500 | 48 | 0 | 0.7 | 0 | 48 | 548 |

**Table 8 (note this is old table 4). Sediment Delivery Rates (in yds$^3$/mi$^2$/year, tons/mi$^2$/year) by primary land use association for the 2 CALWAAs and the entire Middle Main Stem Eel River TMDL study area (includes SEDMODL road-related sediment delivery).**

| CALWAA | | | Non Earthflow | | | | | | Earthflow | | | | | Total sediment yield (non EF+ EF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No land use | Field Measured Road Related | SED MODL Input Road-related | Timber Harvest | Graze/ Homestead Activity | Total non EF sediment yield | No land use | Road Related | Timber harvest | Graze/ Homestead Activity | Total EF sediment yield | |
| | **Sub-total/ %** | **yds$^3$/ mi$^2$/yr 39** | **364** | **96** | **48** | **41** | **3** | **552** | **35** | **0** | **0.5** | **0** | **35** | **587** |
| | | **tons/ mi$^2$/yr** | **559** | **148** | **65** | **64** | **5** | **841** | **54** | **0** | **0.7** | **0** | **55** | **896** |
| **Total for the Middle Main Stem Eel River study area** | Plot <3,000 yds$^3$ sediment sources | yds$^3$/ mi$^2$/yr | 151 | 36 | 37 | 8 | 2 | 234 | 4 | 0 | 0 | 0 | 4 | 238 |
| | | tons/ mi$^2$/yr | 233 | 55 | 49 | 12 | 3 | 352 | 7 | 0 | 0 | 0 | 7 | 359 |
| | | % | 65 | 15 | 16 | 3 | 1 | 100 | 100 | 0 | 0 | 0 | 100 | 100 |
| | AP >3,000 yds$^3$ sediment sources[5] | yds$^3$/ mi$^2$/yr | 154 | 52 | 0 | 24 | 1 | 231 | 25 | 0 | 0.16 | 0 | 25 | 256 |
| | | tons/ mi$^2$/yr | 237 | 80 | 0 | 36 | 2 | 355 | 39 | 0 | 0.25 | 0 | 39 | 394 |
| | | % | 67 | 22 | 0 | 10 | 1 | 100 | 99 | 0 | 1 | 0 | 100 | 100 |
| | **Sub-total/ %** | **yds$^3$/ mi$^2$/yr** | **305** | **88** | **37** | **32** | **3** | **465** | **29** | **0** | **0.16** | **0** | **29** | **494** |
| | | **tons/ mi$^2$/yr** | **470** | **135** | **49** | **48** | **5** | **707** | **46** | **0** | **0.25** | **0** | **46** | **753** |
| | | **%** | **65** | **19** | **8** | **7** | **1** | **100** | **100** | **0** | **0** | **0** | **100** | **100** |

APPENDIX B: Middle Main Eel River TMDL for Sediment
Sediment Source Analysis by PWA
**Middle Main Eel Sediment TMDL Table Assumptions**

1) Air Photos used in analysis: 1960, 1965, 1966, 1980, 1984, 1985, 2000, 2003

2) Conversion factor for $yds^3$ to tons = 1.54 $yds^3$/ton

3) Time period = 65 years (1940-2005)

4) The following equations were used to compute volumes for each feature type

a) Depth for landslides, debris flow sources (excluding earthflows) was calculated using a power equation developed from field verified air photo identified landslides =
Depth = 0.5068*Area^0.2381

b) Torrent tracks and gullies were calculated using and equation developed from studies conducted in the Jordan Creek and Bear Creek watersheds (flow into the lower Eel) Torrent track erosion or gully erosion = Length * 2.91 $yds^3$/ft

c) Bank erosin was calculated using and equation developed from studies conducted in the Jordan Creek and Bear Creek watersheds (flow into the lower Eel). Bank erosion volume = Length of channel * 1.42 $yds^3$/ft

d) Earthflow erosion was calculated using an average earthflow toe retreat rate applied to the width of the toe of the earthflow and an average toe depth.
Earthflow erosion = Width of EF toe*16 ft average depth*1.82 ft retreat per year.
This yields a volume/year. We applied this rate to each air photo period assuming that earthflow activity is in response to high annual rainfall .Earthflow activity is found to continue for years after heavy rainfall years. This is based on Iverson's work on earthflows (Iverson, R. M., 1984. Unsteady, nonuniform landslide motion: theory and measurement. Unpublished PhD thesis, Stanford University, CA. 303p.)

For estimates of earthflow sediment delivery we applied 21 years of activity for the 1960 decade of photos (spans back to 1940), 14 years of activity for the 1980 decade of air photos and 6 years of activity for the 2000 decade of air photos. This was derived form annual rainfall data collected in Scotia, California.

5) The middle main stem component was derived from selecting landslides delivering to the main stem Eel and to main stem interfluves within a 1500' buffer along the main stem Eel. Although the main stem component appears low, this is not surprising. We just finished a watershed analysis in the Eel River just downstream of the Middle Main TMDL study area. We found that landslide rates were much higher in streams that are more affected by channel migration zone shifts. The Larabee Creek watershed which drains to the Eel showed very high landslide rates were the channel migration was more of an influence due to the channel confinement. The section of the Eel River in the watershed analysis area did not show the same rate of landsliding. It appears that the wider channel was better at accommodating the channel migration shifts and resulted in less streamside landslides.