# APPENDIX G: BEDLOADS - BACTERIA LOAD ESTIMATOR SPREADSHEETS (BLEST)

Loads associated with resuspension of sediment (bedloads) can be estimated using the Bacteria Load Estimation Spreadsheet (BLEST) tool, developed by the Texas Commission on Environmental Quality. By multiplying the occurrence of resuspension flows, sediment scour rates, and estimates of stream width and stream lengths, the fecal coliform bedloads can be calculated. . Because loading is a function of stream width and length, the streams with the largest stream surface area exposed to bed sediment will consequently have the largest bed sediment contribution.

The methodology used in BLEST to estimate bedloads is outlined below:

1. Estimate Average Stream Width (from observations, photos).
2. Estimate Stream Length (from monitoring point, to upstream extent of sediment fines source area).
3. Estimate indicator bacteria resuspension from cohesive sediments (Jamieson et al., 2005). In these calculations, the average resuspension rate for bacteria (11,000 CFU $m^{-2}s^{-1}$) from Jamieson et al. was used.
4. Estimate length of time stream experiences critical shear conditions (used default from BLEST spreadsheet, 0.4 hours, using data from NOAA).
5. Assume shear is occurring along the entire stream reach.

BLEST does not use a fecal coliform resuspension rate in the load calculation. BLEST uses an *E.coli* resuspension rate taken from Jamieson et al. (2005). However, *E. coli* concentrations typically track relatively well with fecal coliform concentrations in the water column, and it is assumed here that using the Jamieson et al. *E. coli* resuspension rates is a reasonably good surrogate for potential fecal coliform resuspension rates.

**Alisal Creek Estimated Bedload**

**Methodology**

1. Estimate Average Stream Width (from observations, photos)
2. Estimate Stream Length (from monitoring point, to upstream extent of sediment fines source area)
3. Estimate indicator bacteria resuspension from cohesive sediments (Jamieson et al., 2005)
4. Estimate length of time stream experiences critical shear conditions (used default from BLEST spreadsheet, 0.4 hours, using data from NOAA)
5. Assume shear is occurring along the entire stream reach.

**Input Data**

| | Stream Width (ft) |
|---|---|
| Alisal Creek | 5 |
| Number of Rain Days (>0.5 inches precip) | 10 |
| Typical Storm Length | 8 |
| Portion of storm experience shear > Tc = | 5% |
| Resuspension Rate (cfu/m2/s) | 11000 (See Table 3 to right) |
| cfu/m2/hr | 3.96E+07 |
| cfu/ft2/hr | 3.68E+06 |
| Resuspension rate per storm (cfu/ft2) | 1.47E+07 |

**Table 3. Summary of resuspension parameters computed for the three Swan Creek storm events.**

| Storm | Critical bed shear stress | Critical flow | Resuspension rate |
|---|---|---|---|
| h | N $m^{-2}$ | $m^3$ $s^{-1}$ | CFU† $m^{-2}$ $s^{-1}$ |
| 225 | 1.7 | 0.37 | 11 000 |
| 550 | 1.6 | 0.33 | 8 200 |
| 600 | 1.5 | 0.3 | 15 000 |

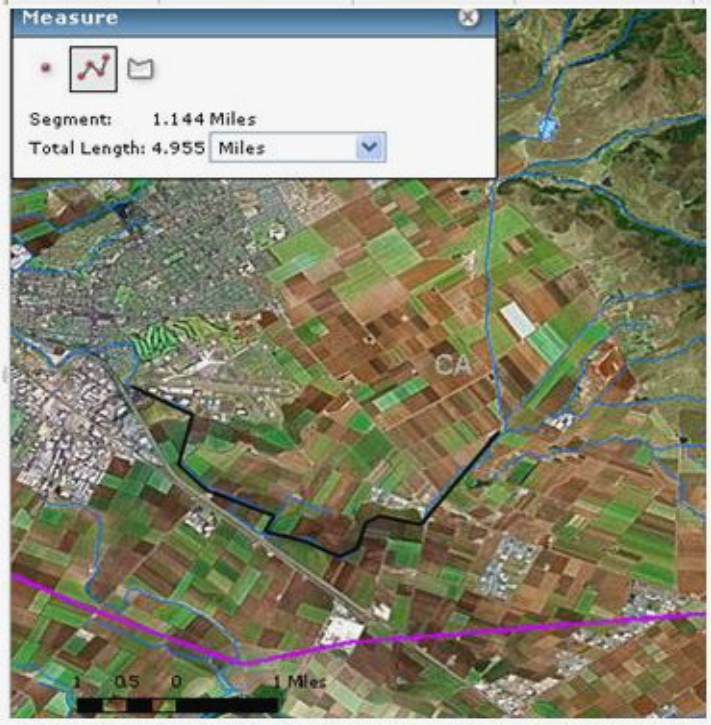
† Colony forming units.

From Jamieson et al., 2005

Wet day = Day with Precip >0.5 inches, from Salinas #2 Weather Station (ave. 10 Wet days per year at Salinas #2)

**Load Calculation**

| Stream | Stream Width (ft) | Stream Length (ft) | MPN/yr | MPN/wet day |
|---|---|---|---|---|
| Alisal Creek | 5 | 24298 | 1.79E+12 | 1.79E+11 |




Stream length = Monitoring point ALI-AIR, to upstream limit of fines sediment source

**Reclamation Ditch Estimated Bedload**

**Methodology**

1. Estimate Average Stream Width (from observations, photos)
2. Estimate Stream Length (measured from monitoring point, to upstream extent of sediment fines source area)
3. Estimate indicator bacteria resuspension from cohesive sediments (Jamieson et al., 2005)
4. Estimate length of time stream experiences critical shear conditions (used default from BLEST spreadsheet, 0.4 hours, using data from NOAA)
5. Assume shear is occurring along the entire stream reach.

**Input Data**

| | Stream Width (ft) |
|---|---|
| Reclamation Ditch Creek | 10 |
| Number of Rain Days (>0.5 inches precip) | 10 |
| Typical Storm Length | 8 |
| Portion of storm experience shear > Tc = | 5% |
| Resuspension Rate (cfu/m2/s) | 11000 (See Table 3 to right) |
| cfu/m2/hr | 3.96E+07 |
| cfu/ft2/hr | 3.68E+06 |
| Resuspension rate per storm (cfu/ft2) | 1.47E+07 |

**Table 3. Summary of resuspension parameters computed for the three Swan Creek storm events.**

| Storm | Critical bed shear stress | Critical flow | Resuspension rate |
|---|---|---|---|
| h | N m$^{-2}$ | m$^3$ s$^{-1}$ | CFU† m$^{-2}$ s$^{-1}$ |
| 225 | 1.7 | 0.37 | 11 000 |
| 550 | 1.6 | 0.33 | 8 200 |
| 600 | 1.5 | 0.3 | 15 000 |

† Colony forming units.

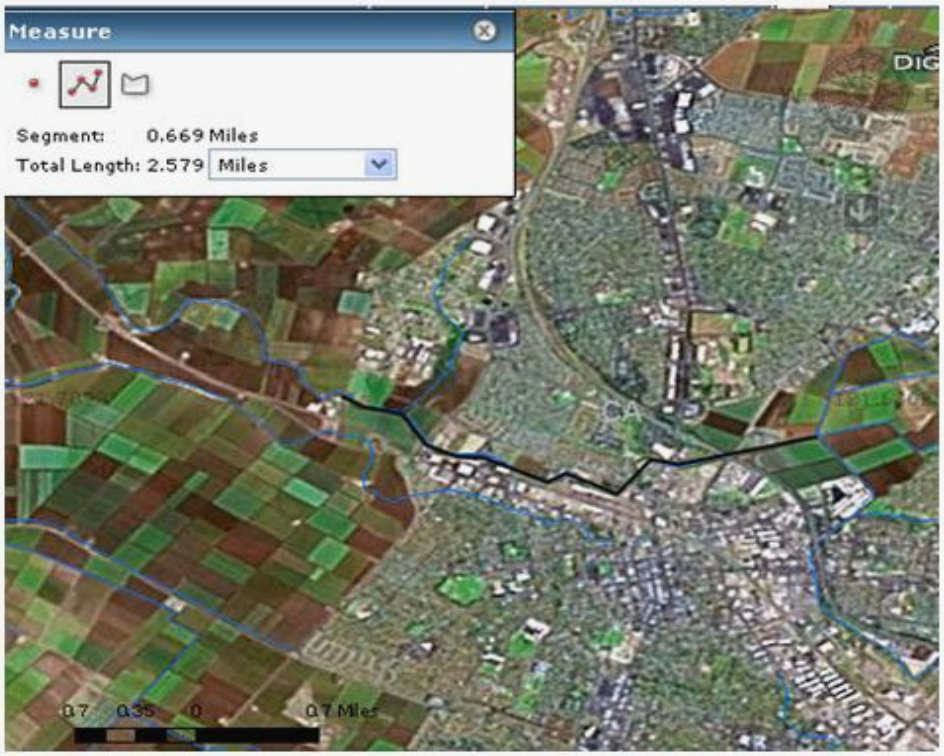
From Jamieson et al., 2005

BLEST Calculation:

Wet day = Day with Precip >0.5 inches, from Salinas #2 Weather Station (ave. 31 Wet days per year at Salinas #2)

**Load Calculation**

| Stream | Stream Width (ft) | Stream Length (ft) | MPN/yr | MPN/wet day |
|---|---|---|---|---|
| Reclamation Ditch | 10 | 13704 | 2.02E+12 | 2.02E+11 |




Stream length = Monitoring point REC-VIC, to upstream limit of subwatershed (Carr Lake)

**Tembladero Slough Estimated Bedload**

**Methodology**

1. Estimate Average Stream Width (from observations, photos)
2. Estimate Stream Length (from monitoring point, to upstream extent of sediment fines source area)
3. Estimate indicator bacteria resuspension from cohesive sediments (Jamieson et al., 2005)
4. Estimate length of time stream experiences critical shear conditions (used default from BLEST spreadsheet, 0.4 hours, using data from NOAA)
5. Assume shear is occurring along the entire stream reach.

**Input Data**

| | Stream Width (ft) | |
|---|---|---|
| Tembladero Slough | 15 | |
| Number of Rain Days (>0.5 inches precip) | 10 | |
| Typical Storm Length | 8 | |
| Portion of storm experience shear > Tc = | 5% | |
| Resuspension Rate (cfu/m2/s) | 11000 | (See Table 3 to right) |
| cfu/m2/hr | 3.96E+07 | |
| cfu/ft2/hr | 3.68E+06 | |
| Resuspension rate per storm (cfu/ft2) | 1.47E+07 | |

**Table 3. Summary of resuspension parameters computed for the three Swan Creek storm events.**

| Storm | Critical bed shear stress | Critical flow | Resuspension rate |
|---|---|---|---|
| h | N $m^{-2}$ | $m^3$ $s^{-1}$ | CFU† $m^{-2}$ $s^{-1}$ |
| 225 | 1.7 | 0.37 | 11 000 |
| 550 | 1.6 | 0.33 | 8 200 |
| 600 | 1.5 | 0.3 | 15 000 |

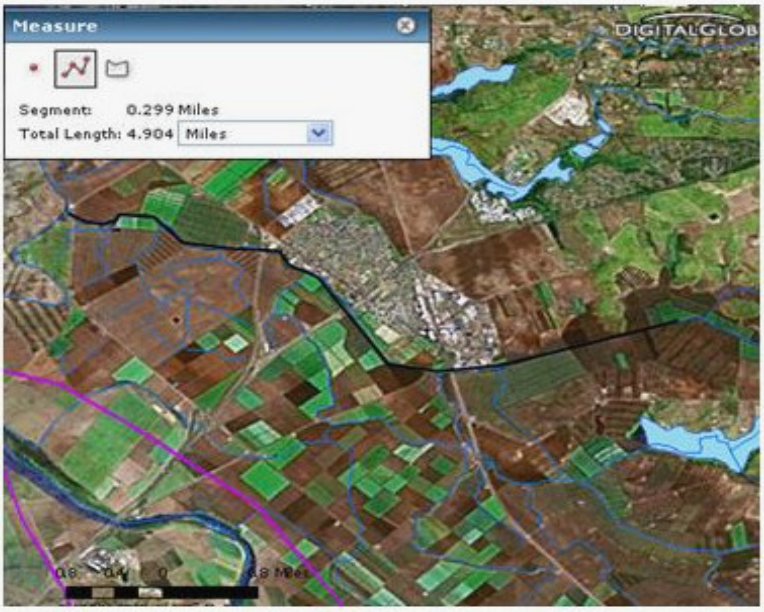
† Colony forming units.

From Jamieson et al., 2005

Wet day = Day with Precip >0.5 inches, from Salinas #2 Weather Station (ave. 31 Wet days per year at Salinas #2 Weather Station)

**Load Calculations**

| Stream | Stream Width (ft) | Stream Length (ft) | MPN/yr | MPN/wet day |
|---|---|---|---|---|
| Tembladero Slough | 15 | 25872 | 5.71E+12 | 5.71E+11 |




Stream length = Monitoring point TEM-MOL, to upstream limit of fines sediment sources (merrit drain)