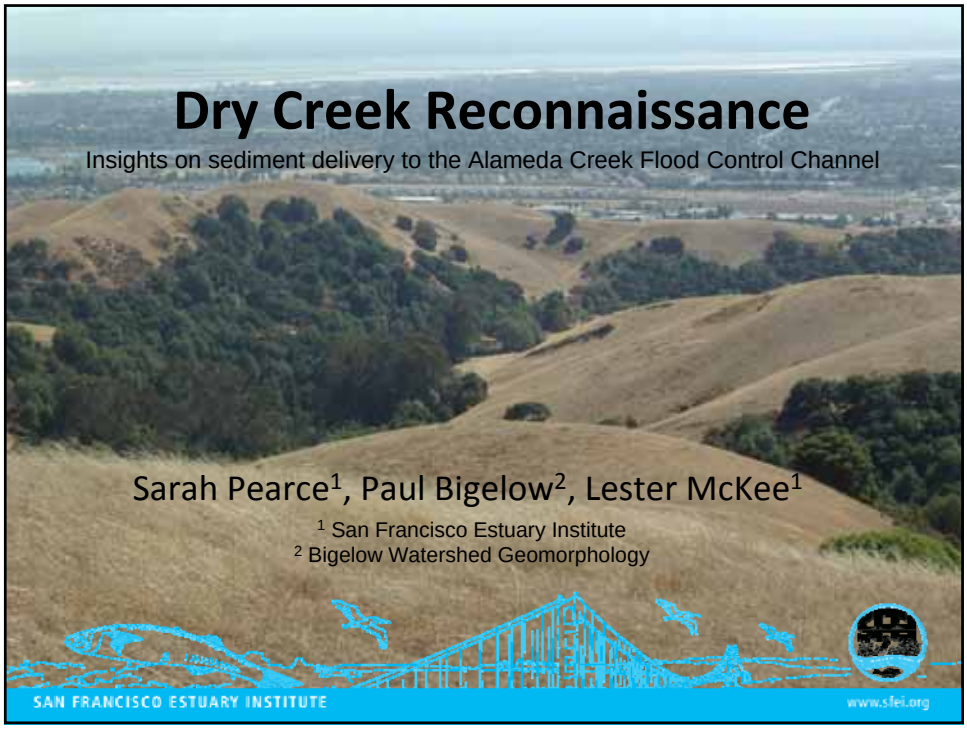


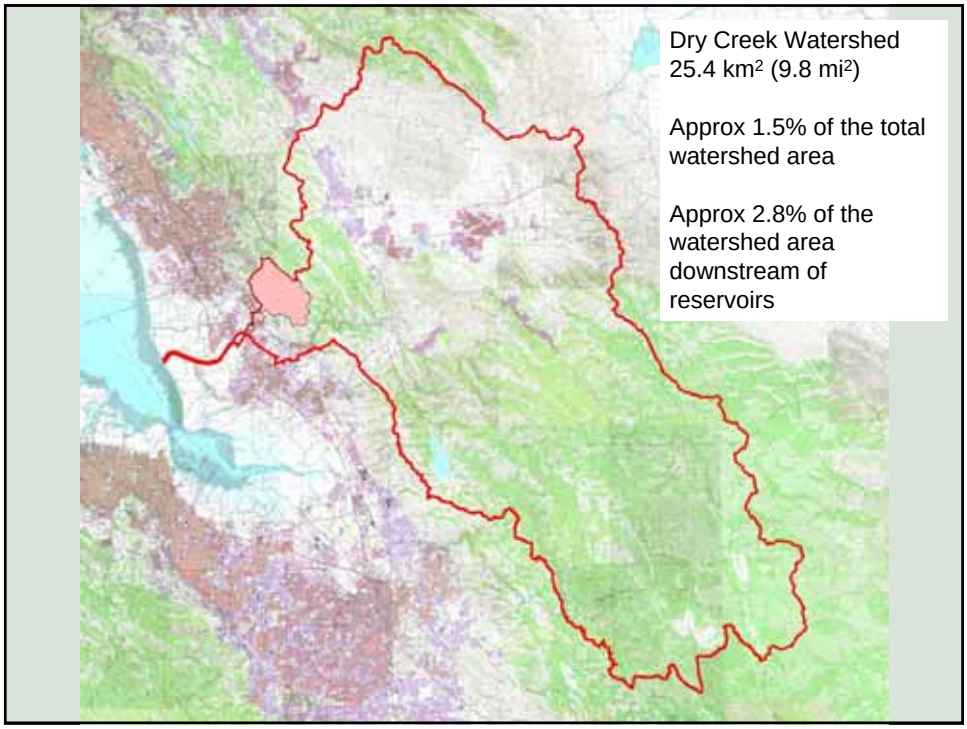
Problem statement

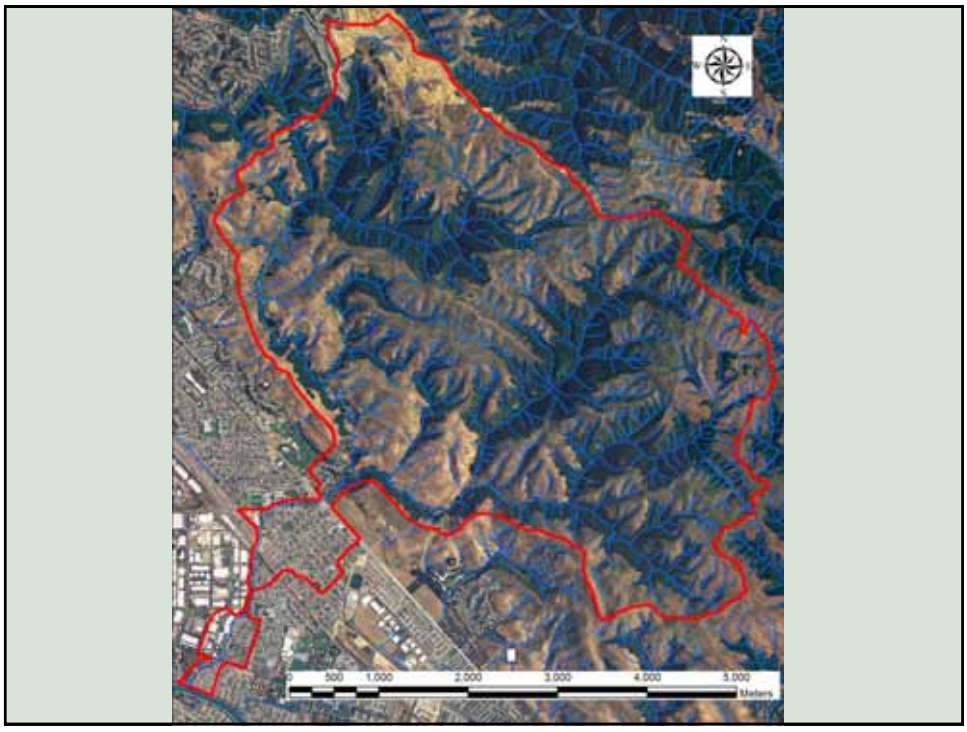
- net sediment deposition has required periodic dredging
- sediment control is now focusing on identifying sources
- previous studies
- sources of coarse sediment that are close
- suspected high sediment load

Is the Dry Creek tributary potentially a significant source of coarse sediment to the Alameda Creek Flood Control Channel?

Study components

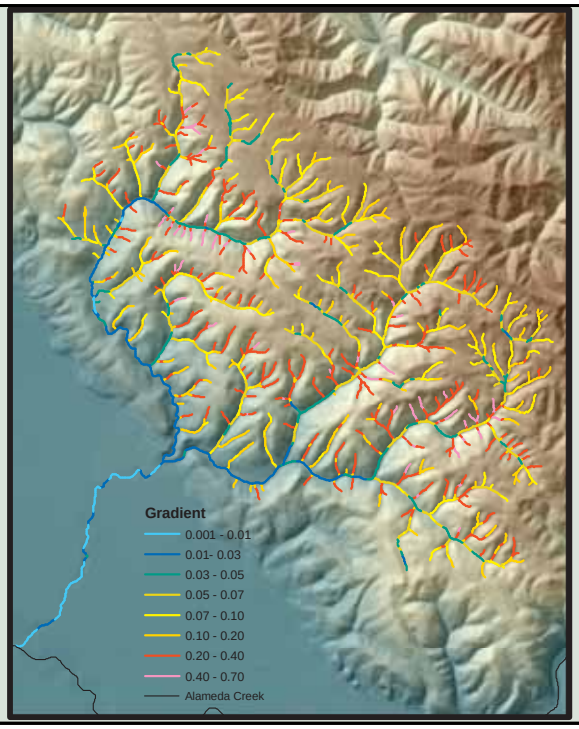
- Sources?
- Storage?
- Sediment transport ability?
- Evidence of excessive sediment supply?
- Sediment yield?

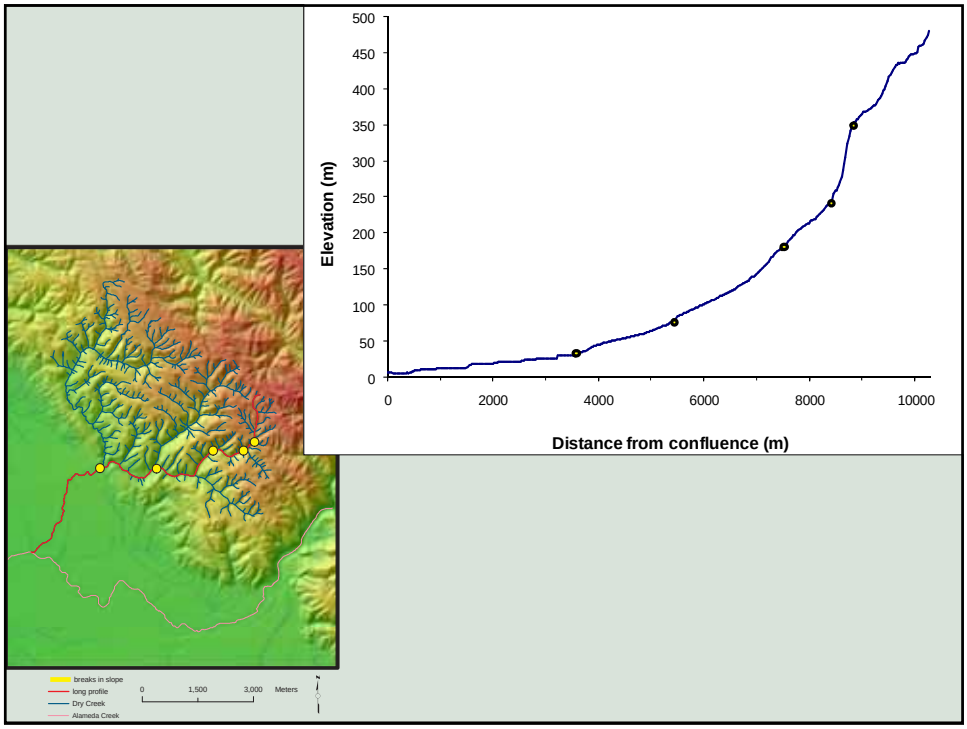

Dry Creek Watershed
25.4 km² (9.8 mi²)
Approx 1.5% of the total watershed area
Approx 2.8% of the watershed area downstream of reservoirs


500 1,000 2,000 3,000 4,000 5,000
Meters

Bedrock geology

- Cretaceous sandstones and shales
- Miocene sandstones and shales
- Jurassic ophiolite
- Hayward fault zone, tectonic uplift of 1.5 mm/yr




Elevation (m)
500
450
400
350
300
250
200
150
100
50
0
0
2000
4000
6000
8000
10000
Distance from confluence (m)
breaks in slope
long profile
Dry Creek
Alameda Creek
0
1,500
3,000
Meters

Jordan Pond

Sources of sediment

- Channel erosion
- Landslides and debris flows
- Hillslope erosion
- Roads and trails
- Urban sources

Channel Erosion

Incision

Incision down to bedrock

Incision through coarse older valley alluvium

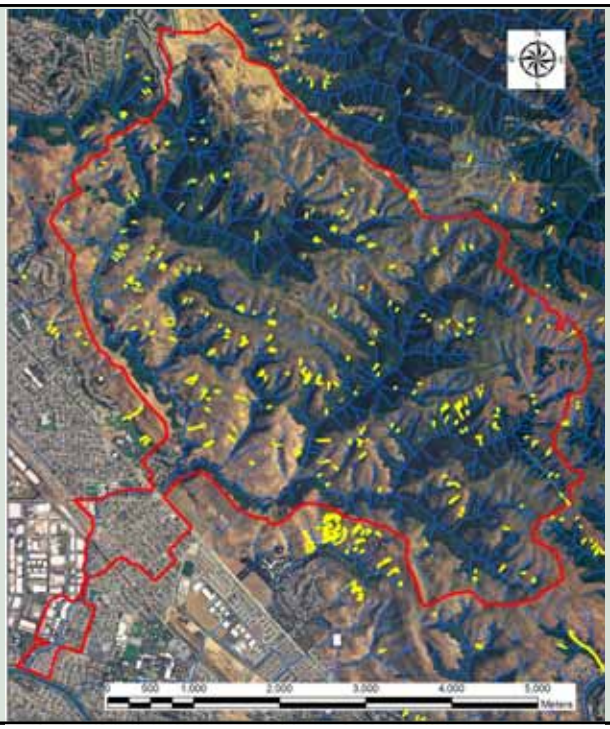
Bank erosion

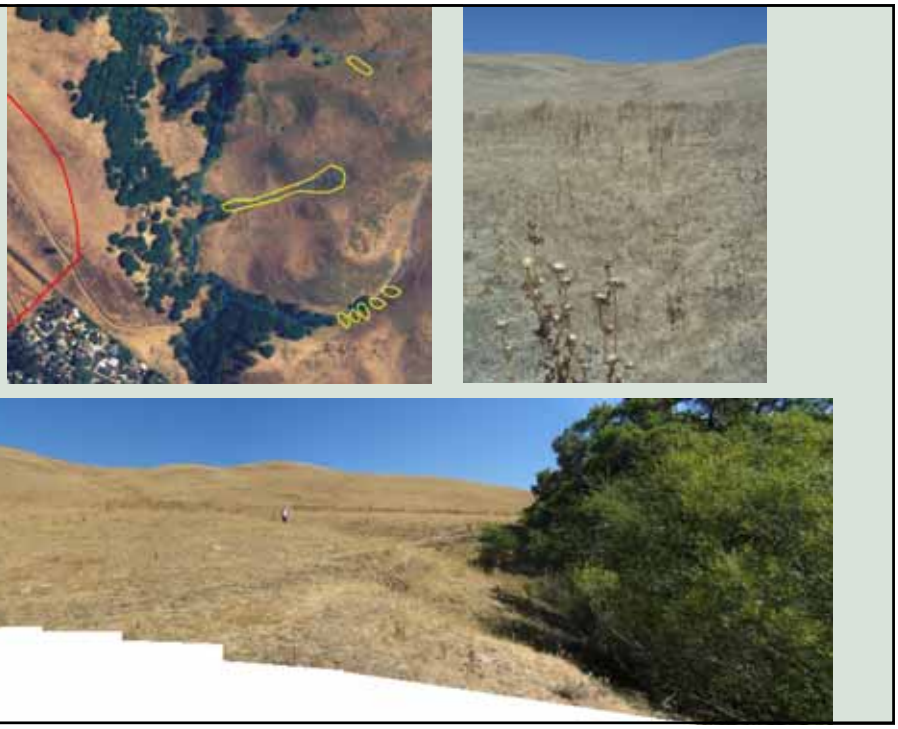
Stream side slides from hillslopes and terraces

Landslides and debris flows

USGS Debris flow mapping

Debris flows triggered by the El Nino rainstorm of February 2-3, 1998
Walpert Ridge and vicinity, Alameda County, California
(Coe and Godt, 2001)





Hillslope erosion

Roads and trails

Urban sources

The urban area downstream of Mission Blvd is 1.5 km^2, or 6% of the total watershed area

Using an estimate from Zone 4 Line A, we can refine our calculations of average sediment yield for this area

2005

2009

Sediment storage

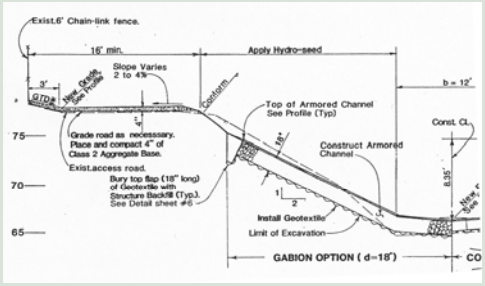
- Floodplains

- Ponds

- Hillslopes

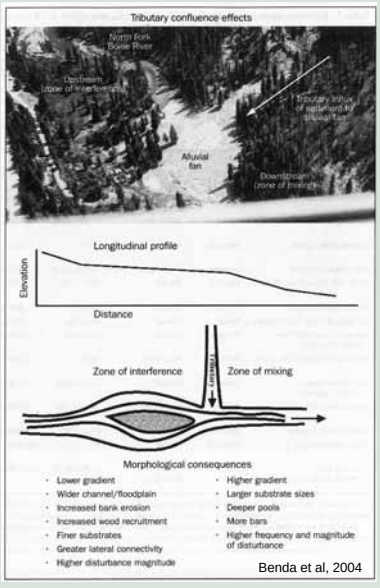
In-channel storage

Dry Creek Flood Control Channel

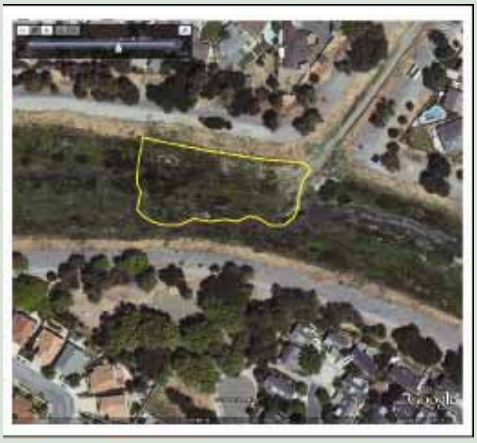


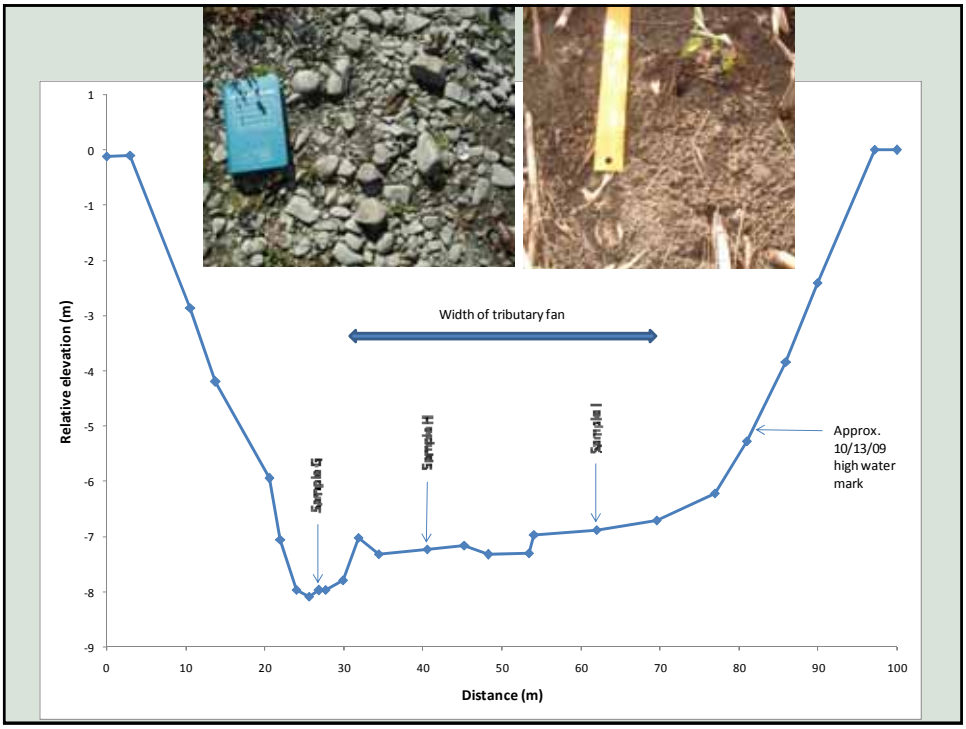
Efficient transport

Tributary Fan



Benda et al, 2004

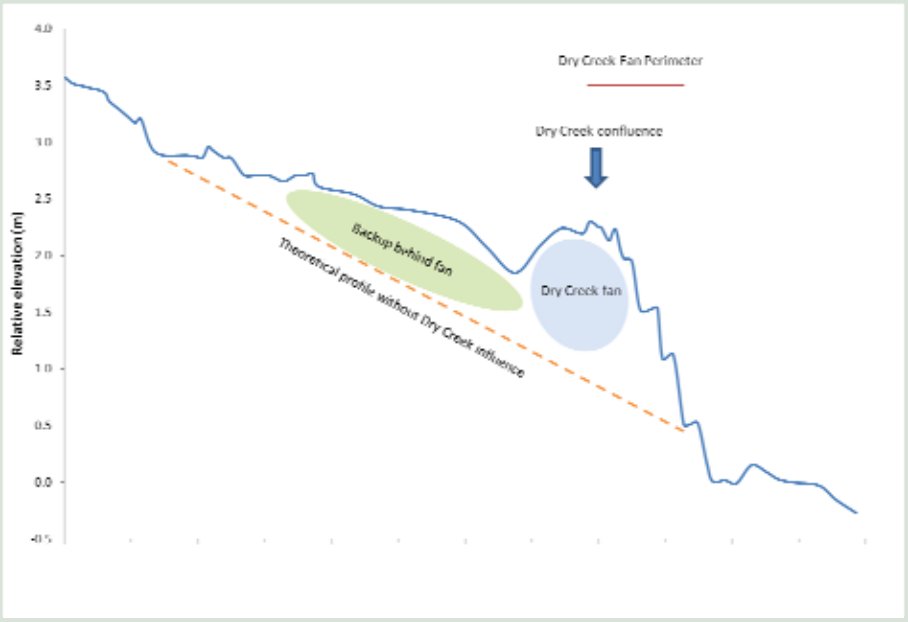


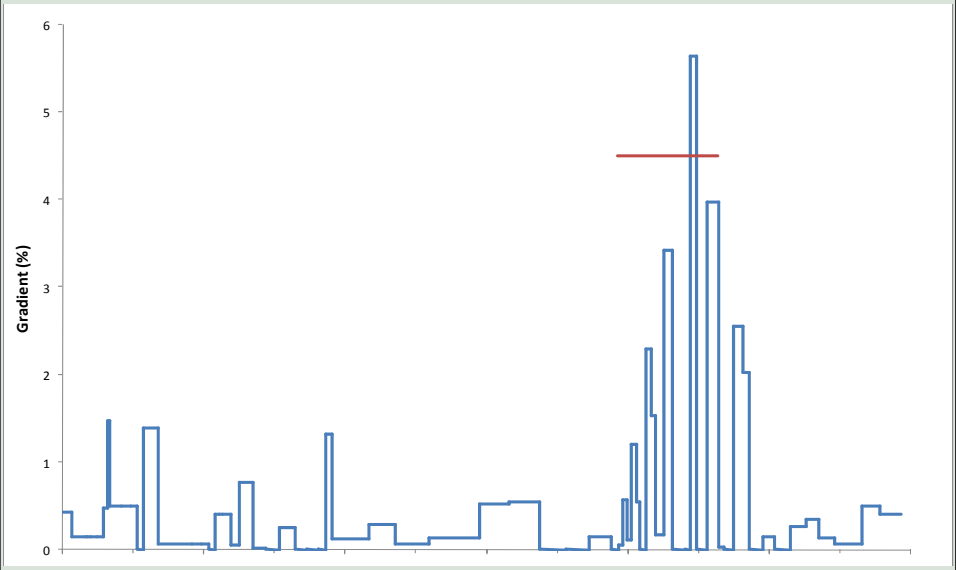


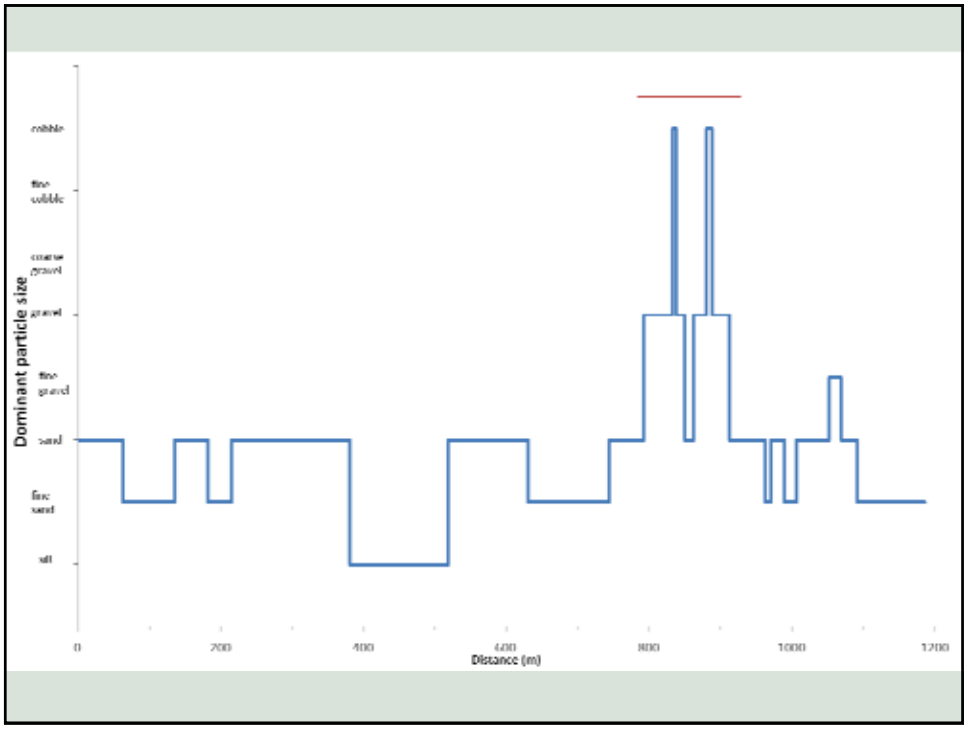
Estimate of fan volume

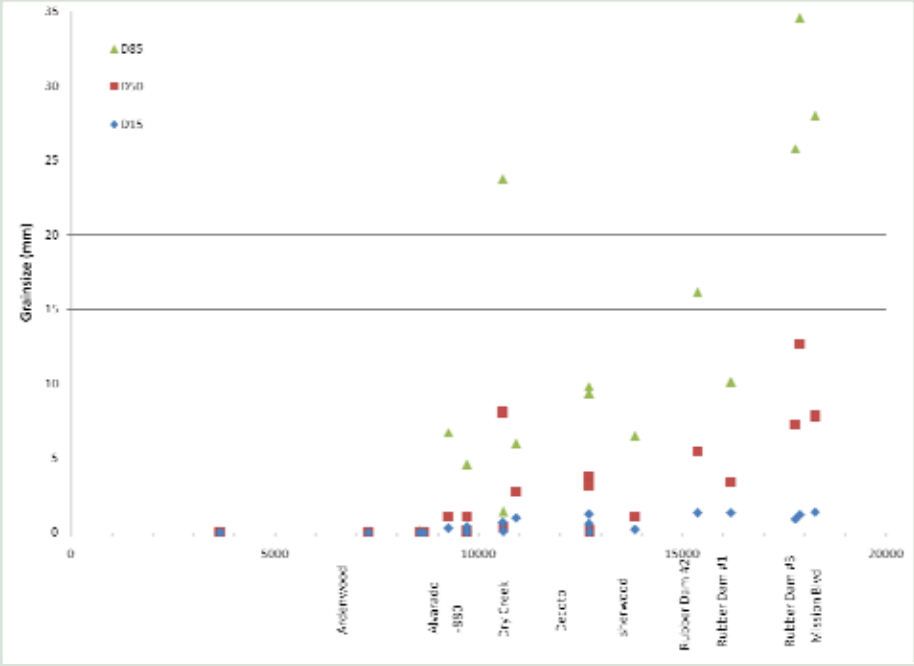
- Roughly rectangular
- 105m x 31m x 1.1m = 3,573 m^3 (4,673 yds^3)
- = 5,700 metric tons (conservative)

- Previous dredging operations have removed 20,600 to 145,000 m^3 (27,000 to 190,000 yds^3)


Dry Creek Fan Perimeter
Dry Creek confluence
Backup behind fan
Dry Creek fan
Theoretical profile without Dry Creek influence
Relative elevation (m)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0


Gradient (%)
6
5
4
3
2
1
0


Dominant particle size
cobble
fine cobble
coarse gravel
gravel
fine gravel
sand
fine sand
silt
0
200
400
600
800
1000
1200
Distance (m)



Comparison of sediment loads

- Can not develop sediment rating curve, instead used estimates based on regional regression equations and adjacent sediment rating curves

- The average of the estimates is 337 tonnes/km^2/yr

  (range 22 – 674 tonnes/km^2/yr)

Annual sediment discharge

- The estimated average annual sediment discharge from Dry Creek
  337 tonnes/km^2/yr * 17.5 km^2 = 5,900 tonnes/yr
- This is roughly **4 percent** of the reported average load in Alameda Creek at Niles gage (1994-2006)
  172 tonnes/km^2/yr * 907 km^2 = 156,000 tonnes/yr
- Order of magnitude estimate

Conclusions

Is the Dry Creek tributary potentially a significant source of coarse sediment to the Alameda Creek flood control channel?

YES, but…

A need for improved data

- A number of unknowns (actual sediment yield, grain sizes, exact sources)
- Potential uses for improved data include:

  source control

  data for existing sediment transport modeling
- Placed in larger watershed context