Effects of Changing Flow Regimes on Stream Physical Habitat

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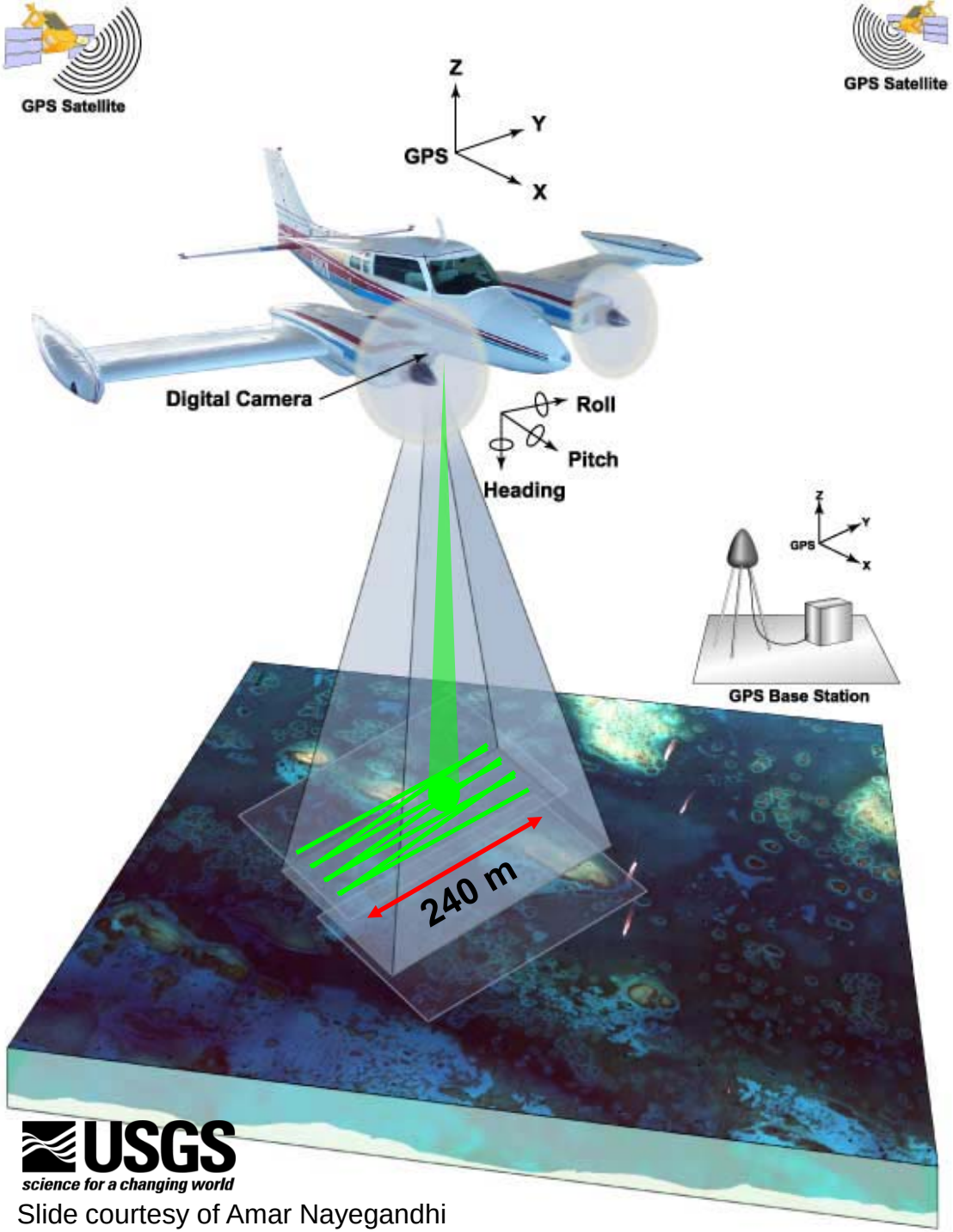
New Remote Sensing Technologies

Experimental Advanced Airborne Research Lidar (EAARL)

Green laser
(532 nm wavelength)
Low power
(70 mJ/pulse)
Small footprint
(15 cm)



Slide courtesy of Amar Nayegandhi

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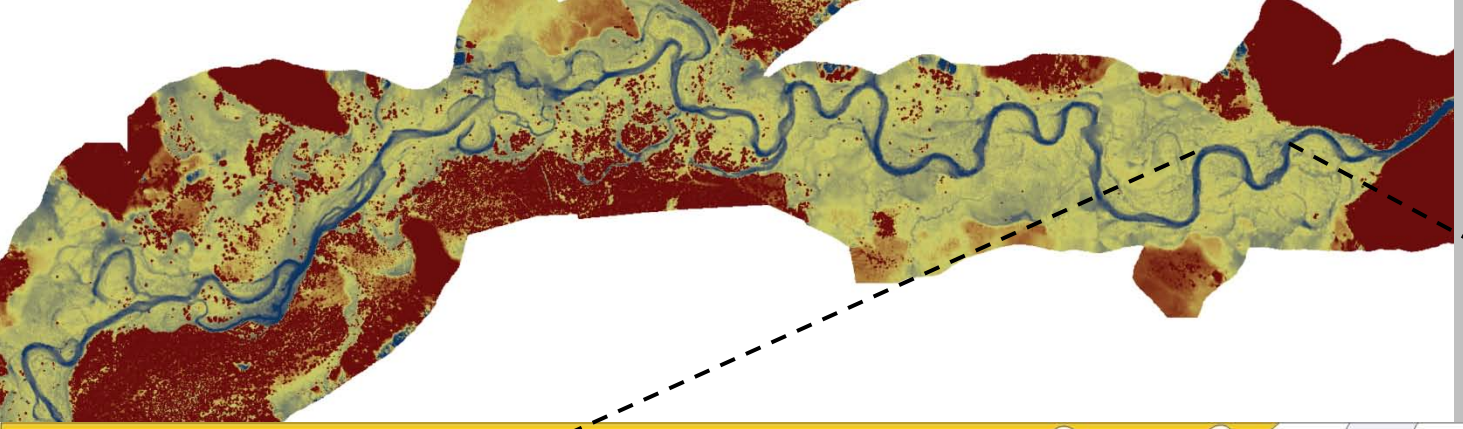
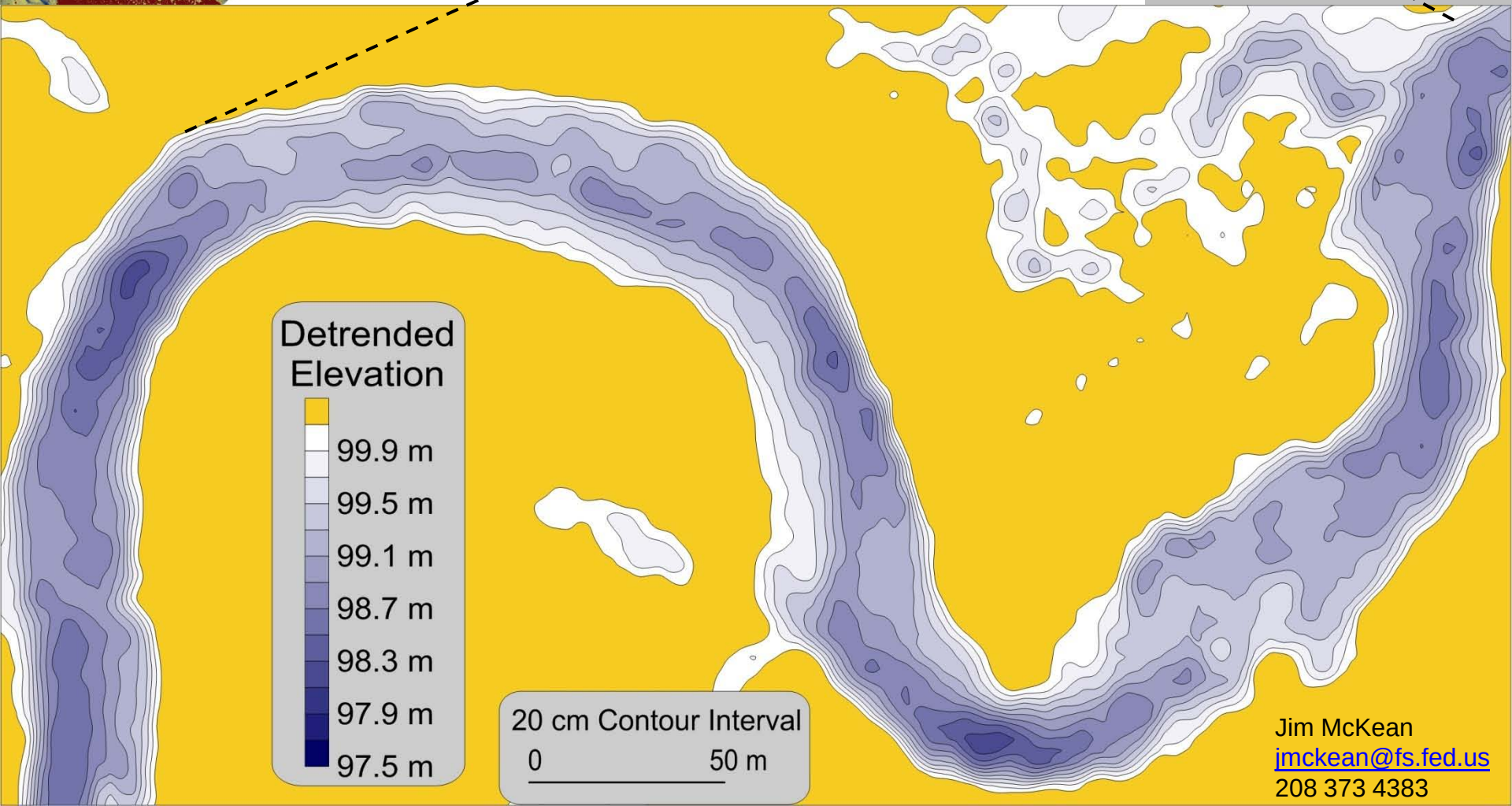
New Remote Sensing Technologies





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Climate Change and Stream Aquatic Habitat Research

- **Stream bed mobility and spawning site viability during larger winter flows**
  http://www.fs.fed.us/rm/boise/AWAE/scientists/profiles/mckean/HIC2010_ClimateChangeImpact_SubmittedVer.pdf
- **Fine sand bedload transport and environmental effects in gravel-bed rivers**
- **Effects of lower base flows on off-channel habitat**
- **Mapping and modeling stream habitat using the EAARL bathymetric lidar sensor**
  http://www.fs.fed.us/rm/pubs_other/rmrs_2009_mckean_j003.pdf
  http://www.fs.fed.us/rm/pubs_other/rmrs_2008_mckean_j001.pdf

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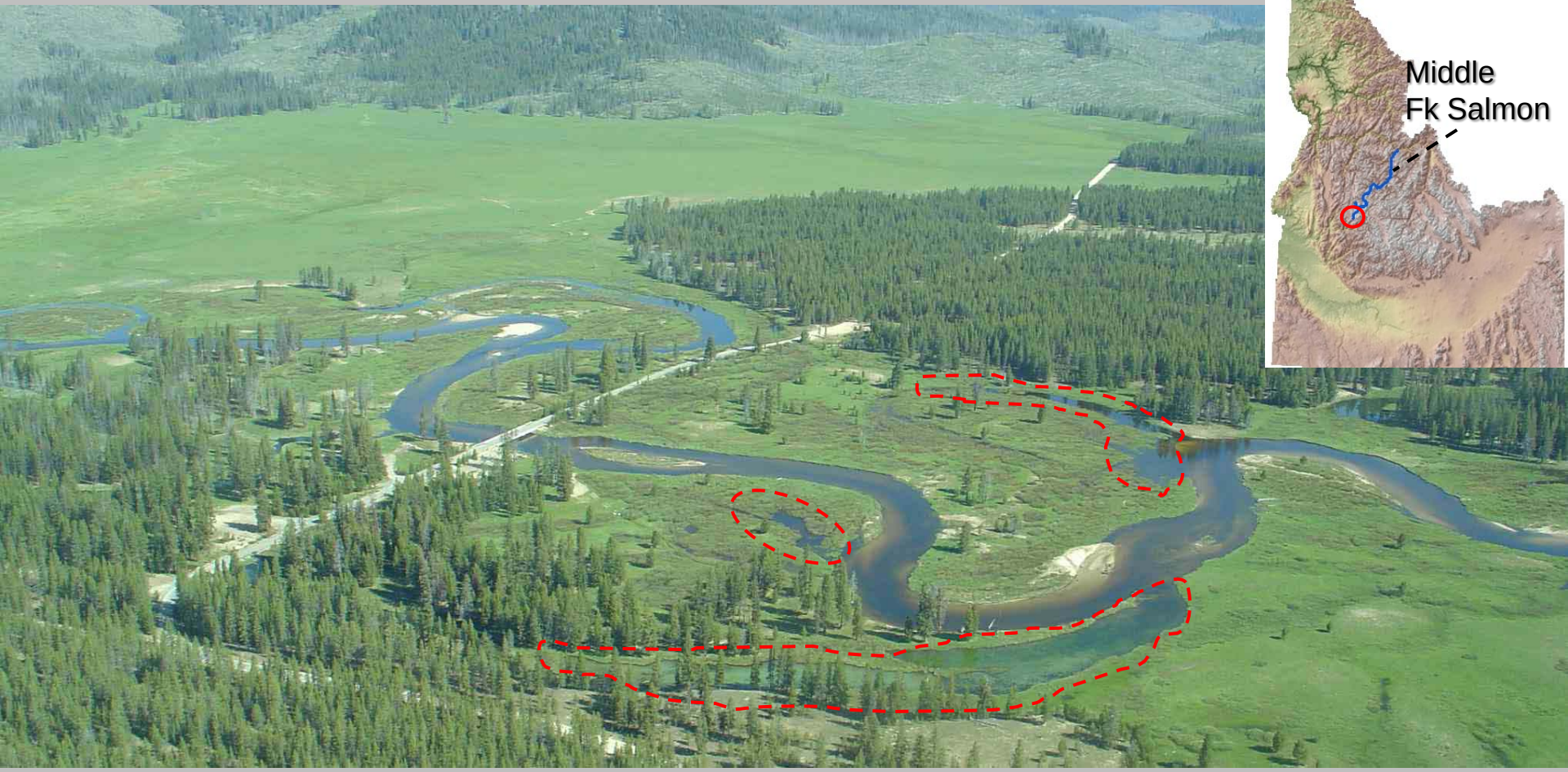
Effects of lower base flows on off-channel habitat (OCH)



Bear Valley Creek, tributary to upper Middle Fork Salmon River, Idaho – Bankfull flow conditions in early June

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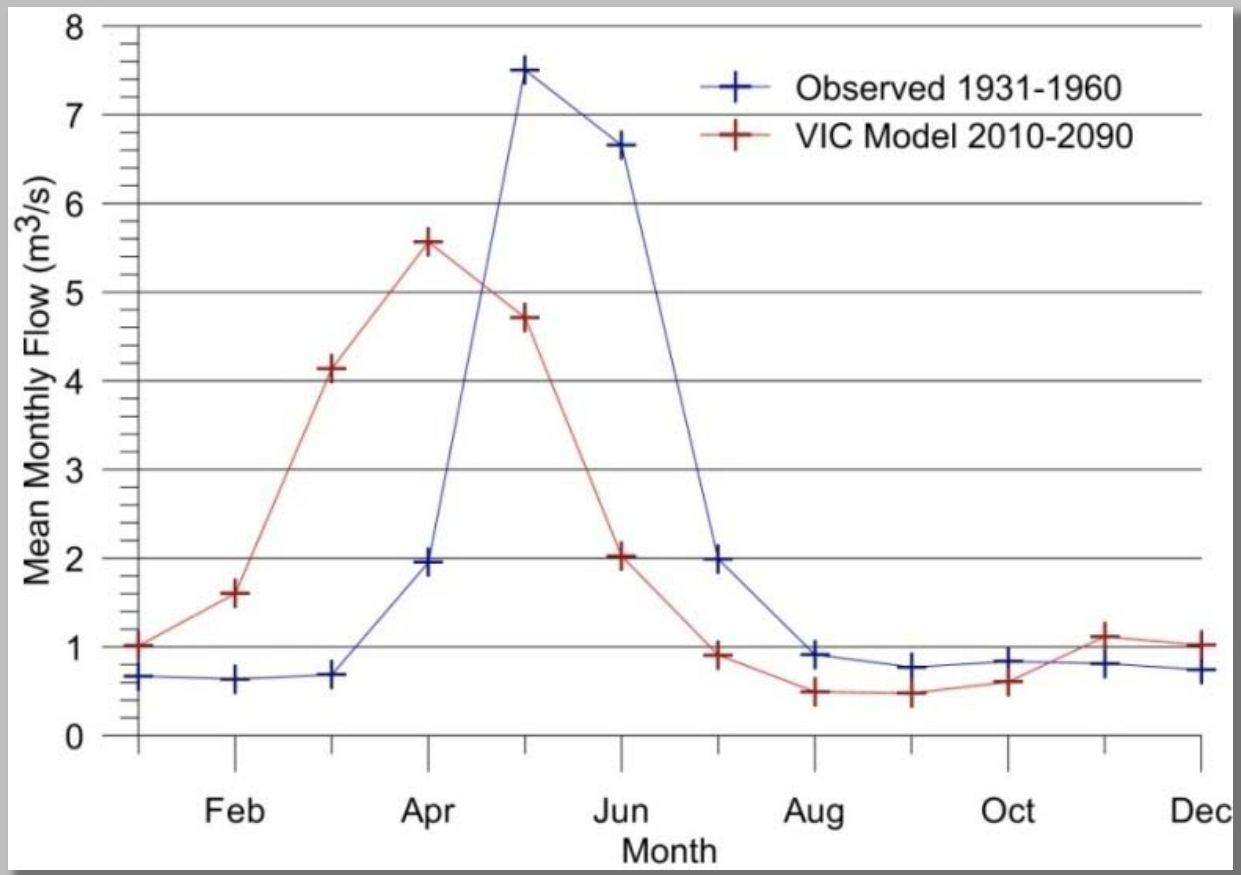
Effects of lower base flows on off-channel habitat (OCH)

Bear Valley Cr. observed and predicted flows



VIC model prediction courtesy of Chungling Tang, Univ of Washington (AR4 Precip)

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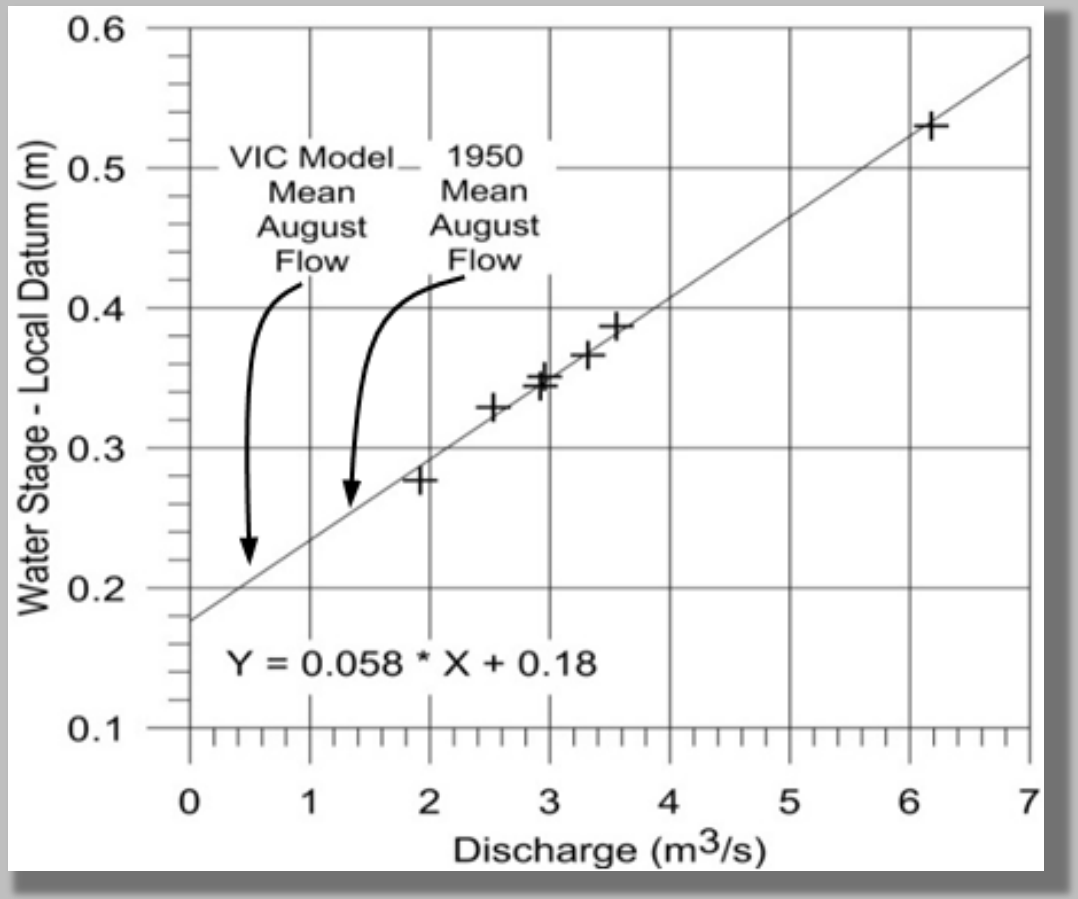
Effects of lower base flows on off-channel habitat (OCH)

Upper Bear Valley Cr. Rating Curve



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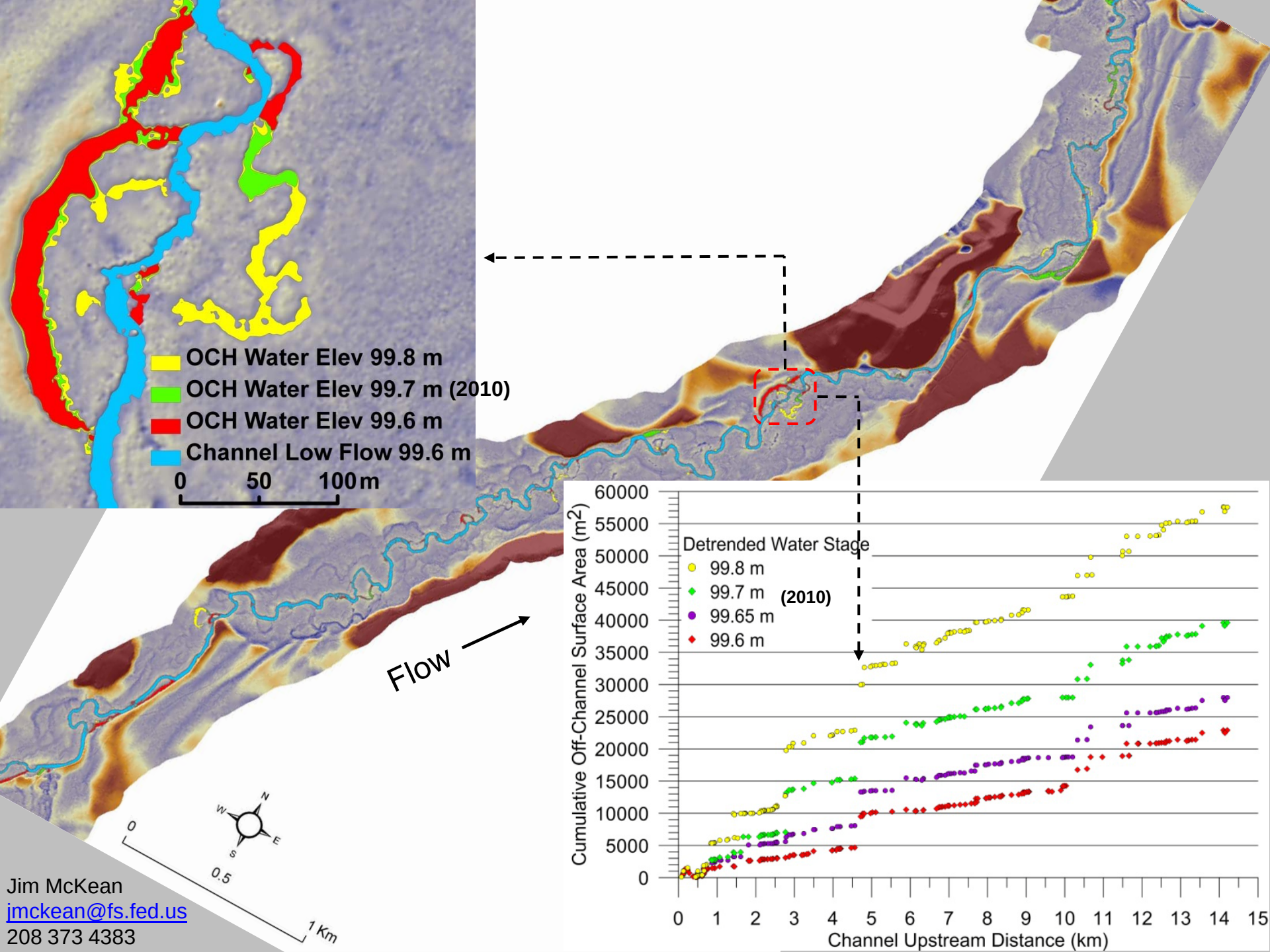

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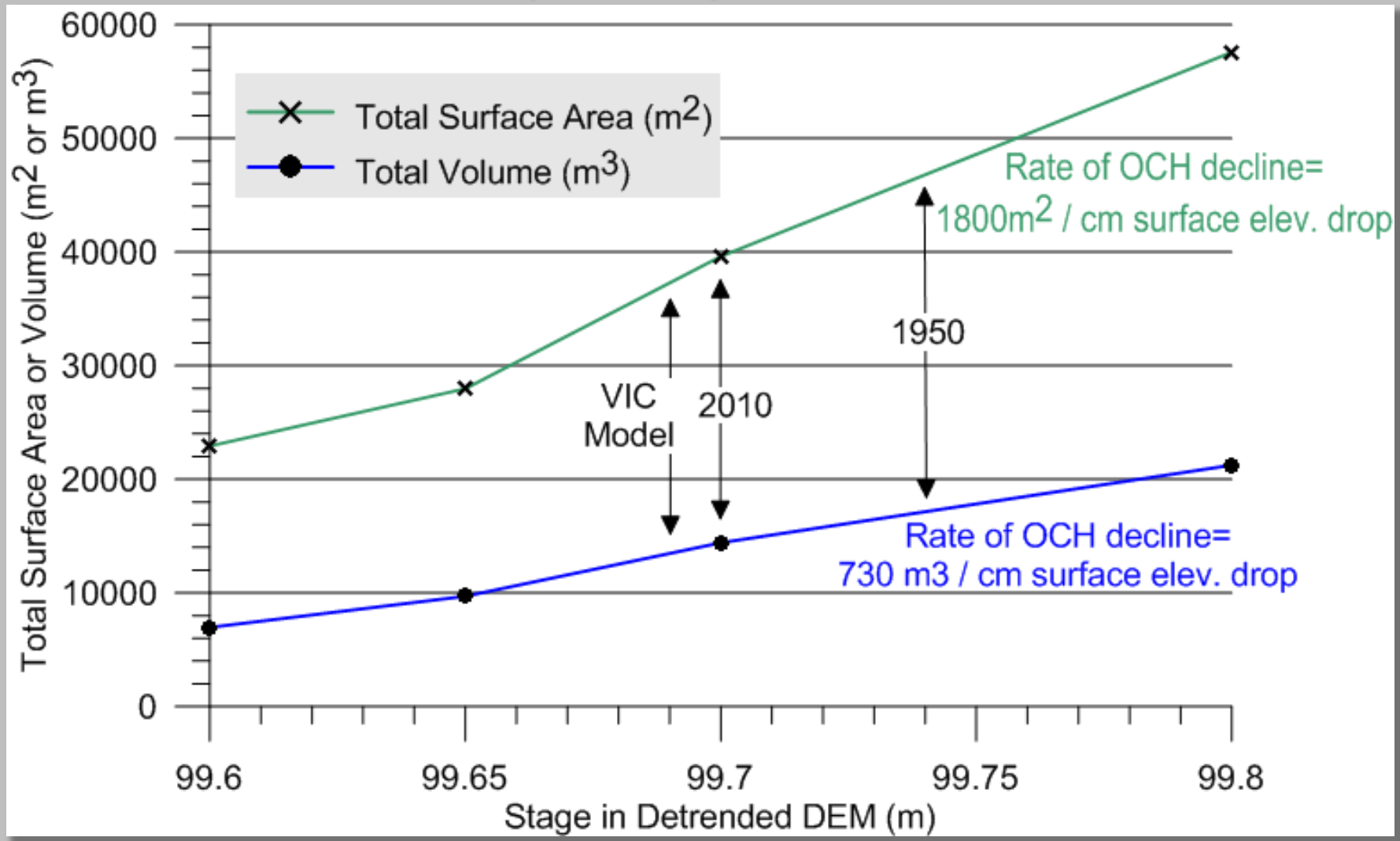
Effects of lower base flows on off-channel habitat (OCH)



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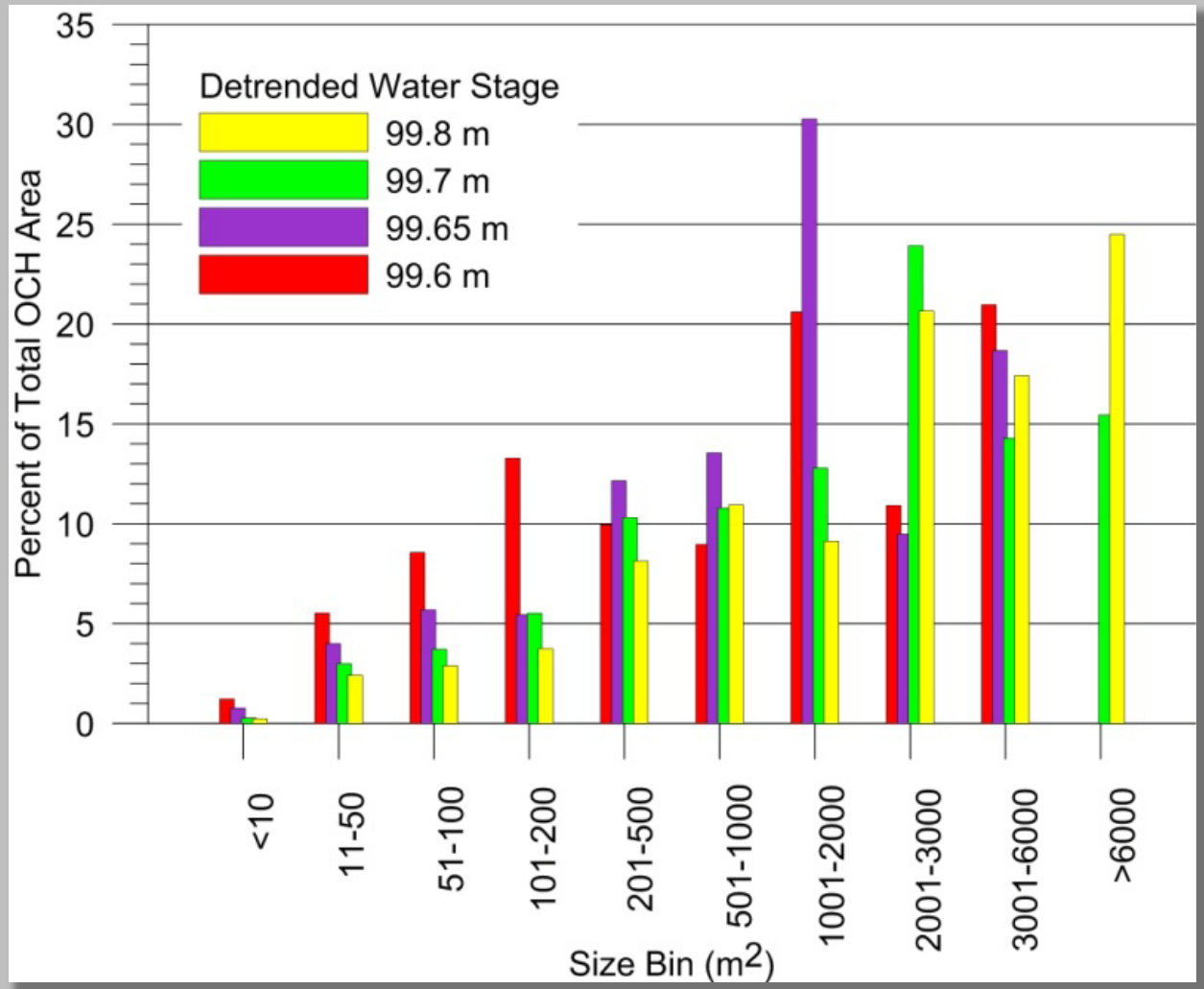
Effects of lower base flows on off-channel habitat (OCH)

Habitat disaggregates as stage declines



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Effects of lower base flows on off-channel habitat (OCH)

Conclusions:

- **Moderate loss of off-channel habitat with declining stage (about 20% of surface area: 1950-2100)**
- **Habitat patch sizes, spatial arrangement, continuity and connectivity also change**
- **VIC model predicts low flow 1 month earlier than at present**
- **Ground water effects ??**
- **Indirect climate change effects, e.g. sediment supply**
- **Biological responses ??**

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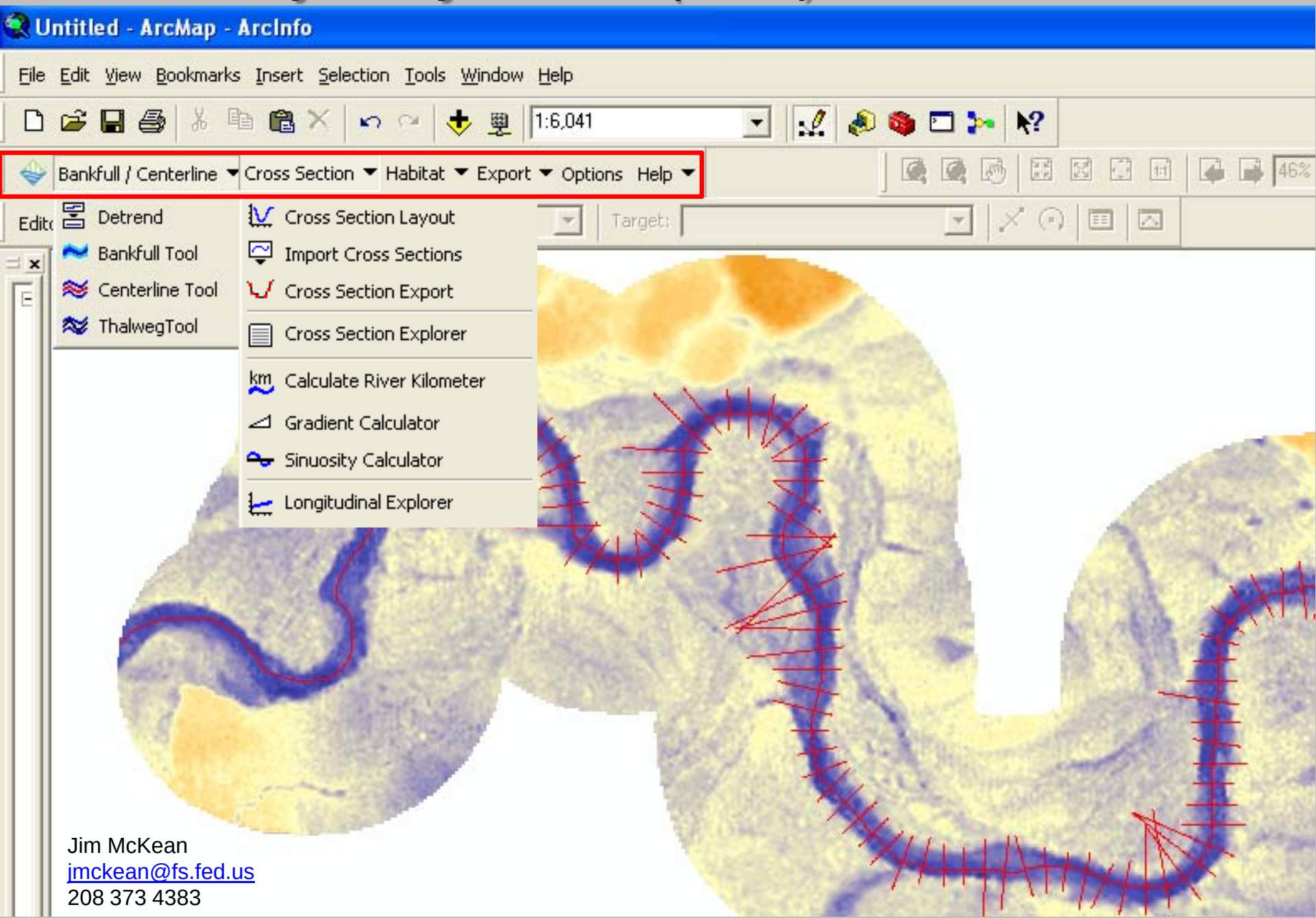
River Bathymetry Toolkit (RBT)



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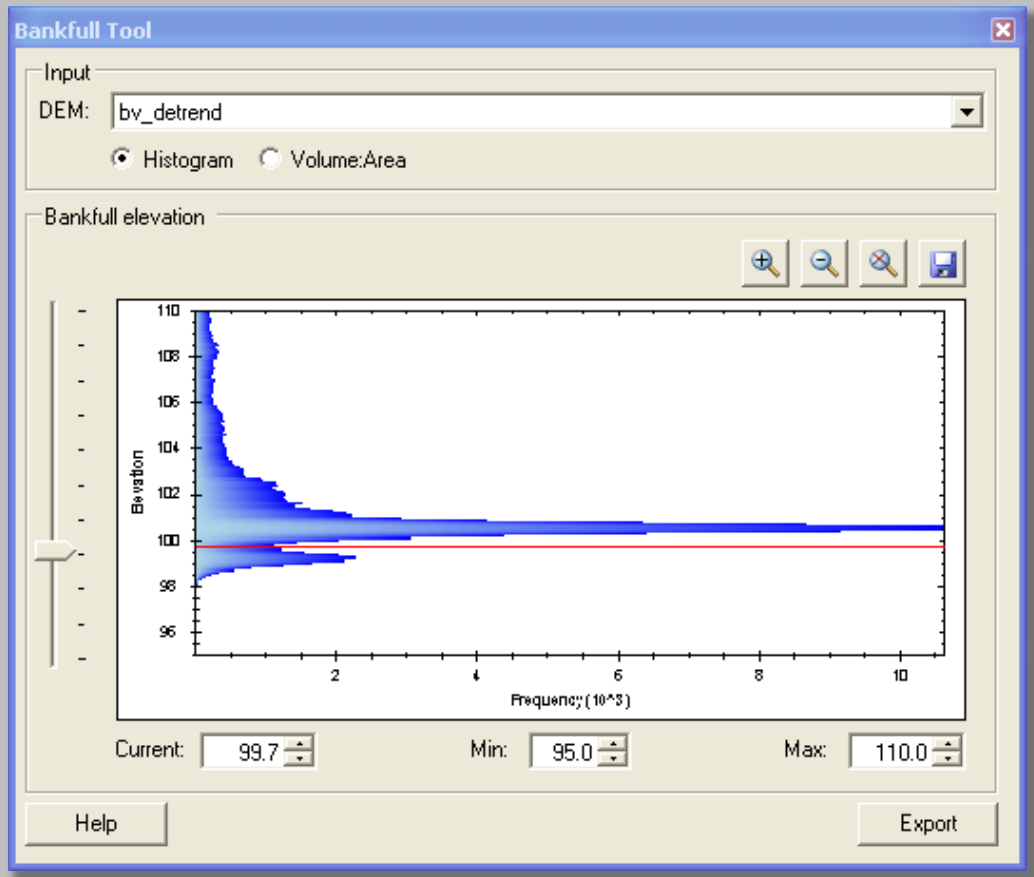
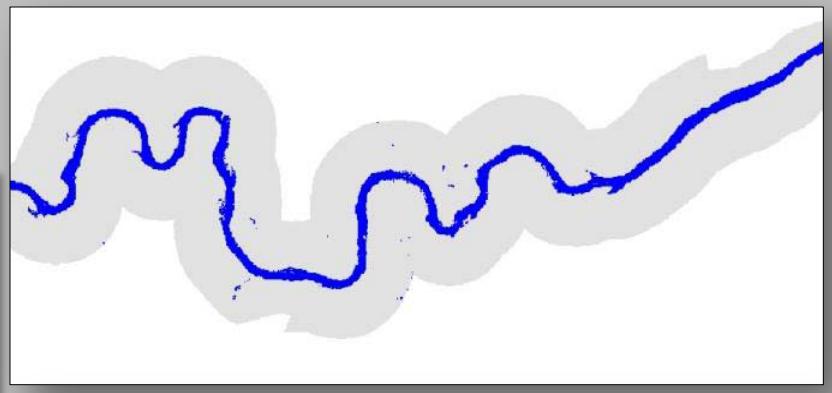
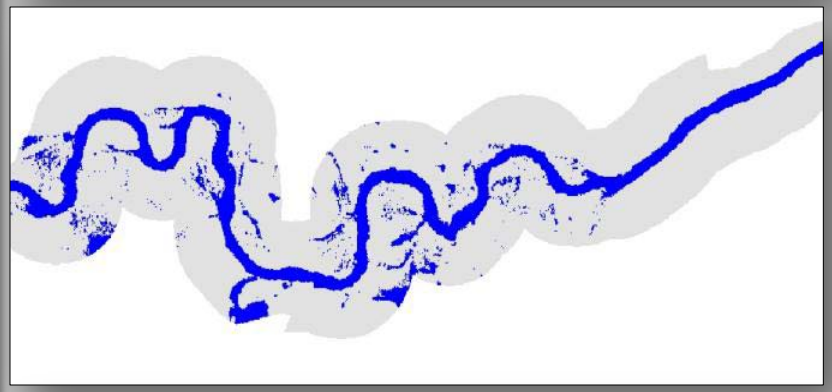
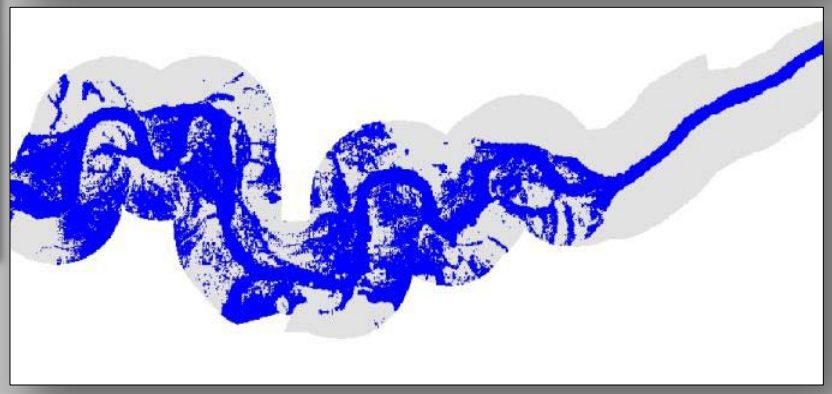
River Bathymetry Toolkit (RBT)

Bankfull Slider









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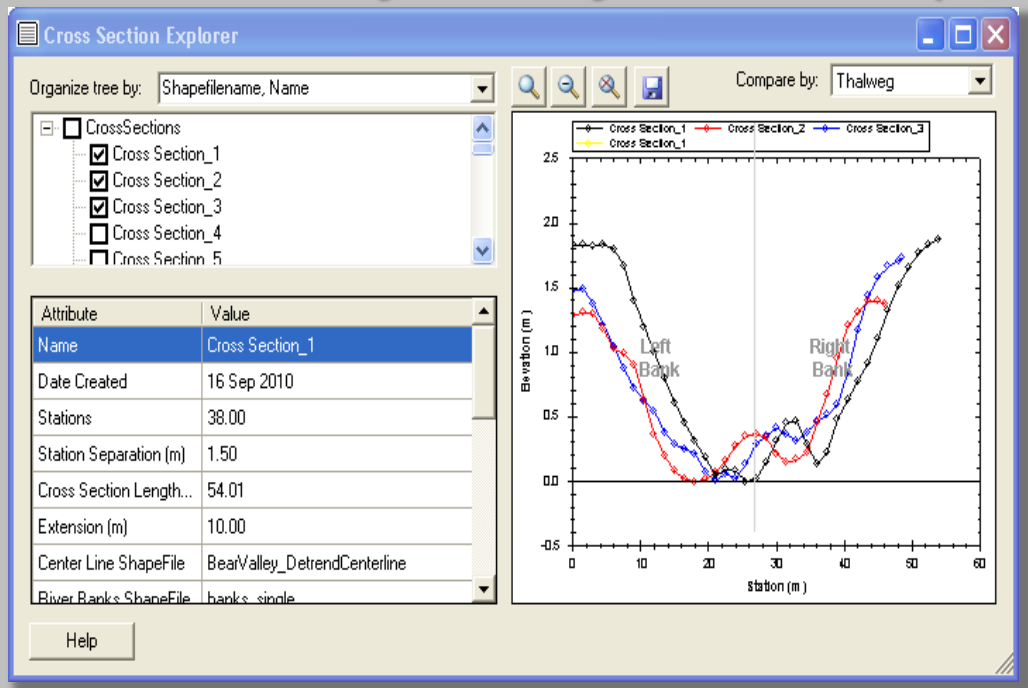
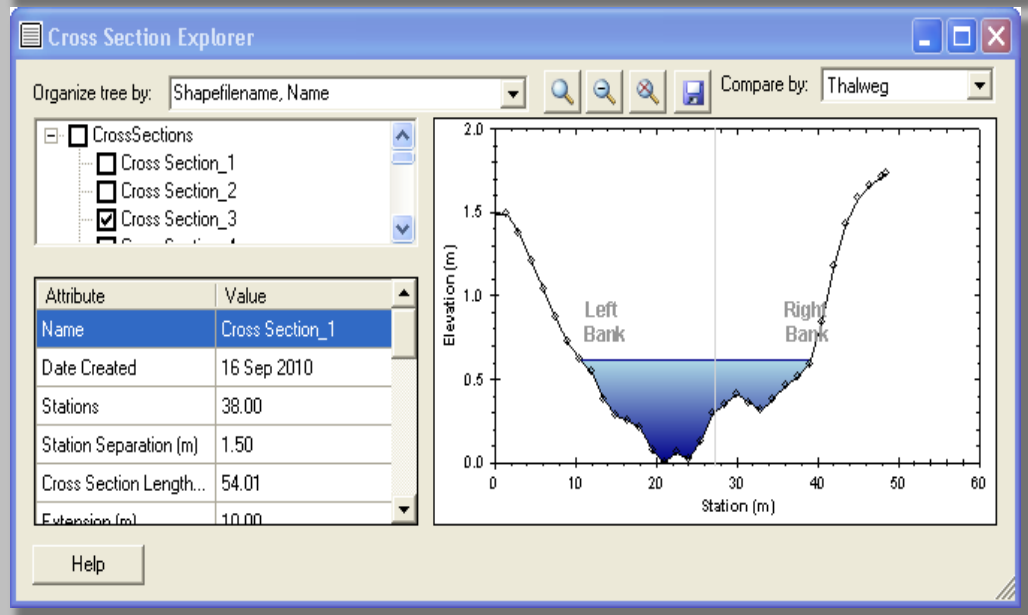
River Bathymetry Toolkit (RBT)

Cross Section Explorer





Attribute	Value
Name	Cross Section_1
Date Created	16 Sep 2010
Stations	38.00
Station Separation (m)	1.50
Cross Section Length...	54.01
Extension (m)	10.00
Center Line ShapeFile	BearValley_DetrendCent
River Banks ShapeFile	banks_single
DEM Raster	bv_dem2
River Kilometer (km)	3.32
Bankfull Elevation (m)	1,920.74
Bankfull Area (m2)	24.47
Bankfull Width (m)	34.05
Hydraulic Radius	0.72
Max Depth (m)	1.13
Mean Depth (m)	0.71
Wetted Perimeter (m)	34.21
Width/Depth	30.27
Gradient (%)	Unknown
Sinuosity	Unknown

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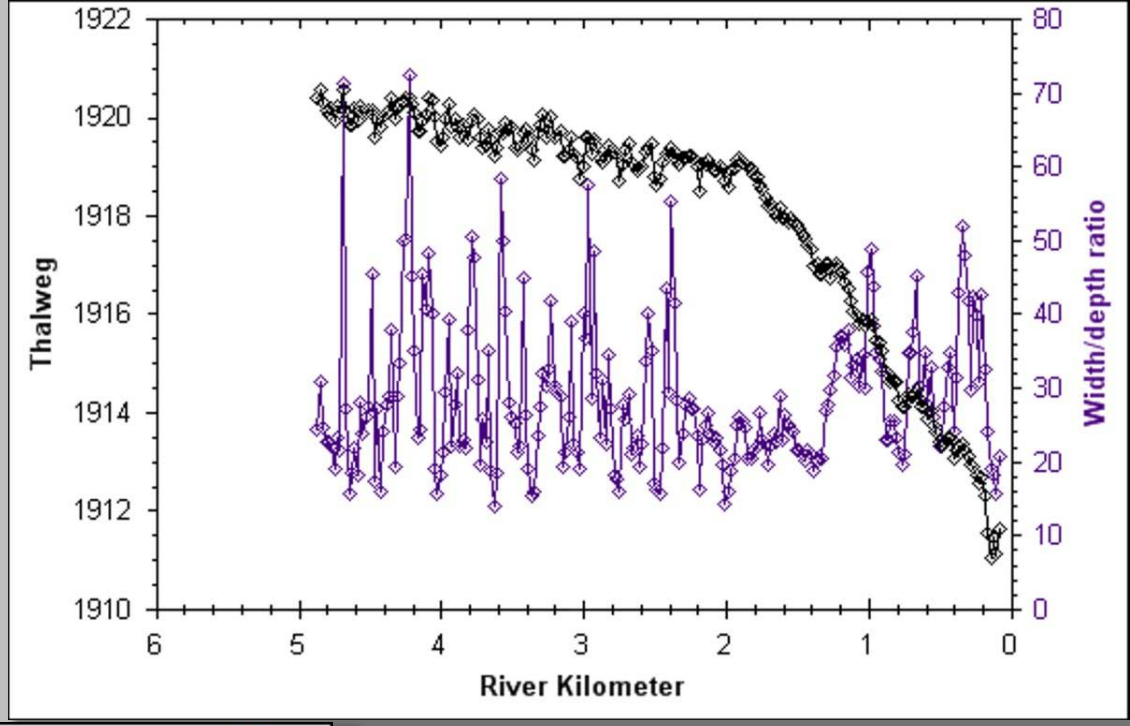
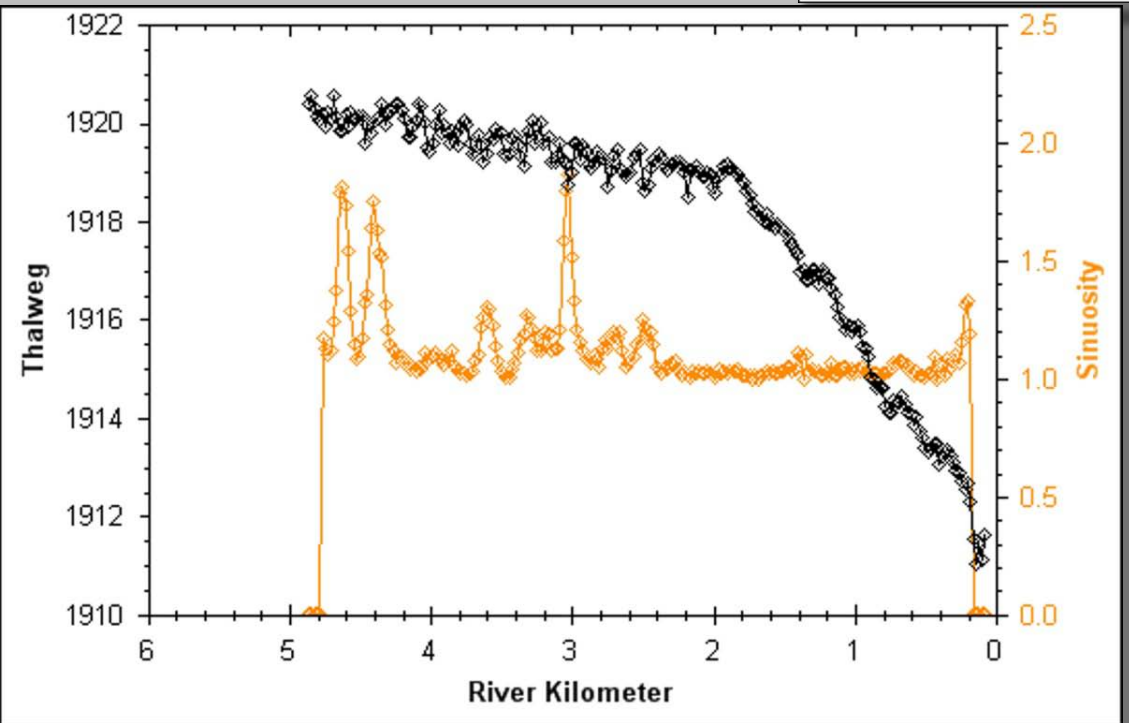
River Bathymetry Toolkit (RBT)

Longitudinal Explorer

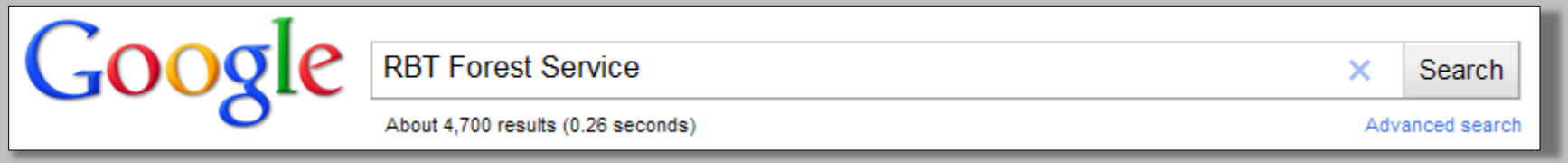




River Bathymetry Toolkit (RBT)

Web Site

Google
“RBT Forest Service”



http://www.fs.fed.us/rm/boise/AWAE/projects/river_bathymetry_toolkit.shtml

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