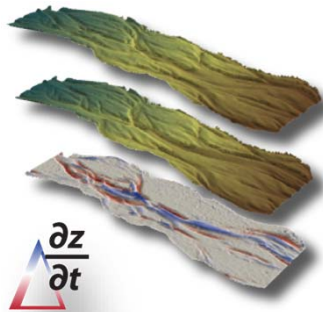


# GEOMORPHIC CHANGE DETECTION SOFTWARE



Joe Wheaton  
USBR Lecture Series



Day 1: March 7th, 2012



## GCD SOFTWARE

<http://gcd.joewheaton.org/>

**GEOMORPHIC CHANGE DETECTION SOFTWARE**

**GCD Software**

- GCD Homepage
- Download Software
- GCD Forum
- © 2011 - Disclaimer & Copyright

**Other Links**

- ICRRR
- ICRRR Short Courses
- Joe Wheaton's Website
- ESSA Technologies
- GCMRC (USGS)
- ET-AL (Lab)
- Links

Welcome to the *Geomorphic Change Detection Software* website.

**What Does it Do?**

The GCD software was developed primarily for morphological sediment budgeting in rivers. The volumetric change in storage is calculated from the difference in surface elevations from digital elevation models (DEMs) derived from repeat topographic surveys. As each DEM has an uncertain surface representation (which might vary in space and time), our ability to detect changes between surveys is highly dependent on surface representation uncertainties inherent in the individual DEMs. The fundamental problem is separating out the changes between the surveys that are due to geomorphic change as opposed to noise in the survey data. GCD provides a suite of tools for quantifying those uncertainties independently in each DEM and propagating them through to the DEM of difference. The program also provides ways for segregating the best estimates of change spatially using different types of masks. The overall suite of tools is more generically applicable to many different spatial change detection problems.

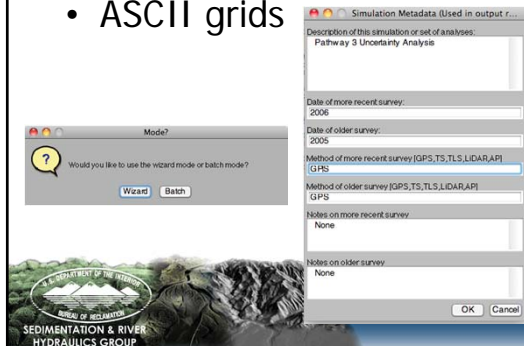
**Background**

The methodological development is described in ([Wheaton et al., 2010a](#)), the Wheaton (2008) thesis, and the Wheaton et al. (2010b) RRA paper. The [Matlab version of the code](#) (DoD 3) is provided as supplemental information with the [ESPL paper](#) so that readers can test or extend the code as they see fit for their purposes.

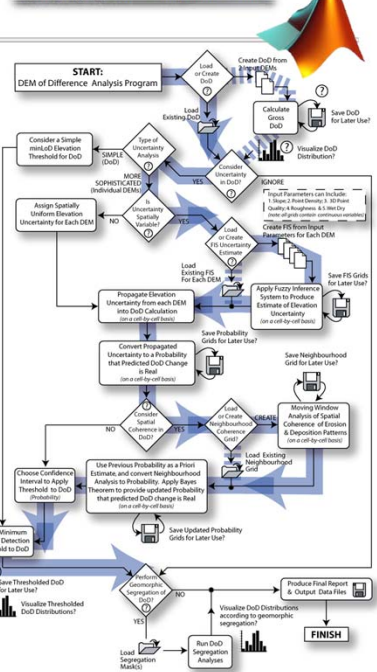


## DOD 3

- Matlab, Wizard Based
- Easy to modify code
- Don't need to know how to code to use...
- Poor Map Visualization
- ASCII grids



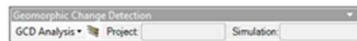
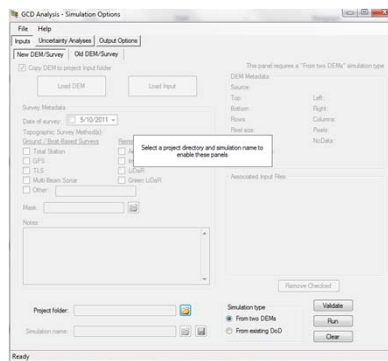
<http://gcd.joewheaton.org/versions/dod-3-0>



## GCD 4

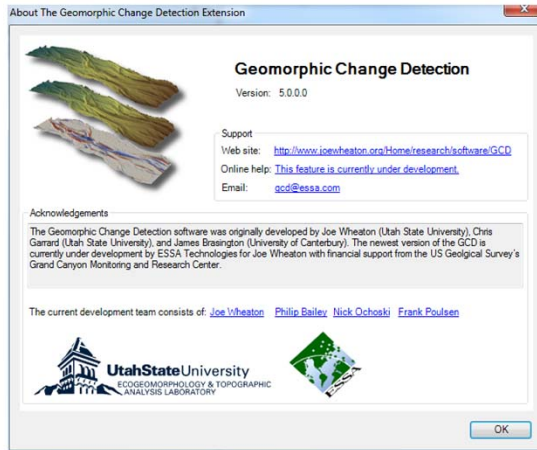
- ArcGIS Plugins (9 & 10)
- Stand Alone Version
- Big Effort was on Underlying C++ Library
- Can be ported into stand-alone apps, web apps, or Arc plugins

<http://gcd.joewheaton.org/versions/gcd-4-0>



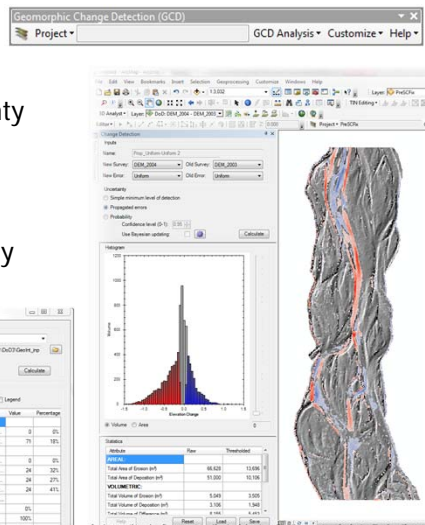
# GCD 5

- BETA!!!!
- More focus on User Interface
- Flexible Analyses
- Extended Functionality
- More Interactivity w/ Analysis

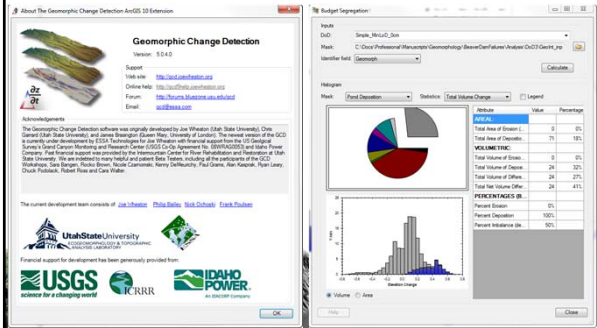


# THIS ANALYSIS USED TO BE CUMBERSOME

- Now, **GCD 5** makes it easy to:
  - Robustly estimate errors in DEMs
  - Determine significance of uncertainty on DoD & Sediment Budget
  - Calculate change in storage sediment budgets (with +/- vol.)
  - Quantitatively interpret and spatially segregate budget



<http://gcd.joewheaton.org>



## ACKNOWLEDGEMENTS

Matlab Software & Methods presented developed in association with:

- James Brasington
- Steve Darby & David Sear



GCD 5 Software developed with

- Philip Bailey
- Nick Ochoski
- Frank Poulsen



GCD 4 Software developed with:

- Chris Garrard



Funding from:



## VOLUNTEERS TOMORROW?



# SHAMELESS SELF PROMOTION PLUG

Course & Workshop Information

Stream Restoration > Workshop Information

## "Geomorphic Change Detection: Restoration Monitoring" Workshop

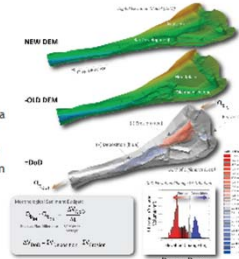
May 7-9, 2012 in Logan, Utah

Cost: \$1000

This intensive 3 day workshop is intended for resource managers, restoration practitioners, researchers and others involved in the monitoring of rivers and/or streams. Participants will come away with a) an understanding of the theory and tools behind geomorphic change detection from repeat topographic surveying using a variety of ground-based and remotely-sensed surveying technologies; as well as b) a working knowledge of how to apply the Geomorphic Change Detection software (provided) to their own monitoring data. Examples will be used from both baseline monitoring and post-project monitoring of restoration projects.

Instructors include Joe Wheaton (Utah State University), Philip Bailey (ESSA Technologies), and Frank Poulsen (ESSA Technologies)

See GCD workshop website for more information:



## GEOMORPHIC CHANGE DETECTION RESTORATION MONITORING WORKSHOP



<https://cwr.usu.edu/streamrestoration/>

