

## Streambank Mapping Driftwood River to Identify Areas of Erodibility

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## Driftwood Watershed



Rapid Watershed Assessment  
Driftwood Watershed, USDA, NRCS

- Located in Indiana
- Drainage area  $\approx$  738,400ac
- Big Blue River and Sugar Creek join to form the Driftwood River.
- Tributary of the East Fork of the White River.

## Why Identify Eroding Streambanks?

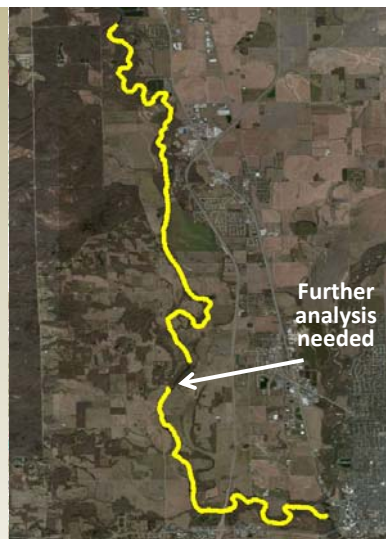
- Eroded and destabilized streambanks are a source of excess sediment
- Excess sediment in streams:
  - Harms aquatic life
  - Reduces potential recreational use
  - Disrupts biological, physical, and chemical processes

## Driftwood River Assessment

- Implement video mapping system
- BES1 video interpretation
- Integrate video assessment into ArcGIS
- Identify highly erosive areas

## Driftwood River Assessment

- Funded by Department of Defense Legacy Program
- Look at stream bank erodibility
- 12 mile section mapped



## Streambank Video Mapping System

### Global Positioning System (GPS)

1HZ Trimble 132  
2 standard strings:  
RMC and GGA  
Position, time,  
velocity, direction (COG)

**2 River Width Sensors:** RS-100, 10HZ  
Range = 100yds

**Depth:** CruzProATU120S or Lowrance LMS350A  
Depends on canoe or kayak mounted

**3 Cameras:** Contour GPS ,1080p video,135° wide-angle, full HD  
Calibrated scale for bank height and other object measurements



# Mapping In Progress



# Bank Erosion Susceptibility Index (BESI)

Connell, BESI, (2012)

Bank Erosion Susceptibility Rating	BankHeight to Bankfull Height (Ratio)	Riparian Diversity (%)	Bank Angle (Degrees)	Surface Protection (%)	Index Totals
<b>Low</b>	Value 1.0-1.19 Index 2.45	Optimal	0-60	55-100	9.8-18.5
<b>Moderate</b>	Value 1.2-1.5 Index 4.95	Sub Opt	61-80	30-54	18.6-24.4
<b>High</b>	Value 1.6-2.0 Index 6.95	Marginal	81-90	15-29	24.5-30.2
<b>Very high</b>	Value > 2.1 Index 9	Poor	>91	< 14	30.3-36.0

Rosgen, Bank Erosion Hazard Index, (2001)

Stream Bank Hazard or Risk Rating	Bank Height to Bankfull Height (Ratio)	Root Depth to Bank Height (Ratio)	Root Density (%)	Bank Angle (Degrees)	Surface Protection (%)	Index Totals
<b>Very Low</b>	Value 1.0-1.1 Index 1.0-1.9	1.0-0.9	100-80	5-20	100-80	5-9.5
<b>Low</b>	Value 1.1-1.19 Index 2.0-3.9	0.89-0.5	79-55	21-60	79-55	10-19.5
<b>Moderate</b>	Value 1.2-1.5 Index 4.0-5.9	0.49-0.3	54-30	61-80	54-30	20-29.5
<b>High</b>	Value 1.6-2.0 Index 6.0-7.9	0.29-0.15	29-15	81-90	29-15	30-39.5
<b>Very High</b>	Value 2.1-2.8 Index 8.0-9.0	0.14-0.05	14-5.0	91-119	14-10	40-45
<b>Extreme</b>	Value > 2.8 Index 10	< 0.05	< 5	< 119	< 10	46-50

# BESI Video Interpretation

- Bank Angle
- Bank Height
- Surface Protection
- Riparian Diversity



Bank Angle (deg)	Bank Height (ft)	Surface Protect (Avg. %)	Riparian Diversity
0-60 =2.45	61-80 =4.95	81-90 =6.95	>91 =9
0-1ft	1ft-3ft	3ft-6ft	6ft-9ft
9ft-12ft	12ft-18ft	>18ft	
100-56	55-30	29-15	<14
=2.45	=4.95	=6.95	=9
Optimal	Sub Opt	Marginal	Poor
=2.45	=4.95	=6.95	=9



Bank Angle = 6.95, Bank Height = 7.5, Surface Protection = 9, Riparian Diversity = 9

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# Bank Erosion Susceptibility Index (BESI) Score Guide

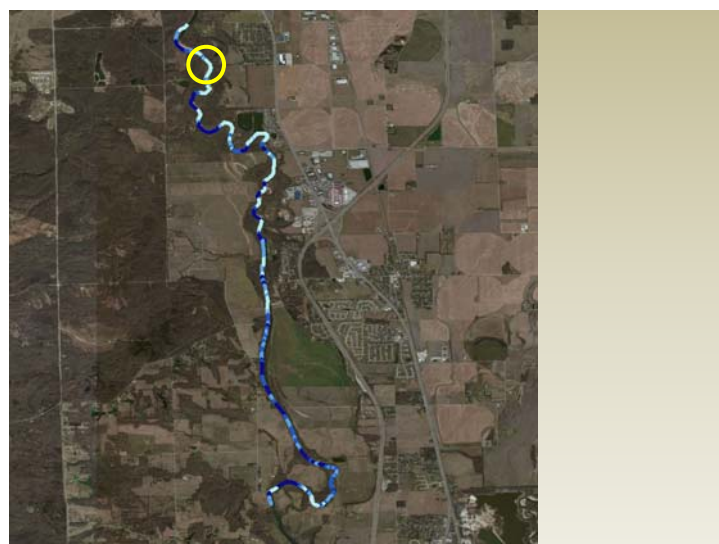
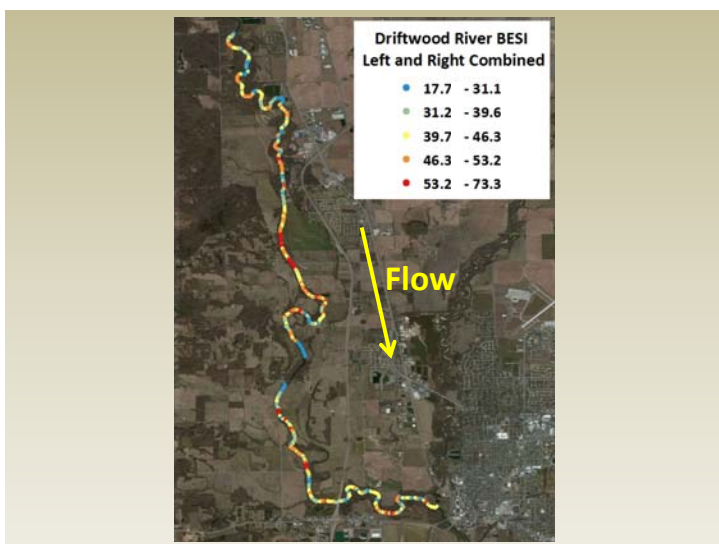
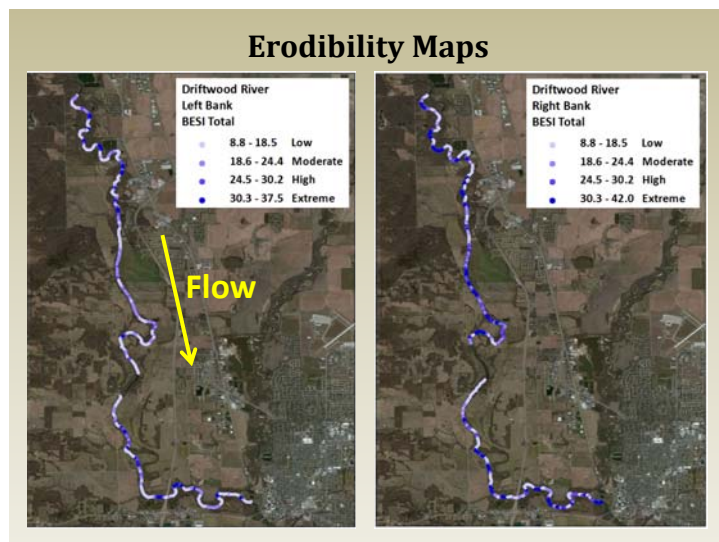
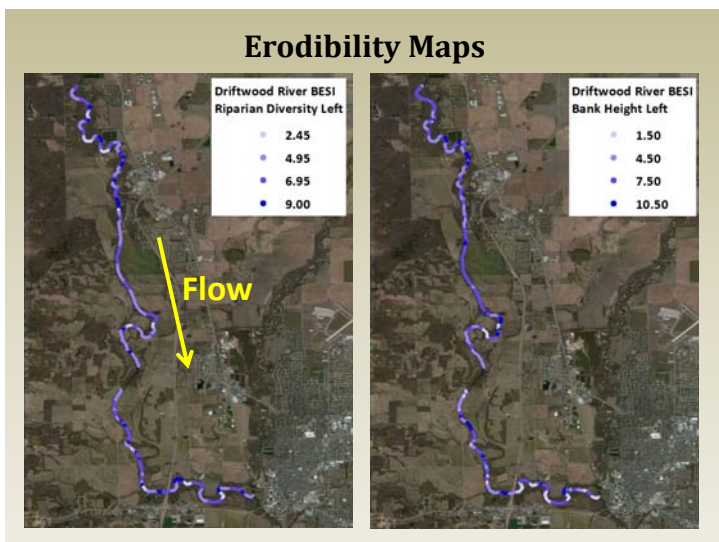
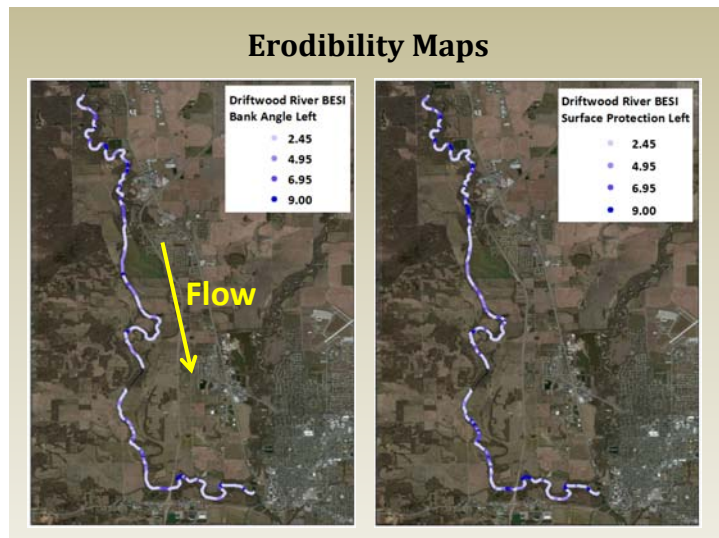
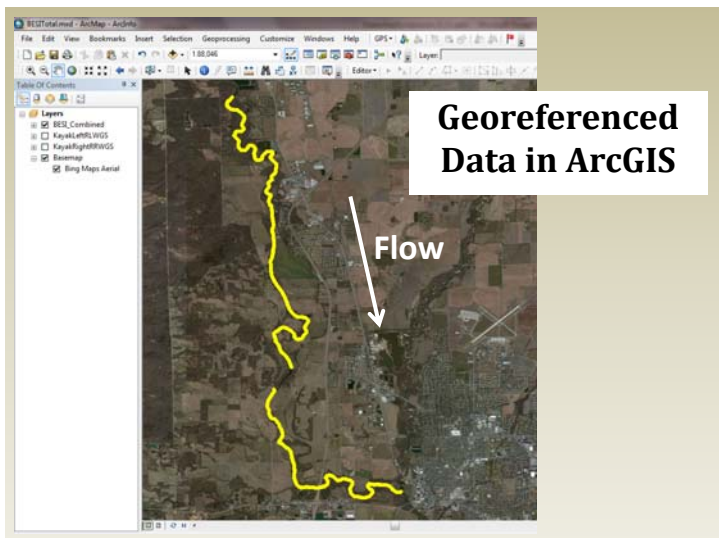
$$BESI = BA + BH/BFH + SP + RD$$

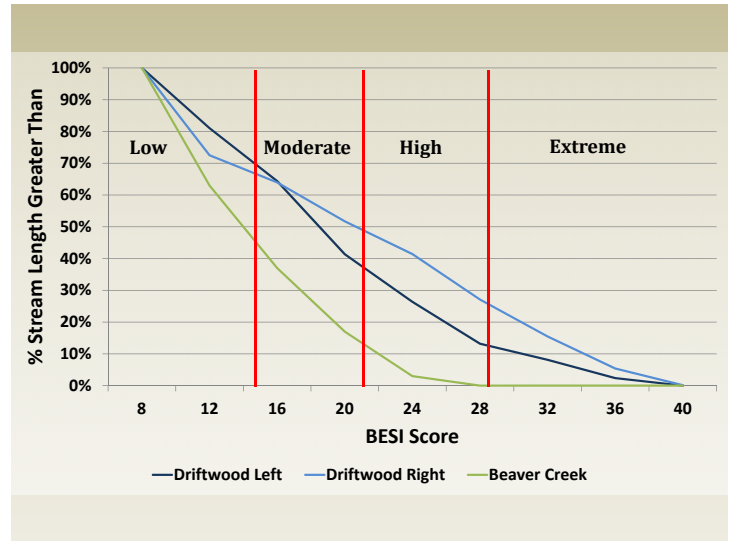
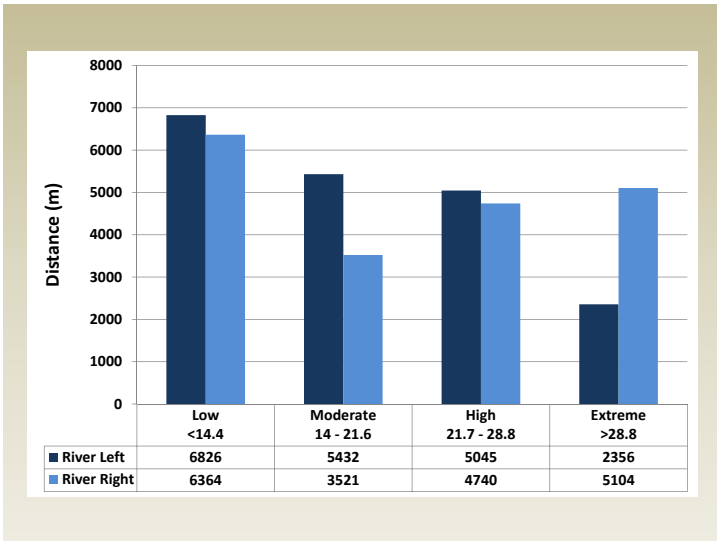
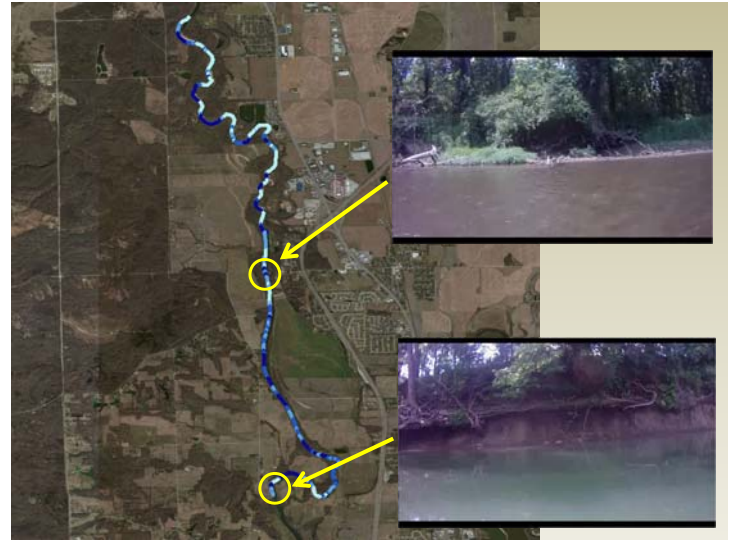
Rating	BESI Score
Low	< 14.4
Moderate	14.5 - 21.6
High	21.7 - 28.8
Extreme	28.9 - 36



Bank Angle = 6.95, Bank Height = 7.5, Surface Protection = 9, Riparian Diversity = 9

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### Field Validation

Connell, (2012)

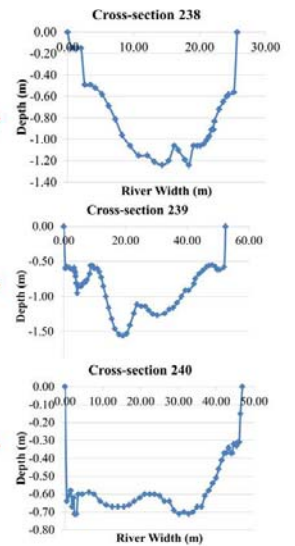
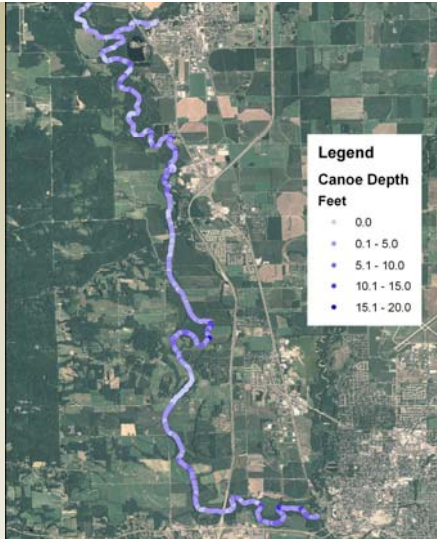
### Benefits of Streambank Video Mapping

- Determine erodibility and erosivity
- Identify areas of restoration needs
- Possible to estimate total streambank erosion?
- Cover large areas (10 miles/day) - continuous
- Non-intrusive, no access required
- Permanent video database
- EPA "approved" for Watershed Assessment of River Stability & Sediment Supply (WARSSS)

### Questions?

## Driftwood River

- 18 miles
- 38,503 Sample Points
- Avg. Thalweg Depth of 0.96 m
- Maximum Depth of 6.52 m



450 cross-sections in 2 days

## River Maps

- First 275 cross-sections
- Avg. river width: 41 m
- Avg. cross-sectional area: 36.5 m<sup>2</sup>
- Avg. velocity: 0.40 m/s

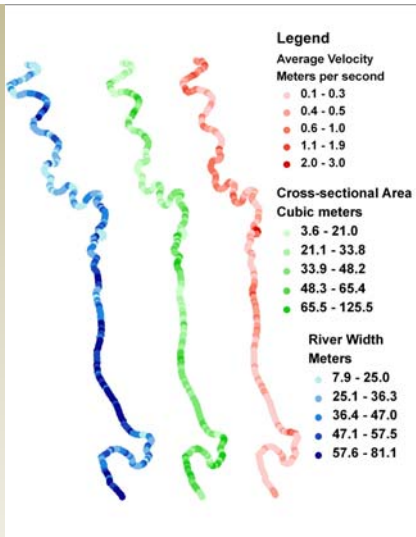


Figure 1: Photo from New River (TN) showing:

Bank Angle = 9, Bank Height = 7.5 ft, Surface Protection = 6.95, Riparian Diversity = 6.95.



Bank Angle = 6.95, Bank Height = 7.5, Surface Protection = 9, Riparian Diversity = 9  
BESI value = 32.45

