Introduction to Indicator Development

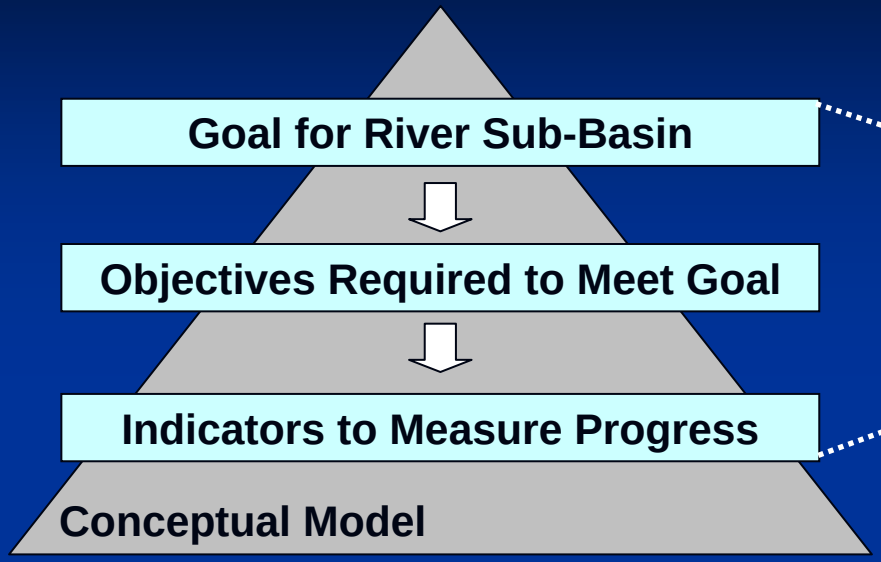
- Review Definitions
- How Indicators fit into an Instream Flow Study
- Examples: Goal, Objectives, Indicators, and Conceptual Model
- Indicators for the Lower San Antonio
- Questions?

Definitions:

- Goal: a vision of a healthy environment for the river system that reflects local values
- Objectives: specific means to accomplish goal
- Indicators: measures that show progress in meeting objectives
- Conceptual model:

  a representation of how a system is thought to function

How Indicators Fit in the Process



Collect Baseline Information and Evaluate

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Goal Development Consistent with Sound Ecological Environment

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Study Design

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Multidisciplinary Data Collection and Evaluation

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Data Integration to Generate Flow Recommendations

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Study Report

Example: Murray-Darling Basin

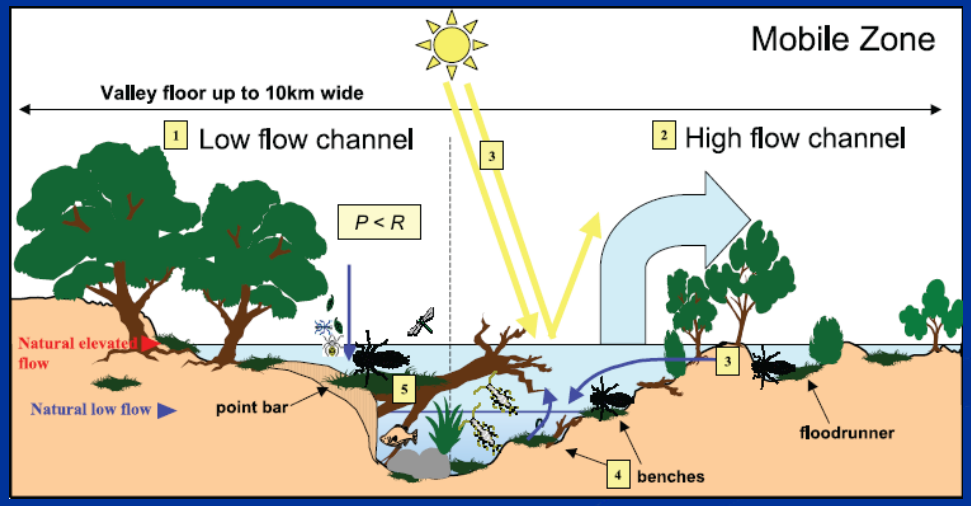
- **Goal:** "a healthy, working river – one that assures us of continued prosperity, clean water and a flourishing environment."

Goal: a healthy, working river

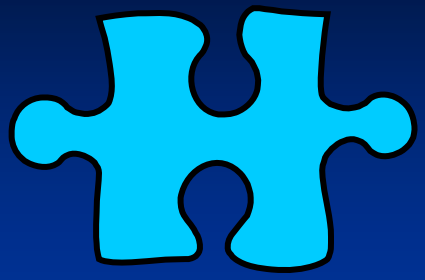
- **Objectives:**

1. Reinstate ecologically significant elements of the flow regime

Hydrology & Hydraulics



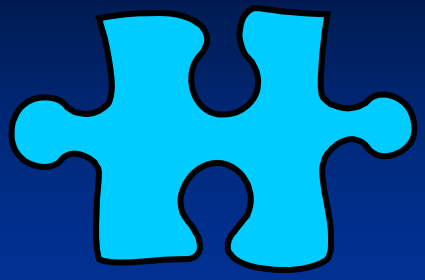
Reinstate ecologically significant elements of the flow regime



- **Indicators:**

High Flow:	**Number of 1 in 10 year floods**
Low/zero flow:	**Number of low flow events**
Variability:	**Seasonal amplitude**
Seasonality:	**Seasonal period index**
Flow volume:	**Median annual flow volume** **Mean annual flow volume**

Reinstate ecologically significant elements of the flow regime



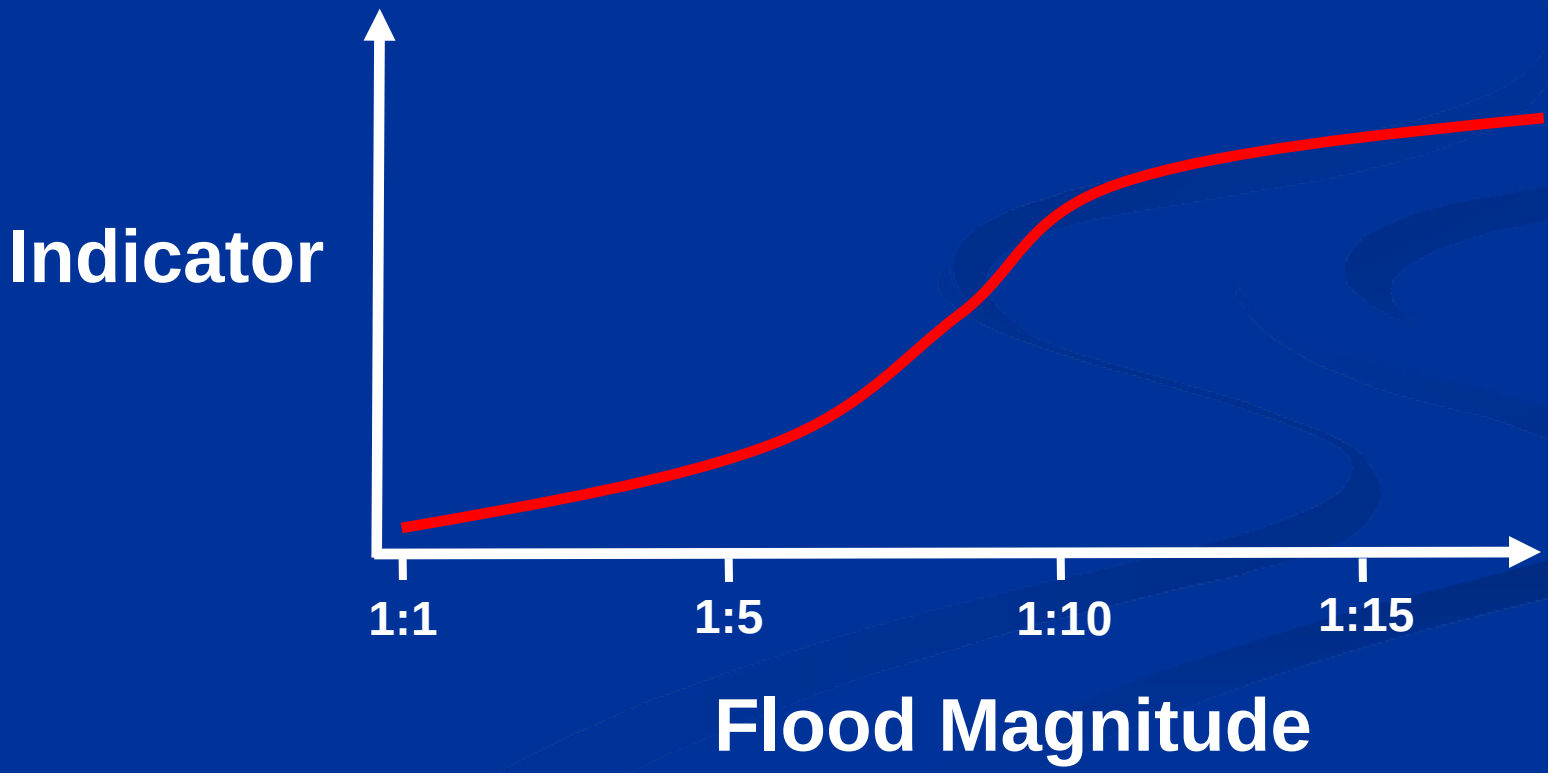
- **Indicators:**

High Flow: **Number of 1 in 10 year floods**

Reinstate ecologically significant elements of the flow regime

- **Indicators:**

High Flow: **Number of 1 in ~~10~~ ? year floods**



Lower San Antonio River System

- **Statewide Goal:** "A resilient, functioning ecosystem characterized by intact, natural processes and a balanced, integrated, and adaptive community of organisms comparable to that of the natural habitat of the region."
- **Specific Goal:** "The goal for the Lower San Antonio River system is a naturally functioning and sustainable ecosystem that supports a balance of ecological benefits and economic, recreational, and educational uses."

Lower San Antonio River System

- **Statewide Objectives:**

"Evaluate intact natural processes:

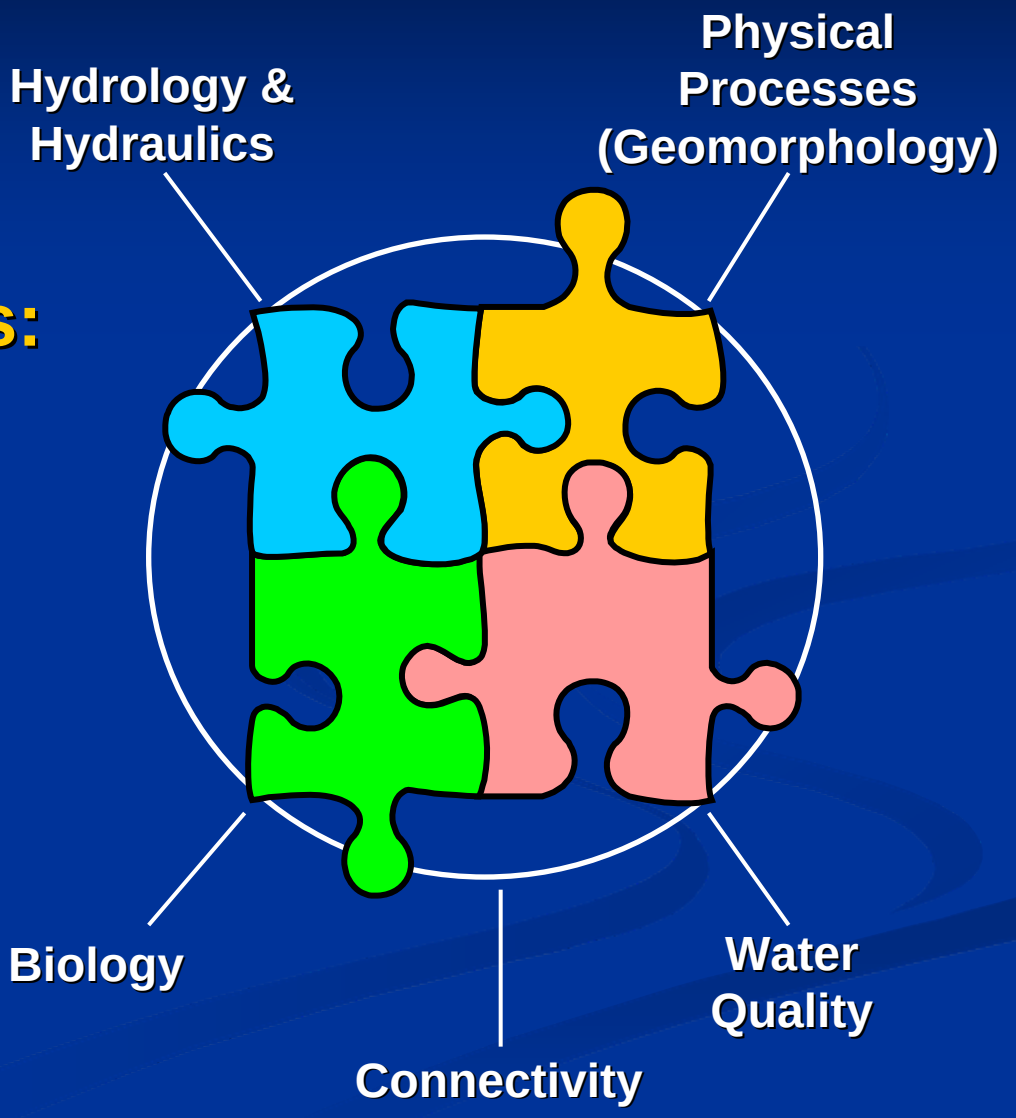
- **Characterize system hydrology and hydraulics**
- **Examine status of geomorphic processes within the system**
- **Characterize system water quality**
- **Define connectivity issues within the system**

Evaluate biological communities

- **Examine the integrity of the biological community**
- **Examine biodiversity within the system**
- **Define the influence and relationship of other riverine components relative to biology of system."**

Lower San Antonio River System

- **Specific Objectives:**



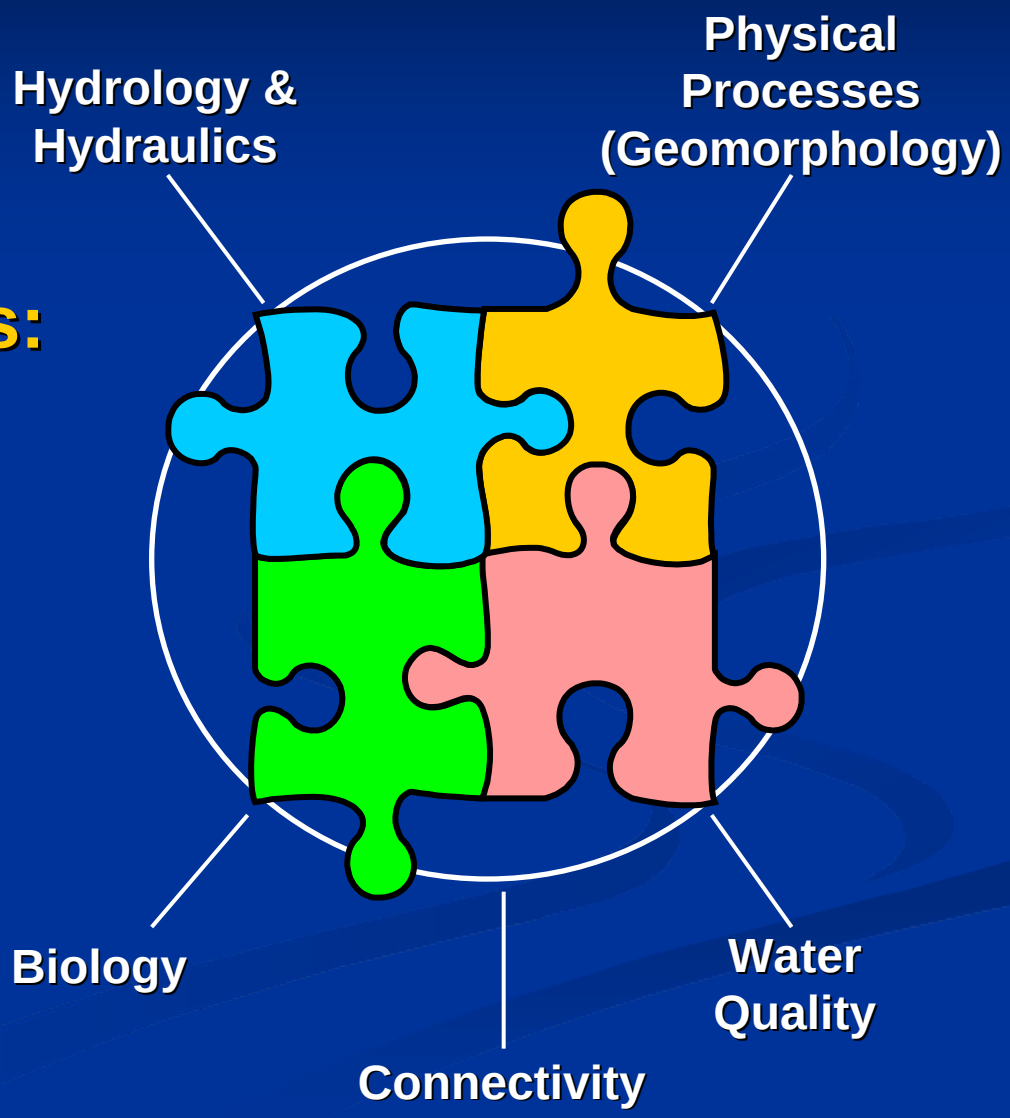
Lower San Antonio River System

- Goal: … a naturally functioning and sustainable ecosystem ….
- Objectives: … native species and biological communities known to occur in the river and riparian zones
- Indicators: measures collected in riparian areas
  - How often they receive flow from the river
  - Soil moisture throughout the year
  - Amount of sediment and nutrients from river

Lower San Antonio River System

- **Specific Objectives:**

Other ?



Lower San Antonio River System

Statewide Goal:

- "a Sound Ecological Environment"

Specific Objectives: Other

- Define goals for recreational uses of the San Antonio River (type and location)
- Buy-in from stakeholders and users

Questions?