

# Introduction to Goal Development

- Definition of a “Goal” for a river
- How a Goal fits into an Instream Flow Study
- Examples: Goal, Objectives, Indicators
- 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



# How a Goal Fits in the Process

**Goal Development Consistent with  
Sound Ecological Environment**

**Collect Baseline  
Information and Evaluate**



**Collaborate with Public and  
Stakeholders through  
Meetings and Workgroups**



**Study Design**



**Multidisciplinary  
Data Collection  
and Evaluation**



**Data Integration  
to Generate Flow  
Recommendations**



**Study Report**



# Example of Goal, Objectives, and Indicators:

- **Goal:** maintaining the current health and productivity of the river, including ..... maintaining riparian areas, .....
- **Objectives:** provide adequate overbank flows to maintain bottomland hardwood areas
- **Indicators:** measures collected in bottomland hardwood areas
  - Soil moisture throughout the year
  - How often they receive flow from the river
  - Amount of sediment and nutrients from river

# Example: Murray-Darling Basin

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

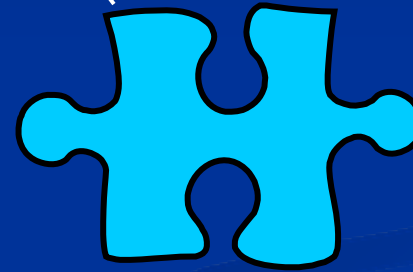


# Goal: a healthy, working river

## ■ Objectives:

1. Reinstate ecologically significant elements of the flow regime

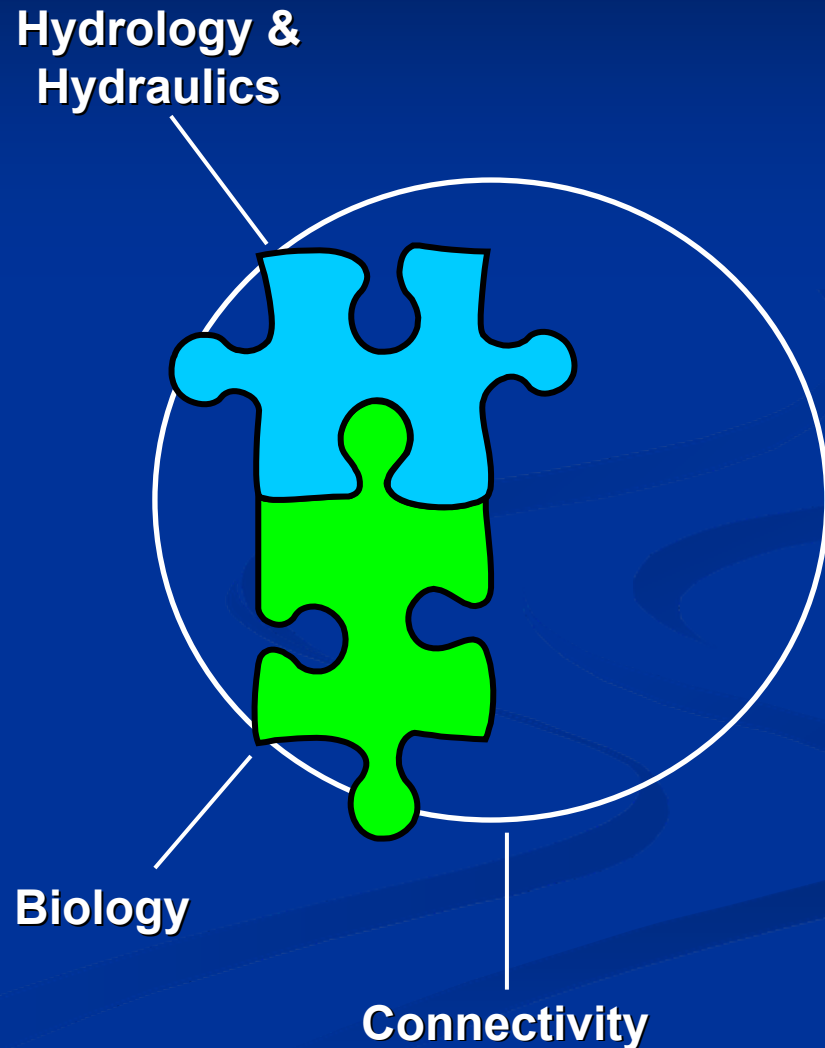
Hydrology &  
Hydraulics



# Goal: a healthy, working river

## ■ Objectives:

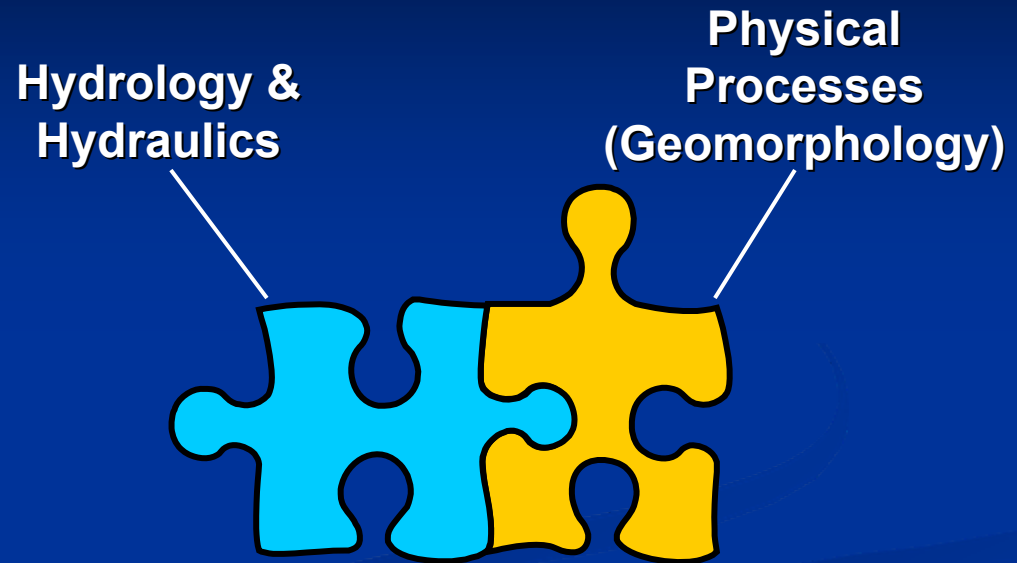
2. Overcome barriers to migration of native fish species



# Goal: a healthy, working river

## ■ Objectives:

3. Maintain current levels of channel stability

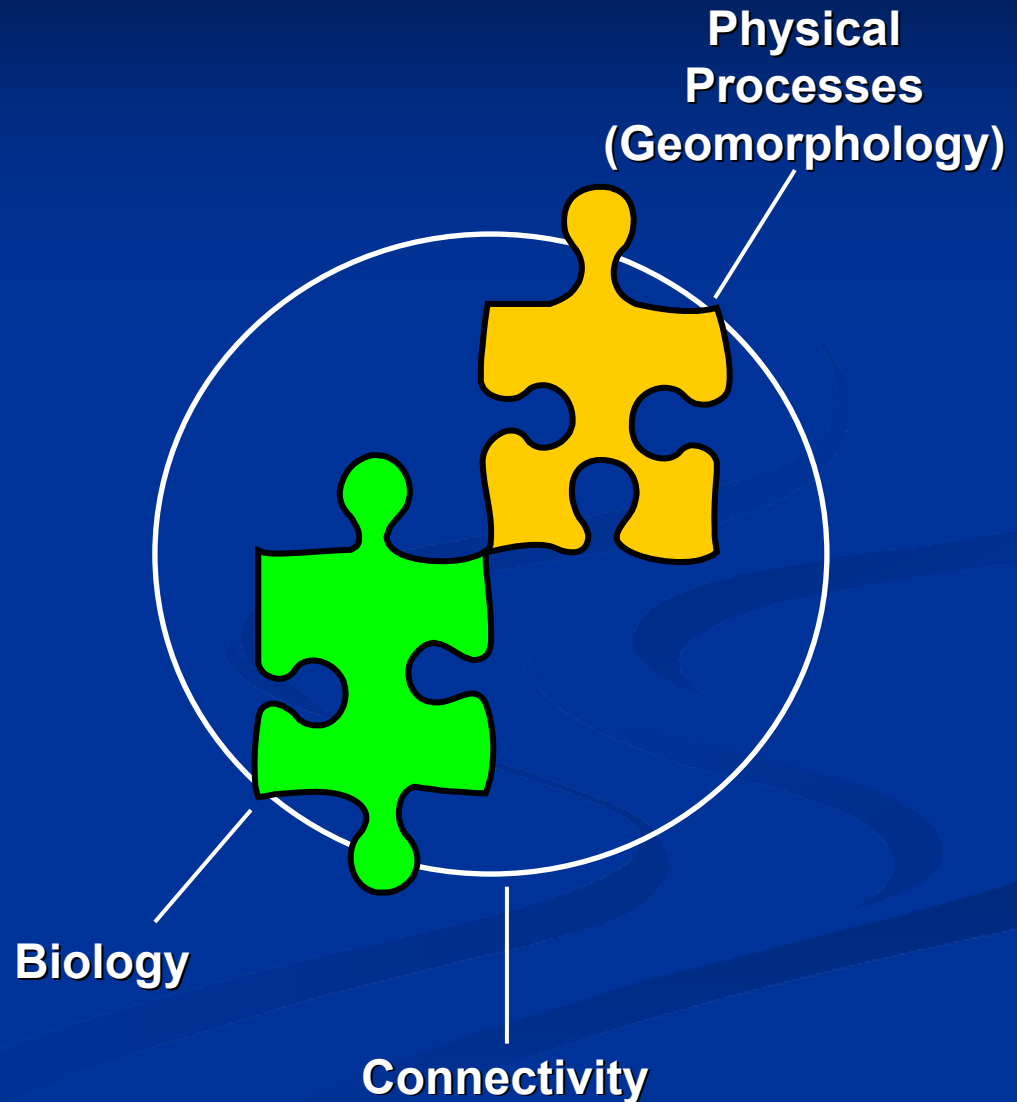




# Goal: a healthy, working river

## ■ Objectives:

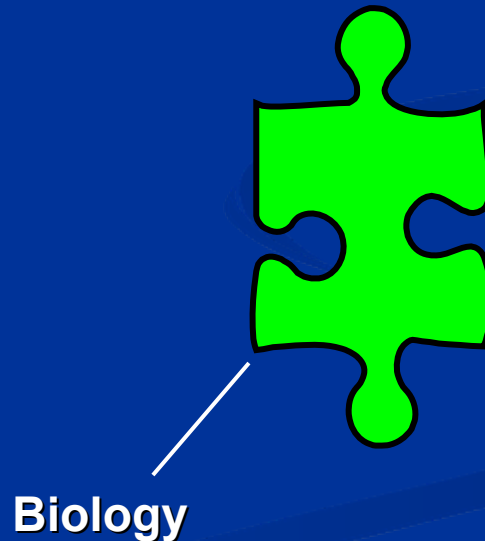
4. Protect and restore key habitat features in the river and riparian zone



# Goal: a healthy, working river

## ■ Objectives:

5. Prevent the extinction of native species from the riverine system



# Goal: a healthy, working river

- Objectives:

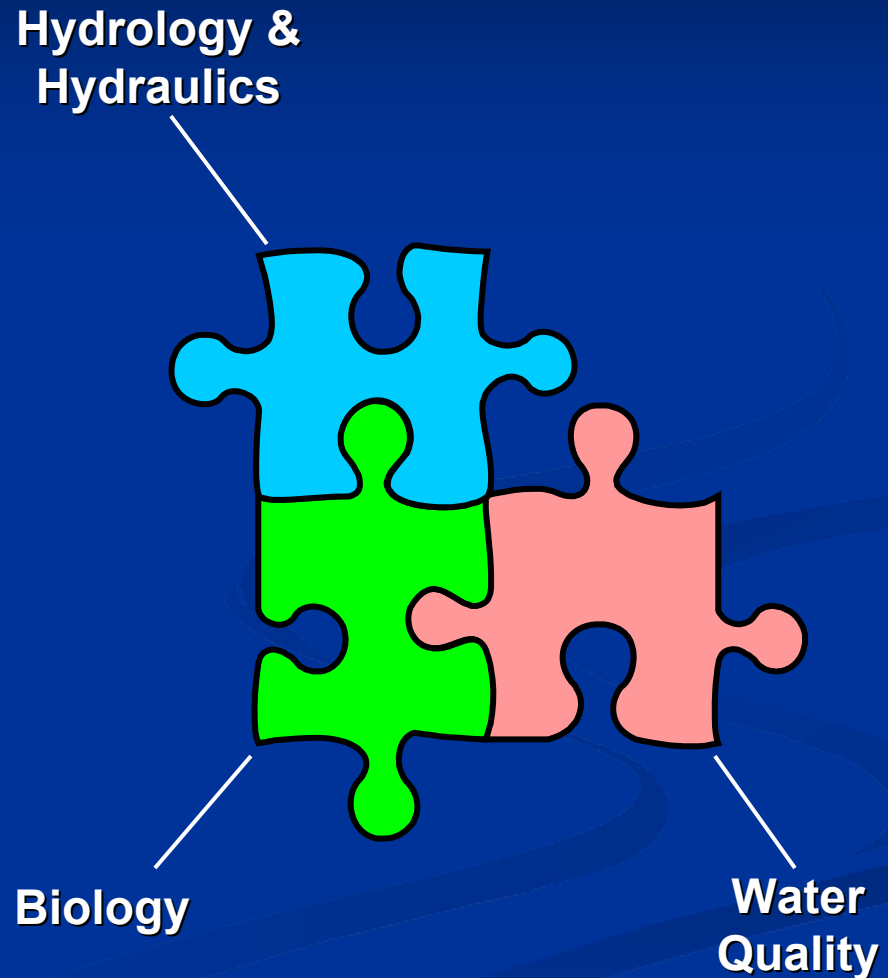
6. Improve connectivity between the river and riparian zone



# Goal: a healthy, working river

## ■ Objectives:

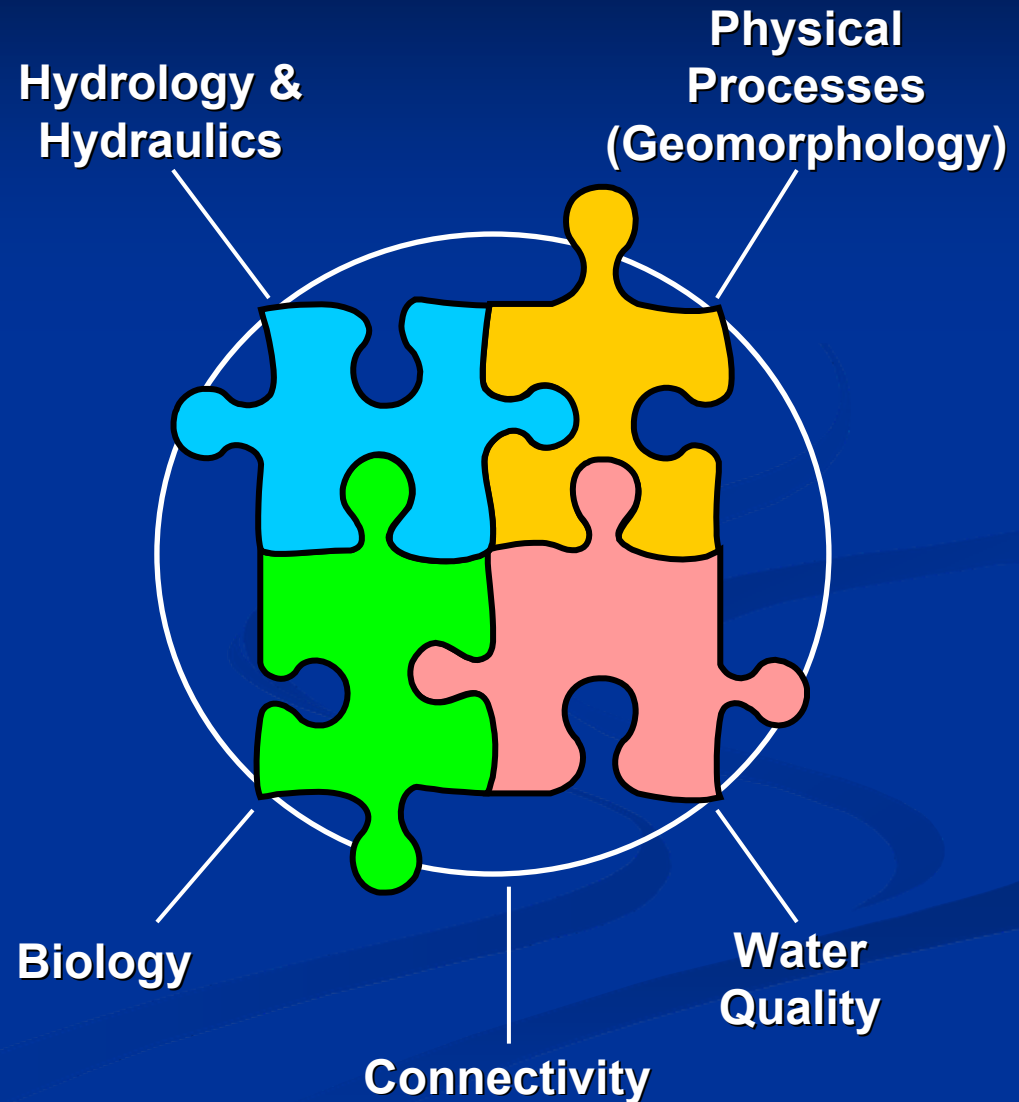
7. Manage flow-related water quality to sustain ecological processes and productive capacity



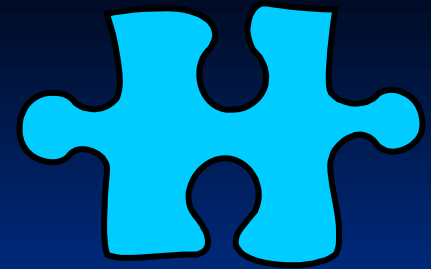
# Example: Murray-Darling Basin

## ■ Indicators:

- Hydrology
- Biology
- Geomorphology
- Water Quality



# Indicators: Hydrology



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

**Low/zero flow:** Number of low flow events

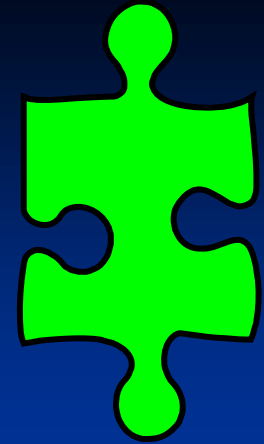
**Variability:** Seasonal amplitude

**Seasonality:** Seasonal period index

**Flow volume:** Median annual flow volume  
Mean annual flow volume

## **Indicators:**

## **Biology**



**Macroinvertebrate:**

**Richness**

**Pollution sensitivity score**

**Fish:**

**Total species richness**

**Proportion native species**

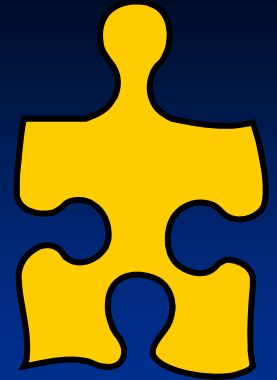
**Proportion megacarnivores**

**Riparian:**

**Waterbird breeding**

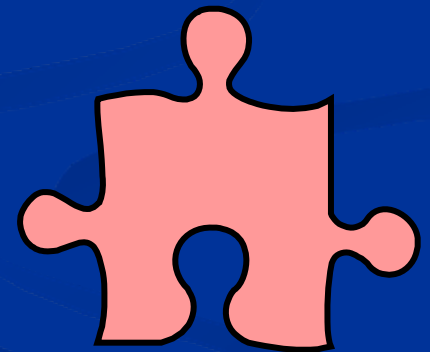
**Healthy vegetation area**

## **Indicators: Physical Processes**



**Channel Stability: Maintain current level of channel erosion**

## **Indicators: Water Quality**



**Total phosphorous:**

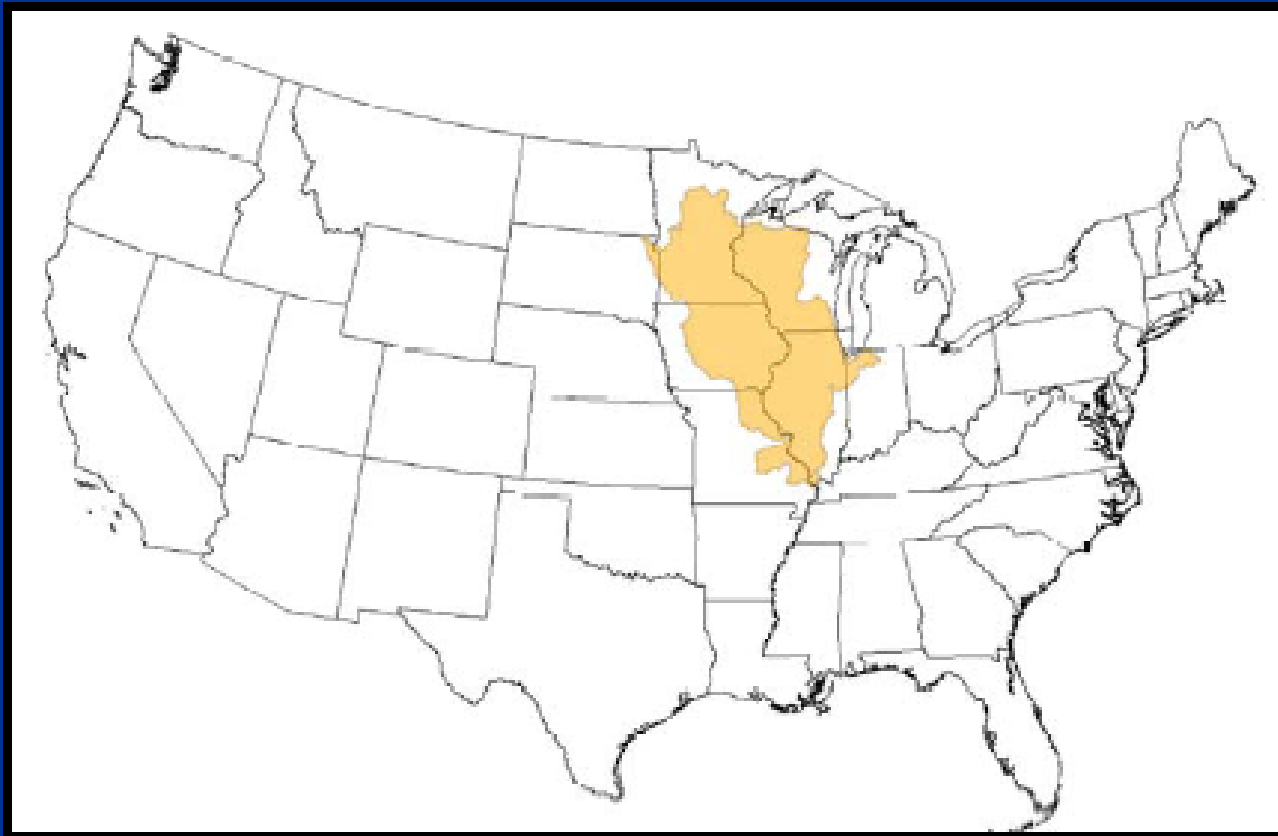
**Upland rivers: < 20  $\mu\text{g/L}$**

**Lowland rivers: < 50  $\mu\text{g/L}$**



# Example: Upper Mississippi River

- Goal: “... to conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System ...”

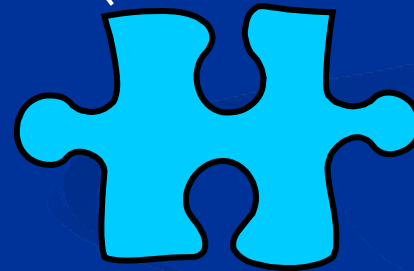


# **Goal:** “... to conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System ...”

## ■ Objectives:

1. a more natural hydrologic regime;

Hydrology &  
Hydraulics



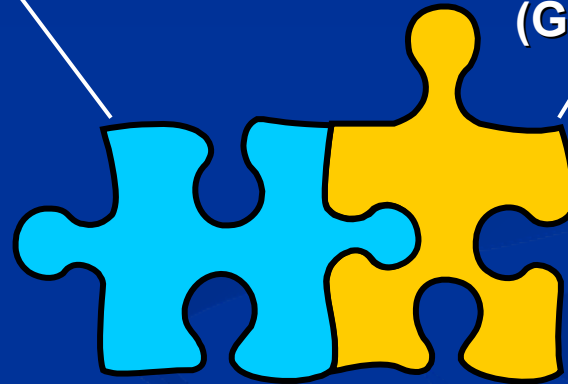
# **Goal:** “... to conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System ...”

## ■ Objectives:

1. a more natural hydrologic regime;
2. processes that shape a diverse and dynamic river channel;

Hydrology &  
Hydraulics

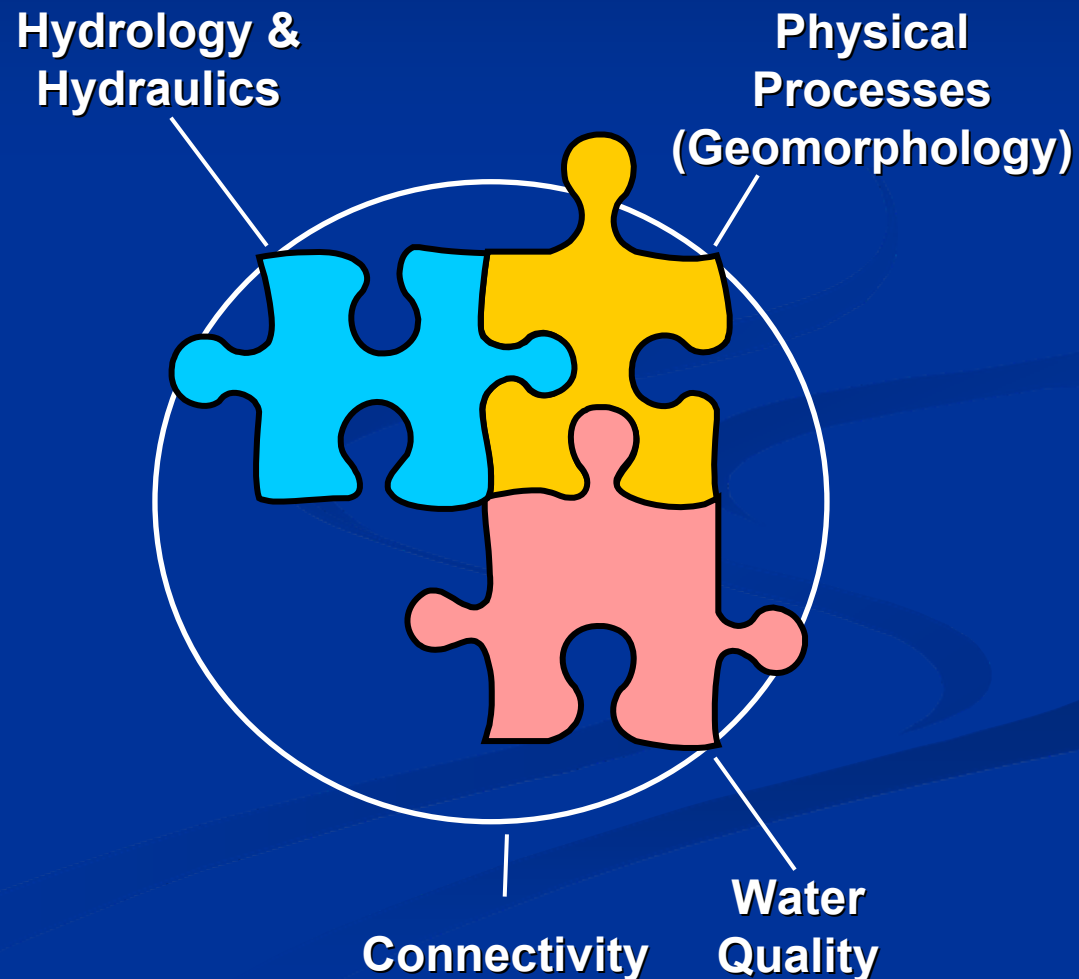
Physical  
Processes  
(Geomorphology)



# Goal: “... to conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System ...”

## ■ Objectives:

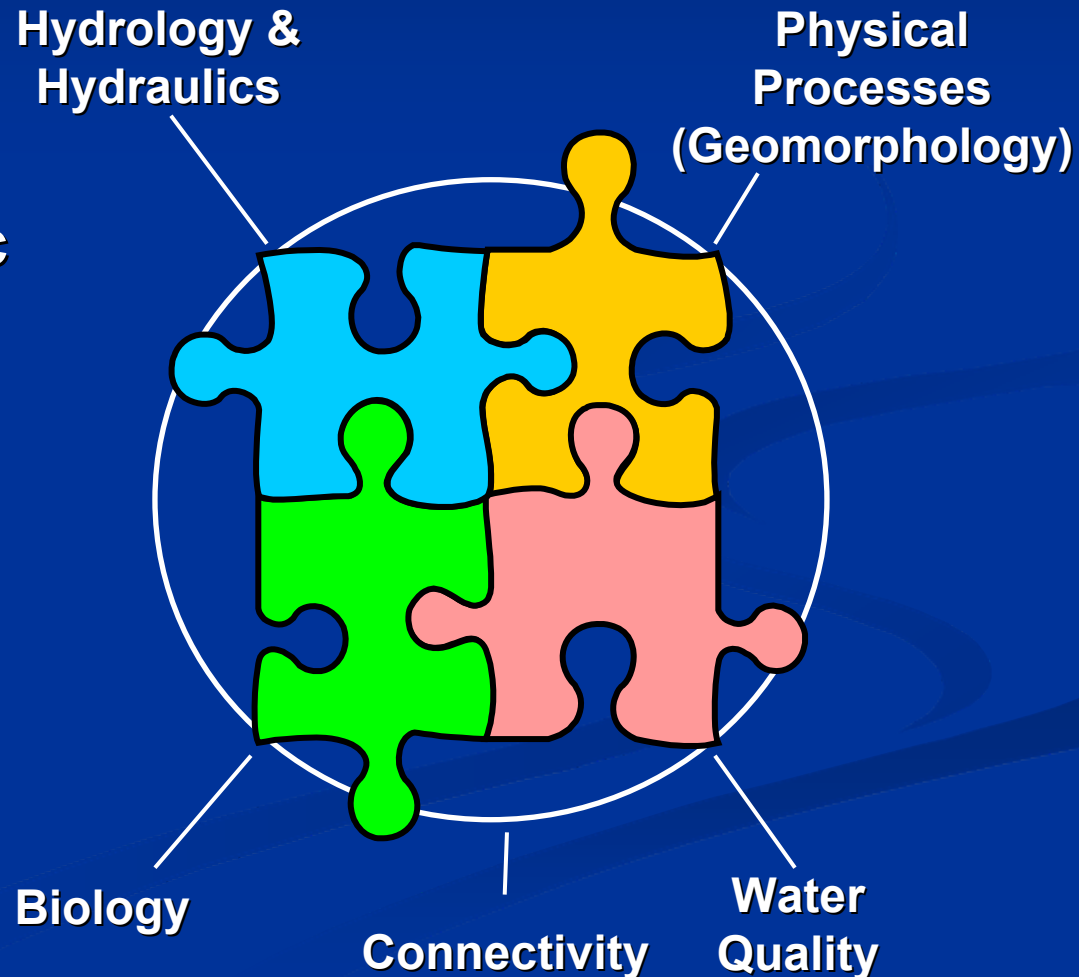
3. processes that input, transport, assimilate, and output materials within UMR basin river-floodplains: water quality, sediments, and nutrients;



# Goal: “... to conserve, restore, and maintain the ecological structure and function of the Upper Mississippi River System ...”

## ■ Objectives:

4. a diverse and dynamic pattern of habitats to support native biota, and;
5. viable populations of native species and diverse plant and animal communities.



# Objective 1: A more natural hydrologic regime


## Indicators:

- Short term fluctuations (hourly to daily) in water levels
- Summer low flows (frequency, magnitude, and duration)
- Winter flows (frequency, magnitude, and duration)

# Objective 2: Processes that shape a diverse and dynamic river channel

## Indicators:

- Flows in secondary channels and backwaters
- Seasonally flooded landscape area
- Formation of natural channel features



## **Objective 3: Processes that input, transport, assimilate, and output materials within river-floodplains: water quality, sediments, and nutrients**

### **Indicators:**

- Mean annual export of nitrogen at Cairo, Illinois
- Denitrification rates within the river corridor
- Sediment and nutrient delivery from tributaries



# **Objective 4: A diverse and dynamic pattern of habitats to support native biota**

## **Indicators:**

- Diversity, patch size, connectivity, [other measures?] of major floodplain habitat types
- Diversity of depths and current velocities in aquatic areas
- Area connected to river channel during a 10 year flood

# Objective 5: Viable populations of native species and diverse plant and animal communities

## Indicators:

- Number of years that skipjack herring and other migratory species reach Minneapolis, Minnesota, and Joliet, Illinois
- Number of locations that support viable populations of ebony shell mussel
- Diversity of the floodplain forest tree community

**Questions?**