

Steps in Establishing Indicators

- **First CAG meeting**
 - Overview and discussion about TMDL and river health
 - Established broad indicators for: water clarity, aquatic vegetation, sedimentation, fish, invertebrates (mussels)
- Technical experts met to identify metrics and recommend targets for each indicator
- **Second CAG meeting**
 - confirmed recommended targets for water clarity, vegetation, sediment
 - identified need for more information on fish assemblages and mussels
 - Added indicator for waterfowl
- **Current CAG meeting**
 - Confirm targets for mussels, fish assemblages and establish baseline information on waterfowl
 - [Finalize \(endorse\) indicator targets??](#)

TMDL* and Mississippi Makeover Indicators	Natural background	Existing	8-year interim target	15-year target (meet standard)
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Aquatic vegetation - SAV % frequency of occurrence – EMAP sampling - species richness (maximum # species)		~9 9	15 10	21* 11
Sedimentation (Lake Pepin) - life span (years) - accumulation amount (metric tons/year)	4,000 80,000	300 865,600	450 683,000	~600 502,000
Mississippi Makeover Indicators			10-year target	20-year target
Invertebrates (mussels) - catch/unit effort (% sites with ≤ 1 /min) - species richness (# species) - Mucket mussel (% of population) – Grier, 1920 Pools 5,6	41 8	33 28 0	25	20 1
Fish - fish assemblage (backwater areas) - fish assemblage (main channel and side channels)				
Waterfowl				
Aquatic Habitat Quality Index (AHQI) – Pool 3		12		15

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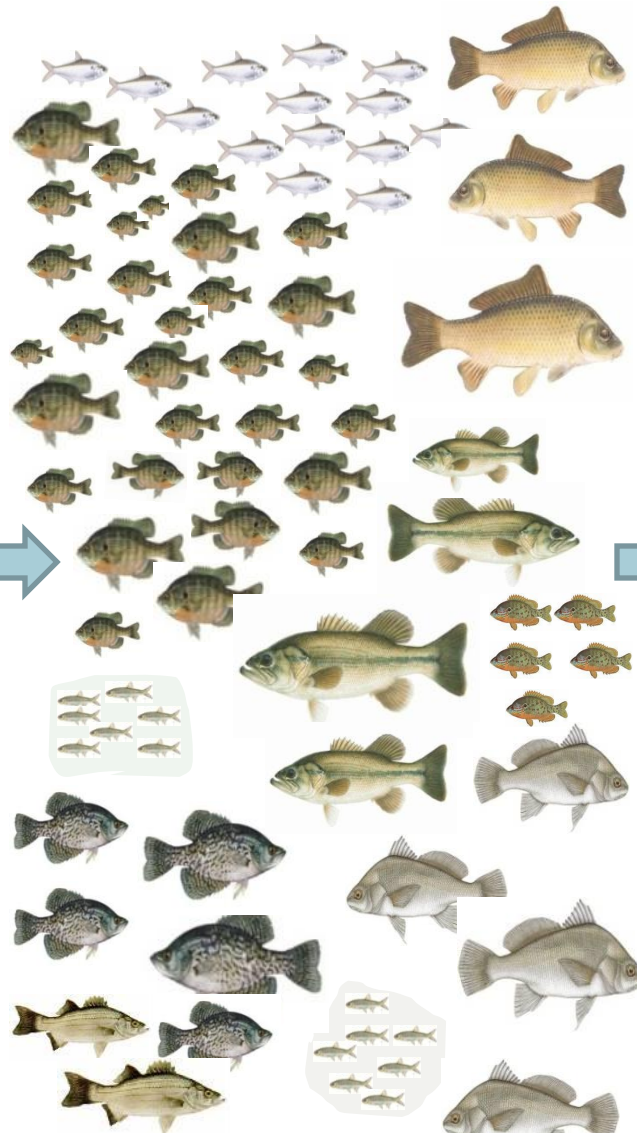
Fish assemblages

- Broken out between backwaters and channels
- Upper Pool 4 data used to represent conditions in Pool 2 and Pool 3
- Current fish assemblage in Pool 13 is realistic for Mississippi Makeover time-frame
- Current fish assemblage in Upper Pool 8 is a possible long-term hopeful goal – dramatic changes in water quality and habitat over a period of decades needed
- Many other factors besides water clarity affect fish --- habitat conditions (number backwaters, flow, tributaries, slope, etc) vary between pools and could influence fish assemblages

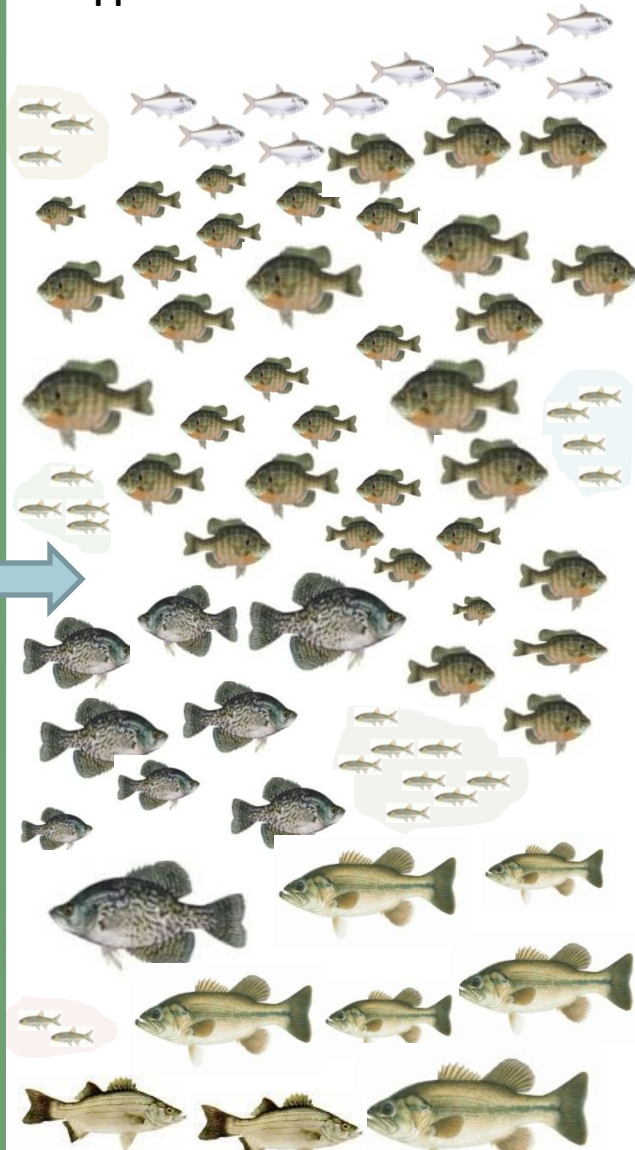
Upper Pool 4 backwaters



Pool 13 backwaters



Upper Pool 8 backwaters

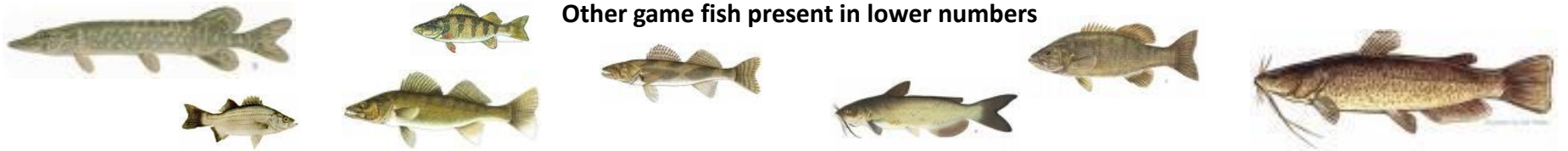


Secchi disk = 11.7 inches

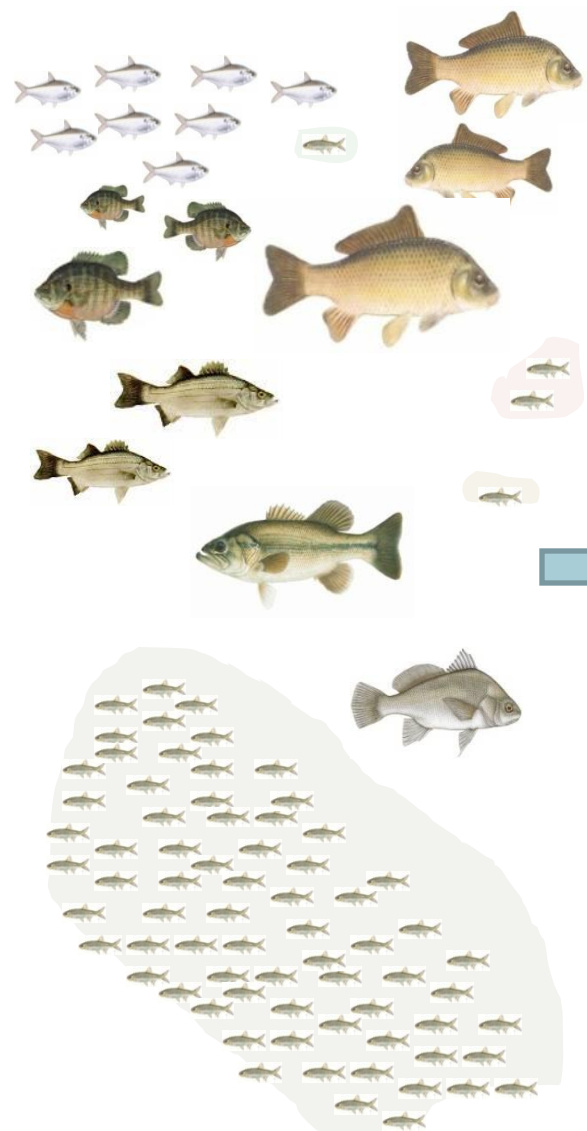
Secchi disk = 14.6 inches

Secchi disk = 22.6 inches

Other game fish present in lower numbers

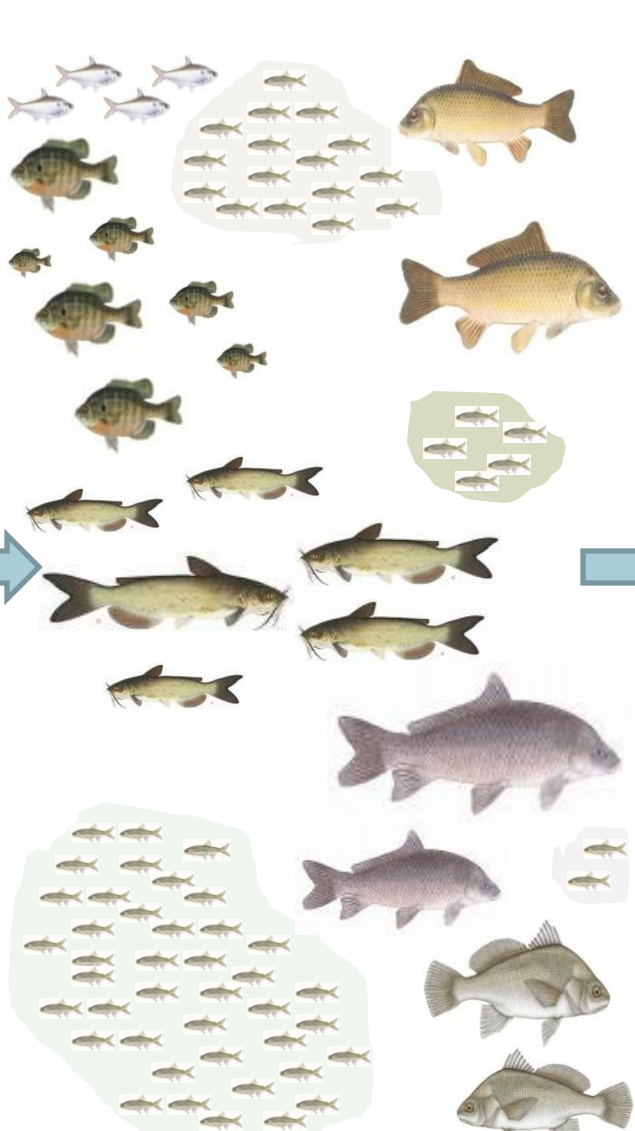


Upper Pool 4 channels



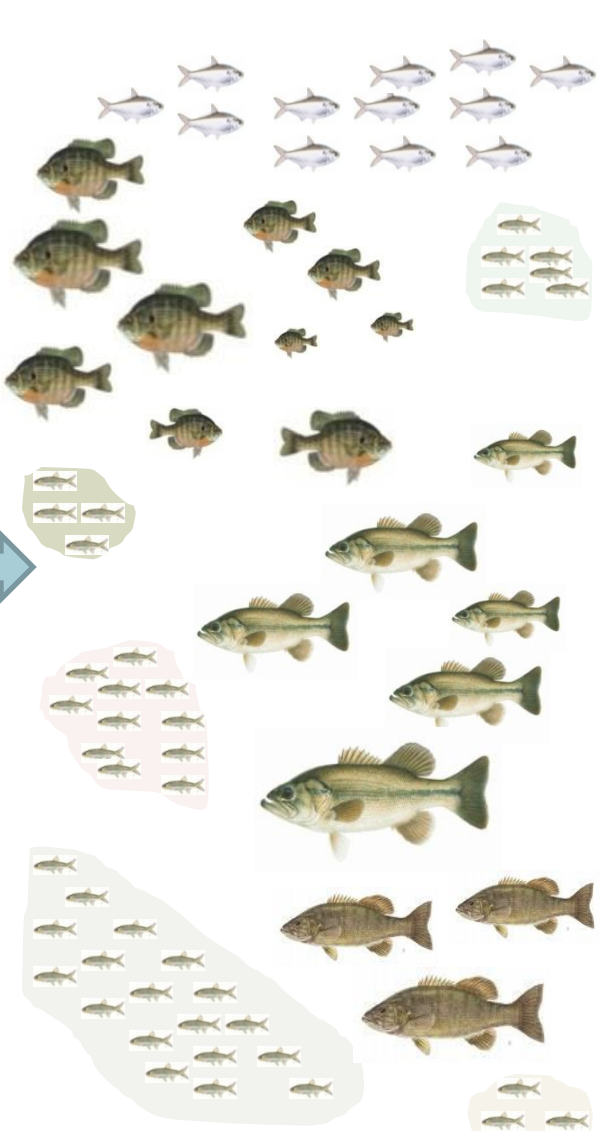
Secchi disk = 15.6 inches

Pool 13 channels



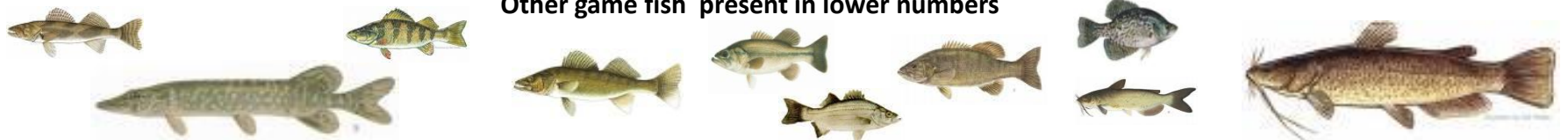
Secchi disk = 18.1 inches

Upper Pool 8 channels



Secchi disk = 26.0 inches

Other game fish present in lower numbers



Fish assemblage – species key



Gizzard shad – abundant and widely distributed forage species found in a variety of habitat types.



Crappie – two species – **black crappie** are more common and prefer clear water with good vegetation – **white crappie** are often found in more turbid areas.



Smallmouth buffalo – less common, non-game species preferring clearer water and flowing channels with moderate current.



Common carp – common, pollution tolerant, non-native species found in all habitat types but preferring shallow backwater areas.



River shiner – usually found in channel areas over a variety of bottom types – tolerant of high turbidity.



White bass – common sport fish that migrates long distances to spawn, tend to avoid highly turbid areas and prefer sandy or rocky bottom.



Bullhead minnow – abundant species that prefers sluggish pools and backwaters having some flow – fairly tolerant of turbid conditions



Mimic shiner – prefers riffle areas with moderate flow, tolerates moderate to high turbidity



Emerald shiner - pollution tolerant, abundant minnow species that tolerates a wide-range of turbidity and bottom types, often found in flowing channels.



Freshwater drum – abundant, pollution tolerant species found throughout channels and pooled areas.



Largemouth bass – popular sport fish found in a variety of habitats, but preferring clear backwaters with abundant aquatic vegetation.



Orange-spotted sunfish – small sunfish species that is tolerant of silt and continuous high turbidity, more common in lower river pools



Weed shiner – less common, non-game minnow species preferring abundant aquatic vegetation and clear water .



Spotfin shiner - prefers clear water areas with moderate or swift current.



Bluegill – one of the most popular sport fish, found in many areas but preferring clear, backwater areas with abundant aquatic vegetation.



Smallmouth bass- popular sport fish found primarily in flowing channels with rocks and riffles and good water quality.



Channel catfish – sport fish preferring flowing areas with deep pools and logs or other cover. Tolerates turbid conditions.



Channel shiner – prefer moderate to swift current over a variety of substrate types

Backwaters

Percent composition by species (top 10 species)

Species	Upper Pool 4	Pool 13	Upper Pool 8
Emerald shiner	46%	7%	8%
Gizzard shad	17	14	10
Bluegill	11	31	35
Black crappie	5	5	9
Carp	4	3	
Bullhead minnow	3		3
Freshwater drum	2	4	
Largemouth bass	2	4	6
Spotfin shiner	1		
White crappie	1		
Mimic shiner		7	4
Orange-spotted sunfish		5	
White bass		2	2
Spotfin shiner			2
Weed shiner			4

Channels

Percent composition by species (top 10 species)

Species	Upper Pool 4	Pool 13	Upper Pool 8
Emerald shiner	71%	18%	18%
Gizzard shad	8	4	12
Bluegill	3	7	11
Carp	3	2	
Bullhead minnow	1		4
Freshwater drum	1	2	
Largemouth bass	1		6
Spotfin shiner	2		12
Mimic shiner	1	41	6
White bass	2		
River shiner		5	4
Smallmouth bass			3
Channel catfish		6	
Channel shiner		2	
Smallmouth buffalo		2	

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