

# Indicators

- Water clarity
- Aquatic vegetation
- Sedimentation
- Fish
- Invertebrates

# Setting targets for indicators based on science

- Convene technical experts
- Identify important metrics
- Determine available data/information
  - Historical
  - Current
- Identify reference or desired future conditions
- Suggest potential targets

# Difference between TMDL and Mississippi Makeover Indicators

## **TMDL**

- Changes expected due primarily to TMDL implementation
  - Watershed best management practices

## **Mississippi Makeover**

- Changes influenced by TMDL but also by other factors
  - Depth and current velocity
  - Locks and dams preventing migration
  - invasive species

# Technical Experts

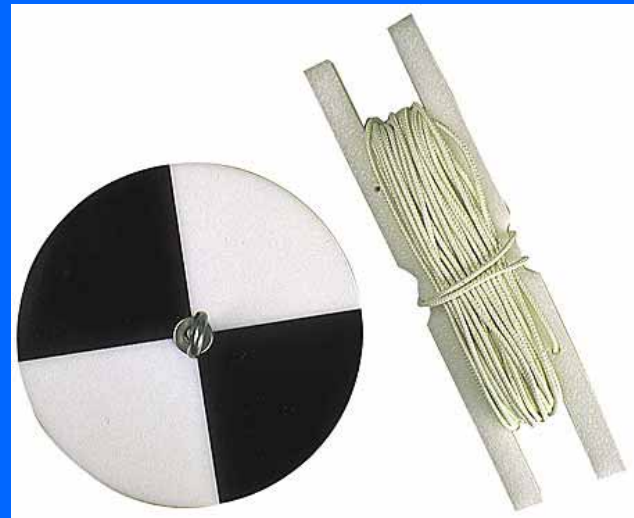
- Group of technical experts with years of experience and knowledge regarding this reach of the Mississippi River
- Representatives from the USFWS, Corps of Engineers, US Geological Survey, WI DNR, MN DNR, PCA

# Existing data sets

- LTRMP – water quality, aquatic vegetation, fish
- E-MAP
- TMDL studies
- State monitoring programs – mussel surveys, aquatic indices, fish populations

# Water clarity metrics

- Total Suspended Solids
- Secchi disk transparency
- Transparency tube



# Aquatic vegetation metrics

- Frequency of occurrence
- Species richness (number of species)
- Biomass (weight)



# Sedimentation metrics

- Sediment rate
  - Life expectancy of Lake Pepin
- Sediment load
  - Tons of sediment





# Invertebrate metrics

- Catch per unit effort (mussels)
  - #/minute
- Species richness
- Mucket mussel
- Mayfly and caddisfly abundance



# Fish metrics

- Catch per unit effort
  - selected species
- Size structure
  - selected species
- Species assemblage



TMDL* and Mississippi Makeover Indicators	Natural background	Existing	8-year interim target	15-year target (meet standards)
Water clarity - TSS (mg/l) – June–Sept. avg 1976-08, L&D 2&3 avg - Secchi (cm) – June–Sept avg at Lock & Dam #3 - Secchi (cm) – June-Sept average in Lake Pepin	<10	47 38.5 68		32* 47 80
Aquatic vegetation - SAV % frequency of occurrence – EMAP sampling - species richness (maximum # species)		~9 9		21* 11
Sedimentation (Lake Pepin) - life span (years) - accumulation amount (metric tons/year)	4,000 80,000	300 865,600		~600 502,000
Mississippi Makeover Indicators				
Invertebrates (mussels) - catch/unit effort (% sites with $\leq 1/\text{min}$ ) - species richness (# species) - Mucket mussel (% of population)	41 8	33 28 0		20  1
Fish - catch per unit effort (individual species) - size structure (individual species) - fish assemblage				
Aquatic Habitat Quality Index (AHQI) – Pool 3		12		15

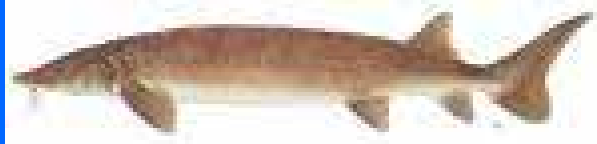
# Fish CPUE and size structure - example species



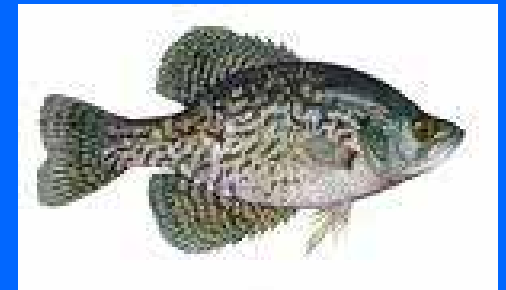
**Bluegill – generalist species that does well in quiet backwater areas with clear water and good aquatic vegetation**



**Weed shiner – unique species that requires clear water and abundant aquatic vegetation**



**Lake sturgeon– rare big river fish that migrates long distances, preferring channel areas with significant flow and depth**

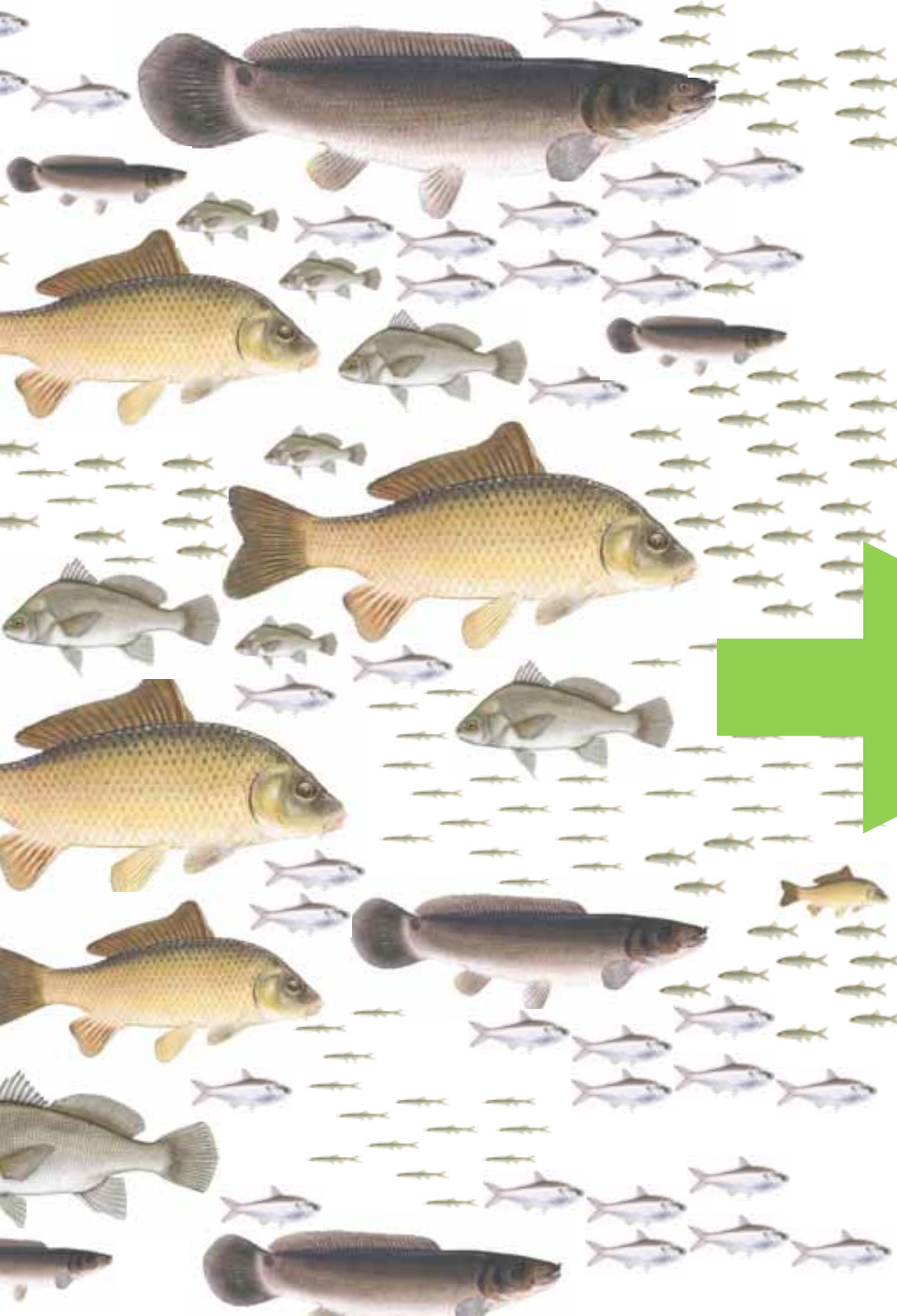


**Black crappie – generalist that prefers quiet backwaters, with slightly turbid water and some vegetation**



**Smallmouth bass – generalist but overall prefers side channels, main channel and other areas with flow, clear water, rocks and aquatic vegetation**





TMDL* and Mississippi Makeover Indicators	Natural background	Existing	8-year interim target	15-year target (meet standard)
Water clarity - TSS (mg/l) – June–Sept. avg 1976-08, L&D 2&3 avg - Secchi (cm) – June–Sept avg at Lock & Dam #3 - Secchi (cm) – June-Sept average in Lake Pepin	<10	47 38.5 68	<b>39.5</b> <b>43</b> <b>74</b>	32* 47 80
Aquatic vegetation - SAV % frequency of occurrence – EMAP sampling - species richness (maximum # species)		~9 9	<b>15</b> <b>10</b>	21* 11
Sedimentation (Lake Pepin) - life span (years) - accumulation amount (metric tons/year)	4,000 80,000	300 865,600	<b>450</b> <b>683,000</b>	~600 502,000
Mississippi Makeover Indicators				<b>20-year target</b>
Invertebrates (mussels) - catch/unit effort (% sites with ≤1/min) - species richness (# species) - Mucket mussel (% of population)	41 8	33 28 0		20  1
Fish - <b>fish assemblage (backwater areas)</b> - <b>fish assemblage (main channel and side channels)</b>				
<b>Waterfowl</b>				
Aquatic Habitat Quality Index (AHQI) – Pool 3		12		15



