

# Restoring the Natural Divide

## Separating the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System

### Overview

THE GREAT LAKES COMMISSION AND THE Great Lakes and St. Lawrence Cities Initiative led a project to develop and evaluate alternatives for physically separating the Great Lakes and Mississippi River basins in the Chicago Area Waterway System to prevent the movement of Asian carp and other aquatic invasive species (AIS). This report summarizes the results of the project and shows that separation can be achieved while also maintaining or enhancing water quality, flood management, and transportation. The engineering and economic analyses suggest that separation is feasible and provide a solid foundation on which further dialogue to advance a long-term solution to the AIS threat can proceed. Separation is defined as stopping the flow of water by placing physical structures at key points in the waterway system.

### The Chicago Area Waterway System

The Chicago Area Waterway System (or CAWS) includes an approximately 130-mile<sup>1</sup> array of natural and constructed rivers, canals, locks and other structures in Chicago and northwest Indiana. Constructed beginning in the 1890s, the waterway system diverted water from Lake Michigan and created a connection across the mid-continental divide to the Mississippi watershed. There are five connections between the CAWS and Lake Michigan, and the Chicago Sanitary and Ship Canal connects the system to the Illinois River and the Mississippi River watershed. The CAWS provides important benefits to the Chicago region, including conveying treated wastewater, supporting commercial shipping, managing flood water, and moving recreational boats and tour boats. However, the system faces significant challenges in these areas and has the potential to better serve residents, businesses and visitors.

### Restoring the Natural Divide

Separation is needed to prevent the movement of Asian carp and other AIS between the Great Lakes and Mississippi River basins in the Chicago-area waterways. Asian carp, in particular, are an imminent threat; in 2010 a bighead carp was collected from Lake Calumet, just five miles from



**Silver carp**, shown here, often feed in schools at the surface and can jump up to 10 feet out of the water when disturbed by boats.

Lake Michigan.<sup>2</sup> Recent research confirms that they can survive and spread in the Great Lakes, and that the CAWS is the most likely point of entry.<sup>3</sup> Current control efforts for the carp are vital, including the electric barriers in the Chicago Sanitary and Ship Canal. However, these efforts are incomplete, costly to maintain, and vulnerable to failure. The electric barriers will not stop the spread of all AIS and may not stop small Asian carp.<sup>4</sup> Monitoring continues to find carp DNA between the barriers and Lake Michigan.<sup>5</sup>

In addition to Asian carp, separation will prevent future AIS from entering the Great Lakes or Mississippi River basins via the CAWS. The U.S. Army Corps of Engineers has identified 39 AIS with a high risk of passing into either the Great Lakes or Mississippi River.<sup>6</sup> More than 250 non-native species are already established in one or both of the basins, and invasive species cost the Great Lakes region alone an estimated \$200 million annually.<sup>7</sup> For these reasons, separation appears to be the best long-term option to prevent Asian carp and other AIS from invading the Great Lakes or Mississippi River basins through Chicago-area waterways.

### Economic Analysis

Like most major infrastructure projects, the costs of separation are substantial. However, they will be spread over nearly 50 years and will likely be shared among different groups within and beyond the Chicago area. At a regional level, the least expensive alternative would cost households in the Great Lakes region approximately \$1 per month or just over \$11 annually from 2012 through 2059. Adding households in the Mississippi River basin reduces the cost to just \$4 a year during this timeframe. Given the widespread concern over the threat from Asian carp, and the benefits to the populations and economies of the two large watersheds, congressional funding support would be justified.

Separation could generate significant benefits for the Chicago region and the Great Lakes and Mississippi River basins as a whole, with the potential for between \$1.4 billion to \$9.5 billion in long-term savings from avoided AIS control costs and damages alone, as well as improved water quality, strengthened flood protection, and modernized shipping facilities. While the separation costs will be incurred over a limited timeframe, the benefits will be enjoyed indefinitely. Without separation, new AIS will likely pass through the CAWS, with the potential to cause significant economic and environmental damage. The documented costs from past AIS damages and controls—estimated at up to \$500 million annually just for

zebra mussels—illustrate the future costs that separation will help avoid. **The project’s technical report concludes that “stopping a single AIS from transferring between basins could avoid billions of dollars in economic loss.”**

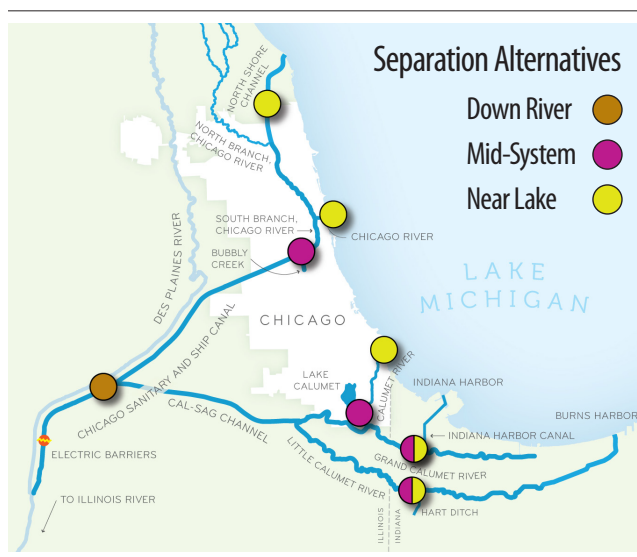
## The Separation Alternatives

Three separation alternatives are identified that illustrate the advantages and disadvantages of placing barriers in different parts of the CAWS. The Down River, Mid-System, and Near Lake alternatives refer to the location of the barriers relative to Lake Michigan. Each alternative includes the location for barriers to divide the flow of water in the CAWS; improvements needed to maintain the system’s benefits; the timing for implementation; and the costs. The report does not identify a preferred alternative. However, the Mid-System Alternative is the most viable. The costs (presented in 2010 dollars) reflect only the new investments that will be required beyond baseline expenditures already planned or underway, as well as the cost of the barriers themselves. It is noteworthy that the costs of just the barriers are a small proportion—approximately 3 percent—of the total investments needed for separation to succeed. Because of uncertainty about future regulatory standards, a range of costs are shown for the water quality investments required by separation. Finally, implementation depends on completion of Chicago’s Tunnel and Reservoir Plan (TARP) for water quality improvement and flood management, scheduled for 2029.

Each of the separation alternatives stops the open flow of water between Lake Michigan and the Mississippi River watershed via the CAWS and maintains or enhances the system’s benefits through investments in flood management, water quality and transportation.

## Next Steps

The report shows that separation is feasible and can be accomplished in a way that maintains or enhances other vital uses of the Chicago waterway system. The report, and the collaborative process through which it was prepared, provides a strong foundation for developing and advancing a solution that benefits the Chicago region and the Great Lakes and Mississippi River basins as a whole. 🚩



## Down River Alternative

This alternative includes a single barrier between the confluence of the Chicago Sanitary and Ship Canal and the Cal-Sag Channel and the Lockport Lock. This has the advantage of requiring only one barrier. However, it has significant impacts on water quality, transportation and flood management.

Separation barriers:	\$109 million
Flood management:	\$2.98 billion
Water quality:	\$290 million to \$5.85 billion
Transportation:	\$560 million
Timeline: Phase I:	One-way barrier with flood water bypass (lake to river) and all transportation improvements completed by 2022.
Phase II:	Two-way barrier completed by 2029
Total Investment:	\$3.94 - \$9.5 billion

## Mid-System Alternative

This alternative includes four barriers, one each on the South Branch of the Chicago River just upstream of Bubbly Creek, north of T.J. O’Brien Lock on the Calumet River, and on the Grand Calumet and Little Calumet rivers. This alternative poses the fewest challenges for stormwater management, flood management and transportation compared to the other two alternatives.

Separation barriers:	\$140 million
Flood management:	\$1.89 billion
Water quality:	\$180 million to \$1.2 billion
Transportation:	\$1.04 billion
Timeline: Phase I:	One-way barrier with flood water bypass (lake to river) and all transportation improvements completed by 2022.
Phase II:	Two-way barrier completed by 2029
Total Investment:	\$3.26 - \$4.27 billion

## Near Lake Alternative

This alternative requires five barriers, one each north of the North Side Wastewater Treatment Plant (WWTP) on the North Shore Channel, at the mouth of the Chicago River, at the mouth of the Calumet River, and on the Grand Calumet and Little Calumet rivers. It poses significant challenges for flood management and transportation.

Separation barriers:	\$140 million
Flood management:	\$3.82 billion
Water quality:	\$120 million
Transportation:	\$5.45 billion
Timeline:	Chicago River barriers completed by 2029 (with completion of TARP) Calumet River barriers completed by 2026 (with completion of new port facilities)
Total Investment:	\$9.54 billion