BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-9 Subdocket C
CHICAGO AREA WATERWAY SYSTEM	)	(Rulemaking – Water)
AND THE LOWER DES PLAILNES RIVER:	)	
PROPOSED AMENDMENTS TO 35 Ill.	)	
Adm. Code Parts 301, 302, 303 and 304	)	

NOTICE OF FILING

TO: John Therriault, Assistant Clerk
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Chicago, IL 60601

Attached Service List

PLEASE TAKE NOTICE that I have today filed with the Illinois Pollution Control Board Pre-Filed Testimony of Greg Seegert Regarding Asian Carp Issues, copy of which is herewith served upon you.

Dated: October 8, 2010

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One of Its Attorneys

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CERTIFICATE OF SERVICE

The undersigned, an attorney, certifies that a true copy of the foregoing Notice of Filing and Pre-Filed Testimony of Greg Seegert Regarding Asian Carp Issues were filed electronically on October 8, 2010 with the following:

John Therriault, Assistant Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street, Suite 11-500
Chicago, IL 60601

and that true copies were mailed by First Class Mail, postage prepaid, on October 8, 2010 to the parties listed on the foregoing Service List.

/s/ Susan M. Franzetti

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PRE-FILED TESTIMONY OF GREG SEEGERT REGARDING ASIAN CARP ISSUES

I. INTRODUCTION

Good morning, my name is Greg Seegert. I am employed as a Senior Scientist and Chief Ichthyologist with EA Engineering, Science, and Technology (EA Engineering). I have been employed with EA Engineering since 1982 and have nearly 40 years of experience in the areas of aquatic ecology and ichthyology. I have a Bachelor and Master of Science in Zoology from the University of Wisconsin. I have attached my *curriculum vitae* hereto as Attachment 1.

I have been extensively involved in aquatic life field studies in the Upper Illinois Waterway (UIW) for many years and am very familiar with the physical and biological conditions of this waterway. I have been engaged by Midwest Generation ("MWGen" or "Midwest Generation") to review and analyze relevant information and data to assess the use designation issues relating to aquatic life goals for the Chicago Area Waterways (CAWS) and the Lower Des Plaines River (LDR), as these relate to Illinois Environmental Protection Agency's ("Illinois EPA" or "IEPA") Proposed UAA Rules.

My prior written testimony before the Board (*see* Board Exhibit 366; *see also* Transcript of 11/9/09 Hearing p.m., pp. 1-150; Transcript of 11/10/09 Hearing a.m., pp. 1-93; Transcript of 11/10/09 Hearing p.m., pp. 1-56) described why Upper Dresden Island Pool (UDIP), rather than "marginally attaining" Clean Water Act (CWA) interim goals as Illinois EPA contends, does not attain, and is not capable of attaining, those goals. In summary, those goals are not attainable primarily because of poor habitat, impoundment effects from the Dresden Island Dam, and poor sediment quality in the UDIP. Other factors, such as barge traffic and water level fluctuations, also contribute to non-attainment of aquatic life goals in the UDIP. A detailed explanation of the relevant information and data supporting these findings is contained in my previous testimony (*see* Board Exhibit 366; see also Transcript of 11/9/09 Hearing p.m., pp. 1-150; Transcript of 11/10/09 Hearing a.m., pp. 1-93; Transcript of 11/10/09 Hearing p.m., pp. 1-56).

Since my prior testimony in this rule-making proceeding, there have been significant new developments concerning the presence of Asian carp in the CAWS and UDIP. In October 2007,

when Illinois EPA proposed to the Board its use designations and associated water quality standards for the CAWS and the Lower Des Plaines River, including the UDIP, it had not considered the biological impacts of Asian carp on the aquatic community of the UDIP nor had it considered how the various Asian carp response and prevention strategies now being considered by various government agencies and stakeholders would or could affect habitat in the UDIP or any of the other waterbodies included as part of this rule-making proceeding.

Although I strongly disagree with the Illinois EPA's contention that the UDIP is capable of "marginally attaining" the Clean Water Act's interim goals, the IEPA has at least acknowledged that there are several limitations on the quality of aquatic life that may be attainable for the UDIP. Now, with the growing evidence of the introduction of Asian carp into the UDIP, another stressor has been introduced to the UDIP. Attainment of the Clean Water Act's aquatic life standards clearly will no longer be achievable once Asian carp have become established in the UDIP. As I will discuss more in this testimony, Asian carp in the UDIP will bring with them significant, adverse impacts to the existing aquatic community and to any alleged potential aquatic community that others have wrongly speculated could be achieved in the UDIP. Further, other, additional negative effects will result if certain response actions intended to prevent Asian carp from moving into Lake Michigan are implemented in the UDIP and in other parts of the CAWS waterway that are a part of this UAA rule-making. The developments regarding the advancement of Asian carp into the UDIP and CAWS provide additional support for my previous findings and conclusion that the UDIP and the Chicago Sanitary and Ship Canal (CSSC) cannot attain the Clean Water Act's aquatic life goals.

II. THE ADVANCE OF "ASIAN CARP" INTO THE UDIP AND CAWS

A. Asian Carp Basic Facts

Before describing how the presence of Asian carp will push the UDIP even further away than it is now from any potential attainment of CWA goals, I want to briefly describe Asian carp, how they came to invade the inland waters of Illinois and how they are now threatening to invade Lake Michigan via the CSSC and/or the Cal-Sag Channel via the O'Brien Lock & Dam ("O'Brien L&D"). In preparing this testimony, in addition to my existing knowledge concerning Asian carp from my work experience, I also reviewed published information concerning Asian carp and their threat to the UAA waters and Lake Michigan. I relied primarily upon the "Asian Carp Control Strategy Framework" (the "Framework 2010") which was prepared jointly by four federal agencies (*i.e.*, United States Environmental Protection Agency ("U.S. EPA"), United States Army Corps of Engineers ("USACE"), United States Fish & Wildlife Service ("USFWS"), and the United States Coast Guard ("USCG")) and the Illinois Department of Natural Resources ("IDNR"). This document synthesized the literature regarding what is known about Asian carp biology, their abundance and distribution, methods to monitor and control them, and how they originally dispersed. I also reviewed numerous published papers concerning Asian carp. These included papers on their food habitats (Voros *et al.* 1997; Williamson and

Garvey 2005; and Pongruktham *et al.* 2010), growth and reproduction (Williamson and Garvey 2005; Kolar *et al.* 2007), natural history (Kolar *et al.* 2007), distribution (Kolar *et al.* 2007), effects on other aquatic species (Voros *et al.* 1997; Irons *et al.* 2010; and Pongruktham *et al.* 2010), and the risks they pose (USACE 2010a and b; Kolar *et al.* 2007). I also reviewed various papers and press releases provided by the Asian Carp Regional Coordinating Committee (ACRCC) at their website (http://www.asiancarp.org) (last accessed, October 7, 2010)). In addition, I considered field data collected by the IDNR and the Illinois Natural History Survey (INHS).

The term "Asian carp" usually refers to four species of carp known as bighead, silver, black, and grass carp. The three species identified for action under the Framework 2010 for rapid response are the silver carp, bighead carp, and black carp, with the first two of these species of immediate concern for the Lower Des Plaines River and CAWS. Like common carp and goldfish, all Asian carp species are large members of the minnow family Cyprinidae.

Bighead carp can grow to over 5 feet in length and 100 pounds or more. These filter-feeding fishes have "gill rakers", which are specially adapted for filtering plankton, one of the bases of the food chain, and are capable of consuming up to 20 percent of their own body weight in food each day. In the wild, their eating habits allow them to quickly out-compete both small and large native fish such as the gizzard shad and bigmouth buffalo fish. Sexual maturity is reached between 2-7 years, depending on the climate of the region (Kolar *et al.* 2007). Upon reaching sexual maturity, they begin spawning anytime between April and September, and can spawn multiple times during each season for the remainder of their lives. They live up to 20 years. (*Id.*)

Silver carp are generally smaller than bighead carp. These highly prolific fish are similar to bighead carp in their feeding and spawning habits. Silver carp are often referred to as "flying fish" and pose a danger to boaters, anglers, and other recreational users because, when these fish are disturbed by boat motors, they will jump from the water. A motor boat traveling at high speeds causes these fish to jump from the water, potentially causing damage to boats and serious injuries to humans onboard. There are several reported incidents in the literature and in the press of such Asian carp behavior and resulting injuries to humans. A recent example is a press report on an August 2010 kayak race on the Missouri River in Kansas City, Missouri that was canceled due to a kayaker being hit and injured by a silver Asian carp that jumped out of the water. (Source: http://www.telegraph.co.uk/news/newstopics/howaboutthat/7966826/Kayaker-hit-in-the-head-by-30lb-carp.html (last accessed, October 7, 2010)).

Although both bigheads and silvers are filter feeders, bigheads feed primarily on zooplankton, whereas silvers feed primarily on phytoplankton. Except during spawning, both species prefer off-channel areas where plankton populations are high (Kolar *et al.* 2007). Dresden Pool contains numerous such areas and should provide excellent habitat for both species.

Black carp differ from bighead and silver carp in both diet and appearance. They have large distinctive scales that are darker in color than those of the grass carp. Their pharyngeal teeth are large, resemble human molars, and are specially adapted for crushing mollusk shells. The largest black carp on record was more than 7 feet long and weighed 150 pounds. Black carp were originally accidentally introduced in the United States in shipments of grass carp. The diet of the black carp, though different from the bighead and silver carp, makes them an equally deadly threat to the waters of the Great Lakes. Black carp consume mollusks and snails; adults can consume an average of 3 to 4 pounds of mussels per day. A single black carp could eat more than 10 tons of mollusks during its life. Although black carp have been found in Illinois, it is not an immediate threat to the Lower Des Plaines River or the CAWS so I will not address it further in my testimony.

With regard to silver and bighead carp, it is their filter feeding style and voracious appetites that make them such a severe threat to native fish populations. Based on the published literature, these two species can consume from 20% to 40% of their body weight per day. Because of their indiscriminate style of feeding, they will consume not only phytoplankton and zooplankton, but fish eggs and larvae, mussel larvae (glochidia) where present, and anything else they encounter during the filtering process. Basically, these species swim around with their mouths open taking in anything they come upon. They have been described as "aquatic vacuum cleaners" that "will come in and clean out our native fish and sport fish" (Charlie Wooley, Deputy Regional Director of the USFWS, as quoted in a February 7, 2010 Chicago Tribune article by Dan Egan). The nutrient-rich waters of the UDIP will provide prime feeding areas for these Asian carp species.

B. Where Asian Carp Are Already Established Below The UDIP And How They Got Here

Bighead and silver carp were originally imported in the 1970's, along with grass carp, to southern United States aquaculture facilities (mainly catfish farms) and wastewater treatment facilities to keep retention ponds clean and to serve the food fish industry. There are many potential ways by which Asian carp may have escaped from these facilities, including inadvertent releases, overland flooding events, or intentional releases. During large floods in the early 1990's, many of the catfish farm ponds overflowed their banks and the Asian carp were released into local waterways in the Mississippi River basin. Thus, we are dealing with ecologically dangerous exotic species that were intentionally introduced into the U.S. and allowed to spread as the result of poor fish culturing techniques and oversight and/or via intentional releases. Since their escape into the lower Mississippi River basin, they have been steadily expanding northward into the nation's major heartland rivers (*e.g.*, the Ohio, Missouri, Wabash, and Illinois). In recent years, the Illinois River population has exhibited exponential growth (USACE 2010a; Sass *et al.* 2009). There is a consensus in the scientific community that Asian carp already have large reproducing populations in the lower Illinois river (*i.e.*, the Alton, LaGrange, and Peoria Pools) and perhaps have now extended these reproducing populations as close as the Marseilles Pool, the pool which is immediately downstream of the UDIP (USACE

2010b). In fact, as part of the governmental efforts to control the advance of Asian carp, commercial netting crews harvested nearly 5000 Asian carp weighing 104,000 pounds from the Marseilles Pool from May through early September 2010 (Vic Santucci, Aquatic Nuisance Species Program, IDNR, personal communication, 9/15/10). The Marseilles Pool is the pool immediately downstream of Dresden Pool meaning that large numbers of Asian carp are poised to move into Dresden Pool, including UDIP.

III. THE INVASION OF ASIAN CARP INTO THE UDIP AND ITS SIGNIFICANT ADVERSE EFFECTS UPON THE UDIP AQUATIC COMMUNITY

In this part of my testimony, I will describe why the invasion of Asian carp into the lower Des Plaines River (*i.e.*, UDIP and Brandon Pool) is inevitable; and how that invasion will result in adverse effects to the aquatic community because of:

- Degraded community structure;
- Reduced food resources;
- Reduced fish condition;
- Reduced recruitment;
- Changed community structure of the zooplankton and phytoplankton communities;
- Changes in benthic community structure; and
- Likely reductions of sensitive native species

A. Why the Invasion of Asian Carp is Inevitable in the UDIP and Brandon Pool

In general terms, with the invasion of Asian carp, we are witnessing an oft-repeated scenario – the introduction (intentional or otherwise) of exotic species into ecosystems. These invasions continue until they are controlled by human intervention or encounter an insurmountable ecological barrier. These scenarios have been well documented in various plant and animal groups. Some well known examples, often with disastrous results, include:

- The beetle that carries Dutch elm disease
- Purple loosestrife
- Reed canary grass
- Kudzu
- Starlings
- House sparrows
- Rock doves (pigeons)
- Fire ants
- "Killer bees"
- Various rodent species but especially rats
- Common carp

- Rainbow smelt
- Alewife
- Sea lamprey
- Round goby
- White perch
- Zebra and Quagga mussels
- Asiatic clam (*Corbicula*)

These are but a few of the better known examples. In many of these cases, state, federal, and local governments spend millions of dollars either keeping these species in check (*e.g.*, sea lampreys, common carp, rats) or dealing with the consequences (*e.g.*, zebra and quagga mussels, *Corbicula*, rats). All of the fish and aquatic macroinvertebrate species listed above are major problems in Illinois.

In some cases, the advance of such species is eventually checked by unfavorable ecological conditions. For example, kudzu, fire ants, and killer bees are problems only in the south because these species cannot survive the cold temperatures in the northern portions of the United States. Other species, however, such as starlings, house sparrows, pigeons, common carp, and rats have spread throughout the nation and are problematic to varying degrees wherever they occur. Also, these species have proven to be largely uncontrollable.

Asian carp have spread northward from their release point in the south (mainly Arkansas) so that they now occur in substantial portions of the Mississippi, Missouri, Ohio, Wabash, and Illinois Rivers. In recent years, they have exhibited exponential growth in the Mississippi and lower Illinois Rivers (Sass *et al.* 2009; USACE 2010a). Nothing has stopped their advance to date. For example, according to the Illinois Natural History Survey (INHS), they first observed bighead carp in the LaGrange Pool of the Illinois River in 1995, and five years later, the collection catch rate of the INHS peaked. (Irons *et al.* 2007). Similarly, the INHS first detected silver carp in the LaGrange Pool in 1998 and their catch rate peaked in 2004. (Irons *et al.* 2007).

The government agencies that make up the Asian Carp Regional Coordinating Committee (the "ACRCC") must believe the spread of Asian carp into the UDIP, the CSSC, and eventually Lake Michigan is inevitable if left unchecked, or else they would not be spending tens of millions of dollars to prevent their entry to Lake Michigan. As I have previously stated here, a large number (about 5000) of Asian carp have been removed from the Marseilles Pool, the pool just below Dresden Pool, already this year. Even more are present in the pools further down the Illinois River. Thus, the leading edge of the main Asian carp population is at the doorstep to the UDIP. In the same way Asian carp moved from the Mississippi River into the various pools of the middle and lower Illinois River, they will continue to advance into the UDIP. Basically, there is an established, long line of Asian carp that stretches in large numbers from the mouth of the Illinois River through Marseilles Pool, immediately downstream of Dresden Pool. As I will discuss further in my testimony, the commercial netting now being done in Marseilles Pool,

though laudable in its intent, is designed to only slow the advance of the carp, not stop it. It is only a matter of time before they move into Dresden Pool in more significant numbers than they are now.

B. Asian Carp are Already Present in the UDIP

The probable, if not inevitable, establishment of resident populations of Asian carp in the UDIP is supported by several undisputable facts. First, Asian carp are already documented to be present in the UDIP, and this evidence does not consist solely of data from the use of the new eDNA testing protocol, over which there is some difference of opinion. Asian carp already have been collected in the UDIP in numbers that clearly show they are present.

As I have described in detail in my prior testimony, EA Engineering performs annual fish survey work in the UDIP for Midwest Generation. In May 2010, a sampling crew with EA Engineering was performing the annual fish survey in the UDIP as part of the long-term monitoring of the UDIP that Midwest Generation conducts pursuant to the terms of its adjusted thermal standard. EA's sampling crew collected six adult bighead carp in the UDIP just upstream of the I55 Bridge during this routine monitoring of the fish community. Photographs documenting the collection of these six adult bighead carp are included in Attachment 2 to this testimony. Most importantly, and also a fact most disturbing for the future of aquatic life in the UDIP, included among just these six captured bighead carp was an egg-laden female (see Photograph No. 4 in Attachment 2). The presence of even one egg-laden female is particularly worrisome. The tailwater area below the Brandon Road Dam likely provides suitable spawning habitat for Asian carp. Based on the difficulties associated with collecting Asian carp as described by the experts in the USACE Interim III report (USACE 2010b), I thought it was likely that many more are present than the six collected and disposed of by EA's field crew. Recent data compiled by and obtained from the IDNR confirmed my suspicions that more Asian carp are indeed present in UDIP. According to Vic Santucci of the IDNR, one bighead carp was collected in 2010 in UDIP in the area below the Brandon Road Dam using electrofishing as the method of collection. However, according to the IDNR, when commercial fisherman instead used the netting method of fish collection, these netting efforts during 2010 alone have yielded 94 Asian carp from Dresden Pool. (V. Santucci, Aquatic Nuisance Species Program, IDNR, Personal Communication, 9/15/10). The significant difference in these Asian carp collection results also underscores the difficulty of collecting Asian carp via electrofishing, the most common monitoring method previously used to conduct fish surveys in the Dresden Pool. The 2010 IDNR netting of 94 Asian carp in the Dresden Pool establishes that indeed a goodly number of Asian carp are already in the UDIP.

Other evidence also shows that Asian carp have passed through the UDIP. For example, one Asian carp was found during the December 2009 poisoning of fish in Lockport Pool below the electric barriers. Also, eDNA evidence indicates that some Asian carp have already passed

through these pools. And, more recently, a bighead carp was collected in June 2010 in Lake Calumet (*i.e.*, upstream of the electric barrier) by commercial fishermen working for IDNR.

C. The Establishment of Asian Carp in the UDIP

The fact that EA collected a bighead carp full of eggs in UDIP is a clear indication that this species comes into breeding condition in this area. Yet, it is not essential that Asian carp actually spawn within the confines of the UDIP in order for them to become established there. To explain further, I will review briefly what is currently known about the spawning habits of the Asian carp. An often-cited value in the literature regarding Asian carp spawning needs is a minimum length of 100 kilometers (62 miles). However, estimates of river length required are based on locations where populations of Asian carp are known to be found and thus do not describe a true minimum. When Asian carp are introduced to a new environment, their reproductive requirements may undergo substantial changes (Opusynski and Shireman 1995). For example, Asian carp successfully spawn in the Kara Kum Canal, a manmade canal that is only 80 km long (Kolar *et al.* 2007, p. 61). Kolar *et al.* (2007, p. 62) go on to note that "it is likely that the river length required for successful bighead carp recruitment depends on water temperature and velocity." As noted in the Framework 2010, "recent research has determined the developmental stage at which Asian carp larvae are capable of swimming and migrating laterally from flowing water into nursery habitats." The Framework 2010 indicates that this information in conjunction with other data should be used to better determine what the spawning requirements of Asian carp are (pp. 34-35). The Framework 2010 goes on to note that additional research is needed to understand better Asian carp spawning requirements.

We currently do not know whether Asian carp larvae can develop successfully in UDIP. However, there are several pieces of evidence indicating that they are capable of spawning in nearby areas. We know that "in the Illinois River, Asian carp have been observed spawning at tributary mouths and below navigation dams". (*See* Responsiveness Statement to Framework 2010, p. 9). Hence, we know that Asian carp can successfully spawn in the Illinois River. We also know that Asian carp have successfully spawned in a man-made canal. Further, the presence of turbulent flows in the Brandon Lock and Dam tailwaters and in portions of the Kankakee River, which is a large tributary to Dresden Pool, provide conditions that are suitable for Asian carp spawning. Therefore, it is reasonable to conclude that Asian carp will be able to spawn in or adjacent to the Dresden Pool.

Asian carp will generally find Dresden Pool to be to their liking. Except during spawning, Asian carp prefer slow moving (lentic) waters, such as riverine backwaters and side channels (the Framework 2010; USACE 2010b). Dresden Pool has an abundance of such habitats. Asian carp prefer such areas presumably because, as filter feeders, they need, or at least prefer, areas with considerable food resources (*i.e.*, phytoplankton, zooplankton, and other suspended organic matter). Again, Dresden Pool, including UDIP fits this description precisely. As noted in the Framework 2010 (p. 37), Asian carp "grow fastest and reproduce the most in systems with ample

food supplies supported by nutrient-rich conditions." The UDIP and the CAWS both provide the nutrient rich conditions that support ample food supplies for the Asian carp. In the CAWS, including the CSSC, WWTP effluent makes up most of the flow, and thus the nutrients fuel phytoplankton growth, which (along with suspended organic matter present in effluent) serves as the primary food source of the carp. The Framework 2010 also states (p. 37) that "Combined sewer overflows (CSO) and stormwater discharges are also sources of nutrient loadings." These hearings have already documented that the CSSC and UDIP are effluent-dominated and, although MWRD is working to reduce the number, there still are numerous CSOs that discharge into the CAWS. This nutrient-rich "soup" provides the ingredients needed to support large phytoplankton populations. Some photos (Board Exhibit 380) introduced during my previous testimony documented the duckweed "bloom" that occurred in UDIP in 2009. During my most recent visit (8-10 September 2010) to the CSSC and the lower Des Plaines River, duckweed was again common to abundant. EA biologists have observed blooms of algae at numerous times. The abundance of duckweed and the frequent algae blooms indicate that the system is highly eutrophic. This abundance of nutrients and algae also should support large zooplankton populations. This abundance of the food preferred by Asian carp (phytoplankton and zooplankton) should support a large population of Asian carp in UDIP. For all of these reasons, the establishment of Asian carp in the UDIP is inevitable.

The ability of Asian carp to establish themselves in the UDIP, as noted previously, is not going to be prevented by either natural or artificial barriers to their entry into the pool. Even current plans for deterrent measures will not keep them out. The USACE's recommendation of the proposed installation of a deterrent measure consisting of a "hybrid ABS fish deterrent system" (*i.e.,* an acoustic bubble curtain with strobe lights, hereinafter the "ABS system") at the extreme upper end of the UDIP will not prevent Asian carp from moving into the UDIP. The existing and proposed additional electric barriers are in locations even further upriver, in the CSSC, and therefore, will not check the advance of Asian carp into the UDIP.

D. Significant Adverse Effects and Destruction will Result from the Establishment of Asian Carp in the UDIP

Because the establishment of Asian carp in the UDIP is inevitable, it is appropriate to consider what the consequences of the Asian carp's invasion will be for the native aquatic life in the UDIP. Unfortunately, they will be many and all will be adverse to the native fish community. These adverse effects will be yet another "stressor" for this already challenged waterbody. In the remainder of this section, I document seven ways in which the invasion of Asian carp into the UDIP will further degrade the already degraded aquatic communities inhabiting this area.

According to the ACRCC, "Asian carp have left a trail of destruction in the Mississippi River system that has harmed the ecosystem, the economy, property, and boaters." (http://asiancarp.org/background-threat/ (last accessed, October 7, 2010)). As I will discuss here, there are multiple reasons for this large scale destruction.

1. Asian Carp Cause a Degraded Fish Community Structure.

As documented in my prior testimony and attachments (*see* Board Exhibit 366; *see also* Transcript of 11/9/09 Hearing p.m., pp. 1-150; Transcript of 11/10/09 Hearing a.m., pp. 1-93; Transcript of 11/10/09 Hearing p.m., pp. 1-56), the fish community in UDIP is already degraded. Admittedly, the extent of the fish community's degradation is not as severe as in the CSSC, but it is clearly degraded when compared to reasonable expectations for a river of this size in Illinois. The current degradation takes the form of reduced species richness, dominance by tolerant species like common carp and bluntnose minnow, a lack of intolerant species (*e.g.*, various minnows and darters), elevated incidence of external anomalies, and poor trophic structure (*e.g.*, too many omnivores and not enough insectivores). In other words, poor fish community structure.

But the fish community in the UDIP is reasonably expected to decline further due to the invasion of Asian carp. USACE concluded that both bighead and silver carp could alter the fish community by "impacting all species of larval fishes and planktivorous adult fishes." (USACE 2010a, p. 23-24) In fact, the Framework 2010 indicates that proceeds from selling Asian carp, assuming a market can be found, will go "to fund ecosystem restoration" to try to rebuild native fish stocks and communities that have been degraded by Asian carp. (Framework 2010, p. 21) Similarly, the Framework 2010 earmarks considerable money to repair damage done by Asian carp and other species because "invasive species disrupt fragile ecosystems causing economic and ecological damage". (*Id.* at p. 29) I agree with the ACRCC's determination that Asian carp will cause considerable ecological damage in the UDIP.

Besides the fish community degradation caused directly by the presence of the Asian carp, the Framework 2010 notes that a number of the technologies or strategies used to control Asian carp will or may have adverse effects on native fishes. A few examples of strategies that could cause adverse effects on native fishes would be netting, acoustic methods, and rotenone. For example, in its March 8, 2010 letter to the ACRCC, Illinois EPA stated "IEPA is concerned that, since rotenone and other fish toxicants are non-specific, frequent use of this control technique could adversely impact populations of other indigenous fish species." The EA fish collections in a portion of the area of the CSSC rotenoned in December 2009 provide evidence of the adverse impacts caused to native fish by rotenone applications. EA's field crews consist of experienced personnel who have performed these fish surveys on the UDIP and portions of the CAWS for several years. These field crews have personal knowledge of the prior fish abundance and diversity that have been recorded in these waterways. EA's field crews have seen reduced fish abundance and diversity in the section of lower Lockport Pool that was rotenoned as compared to prior years when these annual fish field surveys have been conducted. The EA 2010 fish field survey is still underway. Therefore, the fish samples collected and preserved so far have not been processed at this time and the 2010 fish survey data is not yet available. Thus, a quantitative tally and comparison of fish numbers and diversity before and after the rotenone application is not yet possible. Nonetheless, the consensus of the EA field crew leaders is that

catch rates are down and the number of large fish has been noticeably reduced. (Ken Cummings, James Fitzgerald, and Mike Kacinski, EA Engineering, personal communication, 9/12/10).

2. Asian Carp Deprive Native Fish of Food Resources.

Both Sass *et al.* (2009) and Irons *et al.* (2007) reported that Asian carp dominate the lower Illinois River. All these carp have to eat. Because they are filter feeders, they will indiscriminately ingest a wide variety of food resources including phytoplankton, zooplankton, fish eggs, and fish larvae, making these items less available for a wide variety of higher aquatic organisms, *i.e.,* fish, macroinvertebrates, and, if present, mussels. The INHS has documented changes in prey structure in the lower Illinois River. As stated by Charlie Wooley, Deputy Regional Director of the U.S. Fish and Wildlife Service: "They are aquatic vacuum cleaners." Mr. Wooley goes on to state that: "They will come in and clean out our native fish and sport fish." ("Carp talks may miss bigger lake challenge" by Dan Egan, Chicago Tribune, February 7, 2010). Numerous researchers have concluded that Asian carp will or can adversely affect native fishes (Starling 1993, Laird and Page 1996, Voros 1997, Ross 2001, Williamson and Garvey 2005, Varble *et al.* 2007, and Irons *et al.* 2007). Adverse effects to native fishes documented by these and other researchers include: decline in the catch of commercially important species (Li and Xie 2002); reductions in native fish diversity (Williamson and Garvey 2005, Chick and Pegg 2001); 50% reduction in fish species richness (Pavlovskaya 1995); increased interspecific competition (Sampson 2005); reduced numbers or condition of paddlefish (Schrank 35 *et al.* 2003, Varble *et al.* 2007); and reduced condition of gizzard shad and bigmouth buffalo (Irons *et al.* 2007).

Clearly, Asian carp feed mainly at the base of the trophic food chain, *i.e.*, on phytoplankton, detritus, and zooplankton. Virtually all native species, either as larvae, juveniles, and/or adults, depend on this same level of the food chain for their existence. Given the dominance achieved by Asian carp in the lower Illinois River and the fact that they will show up in the UDIP and Brandon Pool in large numbers at some time in the foreseeable future, the resulting reduced numbers and biomass of native species cannot be avoided. The presence of Asian carp in the UDIP and Brandon Pool will move the fish community even further away from being able to attain CWA "fishable" goals than it is today.

3. Asian Carp will Cause Reduced Condition in Fish.

"Condition" refers to the plumpness of fish. Condition factor is a way to measure condition. Emaciated fish have low condition factors, whereas heavy-bodied fish have high condition factors. Because of reduced food supplies caused by the presence of Asian carp, condition factors in the UDIP and Brandon Pool will decline, meaning they will get worse. This adverse effect has been documented by the Illinois Natural History Survey ("INHS") for both bigmouth buffalo and gizzard shad in portions of the Illinois River where densities of Asian carp are

already high (Irons *et al.* 2007). In his 2007 published report, Mr. Kevin Irons of the INHS, who is now in charge of the IDNR's Aquatic Nuisance Species Program, reported that catches of bighead carp and silver carp increased exponentially in the lower Illinois River beginning about 2000. Hence, this raised the question of whether two native filter feeding fishes, gizzard shad and bigmouth buffalo, would be adversely affected by competition from the Asian carp. They compared condition factors of gizzard shad and bigmouth buffalo before the Asian carp became established and after they became established in the lower Illinois River. They found significant declines in the condition (fitness or plumpness) of both species. They also found a significant decline in the catch rate of bigmouth buffalo after establishment of the Asian carp.

Because of these documented adverse effects to gizzard shad and bigmouth buffalo, the 2007 INHS study recommended that Asian carp numbers be reduced. Gizzard shad is an important prey item for native sport fish in the UDIP, especially largemouth bass. IEPA witness Chris Yoder considered gizzard shad to be a RAS for the UDIP and other areas of the CAWS. Because Asian carp out-compete the gizzard shad for food, the decline in gizzard shad numbers will likely in turn result in a decline in native sport fish that also depend on the gizzard shad for food, such as largemouth bass and white bass, in those areas where Asian carp become established. A decline in the condition of paddlefish, another filter feeder, was reported in a portion of the Mississippi River where silver carp were abundant (Varble *et al.* 2007). Detailed studies have not been done on other species, but based on these studies, it is reasonable to conclude that reduced condition will occur in other native species, especially those with similar feeding niches.

Poor fish condition will result in reduced numbers of eggs being produced and likely an increased susceptibility to disease and predation. As discussed above, the larval and juvenile stages of many fishes depend on the phytoplankton and zooplankton resources that Asian carp target. When these larval and juvenile fish species are denied access to sufficient food resources, their condition declines. Given the voracious eating habits of Asian carp, it is reasonable to conclude that the condition of these larval and juvenile life stages will be at particular risk due to their presence in the UDIP and Brandon Pool. Also, in temperate waters like those of the UDIP and Brandon Pool, young-of-the-year fish depend on fat reserves to survive the winter. If their fat reserves are depleted because of competition for food with Asian carp, increased over-winter mortality would be expected for these stages of native fish.

4. Asian Carp will Cause Reduced Fish Recruitment.

"Recruitment" is a term used to describe the process by which fish move from the egg/larval stage to the juvenile/adult stage. Recruitment determines year class strength. Fish could lay many eggs, but unless these eggs are "recruited" into adults, the large number of eggs would be wasted. Due to the presence of Asian carp, reduced recruitment will occur for two reasons. First, as largely indiscriminate filter feeders, Asian carp will surely ingest fish eggs and larvae that are in the water column. Fish that are broadcast spawners, those that have pelagic larvae,

those that use the drift as a dispersal mechanism, and those that produce buoyant or semibuoyant eggs will be most at risk. Among the RAS for the UDIP, these species would include gizzard shad, smallmouth buffalo, quillback, river carpsucker, emerald shiner, brook silverside, white bass, walleye, sauger, and freshwater drum. Second, the number of eggs that fish produce (*i.e.,* fecundity) is directly related to body size (Murphy and Willis 1996), therefore reduced condition (*i.e.,* reduced body size as the result of the lack of adequate food resources) will lead to fewer eggs being produced. Also, fish in poor condition not only produce fewer eggs, they also produce poorer quality eggs, which in turn reduces the percentage of eggs that hatch.

Thus, poor condition, as discussed above, results in poor recruitment. This combination of fewer eggs produced, lower hatching success, and increased predation by Asian carp on the eggs and larvae that are produced will lead to lower recruitment of various native fishes in the UDIP and Brandon Pool.

5. Asian Carp will Cause Adverse Changes in the Phytoplankton and Zooplankton Communities, Which are a Source of Food to Native Fishes.

Phytoplankton and zooplankton are two groups that reside primarily within the water column, where they are at particular risk of predation by filter-feeding Asian carp. This increased and perhaps differential predation will lead to changes in fish community structure. These two groups form the base of the food chain in all aquatic ecosystems and are prey items for many fish (especially during their early life stages) as well as many invertebrates. Thus, one would logically expect changes to the predators that utilize these groups and which will have to compete with Asian carp. In addition to reducing phytoplankton and zooplankton numbers, changes in community structure also occur. Such changes in community structure have been documented on the Missouri River (the Framework 2010, Responsiveness Summary, p. 10), the Mississippi River (Pongruktham *et al.* 2010), and the Illinois River (Kolar *et al.* 2007)) and many other places where Asian carp have become established (Kolar *et al.* 2007). Often, large zooplankters (*e.g.,* many of the cladocerans), which are a preferred food item of many young native fishes, are cropped off, and smaller, less nutritious zooplankters (*e.g.,* rotifers) predominate. A similar shift occurred in Lake Michigan when alewife populations increased dramatically in the 1960's and 1970's; large zooplankton (*e.g.*, *Leptodora*) were reduced and small ones predominated. Exotic planktivores typically shift the zooplankton population from large nutritious species to smaller, less nutritious species. When the zooplankton community is dominated by small-bodied forms, predators must expend more time and energy searching for food, the result often being a population decline in these predators. This occurred in Lake Michigan when yellow perch populations crashed during the peak of the alewife explosion. Also, when Asian carp become established, there tends to be a shift from zooplankton to phytoplankton, which again would be detrimental to most native fishes. (Framework 2010, Responsiveness Summary, p. 10)

6. Asian Carp will Cause Adverse Changes in Benthic Community Structure.

Many benthic invertebrates feed on phytoplankton and zooplankton. Some large invertebrates feed on smaller invertebrates, which in turn depend on these two groups. Thus, changes in the abundance or structure of these groups are logically expected to affect benthic organisms. Also, many benthic macroinvertebrates feed in or on the detrital material on the bottom of lakes and streams. Asian carp also can feed on detrital material under certain circumstances, meaning even more competition with aquatic invertebrates. Species or groups that are filter feeders would likely be most affected by reductions in phytoplankton or zooplankton populations. Example of these would be all mussels, some midges, and net-spinning caddisflies. In-faunal organisms (bugs that live in the mud), such as worms and many midges, would be affected the least, but even these groups could be affected in situations where Asian carp turn to detrital material after they have exhausted other, more preferred, food resources.

7. Asian Carp will cause Reductions in Certain Native Species.

As discussed previously, certain native species, including a number of RAS identified by Mr. Yoder for the UDIP and Brandon Pool, would be adversely affected by large numbers of Asian carp invading UDIP. Due to a general reduction in food supplies, all species would be at some risk because of the vulnerability of most early life stages (*i.e.,* larvae and young-of-the-year). However, some species or groups would be particularly at risk. These would include species or groups either in direct competition with Asian carp for food resources (*e.g.,* gizzard shad, bigmouth buffalo, and other filter feeding fishes, as well as the types of benthic organisms just mentioned). This would also include those species or groups most at risk to predation: fish larvae that inhabit the water column; fish that are broadcast spawners (*e.g.,* carpsuckers and buffaloes); fish whose eggs are buoyant (drum) or semibuoyant (emerald shiner); as well as most zooplankton and phytoplankton.

In summary, the entire UDIP ecosystem will be adversely affected by the invasion of Asian carp, but certain species or groups are particularly vulnerable.

IV. FOR THE UDIP, PROPOSED ASIAN CARP CONTROL ACTIVITIES WILL HAVE LIMITED EFFECT, WILL FURTHER DEGRADE THE HABITAT AND ADVERSELY AFFECT RESIDENT FISH POPULATIONS

The focus of the ACRCC's efforts is to keep Asian carp out of Lake Michigan, not out of the UDIP. Most of the control strategies are to take place upstream of the UDIP. Only one strategy is proposed to take place downstream of the UDIP. Those strategies that may be implemented in the UDIP are likely to adversely affect native fish populations in the UDIP.

The control strategies are divided into short-term and long-term strategies (Framework 2010). Many of the strategies, especially the long-term ones, are research activities or monitoring efforts only (*e.g.*, eDNA monitoring).

A. Short-Term Strategies for Trying to Control Asian Carp

Among the short-term strategies identified in the Framework 2010, there are five that are designed to halt or slow movement of Asian carp through the CAWs:

- Targeted removal of Asian carp within the CAWS
- Commercial fishing at "high risk" locations
- Construction of physical barriers in the Des Plaines River and I&M Canal to prevent carp from crossing the drainage divide during floods
- Expedited construction of electric Barrier IIB
- Rotenone treatment during barrier maintenance

However, all of these short-term strategies will take place upstream of the UDIP. Therefore, none of them will impede Asian carp movement into and their establishment in the UDIP.

B. Long-Term Strategies to Try to Control Asian Carp

Several of the long-term strategies (*e.g.*, use of selective toxicants, nutrient removal, use of seismic technology to divert or kill Asian carp, and disruption of spawning behavior) are still at the research level and the areas where they would be implemented have yet to be determined. One such long-term strategy under consideration is the creation of a toxic zone, which would be established either by creating an anoxic zone or by high levels of ammonia. These toxic zone options would require participation by one or more MWRD plants, all of which are upstream of the UDIP.

Another oft-mentioned, potential long-term strategy is to physically separate the Illinois River and Lake Michigan basins. Although the location where the separation would be made has not been established, one would assume it would be where the waterway is narrow, *i.e.*, in either the Lockport or Brandon pools, both of which are upstream of UDIP.

Two of the currently available long-term strategies would or could be implemented downstream of the UDIP. Both of these long-term strategies are designed only to retard, not stop, the progress of Asian carp. One of these strategies is the modified operations of the locks. This strategy potentially could be used downstream of UDIP. However, the experts considering the various operational strategies concluded that "there is no individual or combination of lock operation scenarios that experts believe will lower the risk of Asian carp establishing self-sustaining populations in Lake Michigan to an acceptable level" (USACE 2010b, p. 25). Thus, modification of lock operation will not appreciably slow the movement of Asian carp into the UDIP, even if it were to be implemented downstream of it.

The only long-term strategy that could retard, though not stop, Asian carp from invading UDIP is commercial fishing for removal below Lockport (Framework 2010, p. 21). According to the Framework 2010, "This action will employ commercial fisherman in the pools below the barrier in a sustained program of catch and removal of Asian carp from the system, while minimizing detrimental effects on native fish species. In both Lockport and Brandon Road Pools, densities of Asian carp are relatively low therefore at this time no commercial fishing efforts are planned." (*Id.* at p. 21) Thus, this action is not designed to stop Asian carp from advancing through the CSSC, but only to slow their progress. Further, as the quoted passage indicates, detrimental effects to native fishes are expected to occur from commercial fishing. While an effort will be made to minimize these detrimental effects on native fishes to the extent possible, this does not negate the fact that they will definitely occur. I know of no netting or other removal techniques that would not cause damage or mortality to non-target organisms (*i.e.,* all fishes except for Asian carp). Netting is not species-specific. Netting will result in the capture of all fish whose size range overlaps with that of Asian carp. In the Lower Des Plaines River and the CAWS, this would include a variety of fishes: common carp, catfish, freshwater drum, both large and smallmouth bass, other sunfish species (*e.g.*, bluegills and crappies), sauger, walleye, northern pike, gar, and many sucker species including greater redhorse, a state-endangered species, and river redhorse, a state-threatened species. All these species, and more, would also become entangled in the nets used to capture Asian carp. Some mortality will occur regardless of how often the nets are checked. For example, if the nets are only checked once a day, which is the normal procedure, mortality can be severe. Given the number of times netting would have to occur and the number of nets that would need to be set to be effective in terms of Asian carp removal, the cumulative effect on native species could be severe.

According to Mr. Vic Santucci, Aquatic Nuisance Species Program, IDNR, commercial netting has taken place this year in the Marseilles, Dresden, Brandon, and Lockport pools. The intensity of this effort is high. For example, according to the ACRCC web site, five netting crews were scheduled to be in the Marseilles Pool from September 15-18, 2010. This level of effort would be expected to adversely affect resident fishes. Given the emphasis on and ultimate goal of slowing the progress of Asian carp through these efforts, a considerable amount of unavoidable collateral damage to native fishes is reasonably to be expected. Given the number of stresses on native fish that already exist in the UDIP, the additional stress of commercial netting will adversely affect native fishes to some degree, and make attainment of aquatic life use CWA interim goals that much more difficult.

Moreover, netting is likely to have only limited success because the deployment of nets in active shipping lanes will not be possible. The existing navigational use of the Dresden Pool, including the UDIP, characterized by significant barge and other commercial boat traffic, will either prevent setting out nets because they will interfere with such traffic or the nets that are set out are likely to be damaged and rendered ineffective by the presence of the barge and boat traffic. Therefore, in all of the active shipping lane areas of the Dresden Pool, Asian carp will be able to

find "safe areas" for their continued migration into and existence in the UDIP. Lastly, netting is designed to only slow the movement of Asian carp, not to prevent its migration into the UDIP. Eventually, just as it has in the lower pools, the Asian carp population will build up to significant levels in UDIP and the detrimental effects described in my testimony will occur.

The ACRCC also has identified a new type of barrier as a potential long-term strategy for deterring the advancement of Asian carp. The USACE commissioned a study (USACE 2010a) that considered the feasibility of using behavioral barriers to stop or impede the movement of Asian carp in the CAWS. The study evaluated the effectiveness of sound (known as "acoustical barriers"), strobe lights, and bubble curtains either singly or in combination. It concluded that none of these technologies was proven to repel Asian carp but perhaps all three in combination might prove useful. Based on the study results, the installation of a combination system as a demonstration project was recommended. The recommended location is in extreme upper UDIP at the downstream opening to the Brandon Road Lock. If this system works, which is still unknown, it may deter Asian carp from entering Brandon Pool but it is not intended to and will certainly not deter them from entering the UDIP. As described in Ms. Julia Wozniak's pre-filed testimony on behalf of MWGen, the ABS system is being designed to not only deter Asian carp from moving into the lock chamber that connects the Dresden and Brandon Pools, but to shunt or herd them to the tailwater area below the Brandon Road Dam, where they will be removed or killed. Poisoning them with the non-selective piscicide rotenone appears to be a preferred option, according to the published information on this proposed control strategy. Certainly, the application of a piscicide would be the most effective option for removing Asian carp from the UDIP. Unfortunately, this Brandon Road tailwater area contains the best habitat in Dresden Pool, especially for fishes that need rocky, fast water areas to spawn. As described in more detail later in my testimony, periodically poisoning or otherwise removing fish from this small area of good habitat would have the unintended but unavoidable consequence of adversely affecting native fishes in the UDIP, and may render this area useless for spawning. This is an excellent example of the "collateral damage," as discussed later in my testimony, that will occur as part of the necessary and government-mandated effort to stop or slow the movement of Asian carp into Lake Michigan.

In summary, most of the control strategies now being considered will be installed upstream of UDIP and thus obviously will not slow the progress of Asian carp into UDIP and their establishment in that pool. Of the few strategies that would or could be implemented in or downstream of UDIP, their effectiveness will either be limited (*e.g.*, modified lock operation) or the measure itself is likely to adversely affect native fishes (*e.g.*, commercial netting). Thus, Asian carp will largely be able to move undeterred into UDIP causing the myriad problems described previously in my testimony.

Another potential long-term strategy recommended to combat Asian carp is to develop a piscicide that is specific to Asian carp, analogous to the chemical agent that now is keeping sea lampreys in check in U.S. waters. A "piscicide" is a chemical agent that is applied to a

waterbody to target fish species for destruction by poisoning. Rotenone is an example of a piscicide, but one that kills all fishes. At this time, no control agent specific to Asian carp has been found. Even if one is found or developed, which historically has taken years, it would then likely take a considerable additional period of years to reduce the numbers of Asian carp significantly, as was the case for sea lampreys. Although the development of a piscicide to keep lampreys is considered a success, some of the damage caused by lampreys has never been reversed. For example, lake trout was the keystone species in Lake Michigan. Fifty years after lake trout were nearly eliminated by sea lampreys, there remains little or no reproduction of this species. Several species of ciscos were eliminated from Lake Michigan and one species has gone extinct during the past 50 years. Predation by sea lamprey contributed to the decline in these ciscos.

If a piscicide specific to Asian carp were to be developed, diligent follow-up applications of the piscicide would be needed, again, as is currently the case with sea lamprey. Regular re-application would be necessary because there is essentially an unlimited source of Asian carp in the Mississippi River and the lower Illinois River that will continue to re-invade UDIP after each treatment with this yet-to-be-developed piscicide. Perhaps most important is to understand that the chemical used to treat sea lampreys also kills other species, albeit not to the degree that it kills sea lampreys. In the case of sea lampreys, a societal decision was made to accept this collateral damage to native species in order to protect the Great Lakes. It seems likely that management biologists would look upon impacts to UDIP and the CAWS the same way, *i.e.*, acceptance of collateral damage to native fishes in order to protect the greater good (the Great Lakes). The problem is, as discussed at length in my previous testimony (*see* Board Exhibit 366; *see also* Transcript of 11/9/09 Hearing p.m., pp. 1-150; Transcript of 11/10/09 Hearing a.m., pp. 1-93; Transcript of 11/10/09 Hearing p.m., pp. 1-56), that the UDIP cannot stand any more stressors. The system is already "stressed out."

It may be contended that even if native fish are sacrificed as part of the effort to control Asian carp, they can be re-established in the future through restocking efforts. For several reasons, restocking of native fishes, as discussed in the Framework 2010, will not be an effective tool. First, the system will initially be degraded. Second, reapplications of the piscicide would certainly be needed to handle new arrivals of Asian carp from further downriver. Thus, the system would be in a perpetual state of being impacted. Lastly, there are no ready sources for many of these native fishes. Hatcheries can provide bass, bluegills, catfish, and a few other standard sport fish but they cannot provide native minnows, darters, buffaloes, carpsuckers, gars, madtoms, etc. that are part of the fish community in the UDIP. Thus, any "restored" community would be even more unbalanced than it is now. The UDIP would be moved even further away from attaining CWA goals.

C. There will be a Negative Effect on the UDIP from a Proposed Physical Separation between the CAWS and Lake Michigan

If the CAWS and Lake Michigan were to be physically separated, there will a negative impact upon the UDIP. The water in the UDIP is already dominated by wastewater effluent from the Stickney Plant. Water of marginal quality is also supplied by the Upper Des Plaines River. The only source of good quality water to the UDIP is that which is diverted from Lake Michigan. If the separation is accomplished, that source of "good" water will be elimimated.[1] Further exacerbating the problem will be the attendant reduction in flow. As noted by myself and other witnesses in this proceeding, the CAWS and UDIP are low gradient waterways. As I have previously testified, this already limits fishes that prefer fast water and rocky, riffle type habitat. Taking away the Lake Michigan flow to the UDIP, one of the existing flow components to the system, will further exacerbate the problem caused by low flow conditions in the UDIP.

Although the changes as a result of separation may be fairly small on a percentage basis, they will all be in the same direction, *i.e.,* negative. In a system that is already constrained by the lack of good habitat, low flow conditions and contaminated sediments, and now the adverse, stressor effects that will be caused by the Asian carp's arrival and establishment, these additional negative effects that will result from a physical separation of the CAWS from the Great Lakes would be another reason why the UDIP will not, in fact, attain CWA goals.

V. CONCLUSION

Because the entire Upper Illinois Waterway system is habitat limited, as demonstrated in previous testimony in this rule-making proceeding (*see, e.g.,* Board Exhibit 366; *see also* Transcript of 11/9/09 Hearing p.m., pp. 1-150; Transcript of 11/10/09 Hearing a.m., pp. 1-93; Transcript of 11/10/09 Hearing p.m., pp. 1-56), the presence of Asian carp is a further limitation on the quality that the aquatic community can attain. This means that improvements to water quality, be they DO, temperature, or anything else, will have little or no beneficial effect because the aquatic community is limited not by water quality but by the impounding effects of the dams, poor habitat, toxic sediments, water level fluctuations, barge traffic, and now the additional detrimental effects from the invasion of Asian carp.

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[1] In a January 2010 affidavit submitted in support of the State of Illinois' opposition to the State of Michigan's and other Great Lakes states' legal action seeking a preliminary injunction before the U.S. Supreme Court to close the locks connecting the CAWS to Lake Michigan, Robert B. Sulski, one of the Illinois EPA witnesses in this rule-making, stated that "discretionary diversion from Lake Michigan is the only means available for mitigating periodic low or zero D.O. conditions that can result in extremely noxious conditions, including mass fish kills." (*Appendix of State of Illinois, Affidavit of Robert B. Sulski, States of Wisconsin et al. v. State of Illinois et al.*, January 4, 2010, p. 15a at paragraph 12, a copy of which is attached as Attachment 3).

In my testimony today, I have identified seven ways in which Asian carp will adversely affect aquatic organisms in the Lower Des Plaines River, including the UDIP, as well as in the CAWS. These seven adverse effects are:

- **Degraded Fish Community Structure** - Competition for food will disrupt the current trophic structure and lead to a poorer quality fish community.
- **Native Species will be Deprived of Important Food Resources** - Because of their numbers, size, and filtering effectiveness, Asian carp will reduce phytoplankton and zooplankton populations. Because virtually all fishes depend on phytoplankton and zooplankton at some life stage, almost all fish species will be adversely affected.
- **The Condition of Fish will be Reduced -** The reduction in food resources will lead to a reduction in the condition (*i.e.,* fitness) of fish. Species in direct competition with Asian carp, like gizzard shad and bigmouth buffalo, will be affected the most, as confirmed and documented by a study conducted by the INHS.
- **Recruitment of Fish will be Reduced** - In order to successfully reproduce, fish need to be fit. Due to competition for food resources, the fitness of many native fish species will be reduced, which in turn will lead to reduced reproductive success. Further, even if native fish are successful in reproducing, Asian carp also ingest native fish eggs and larvae that are in the water column, thereby reducing the number of native fish that may be present.
- **Phytoplankton and Zooplankton Populations will be Reduced and their Composition Changed** - Effective filtering by large numbers of Asian carp will reduce plankton populations. There also will be a reduction in large zooplankton, the preferred prey of many native fishes.
- **Benthic Community Structure will be Adversely Affected** - Because of the reductions in phytoplankton and zooplankton, the principal food for many benthic organisms, populations of benthic organisms will be reduced.
- **Certain Fish Species will be Particularly Vulnerable -** Fish species that are in direct competition with Asian carp (*i.e.,* other filter feeding fishes) will be disproportionally affected. Species whose eggs or larvae spend time in the water column will also be at particular risk.

Although it is possible that some of the control strategies recommended by the ACRCC may be successful, most are not going to be applied to protect the UDIP from Asian carp. Except for efforts towards intensive removal of Asian carp by commercial fishermen, all the strategies under consideration will be applied above (*i.e.,* lakeward) of the UDIP. Even if the electric barrier or other measures are successful in terms of preventing Asian carp from reaching Lake Michigan, they are not designed to keep them from reaching the UDIP. Thus, the movement of substantial numbers of Asian carp into the UDIP is inevitable. And when that occurs, the adverse effects described in this testimony will occur.

Finally, several of the proposed controls will have adverse affects on native fishes. Netting efforts to remove Asian carp will kill or injure non-target fishes. Spot treatments using rotenone will be even more destructive. Ecological separation of the CAWS from the Great Lakes to prevent the migration of Asian carp to Lake Michigan will bring another set of problems to the UDIP.

In summary, the adverse effects of the Asian carp themselves, coupled with the negative effects from various control strategies, will move UDIP even further away from attainment of the CWA interim aquatic life goals than it is today.

Respectfully submitted

Greg Seegert

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ATTACHMENTS

Pre-Filed Testimony of Greg Seegert
Regarding Asian Carp Issues

Attachment 1	**Resume of Mr. Greg Seegert of EA Engineering, Science, and Technology, Inc.**
Attachment 2	**Photographs documenting EA Engineering, Science, and Technology, Inc. collection of adult bighead carp in the UDIP for annual fish survey, May 2010**
Attachment 3	**Appendix of State of Illinois, Affidavit of Robert B. Sulski, *States of Wisconsin et al. v. State of Illinois et al.*, U.S. Supreme Court filing, January 4, 2010**

ATTACHMENT 1

Resume for Mr. Greg Seegert of EA Engineering, Science, and Technology, Inc.

Gregory L. Seegert
Chief Aquatic Biologist

Mr. Seegert is a senior scientist at EA's office in Deerfield, Illinois as well as Chief Ichthyologist at EA. His areas of special expertise are aquatic ecology and aquatic toxicology. In his 35 years of experience in these areas, Mr. Seegert has conducted studies throughout the Midwest and much of the East and Southeast. He is a recognized expert on biocriteria and biologieal sampling methods to assess impacts to aquatic life. He works regularly with the private sector and regulatory agencies in designing and implementing bioassay and aquatic biological studies. He has designed and directed numerous studies investigating the effects of water intakes and discharges on aquatic life. Issues regularly addressed by Mr. Seegert include factors affecting the abundance and distribution of fishes, entrainment at hydroelectric facilities, 316(a) and (b), aquatic toxicology, bioaccumulation, endangered species, and eeological risk.

Qualifications

Education
M.S.; University of Wisconsin–Milwaukee; Zoology; 1973
B.S.; University of Wisconsin–Madison; Zoology; 1970

Specialized Training
SEAK Expert Witness Training; 2007
EA Project Manager Training; 1997
EA Expert Witness Training; 1990
EA Toxicity Reduction Evaluation Training; 1989

Professional Affiliations/Appointments
American Fisheries Society National Society and three State Chapters
American Society of Ichthyologists and Herpetologists
Wisconsin Society of Ornithology

Professional Experience

Aquatic Ecology—Designed, conducted, managed, and reviewed aquatic studies throughout the East, South, and Midwest. Recognized expert on the distribution of fishes and fish taxonomy, biocriteria, and Index of Biotic Integrity (IBI) theory and implementation. Worked on small streams, wetlands, large rivers (e.g., Ohio, Wabash, Mississippi), ponds, reservoirs, and the Great Lakes. Worked with numerous utilities in studying the effects of thermal discharges on aquatic life. Evaluated impingement and entrainment losses of aquatic organisms and the effects of construction and flow alterations on salmonids. Annually directs a large fish study that covers most of the Ohio River. Regularly conducts surveys of endangered fishes. Instructor at several workshops on fish identification.

Habitat Evaluation—Used a variety of qualitative and quantitative techniques (e.g., Ohio Environmental Protection Agency's [EPA's] Qualitative Habitat Evaluation Index, ORSANCO Habitat Class) to evaluate the suitability of waterbodies for fishes. Using correlation analysis, determined which habitat (e.g., amounts of cover, silt, eobble, ORSANCO class) or physical (e.g., river flow, depth, temperature) variables significantly affected biological variables (e.g., catch-per-unit-effort, Index of Well Being mod scores, IBI scores, fish biomass, diversity). Determined how fish communities in the Upper Illinois Waterway responded to habitat quality as measured by the Qualitative Habitat Evaluation Index. Determined how changes in physical variables (current velocity, depth) and the amount of useable habitat would affect fish and macroinvertebrate in the Red River of the North as a result of planned water diversions.

Clean Water Act Section 316(a)—Designed and conducted field studies in 1995 and 2000 as part of 316(a) demonstrations at a paper mill on the Pigeon River in North Carolina. Also prepared all associated reports. Prepared 316(a) demonstrations for the WE-Energies Oak Creek/Elm Road project and the Point Beach Nuclear Plant, both on Lake Michigan, as well as demonstrations for plants on the Wabash and Muskingum Rivers. Used EA-collected biological data to develop alternative thermal limits for the Lower DesPlaines River.

Clean Water Act Section 316(b)—From 1998 through 2003, served as a principal advisor to Utility Water Act Group (UWAG) on freshwater issues and has worked with them and various industry representatives in developing comments on EPA's 316(b) Phase I and II rules. During this period, attended various workshops, conferences, and meetings representing UWAG and various utilities. On behalf of a group of Ohio River users, developed and submitted comments regarding EPA's Ohio River Case Study Example. On behalf of the American Petroleum

Institute, developed a position paper relative to establishment of the Calculation Baseline and various related issues. Based on these reviews, has made numerous presentations at various industry forums. Has managed or directed entrainment and/or impingement studies at approximately 50 plant sites. These include studies on lakes, reservoirs, small rivers, large rivers, and Lake Michigan. For Electric Power Research Institute, was project director on impingement studies at 15 power plants on the Ohio River. Also managed impingement and entrainment studies at 5 American Electric Power plants on smaller Midwestern rivers.

Environmental Toxicology—Conducted numerous acute and life cycle bioassays to determine the effects of effluents and of numerous individual organic and inorganic chemicals on aquatic organisms. These tests involved a wide variety of freshwater and marine fish and macroinvertebrates. Determined the upper thermal tolerance of smallmouth redhorse and golden redhorse. On behalf of Cincinnati Gas and Electric, evaluated the effects of ash pond and cooling tower blowdown on aquatic organisms. Designed and conducted laboratory and field studies at two Ashland Oil refineries. For the Minnesota Pollution Control Board, evaluated the effects of chlororganics from the St. Regis paper plant at Sartell on aquatic life and human health. Directed two 28-day dioxin biouptake studies at a Champion International paper mill in Quinnesec, Michigan. At this same site, directed a long-term research and development effort to assess and mitigate impairment of the flavor of fish in the receiving waterbody.

Critical Reviews—On behalf of various companies and trade associations (e.g., American Petroleum Institute), conducted detailed reviews of various state and federal technical and regulatory documents. Several of these reviews have led to extensive revisions in the subject document. Chlorine-related literature is an area of particular expertise and, as a result, Mr. Seegert's expertise has been solicited regularly by EPA, various states, and numerous industrial clients. For American Petroleum Institute, reviewed the status of biocriteria development in the United States. Also reviewed several ecoregion IBI reports in Indiana.

Mining Studies—Directed all aquatic and water quality activities associated with a 2-year, $1 million study designed to assess the impacts of New Source coal mining in West Virginia. In conjunction with this study, developed a unique system of ranking the biological resources of each waterbody, developed detailed methodologies to monitor the aquatic environment before, during, and after mining, and ranked all the fishes of West Virginia with regard to their susceptibility to coal mining. Directed a five-year study of issues related to effluent quality, sedimentation, tissue contamination, loss of spawning habitat, alterations in flows, and rates of recolonization at the site of a proposed copper/zinc mine in Wisconsin. Directed and managed a long term study to evaluate biological recovery following the pumpout of a flooded coal mine in Ohio.

Hydropower Development—Evaluated effects of hydropower development on aquatic life at numerous sites throughout the Midwest and Southeast. Designed and conducted population surveys of various fish species to evaluate impacts on these species. Measured entrainment rates and entrainment mortality at various sites and assessed the impact of these losses on resident and migratory warmwater and coldwater fishes. Evaluated effects of flow alterations and flow reductions on stream fishes.

Selected Publications and Presentations

Organizer and moderator of a national workshop on evaluating large river fish communities.

Seegert, G.L. (B.M. Burr, D.J. Eisenhour, K. M. Cook, C.A. Taylor, R.W. Sauer, E.R. Atwood, eo-authors). 1996. Nonnative fishes in Illinois waters: What do the records reveal? *Trans. Ill. Acad. Sci.* 89:73-91.

Seegert, G.L. (B.M. Burr, K. M. Cook, D.J. Eisenhour, K.R. Piller, W.J. Poly, R.W. Sauer, C.A. Taylor, E.R. Atwood, co-authors). 1996. Selected Illinois fishes in jeopardy: New records and status evaluations. *Trans. Ill. Acad. Sci.* 89:169-186.

Seegert, G.L. 1986. Rediscovery of the greater redhorse in Illinois. *Trans. Ill. Acad. Sci.* 79:293-294

Seegert, G.L. 1984. Fisheries studies of Pool 5A of the Upper Mississippi River, 1982, in Proc. 40th Upper Mississippi River Conservation Committee. UMRCC, Rock Island, Illinois.

Seegert, G.L. (J. Fava and P. Cumbie, co-authors). 1983. How representative are the data sets used to derive national water quality criteria?, in Proc. Seventh Aquatic Toxieological Symposium. ASTM, Philadelphia.

Seegert, G.L. (R.B. Bogardus, co-author). 1980. Ecological and environmental factors to be considered in developing ehlorine criteria, in Water Chlorination: Environmental Impact and Health Effects, Vol. 3 (R.L. Jolley, ed.). Ann Arbor Science, Ann Arbor, Michigan.

Seegert, G.L. (A.S. Brooks, J. Vande Castle, and K. Gradall, co-authors). 1979. The effects of monoehloramine on selected riverine fishes. Trans. Am. Fish. Soc. 108:88-96.

The fish community of the Chippewa River and Dells Pond near Eau Claire, Wisconsin. Presented at WI AFS meeting. 1998. Eau Claire, WI. January.

Entrainment and impingement studies at two power plants on the Wabash River in Indiana. 1998. Presented at Electric Power Research Institute Clean Water Act Section 316(b) Technical Workshop. Berkeley Springs, West Virginia. September.

Status and application of biocriteria. 1998. Presented at the TAPPI Environmental Conference. Vancouver, British Columbia. April.

Improvements to the Pigeon River following modernization of the Champion International Mill. 1997. Presented at the TAPPI Environmental Conference. Minneapolis, Minnesota. May.

Improvements to the Pigeon River following modernization of the Champion International Mill. 1997. Presented at the TAPPI Biological Symposium. San Francisco, California. October.

Geographic and historic changes in Ohio River Fish Communities. 1997. Presented at the Ohio River Fisheries Conference. Cincinnati, Ohio. January.

Small mammals of the Ohio River floodplain in western Kentucky and adjacent Illinois. 1982. Trans. Kentucky Acad. Sci. Co-authored by R.K. Rose.

Factors in the design of chlorine toxicological research. 1982. In: R.L. Jolley, ed. Water chlorination: environmental impact and health effects, Vol. 4, Ann Arbor Science, Ann Arbor, Michigan. Co-authored by J.A. Fava.

Low level chlorine analysis by amperometric titration. 1979. J. Water Poll. cont. Fed. 51:2636-2640. Co-authored by A.S. Brooks.

WAPORA, Inc. 1978. Review of the Mattic and Zittel paper: site-specific evaluation of power plant chlorination. Project 218. Submitted to Edison Electric Institute, Washington, D.C.

A preliminary look at the effects of intermittent chlorination on selected warmwater fishes. 1978. Pages 95-110. In: R.L. Jolley, H. Gorchev, and M. Hamilton eds., Water chlorination: environmental impact and health effects, Vol. 2. Ann Arbor Science. Ann Arbor, Michigan. Co-authored by A.S. Brooks.

The effects of intermittent chlorination on coho salmon, alewife, spottail shiner, and rainbow smelt. 1978. Trans. Am. Fish. Soc. 107:346-353. Co-authored by A.S. Brooks.

Dechlorination of water for fish cultures: a comparison of the activated carbon, sulfite reduction, and photochemical methods. 1978. J. Fish. Res. Bd. Can. 35:88-92. Co-authored by A.S. Brooks.

Diel variations in sensitivity of fishes to potentially lethal stimuli. 1977. Prog. Fish. Cult. 39:144-147. Co-authored by R.E. Speiler and T.A. Noeske.

The effects of intermittent chlorination of rainbow trout and yellow perch. 1977. Trans. Am. Fish. Soc. 106:278-286. Co-authored by A.S. Brooks.

The effects of intermittent chlorination of the biota of Lake Michigan. 1977. Special Report #31, Center for Great Lakes Studies, University of Wisconsin. Milwaukee, Wisconsin. Co-authored by A.S. Brooks.

The effects of a 30-minute exposure of selected Lake Michigan fishes and invertebrates to residual chlorine. 1977. Pages 91-99. In: L.D. Jensen, ed. Biofouling control procedures: technology and ecological effects, Marcel Dekker, Inc., New York, New York. Co-authored by A.S. Brooks.

The effects of intermittent chlorination on seleeted warm water fishes. 1977. Presented at the Conf. on Water Chlorination: Environmental Impact and Health Effects. 31 October – 4 November 1977. Gatlinburg, Tennessee. Co-authored by A.S. Brooks.

The effects of intermittent chlorination on selected Great Lakes fishes. 1977. Presented at the 38th Midwest Fish & Wildlife Conf. 5-8 December 1975. Dearborn, Michigan. Co-authored by A.S. Brooks.

Toxicity of chlorine to freshwater organisms under varying environmental conditions. 1976. Pages 277-298. In: R.L. Jolley, ed. Proceedings of the Conference on Environmental Impact of Water Chlorination, 22-24 October 1975, Conference 761096. Oak Ridge National Laboratory. Oak Ridge, Tennessee. Co-authored by A.S. Brooks.

The Beaver Dam River. 1976. Pages 210-213. In: D.D. Tessen, ed. Wisconsin's favorite bird haunts. Wisconsin Society for Ornithology. Green Bay, Wisconsin.

The effects of heat on plasma potassium levels, hematocrit, and cardiac activity in the alewife, common shiner, and two other teleosts. 1973. Presented at the 16th Conf. on Great Lakes Research. 16-18 April. Huron, Ohio. Co-authored by C.R. Norden.

The effects of lethal heating on plasma potassium levels, hematocrit and cardiac activity in the alewife (Alosa pseudoharengus) compared with three other teleosts. Pages 154-162. In: Proeeedings of the 16th Conf. Great Lakes Res. International Association Great Lakes Res.

Numerous presentations at state, division, and national American Fisheries Society Meetings. Topics have included:

- Effects of power plant intakes
- General fish surveys
- Threatened and endangered species surveys
- Thermal assessments
- IBI protocols
- Large river sampling methods
- Toxicity studies
- Use attainability
- Biological variability
- Habitat assessment

Professional Recognition

Chief Instructor for several fish identification workshops sponsored by the Indiana American Fisheries Society, Co-Instructor for two, 3-day fish identification workshops sponsored by the Wisconsin American Fisheries Society.

Candidate for President, Wisconsin Chapter of American Fisheries Society. 1998 and 2008.

Chairperson, Fish Physiology Section, American Society of Ichthyologists and Herpetologists, 1997 Annual Meeting. Seattle, Washington.

Member, Endangered Species Committee, American Fisheries Society. 1996 and 1998.

Invited speaker at various seminars and workshops.

ATTACHMENT 2

Photographs documenting EA Engineering, Science, and Technology, Inc. collection of adult bighead carp in the UDIP for annual fish survey, May 2010

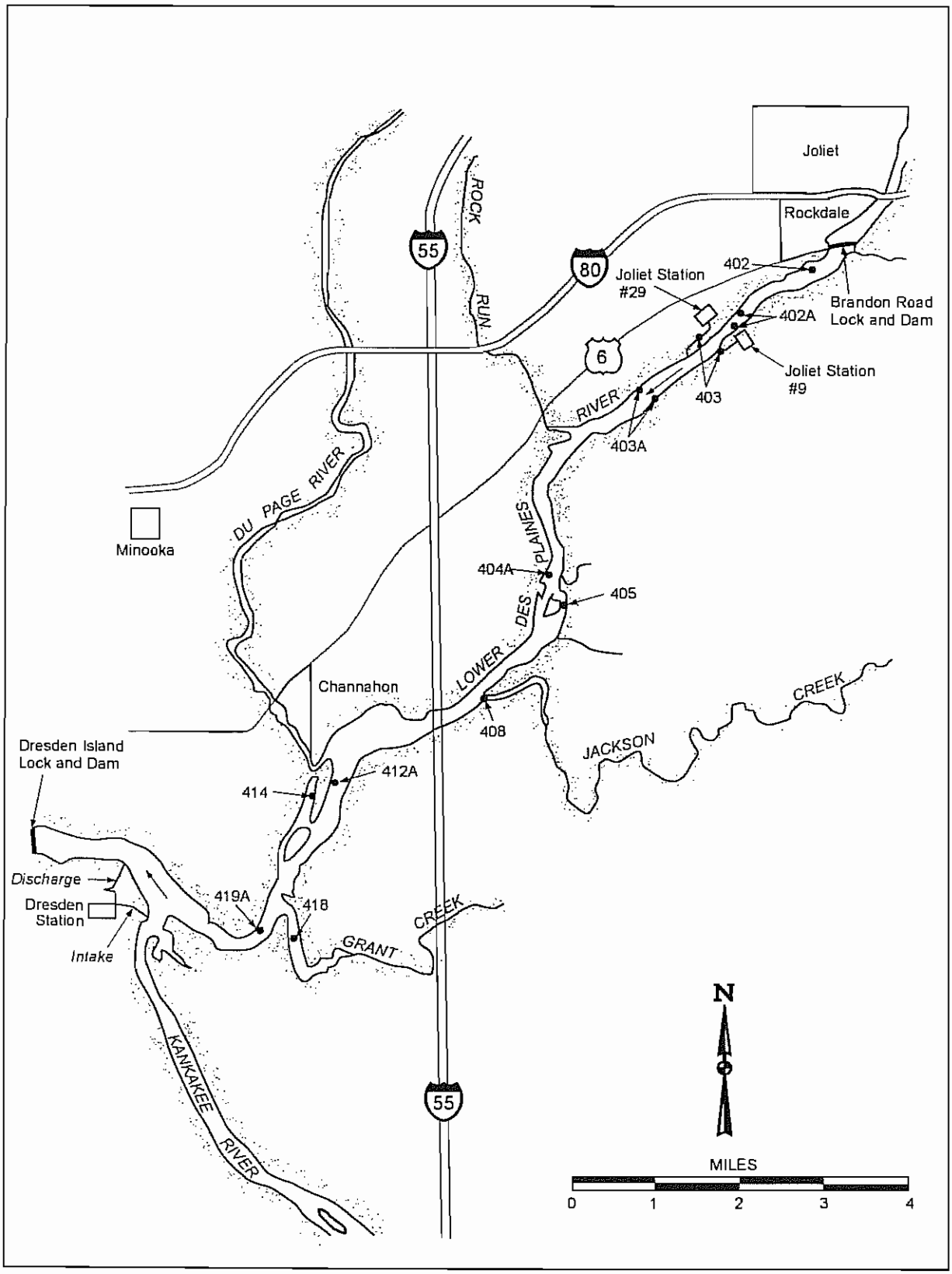

Figure 2. Fish Sampling Locations within the Upstream and Downstream I-55 Segments of the Lower Des Plaines River.

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Photo 1: Six Bighead Carp Collected from lower Des Plaines River within Jackson Creek Embayment at River Mile 278.3 on May 20, 2010. Total lengths ranged from 694 to 1,059 mm and individual weights ranged from 6,800 to 14,700 **g (Photograph by EA Engineering, Science, and Technology, Inc.)**

Photo 2: EA Fisheries Biologist, Patrick Hilbert, Holding Two Bighead Carp collected by AC Electrofishing from the lower Des Plaines River within the Jackson Creek Embayment at River Mile 278.3 on May 20, 2010 (Photograph by EA Engineering, Science, and Technology, Inc.)

Photo 3: EA Fisheries Biologist, Mr. James Fitzgerald, Holding Two Bighead Carp that were Collected by AC Electrofishing from the lower Des Plaines River within the Jackson Creek Embayment at River Mile 278.3 on May 20, 2010 (Photograph by EA Engineering, Science, and Technology, Inc.)

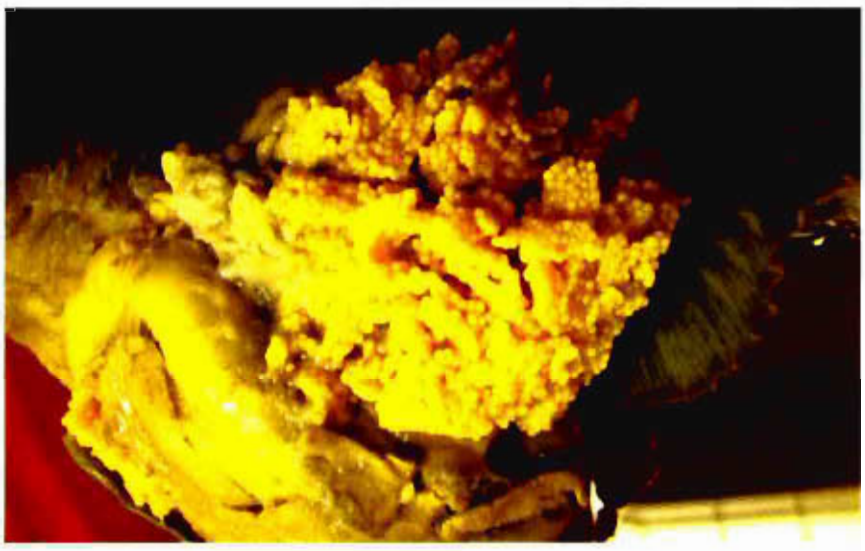

Photo 4: One of the Six Bighead Carp, that was Collected by AC Electrofishing from the lower Des Plaines River within the Jackson Creek Embayment at River Mile 278.3 on May 20, 2010, was Retained as a Voucher Specimen. It was a Ripe Female as Depicted by the Egg Mass above (Photograph by EA Engineering, Science, and Technology, Inc.)

ATTACHMENT 3

Appendix of State of Illinois, Affidavit of Robert B. Sulski,
States of Wisconsin et al. v. State of Illinois et al.,
U. S. Supreme Court filing, January 4, 2010

In The
Supreme Court of the United States
October Term, 1966

STATES OF WISCONSIN, MINNESOTA, OHIO, AND PENNSYLVANIA, *Complainants*, *v.* STATE OF ILLINOIS AND METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*.	No. 1 Original
STATE OF MICHIGAN, *Complainant*, *v.* STATE OF ILLINOIS AND METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*.	No. 2 Original
STATE OF NEW YORK, *Complainant*, *v.* STATE OF ILLINOIS AND METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*.	No. 3 Original

APPENDIX OF STATE OF ILLINOIS

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Deputy Solicitor General

In The

Supreme Court of the United States

October Term 1966

STATES OF WISCONSIN, MINNESOTA, OHIO, AND PENNSYLVANIA, *Complainants*, v. STATE OF ILLINOIS AND THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*,	No. 1 Original
STATE OF MICHIGAN, *Complainant*, v. STATE OF ILLINOIS AND THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*,	No. 2 Original
STATE OF NEW YORK, *Complainant*, v. STATE OF ILLINOIS AND THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, *Defendants*, UNITED STATES OF AMERICA, *Intervenor*.	No. 3 Original

STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)

AFFIDAVIT

ROBERT B. SULSKI, being first duly sworn upon oath, deposes and states that I have personal knowledge as follows:

1. I hold a B.A. in Zoology and an M.A in Environmental Engineering from Southern Illinois University at Carbondale. I have worked for the Bureau of Water in the Illinois Environmental Protection Agency (IEPA) for 25 years.

2. In the last 6 years I have worked as a water pollution programs manager on water quality and compliance and monitoring issues in the Chicago Metropolitan Area, including Use Attainability Analysis, Total Maximum Daily Load, non-point source pollution, water quality standards, state and NPDES permit issuance and re-issuance and federal and state enforcement action programs.

3. During this time I also have represented IEPA on the interagency Aquatic Nuisance Species Dispersal Barrier Panel.

4. Prior to my duties as a programs manager, I worked for 19 years as a water pollution control compliance engineer, during which time I monitored major facilities that discharge into the Chicago Area Waterway Systems (CAWS) and assisted in efforts to remedy water quality problems in CAWS and Lake Michigan.

5. The CAWS watershed contains about half of Illinois' population. It also is the receiving stream of some of the largest dischargers in the State, and in some cases the nation, including the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), Midwest Generation coal fired power plants, and numerous chemical manufacturing facilities.

6. The dense urban nature of the Chicago Metropolitan area and the configuration of its waterways have made solutions to ongoing water quality issues uniquely challenging. To begin, CAWS has been modified to protect Lake Michigan from domestic wastewater loadings, to mitigate flooding from massive storm water loadings, and to enhance waterway commerce between the Great Lakes and Mississippi River basins.

7. The modifications include a reversal of the original flow direction of the waterways away from the lake, which was accomplished by deepening and widening the

existing waterways and by constructing new channels and control structures where none previously existed.

8. The resultant deep-draft, vertical-walled, low- or no-flow velocity waterways and channels limit natural aeration and cooling.

9. Additionally, much of the area was constructed with combined sewers, which carry both storm water and wastewater in a single system of pipes that overflow to CAWS during extreme storm events and further exacerbate low, sometimes zero dissolved oxygen (D.O.) conditions.

10. The low or zero D.O. conditions have been addressed to some extent in parts, but not all, of CAWS, through the installation of in-stream and side-stream, supplemental aeration units. Such units do not exist or are undersized in the Chicago River system.

11. Improvements in low D.O. conditions in the Chicago River system are not expected to occur prior to the next 5- to 15-year timeframe, when MWRDC's combined sewer overflow Long Term Control Plan is completed and, if further necessary, additional supplemental aeration units and CAWS flow redistribution systems are installed.

12. In the interim, discretionary diversion from Lake Michigan is the only means available for mitigating periodic low or zero D.O. conditions that can result in extremely noxious conditions, including mass fish kills. Discretionary diversion is accomplished primarily through sluice gates and secondarily through pumps.

13. The sluice gates are located at the Wilmette Pumping Station, the Chicago River lock and the O'Brien Lock and have the capability of diverting upwards of 13,800 cfs from the lake into the rivers.

14. The pumps are located at Wilmette and Chicago River and have a much more limited maximum diversion capacity of only 140 cfs. 140 cfs may not be enough to overcome D.O. sags that can lead to noxious conditions and fish kills.

FURTHER AFFIANT SAYETH NAUGHT.

Robert B. Sulski

ROBERT B. SULSKI

Subscribed and Sworn to before me
this 4th day of January, 2010.

Darlene F. Armstrong-Barnes

NOTARY PUBLIC