US Army Corps of Engineers
Chicago District

Asian Carp Monitoring Fact Sheet

eDNA Surveillance and Calibration

Chicago Sanitary and Ship Canal – Aquatic Nuisance Species Dispersal Barrier

Overview:
One of the tools implemented by the Asian Carp Regional Coordinating Committee's (ACRCC) Monitoring and Rapid Response Work Group (MRRWG) to conduct monitoring of Asian carp in the Chicago Area Waterways System (CAWS) is Environmental DNA (eDNA) surveillance. eDNA is a genetic tool that indicates the presence or absence of species-specific DNA in the aquatic environment. Fishes, including Asian carp, release cells containing DNA into the environment from mucus, feces and urine. DNA degrades in the environment, but this process is not instantaneous, and DNA can be held in suspension and transported. Species can be detected by filtering water samples and then extracting and amplifying short fragments of the shed DNA. This method was developed by the University of Notre Dame and through a cooperative agreement with the U.S. Army Corps of Engineers, was applied as a monitoring tool for the MRRWG Monitoring Plan.

A positive eDNA sample indicates the presence of Asian carp DNA. At present, eDNA evidence cannot verify whether the DNA is from a live fish nor does it provide information about Asian carp quantity, age, size, how they got there or how long they may have been there.

Methods:
The *Quality Assurance Project Plan (QAPP) for the eDNA Monitoring of Invasive Asian Carp in the CAWS* outlines the detailed procedures for the planning, collection, filtering, processing and reporting of eDNA samples and is available online:www.asiancarp.us/documents/USACE-eDNA-QAPP.pdf

The MRRWG team (interagency team comprised of USACE-USFWS-ILDNR-USEPA) is responsible for the collection and filtration of water samples from sites each month (from May to October):

- North Shore Channel (60 samples)
- South Branch Chicago River and Chicago River to the Chicago Lock (60 samples)
- Little Calumet River downstream of O'Brien Lock (60 samples)
- Lake Calumet (60 samples)
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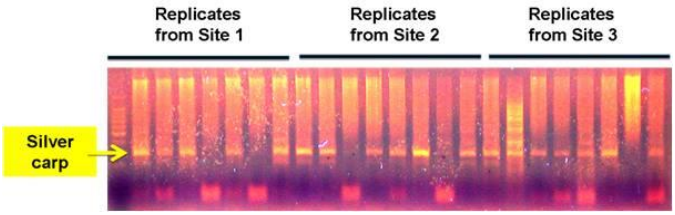
Each filtered sample is sent to the USACE Engineer Research and Development Center (ERDC) in Vicksburg, Miss. where a team of geneticists analyze the samples for bighead and silver carp eDNA. The results (positives or negatives) are reported back in about 10 days and posted on www.lrc.usace.army.mil/AsianCarp/



Silver carp DNA bands in gel electrophoresis (UND photo)

What's Next?
USACE is leading an interagency eDNA Calibration Study (ECALS) with USGS and USFWS to reduce the uncertainty surrounding eDNA results and refine the eDNA method.

ECALS will:

- investigate potential alternative viable sources and pathways for DNA (other than a live fish),
- develop more efficient markers, decreasing the processing time for eDNA samples,
- determine the relationship between the number and distribution of positive eDNA samples with the number of Asian carp in the system,
- determine the effect of environmental variables (light, temperature, water velocity) on the persistence and degradation of DNA in water and
- model eDNA transport in the CAWS.

At present, eDNA evidence cannot verify whether live Asian carp are present, whether the DNA may have come from a dead fish, or whether water containing Asian carp DNA may have been transported from other sources such as bilge water, storm sewers or piscivorous birds. How environmental variables (light, temperature, water velocity) impact the detection rate, degradation rate or persistence of DNA in the environment is also not fully understood. Additionally, there currently is not an understanding how the number of positive samples correlates to the strength of the DNA source.

The viability of other potential eDNA sources, such as dead fish from barges or vessels, fertilizers using Asian carp as an ingredient, and piscivorous birds that may be transporting eDNA in their feathers or feces will continue to be investigated.

For more information, please e-mail the eDNA program manager at Kelly.L.Baerwaldt@usace.army.mil, or visit Asiancarp.us.