# Upper Midwest Environmental Sciences Center

# October 2025 – April 2026 Activity Report

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- Silver Carp passage at three locks and dams on the Tennessee and Cumberland rivers from 2016-2019
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- Data Release: Aerial imagery from the SEABirD (Safe, Efficient, Aerial Bird Detection) Platform collected over the Atlantic Ocean

## Acronyms used throughout report

**GLSC** – Great Lakes Science Center

**OKI WSC** - Ohio-Kentucky-Indiana Water Science Center

**USGS** – United States Geological Survey

**UMESC** – Upper Midwest Environmental Sciences Center

**UMID WSC**– Upper Midwest Water Science Center


USGS scientist Andres Fritts holding a telemetered invasive bighead carp on the Mississippi River near Keokuk, Iowa. Photo USGS

## Biological Threats and Invasive Species

### Silver Carp passage at three locks and dams on the Tennessee and Cumberland rivers from 2016-2019

Photo researchers pulling invasive carp out of the water. Photo USGS

Bigheaded carps, including silver and bighead carp, are non-native species that continue to expand their ranges throughout North American river systems, including the Tennessee and Cumberland River system. These species are known to have deleterious effects on native fishes. Management efforts have focused on reducing upstream passage at dams coupled with intensive removal of individuals occupying upstream reaches. Understanding mechanisms affecting the success of upstream fish passage through lock chambers is critical to determining immigration rates into upstream habitats, likelihood of success for upstream removal efforts, and potential effects of upstream passage reduction using deterrents. This research used acoustic telemetry to examine the timing of Silver Carp upstream and downstream dam passages, patterns of fish movement throughout the river systems, and the relationship between fish size and upstream passage through the lock chamber. The findings from this study may help managers model Silver Carp populations and inform decisions regarding fish deterrent placement and operation. For more information contact Andrea Fritts (afritts@usgs.gov).

**Vallazza, J.M.** (retired), **K. J. Mosel**, **W. R. Budnick** (former), **D. K. Gibson-Reinemer**, J. K. Tompkins, J. Morris, T. W. Spier, T. L. Cox, **M. W. Rogers**, **C. R. Harty**, **B. C. Knights** (retired), **M. K. Brey**, **A. K. Fritts**. 2025. Silver Carp Passage at Three Locks and Dams on the Tennessee and Cumberland Rivers from 2016-2019. Journal of Wildlife Management.
https://doi.org/10.1002/jwmg.70112

### Silver Carp *Hypophthalmichthys molitrix* movement patterns and dispersal dynamics in the upper Mississippi River

Silver Carp jumping out of the water. Photo USGS

Within the upper Mississippi River Basin, invasive Silver Carp use tributaries including the Des Moines, Iowa, and Cedar rivers; however, the extent Silver Carp move and intermix among these systems and pools of the upper Mississippi River is largely unknown. The authors used acoustic telemetry and multistate models to 1) identify individual and spatial variability in movement strategies, 2) use survival and transition probability estimates to evaluate population dynamics and connectivity, and 3) evaluate the influence of temporal and environmental variables on survival and transition probabilities. Overall, Silver Carp displayed diverse movement strategies with high connectivity that can inform invasive species management strategies. For more information contact Andrea Fritts (afritts@usgs.gov).

Brandt, B., **Brey, M., Fritts, A.,** Fritts, M., and Weber, M., 2026, Silver Carp *Hypophthalmichthys molitrix* movement patterns and dispersal dynamics in the upper Mississippi River. Canadian Journal of Fisheries and Aquatic Sciences.

# Off-Channel Habitat Use by Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (H. nobilis) in the Upper Mississippi River

USGS Biologist holds a 79 lb bighead carp. Photo USGS

A newly published paper in River Research and Applications provides information on the use of acoustic telemetry to investigate factors affecting off-channel habitat use by bigheaded carp [silver carp and bighead carp] in the upper Mississippi River during 2017-2018. Knowledge of fish movement and dispersal patterns are critical for fisheries management planning because it provides managers with key insights to behaviors of invasive carps. Backwater areas generally had high use when temperatures were warm and river discharge was high, and impounded areas generally had high use when temperatures were cooler and discharge was lower. This information can be used by managers to increase the efficiency of targeted removal efforts to slow the spread of these invasive species. For more information contact Amanda Milde (amilde@usgs.gov).

**Milde, A. S., D. K. Gibson-Reinemer, J. H. Larson, J. M. Vallazza, K. J. Mosel, S. W. Bailey, B. C. Knights (retired), A. K. Fritts**. 2025. Off-Channel Habitat Use by Silver Carp (Hypophthalmichthys molitrix) and Bighead Carp (H. nobilis) in the Upper Mississippi River. River Research and Applications 1â€“14. https://doi.org/10.1002/rra.70043

## Conservation Ecology and Planning

### Changing dynamic phosphorus forms from field to stream during runoff events

Agricultural runoff from a farm field. Photo: USDA

Becky Kreiling, Kenna Gierke (UMESC), Tanja Williamson (OKI WSC), Faith Fitzpatrick, James Blount, Pat Perner, Isaac Mevis, Heidi Broerman, Matt Komiskey (UMID WSC), and Katie Merriman (New York Water Science Center) published a paper in Journal of Environmental Quality. For the project, they quantified the amount of phosphorus that was in the dissolved form or attached to suspended sediment in water samples collected during runoff events at a farm field and a downstream streamgage in the East River Basin, Wisconsin. They observed that during most events, water leaving the field mainly was dissolved phosphorus whereas at the river site, phosphorus was mainly attached to fine suspended sediment particles. This means that the phosphorus in the water at the river site is less bioavailable and likely to be taken up by algae, potentially leading to a lower likelihood of an algal bloom occurring. For more information contact Becky Kreiling (rkreiling@usgs.gov).

**Kreiling, R.M.**, **T.N. Williamson**, **F.A. Fitzpatrick**, **K.J. Gierke**, **J.D. Blount**, **P.M. Perner**, **I.J. Mevis**, **H.M. Broerman**, **K.R. Merriman**, and **M.J. Komiskey**. 2025. Changing dynamic phosphorus forms from field to stream during runoff events. Journal of Environmental Quality, https://doi.org/10.1002/jeq2.70096

### River-to-lake transitional areas contribute disproportionately to in-lake nutrient loading

James Larson, Becky Kreiling, Sean Bailey, Kenna Gierke, Lynn Bartsch (UMESC) and Mary Ann Evans (GLSC) published a paper in Ocean-Land-Atmosphere Research with collaborators from Trent University. They measured sediment nutrient processing rates in cores collected from the Maumee Rivermouth and Maumee Bay (Toledo, OH). They upscaled the rates to the entire rivermouth and Maumee Bay to estimate internal nitrogen and phosphorus loading rates. The area was largely a source of phosphorus and ammonium-nitrogen and a sink for nitrate-nitrogen, contributing potentially ~17% more dissolved phosphorus to the water column relative to the external load from the Maumee River. For more information contact James Larson (jhlarson@usgs.gov).

USGS Scientists collecting a sediment core from Maumee Bay, Lake Erie during an August algal bloom. Photo USGS

Pearce, N.J.T., **J.H. Larson**, **R.M. Kreiling**, **M.A. Evans**, **S. Bailey**, **K. Gierke**, **L. Bartsch** (Retired), M.A. Xenopoulos, and P.C. Frost. 2025. River-to-lake transitional areas contribute disproportionately to in-lake nutrient loading. Ocean-Land-Atmosphere Research, https://spj.science.org/doi/10.34133/olar.0109

Associated data released for this publication:

**Larson, J.H.**, Pearce, N.J.T., and **Bailey, S.W.** 2025. Data from surface water and sediment nutrient processing experiments associated with the Maumee River (Toledo, OH) during the 2021 growing season: U.S. Geological Survey data release, https://www.usgs.gov/data/data-surface-water-and-sediment-nutrient-processing-experiments-associated-maumee-river-toledo

## Data Release: Freshwater Drum (*Aplodinotus grunniens*) age data from the Upper Mississippi and Illinois Rivers

Artwork of a Freshwater Drum. Photo: USFWS

This dataset includes age estimates for Freshwater Drum collected in five study reaches of the Mississippi River and one study reach in the Illinois River from 1992 to 2005 and from 2018 to 2020. Fish were collected by Long Term Resource Monitoring field stations of the Upper Mississippi River Restoration Program and otoliths were processed by the Illinois River Biological Station. For more information contact Kristen Bouska (kbouska@usgs.gov).

**Bouska, K.L.,** Solomon, L., and Lamer, J., 2026, Upper Mississippi River System Vital Rate Data - Freshwater Drum (*Aplodinotus grunniens*) 1992-2020: U.S. Geological Survey data release, https://doi.org/10.5066/P1WU76A6

## A tiered assessment framework for interregional flows of ecosystem services from migratory species

Darius Semmens (former USGS), Jay Diffendorfer (Geoscience and Environmental Change Science Center), Wayne Thogmartin (UMESC), and colleagues from the University of Arizona published research describing a structured way to understand how ecosystem benefits (like pollination or pest control) delivered by migratory species flow across regions and affect communities and economies. By outlining a four-tiered assessment, from basic recognition of these flows to detailed modeling of how habitat changes influence services over time, the authors offer a framework to guide fairer, more effective payment and conservation strategies for shared, migratory biodiversity. For more information contact Wayne Thogmartin (wthogmartin@usgs.gov).

Monarch butterfly on a Joe Pye Weed plant. Photo: USGS

**Semmens, D. J., K. J. Bagstad**, J. J. Derbridge, **J. E. Diffendorfer**, **W.E. Thogmartin**, B. J. Mattsson, A. Lien, C. C. Chester, J. A. Dubovsky, L. LÃ³pez-Hoffman. 2026. A tiered assessment framework for interregional flows of ecosystem services from migratory species. Conservation Biology 40(1):e70008 https://doi.org/10.1111/cobi.70008

## Harvest of long-tailed ducks from an important hunting location on Lake Michigan

Female Long-tailed duck at her nest. Photo: USFWS

A recently published article provides an evaluation of how environmental variables influence sea duck hunter participation and harvest from a select location on Lake Michigan. Results indicate that, wave height greatly influences hunter participation and that temperature influences harvest. This research was a collaboration between Southern Illinois University - Carbondale and UMESC. For more information contact Luke Fara (lfara@usgs.gov).

**Fara, L. J., W. S. Beatty**, **B. R. Gray** (retired), **K. P. Kenow**, and M. W. Eichholz. 2026. Harvest of longtailed ducks from an important hunting location on Lake Michigan. Journal of Wildlife Management e70182. https://doi.org/10.1002/jwmg.70182

## Incorporating location uncertainty improves inference with stop-level North American Breeding Bird Survey (BBS) data

Ryan Burner (UMESC) and colleagues from the Eastern Ecological Sciences Center and National Park Service published a paper presenting simulations used to test a method they developed in 2024 to account for location and covariate uncertainty in data from the North American Breeding Bird Survey. In this method, uncertainty in model covariate values is estimated and then specified in models via Bayesian informative priors, rather than treating these uncertain values as known and fixed. Simulations reveal that this method improves inferences and predictions, providing less biased coefficient estimates with more accurate credible intervals. For more information contact Ryan Burner (rburner@usgs.gov).

American Robin Photo: USFWS

**Burner, R.C., Hostetler, J.A.**, and Kirschbaum, A. 2026. Incorporating location uncertainty improves inference with stop-level North American Breeding Bird Survey (BBS) data. Ornithological Applications duag032 https://doi.org/10.1093/ornithapp/duag032

## Upper Mississippi River Restoration

### Upper Mississippi River Restoration future hydrology meeting series

Upper Mississippi River Restoration program partners meet in the field to discuss a backwater habitat rehabilitation project in Pool 4 of the Mississippi. Photo Minnesota DNR

Molly Van Appledorn (UMESC) and Lucie Sawyer (US Army Corps of Engineers) have co-authored a report that summarizes outcomes from a series of meetings occurring in 2021 and 2022 that engaged the Upper Mississippi River Restoration (UMRR) partnership in discussions about how improved access to hydrologic data of potential future conditions could help scientists, engineers, and resource managers better understand how changing conditions may affect the river's ecology and guide restoration efforts. The report documents UMRR priority needs for understanding future hydrology, desired attributes of quantitative datasets on river flow, and a workflow for acquiring, assessing and distributing a hydrologic dataset of potential future conditions. For more information contact Molly Van Appledorn (mvanappledorn@usgs.gov).

**Van Appledorn, M.**, and L. Sawyer. 2025. Upper Mississippi River Restoration future hydrology meeting series. Open-File Report 2025-1050, 93 p., https://doi.org/10.3133/ofr20251050

### Future forest conditions under alternative management and hydrological scenarios in the Upper Mississippi River floodplain

Matthew Trumper, Nathan De Jager, Molly Van Appledorn (UMESC), and Andrew Meier (U.S. Army Corps of Engineers) recently published a paper in the journal Landscape Ecology. In the study, they used a forest landscape model to examine the effects of alternative management and hydrological regimes on forest succession at a floodplain site with a restoration project in planning. Across all scenarios, the model projected a decline in forest biomass. This paper builds on previous USGS research using forest landscape models to support management decisions in the Upper Mississippi River System. For more information contact Matthew Trumper (mtrumper@usgs.gov).

Flooding on Pool 8 of the Upper Mississippi River in Spring 2019. Photo USGS

**Trumper, M.L., De Jager, N.R., Van Appledorn, M.,** and Meier, A.R. 2025. Future forest conditions under alternative management and hydrological scenarios in the Upper Mississippi River floodplain. Landscape Ecology Vol 40, article 186. https://doi.org/10.1007/s10980-025-02144-7

Associated data release:

**Trumper, M.L., De Jager, N.R., Van Appledorn, M.,** and Meier, A.R. 2025. Forest biomass projections under alternative management and hydrological scenarios in the Reno Bottoms area of the Upper Mississippi River floodplain: U.S. Geological Survey data release, https://doi.org/10.5066/P13TYTXC

## Long term resource monitoring procedures aquatic vegetation monitoring

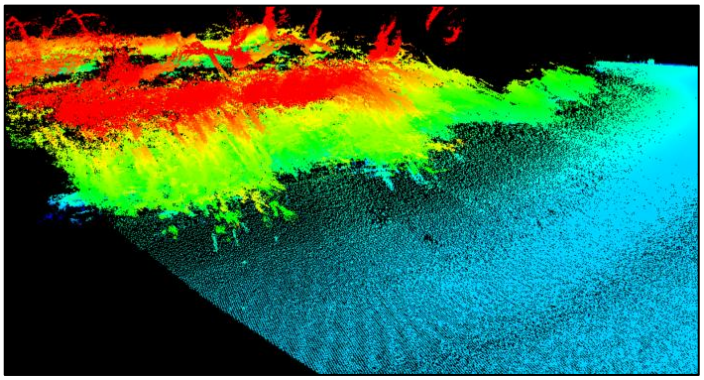
The Mississippi River supports a diversity of aquatic plant types, such as those pictured under water, floating on the water's surface, and those emerging out of water. Photo USGS

The Upper Mississippi River Restoration Program's Long Term Resource Monitoring element updated the standard operating procedure manual for collecting data on aquatic vegetation in the Upper Mississippi River System. The monitoring data is used to assess the status and trends of aquatic plants and helps restoration managers to engineer habitat conditions. The protocol can be adapted to any freshwater ecosystem that emphasizes aquatic plant communities. For more information contact Danelle Larson (dmlarson@usgs.gov).

**Larson, D.M.,** Lund, E., Carhart, A.M., Fopma, S., and Szura, S., 2025, Long Term Resource Monitoring procedures Aquatic vegetation monitoring: U.S. Geological Survey Techniques and Methods, book 2, chap. A22, 40 p., https://doi.org/10.3133/tm2A22

## Mapping potential sensitivity to hydrogeomorphic change in the UMRS riverscape

In 2020 the USGS as part of the Upper Mississippi River Restoration (UMRR) Program, began a new project to characterize potential hydrogeomorphic change associated with hydrogeomorphic units and their catenae (units linked by their association with sediment sources and flow origins). The goal of the project was to develop a geographic information system database of hydrogeomorphic units for the Upper Mississippi River System available to both scientists and river managers working on UMRR studies and Habitat Rehabilitation and Enhancement Project planning and design studies. For more information contact Angus Vaughan (aavaughan@usgs.gov).



Example point cloud of lidar/bathymetry survey of a sloped bank covered with vegetation. Photo USGS

**Vaughan, A.A., Fitzpatrick, F.,** Strange, J.M., **Van Appledorn, M.** 2025; Mapping potential sensitivity to hydrogeomorphic change in the UMRS riverscape, Federal Government Series Completion Report, 2021HG7. https://pubs.usgs.gov/publication/70272031

## Big river bluegill: Combining vital rates and long-term monitoring to understand population dynamics in large rivers

Image of a Bluegill underwater. Photo USFWS

To identify mechanisms underlying contrasting patterns of relative abundance in Bluegill across the Upper Mississippi and Illinois River, Kristen Bouska (UMESC) and colleagues integrated age data with long-term monitoring to estimate vital rates (growth, maturity, mortality, recruitment) and assess spatial trends across six reaches. Results showed Bluegill in downstream reaches exhibiting smaller maximum size, earlier maturation, lower mean age, declining recruitment, and reduced spawning stock. These findings support life-history theory, indicating Bluegill adapt to unstable environmental conditions through shifts in growth and reproductive strategies, and demonstrate the value of integrating periodic age data with long-term monitoring for population assessments. For more information contact Kristen Bouska (kbouska@usgs.gov).

**Bouska, K. L.,** L. Solomon, A. Bartels, M. Bowler, S. DeLain, E. Gittinger, T. Kueter, K. Maxson, E. Ratcliff, J. West, J. Lamer, H. Kim and **Q. Phelps.** 2025; Big river bluegill: Combining vital rates and long-term monitoring to understand population dynamics in large rivers, River Research and Applications, https://doi.org/10.1002/rra.70108

## Data release: Upper Mississippi River Pool 8 large wood study: sampling areas and wood piece characteristics

Large wood is an important component of aquatic ecosystems. This data product comprises two datasets that support studies of large wood distributions and dynamics in navigation pool 8 of the Upper Mississippi River. The datasets include a polygon shapefile of study area locations and a point shapefile of large wood pieces and their characteristics identified via aerial photography and high-resolution satellite image analysis prior to and following a high discharge event. For more information contact Molly Van Appledorn (mvanappledorn@usgs.gov).

Large wood floating down a flood river. Photo USGS

**Van Appledorn, M.** and A. Bast. 2026. Upper Mississippi River Pool 8 Large Wood Study: Sampling Areas and Wood Piece Characteristics. Data: U.S. Geological Survey data release. https://doi.org/10.5066/P13LZ2XB

## Evaluating hydrologic data products for scientific and management applications related to potential future streamflow conditions in the Upper Mississippi and Illinois Rivers

Molly Van Appledorn (UMESC), John Delaney (UMESC), and colleagues from the U.S. Army Corps of Engineers and Bureau of Reclamation have co-authored a report that describes a framework for evaluating hydrologic data products of potential future streamflow. The framework comprises a comprehensive set of quantitative and qualitative analyses to determine whether and to what degree the magnitude, timing, and overall regime of observed streamflow is captured by simulated hydrologic data products. The authors demonstrate how the framework may be applied to evaluate a set of hydrologic data projections, the LOCA-VIC-mizuRoute hydrologic data products, in supporting ecological modeling, restoration decision-making applications, and other Upper Mississippi River Restoration program activities. The results of analysis suggest that the evaluated hydrologic data products are unsuitable for the intended applications in the Upper Mississippi and Illinois Rivers. Despite this result, the authors highlight the broader utility of the framework for evaluating other hydrologic data products both in their study system and in other river basins. For more information contact Molly Van Appledorn (mvanappledorn@usgs.gov).

Pool 8/Pettibone Island, Upper Mississippi River, Spring 2019, flooding. Photo USGS

**Van Appledorn, M**., L. Sawyer, **J. Delaney**, C. Mueller, L. Youngblood, J. Harrell, B. Breaker, and C. Frans. 2025. Evaluating hydrologic data products for scientific and management applications related to potential future streamflow conditions in the Upper Mississippi and Illinois Rivers. U.S. Geological Survey Scientific Investigations Report 2025-5101, 61 p., https://doi.org/10.3133/sir20255101.

# Greater white-fronted goose habitat use in Louisiana provides water depth management insights

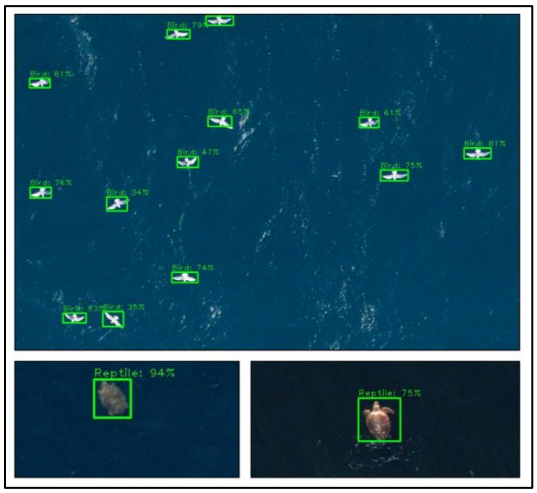
Greater white-fronted geese in a moist soil unit at Lacassine National Wildlife Refuge. Photo Louisiana Department of Wildlife and Fisheries

The greater white-fronted goose has shifted its wintering distribution from Gulf of America coastal marshes to interior landscapes in the south and midwest. The range shift has created challenges for waterfowl managers in the form of reduced local hunting opportunities of this important game species. William Beatty (UMESC) and colleagues collected fine-scale habitat data from ground-truthed surveys of greater white-fronted geese in Louisiana. Results indicated that goose habitat use was higher in wet areas compared to dry areas, which contrasted with other studies that used remote sensing to characterize habitats. For more information contact Willian Beatty (wbeatty@usgs.gov).

**Beatty, W.S.,** P.T. Link, B.A. Leach, S.C. Houdek, and **E.B. Webb.** 2025. Greater white-fronted goose habitat use in Louisiana provides water depth management insights. Journal of Wildlife Management e70153. https://doi.org/10.1002/jwmg.70153

**Other**

# Data Release: Aerial imagery from the SEABirD (Safe, Efficient, Aerial Bird Detection) Platform collected over the Atlantic Ocean




A collage of oceanic wildlife captured from aerial imagery including seabirds, turtles, bony fish, and other aquatic species. Photo Bureau of Ocean Energy Management

The data release contains over 1,100,000 aerial images collected along the Atlantic Outer Continental Shelf from North Carolina to Maine between April 2023 and February 2024. Images are published as very high spatial resolution JPG files at approximately 1 centimeter per pixel. When available, metadata for the spatial, temporal, and in-flight platform metrics (e.g., roll, pitch, yaw, FStop, etc.) are paired with images in both a comma-separated and a geopackage file format. Images were collected by the U.S. Fish and Wildlife Service with their SEABirD (Safe, Efficient, Aerial Bird Detection) platform funded by Bureau of Ocean Energy Management. For more information contact Kyle Landolt (klandolt@usgs.gov).

Koneff, M., Pickens, B., Dotson, R., **Landolt, K.L.**, **Schuster, S.M.**, **Murphy, A.C.**, and White, T., 2025, Aerial imagery from the SEABirD (Safe, Efficient, Aerial Bird Detection) Platform collected over the Atlantic Ocean: U.S. Geological Survey data release, https://doi.org/10.5066/P16N2NAB