



Upper Midwest Environmental Sciences Center

March 2025 – September 2025 Activity Report

Significant Collaborations and Activities

- USGS Development of AI Tools and Workflows to Support Offshore Energy Development
- Multi-Agency Team Conducts Mass Marking of Invasive Silver Carp in the Illinois River
- USGS Partners with USFWS to Stock an Endangered Freshwater Mussel Species in Wisconsin

Recent Products: Biological Threats and Invasive Species

- Evaluation of Rapid DNA Extraction Methods to Better Enable Point-of-Use Environmental DNA Detection
- Placing Environmental DNA Monitoring for New Detections into Perspective: Fishes in The Milwaukee River, Wisconsin
- Exploring The Importance of Metapopulation Dynamics with Population Control Strategies for Invasive Silver Carp in The Upper Mississippi River
- Movement Patterns of Invasive Red Swamp Crayfish Vary with Sex and Environmental Factors
- Tailwater Residency Patterns of Silver Carp *Hypophthalmichthys Molitrix* at Kentucky Lock and Dam
- Considerations For Using Tag Returns to Monitor Targeted Removal of Invasive Fishes
- Characterizing The Niche of *Phalaris Arundinacea* (Reed Canarygrass) In Floodplain Forest Understories of the Upper Mississippi River

Recent Products: Conservation Ecology and Planning

- U.S. Geological Survey Pollinator Science Strategy, 2025-35 - A Review and Look Forward
- Three Decades Of Declines Restructure Butterfly Communities In The Midwestern United States
- A 21st Century Butterfly Net: Using Edna to Detect the Imperiled Dakota Skipper

Recent Products: Upper Mississippi River Restoration

- Data Release: Upper Mississippi River System Changes in Floodplain Inundation From 1940 To 2022 - Raster Data Sets
- Variation And Controls on Sediment Oxygen Demand in Backwater Lakes of the Upper Mississippi River During Winter
- Impacts Of Flowering Rush (*Butomus Umbellatus L.*) On Macrophyte Diversity and Composition in the Upper Mississippi River

Recent Products: Fish and Wildlife Health

- Data To Evaluate Frog Community Changes Over Time in the Upper Midwest
- Trends In Richness and Occupancy of Ugandan Birds and Relation to Local Tree Cover

Recent Products: Other

- Quantifying The Substantive Influence of Public Comment on United States Federal Environmental Decisions Under NEPA

Acronyms used throughout report

CRU – Cooperative Research Unit

eDNA – Environmental DNA

EESC – Eastern Ecological Science Center

EMA – Ecosystem Mission Area

FORT – Fort Collins Science Center

FRESC – Forest and Rangeland and Ecosystem Science Center

GLSC – Great Lakes Science Center

MW CASC – Midwest Climate Adaption Science Center

NEPA – National Environmental Policy Act

NOROCK – Northern Rocky Mountain Science Center

NPWRC – Northern Prairie Wildlife Research Center

qPCR – Quantitative PCR

USGS – United States Geological Survey

UMESC – Upper Midwest Environmental Sciences Center

UMID WSC – Upper Midwest Water Science Center

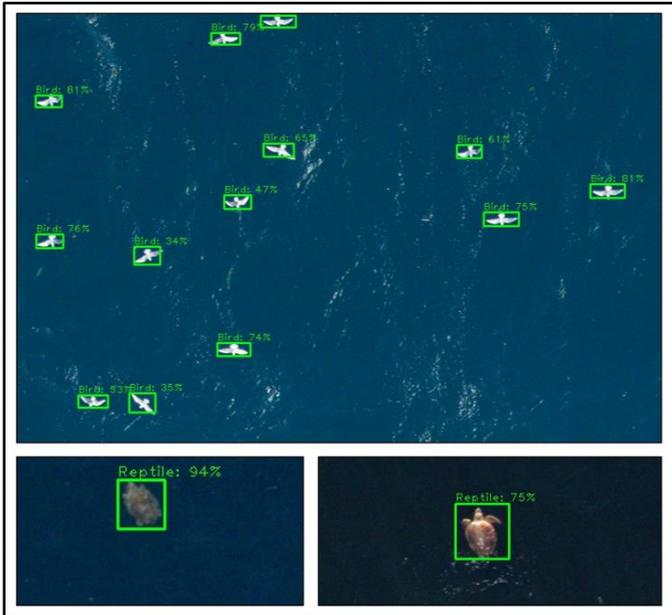
WY-MT SC – Wyoming-Montana Water Science Center



Water tower and research pond at the Upper Mississippi River Environmental Sciences Center La Crosse, Wisconsin. Photo USGS

Recent Products: Significant Collaborations and Activities

USGS Development of AI Tools and Workflows to Support Offshore Energy Development



A collage of oceanic wildlife detected by machine learning methods and classified at a high level (e.g. bird and reptile with “confidence” values) from aerial imagery provided by Bureau of Ocean Energy Management.

The 2024 Department of the Interior Remote Sensing Activities Report has been published, showcasing remote sensing science across the Department of the Interior agencies. The report highlighted work by Kyle Landolt, Sierra Schuster, and Aaron Murphy (UMESC) that uses artificial intelligence to automate the detection of marine wildlife and support the development of offshore energy resources. In partnership with Bureau of Ocean Energy Management and Fish and Wildlife Service, we have collected over 5 million images, created a dataset of over 150K labeled birds, mammals, and reptiles, and trained several AI models capable of rapidly detecting wildlife in new imagery using USGS supercomputing resources. Find the full report here: <https://eros.usgs.gov/doi-remote-sensing-activities/2024>. For more information contact Aaron Murphy (amurphy@usgs.gov).

Multi-Agency Team Conducts Mass Marking of Invasive Silver Carp in the Illinois River

Marybeth Brey and Jessica Stanton (UMESC) will lead a new study aimed at estimating current fishing mortality and population size of invasive silver carp in the Starved Rock pool of the Illinois River. The multi-agency effort kicks-off with a silver carp mass marking event the week of September 22, 2025 by a team of biologists from the U.S. Geological Survey, U.S. Army Corps of Engineers - Chicago District, and the Illinois Department of Natural Resources. Fish will be captured by Illinois Department of Natural Resources contract fishers and marked with two types of tags (metal jaw tags and plastic loop tags). Over the course of two years, captures and reporting of fish with tags by contract, commercial, or recreational fishers will allow biologists to estimate tag loss, fishing mortality, and population size of silver carp. The data will be used to inform population modeling efforts and to evaluate the efficacy of silver carp management actions in the Illinois River. For more information contact Marybeth Brey (mbrey@usgs.gov).



Silver carp jumping from the Mississippi River because of the vibrations from the motor. Photo USGS

USGS Partners with USFWS to Stock an Endangered Freshwater Mussel Species in Wisconsin



Juvenile Winged Mapleleaf Mussel (*Quadrula fragosa*) under a dissecting scope that is 1.5 mm in length. Photo USGS

On June 11, 2025, USGS partnered with U.S. Fish and Wildlife Service at Genoa National Fish Hatchery to stock 551 endangered Winged Mapleleaf (*Quadrula fragosa*) in the Chippewa River near Meridean, WI. The mussels stocked were from two separate parent cohorts this year. 514 mussels from cohort one mussels were 6-8 weeks old and averaged 585 um in length. 37 mussels from cohort two were 4 weeks old and averaged 547 um in length. This effort between the U. S. Geological Survey, Fish and Wildlife Service, National Park Service, Minnesota Department of Natural Resources, and Wild River's Conservancy has been a collaborative project to bring back the endangered mussel. The stocking location has been designated as critical habitat by the Fish and Wildlife Service and if successful, will supplement reproducing populations in the neighboring St. Croix River. For more information contact Matt Meulemans (mmeulemans@usgs.gov).

Recent Products: Biological Threats and Invasive Species

Evaluation of Rapid DNA Extraction Methods to Better Enable Point-of-Use Environmental DNA Detection



Environmental DNA sample collection.
Photo USGS

Melisa Kozaczek, Stephen Spear, Christopher Merkes (UMESC) and Elliot Barnhart (WY-MT SC) published a manuscript in the journal *Environmental DNA* evaluating several rapid (less than 15 minutes) DNA extraction methods to aid in the development of field-based point-of-use eDNA protocols to permit real-time detection of species through eDNA. Using filters experimentally spiked with grass carp cells, they demonstrated that two DNA extraction solution methods had the highest yields of eDNA. These extraction solutions are simple to use, requiring only a 5-15 minute heating step. This method can be combined with rapid genetic assays to assist early detection of invasive species and other applications where an immediate result is desired. For more information contact Stephen Spear (sfspear@usgs.gov).

Kozaczek, M. E., S. F. Spear, T. J. Untiedt, P. Albosta, C. Jungbluth, J. J. Homola, E. P. Barnhart, and C. M. Merkes. 2025. Evaluation of rapid DNA extraction methods to better enable point-of-use environmental DNA detection. *Environmental DNA*. <https://doi.org/10.1002/edn3.70159>

Placing Environmental DNA Monitoring for New Detections into Perspective: Fishes in The Milwaukee River, Wisconsin

The U.S. Fish and Wildlife Service uses environmental DNA (eDNA) for invasive carp monitoring throughout the Great Lakes and Mississippi River Basins. Richard Erickson, Stephen Spear, and Tariq Tajjioui (UMESC), USGS Student Services Contractors, and U.S. Fish and Wildlife Service collaborators reanalyzed eDNA samples from the U.S. Fish and Wildlife Service monitoring program to understand what a single detection for invasive carp means during a single sampling event by reprocessing and analyzing data. Their results showed that the current sampling efforts could detect other species, and bigheaded carp eDNA was not common in the Milwaukee River compared to these species. More specifically, this finding indicates bigheaded carp eDNA detections are as rare as, or rarer than, Grass Carp eDNA detections, a recent invader to the basin. For more information contact Richie Erickson (rerickson@usgs.gov).



Researcher holding a grass carp the from Sandusky River, Ohio. Photo University of Toledo

Erickson, R.A., DeHaan, P.W., Hayer, C.-A., Oettiner, K.L., Tajjioui, T., Von Ruden, K.M., Willner, H.M., Spear, S.F. 2025. Placing environmental DNA monitoring for new detections into perspective: Fishes in the Milwaukee River, Wisconsin. *Journal of Wildlife Management* <https://doi.org/10.1002/jwmg.70102>

Exploring The Importance of Metapopulation Dynamics with Population Control Strategies for Invasive Silver Carp in The Upper Mississippi River



Jumping silver carp on the Tennessee River. Photo USGS

Silver carp are currently spreading in the upper Mississippi River. Richard Erickson, Jessica Stanton (UMESC) and Charles Labuzzetta (FORT) along with the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, and University of Wisconsin-La Crosse collaborators parameterized a population model for silver carp in the upper Mississippi River. They used the model to compare different control strategies for silver carp in the upper Mississippi River. Their results show that metapopulation dynamics can play an important role for determining control strategies for silver carp in the system. For more information contact Richie Erickson (rerickson@usgs.gov).

Frame, K., Sandland, G., **Labuzzetta, C.J.**, Lopnow, G.L., **Stanton, J.C.**, Kao Y-C., **Erickson, R.A.** 2025. Exploring the importance of metapopulation dynamics with population control strategies for invasive silver carp in the upper Mississippi River. *Journal of Wildlife Management* <https://doi.org/10.1002/jwmg.70101>

Movement Patterns of Invasive Red Swamp Crayfish Vary with Sex and Environmental Factors

Red swamp crayfish (*Procambarus clarkii*) are an invasive species currently spreading across the United States and threaten resources in the Great Lakes Basin. The paper provides an understanding how sex and reproductive form drive red swamp crayfish movement patterns and are more important than other factors such as time of day or habitat conditions. This information will assist resource managers in directing control efforts as part of adaptive management strategies targeting the species and researchers in designing new control tools. For more information contact Aaron Cupp (acupp@usgs.gov).

Raboin M, Roth B.M., Sullivan A., **Allert A.L.**, Stoeckel J.A., Nathan L.R., Quebedeaux K.B., **Sholtis M.D.**, **Smerud J.R.**, **Erickson R.A.**, **Cupp A.R.**, 2025. Movement patterns of invasive red swamp crayfish vary with sex and environmental factors. *Scientific Reports*. 15, 14312 (2025). <https://doi.org/10.1038/s41598-025-96379-8>



Invasive Red Swamp Crayfish (*Procambarus clarkii*) in the reproductive form. Photo USGS

Tailwater Residency Patterns of Silver Carp *Hypophthalmichthys Molitrix* at Kentucky Lock and Dam



USFWS electrofishing while silver carp jump from the water.
Photo: USFWS

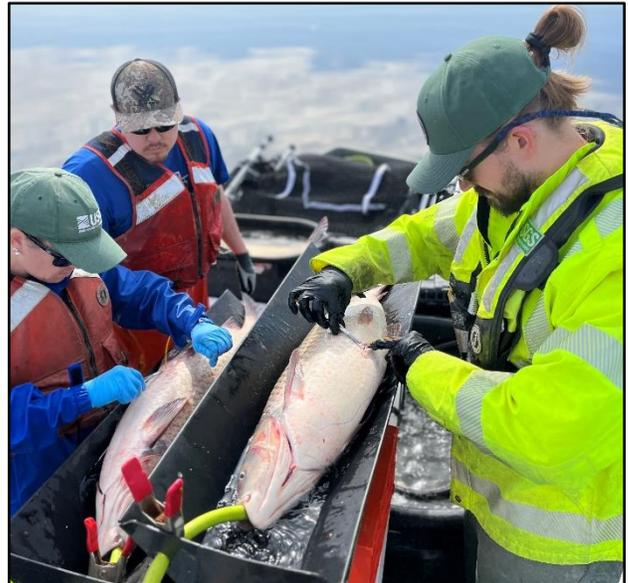
A manuscript coauthored by William Budnick, Kyle Mosel, Marybeth Brey, and Andrea Fritts (UMESC) was published in North American Journal of Fisheries Management. Silver carp management in the Tennessee River Basin focuses on removal, and interest exists in extending removal efforts to tailwater environments of high-head locks and dams. The researchers used Silver Carp acoustic telemetry data to understand important ecological associations underlying silver carp residence in the Kentucky Dam tailwater. This information helps to inform managers regarding how to adjust fishing effort to optimize removal rates in response to changing conditions. For more information contact Andrea Fritts (afritts@usgs.gov).

Budnick, W., Mosel, K., Tompkins, J., Knights, B. (Retired), **Vallazza, J., Brey, M., Fritts, A.** 2025. Tailwater residency patterns of silver carp *Hypophthalmichthys molitrix* at Kentucky Lock and Dam. North American Journal of Fisheries Management. <https://doi.org/10.1093/najfmt/vqaf043>

Considerations For Using Tag Returns to Monitor Targeted Removal of Invasive Fishes

A paper co-authored by Jessica Stanton (UMESC), Ben Marcek (U.S. Fish and Wildlife Service), and Marybeth Brey (UMESC) was published in the North American Journal of Fisheries Management. Tag return studies can be used to monitor targeted removals of invasive fishes. Using simulations, we outline some considerations when planning studies using this method to measure removal rates. U.S. Geological Survey discusses how study objectives, underlying population conditions, and the tolerance level for error may be considerations when planning how many fish to tag or how long to conduct a study. For more information contact Jessica Stanton (jcstanton@usgs.gov).

Stanton, J.C., Marcek, B.J., Brey, M.K. 2025. Considerations for using tag returns to monitor targeted removal of invasive fishes. North American Journal of Fisheries Management. <https://doi.org/10.1093/najfmt/vqaf049>



Inserting telemetry tag into invasive cap. These tags are used to track carp movements in the river. Photo: USGS

Characterizing the Niche of *Phalaris Arundinacea* (Reed Canarygrass) in Floodplain Forest Understories of the Upper Mississippi River



Reed canarygrass that can be found in the Upper Mississippi River. Photo USGS

John Delaney, Molly Van Appledorn, Nathan De Jager, Kristen Bouska, and Jason Rohweder (UMESC) published a manuscript in the journal *Wetlands* about using an ecological niche model to better understand the optimal conditions for reed canarygrass in floodplain forest of the Upper Mississippi River. Favorable and unfavorable conditions for reed canarygrass across several ecological gradients including tree canopy cover, distance from invaded wet meadows, and aspects of inundation (frequency, depth, and duration) were identified. This information could be used to prioritize restoration efforts and inform landcover change research. For more information contact John Delaney (jdelaney@usgs.gov).

Delaney, J. T., M. Van Appledorn, N. R. De Jager, K. L. Bouska, and J. J. Rohweder. 2025. Characterizing the niche of *Phalaris arundinacea* (reed canarygrass) in floodplain forest understories of the Upper Mississippi River. *Wetlands*. <https://doi.org/10.1007/s13157-025-01956-2>

U.S. Geological Survey Pollinator Science Strategy, 2025-35 - A Review and Look Forward



Long-horned bee collecting pollen on a sunflower in Minnesota. Photo: USGS

Clint Otto (NPWRC), Tabitha Graves (NOROCK), Desiree Robertson-Thompson (MW CASC), Wayne Thogmartin (UMESC), Ralph Grundel (GLSC), Ian Pearse (FORT), Caroline Murphy (CRU), Lisa Webb (CRU), Sam Droege (EESC), and Melanie Steinkamp (EMA) from across the U.S. Geological Survey, published a bureau science strategy for addressing information needs for pollinators. This science strategy focuses on five themes: assessing pollinator ecology and natural history, assessing species status and trend, understanding threats, informing conservation and management actions, and developing novel methods, to support pollinators and the services they provide to natural ecosystems and U.S. agriculture. For more information contact Wayne Thogmartin (wthogmartin@usgs.gov).

Otto, C.R.V., Graves, T.A., Robertson-Thompson, D., Pearse, I., Thogmartin, W.E., Murphy, C., Webb, L., Droege, S., Steinkamp, M., and Grundel, R., 2025, U.S. Geological Survey Pollinator Science Strategy, 2025-35 - A review and look forward: U.S. Geological Survey Circular 1556, 16 p., <https://doi.org/10.3133/cir1556>

Three Decades Of Declines Restructure Butterfly Communities In The Midwestern United States

Based on three decades of butterfly monitoring, research published by Wayne Thogmartin (UMESC) and colleagues with Michigan State, North Carolina State, and Georgetown Universities indicates no species increased in abundance over that timespan. Fifty-nine out of 136 butterfly species declined with losses distributed across all functional groups including residents, migrants, rare, and common species, indicating that declines are likely cascading across ecosystems. For more information contact Wayne Thogmartin (wthogmartin@usgs.gov).



Tree swallow studied by USGS scientists. Photo USGS

Leuenberger, W., J. Doser, M. Belitz, L. Ries, N. Haddad, **W. E. Thogmartin**, and E. Zipkin. Three decades of declines restructure butterfly communities in the Midwestern U.S. *Proceedings of the National Academy of Sciences of the United States* 122(33): <https://doi.org/10.1073/pnas.2501340122>

A 21st Century Butterfly Net: Using Edna to Detect the Imperiled Dakota Skipper



A dakota skipper perched on a native flower. Photo USFWS

David Pilliod, Michaela Grossklaus (FRESC), Stacie Kageyama and Stephen Spear (UMESC) and collaborators from the Minnesota Zoo and the U.S Fish and Wildlife Service published a manuscript in the journal *Global Ecology and Conservation* developing and testing a targeted quantitative PCR (qPCR) assay to detect the federally threatened Dakota Skipper butterfly environmental DNA (eDNA) on flowers. The newly developed assay was first tested on flowers placed with butterflies housed at the Minnesota Zoo to demonstrate proof of concept and to evaluate if more butterflies increased probability of eDNA detection. After demonstrating success in the zoo population, floral samples were taken from Dakota skipper sites in Minnesota, North Dakota, and South Dakota and tested for eDNA. Skipper DNA was detected on 15% of collected flowers and eDNA was detected at 50% of sampled sites. This marker provides a low-impact, non-lethal method to confirm presence of this species. For more information contact Stephen Spear (sfspear@usgs.gov).

Pilliod, D. S., M.R. Grossklaus, S.A. Kageyama, C. Nordmeyer, J. Reinsch, E. Runquist, and S.F. Spear. 2025. A 21st Century butterfly net: using eDNA to detect the imperiled Dakota skipper. *Global Ecology and Conservation*.

<https://doi.org/10.1016/j.gecco.2025.e03815>

Data Release: Upper Mississippi River System Changes in Floodplain Inundation From 1940 To 2022 - Raster Data Sets



Example of raster data that shows the elevation changes across the lower 48 states.
Photo USGS

Molly Van Appledorn, Jason Rohweder, and Nathan De Jager (UMESC) have published a set of raster data on ScienceBase. The rasters contain results of a change analysis that estimate shifts in inundation depths, durations, and timing for navigation pools 3 through 10 along the upper Mississippi River. Data were derived from a geospatial model of surface water inundation developed for the Upper Mississippi River System. The raster datasets could be used to prioritize restoration efforts and inform landcover change research. For more information contact Molly Van Appledorn (mvanappledorn@usgs.gov).

Van Appledorn, M., Rohweder, J.J., and De Jager, N.R. 2025, Upper Mississippi River System Changes in Floodplain Inundation from 1940 to 2022 - Raster Data Sets: U.S. Geological Survey data release, <https://doi.org/10.5066/P145U5QY>

Variation And Controls on Sediment Oxygen Demand in Backwater Lakes of the Upper Mississippi River During Winter

Pat Perner (UMID WSC), Becky Kreiling (UMESC), Kathi Jo Jankowski (UMESC) and a collaborator from the University of Wisconsin-La Crosse are publishing a paper in *River Research and Applications* where they assessed the drivers of sediment oxygen demand in backwater lakes in the upper Mississippi River during winter. Backwater lakes are a key overwintering habitat for fish, and high rates of sediment oxygen demand may deplete the oxygen in the water column, which can negatively impact fish. Vegetation presence, depth, and flow velocity played greater roles in controlling sediment oxygen demand rates than sediment characteristics. This information can be used by river managers when restoring overwintering habitat. For more information contact Becky Kreiling (rkreiling@usgs.gov).



Researcher taking sediment sample from under the ice on the Mississippi River near Staddard WI. Photo USGS

Perner, P.M., R.M. Kreiling, K.J. Jankowski, and E.A. Strauss. 2025. Variation and controls on sediment oxygen demand in backwater lakes of the Upper Mississippi River during winter. *River Research and Applications*, <https://doi.org/10.1002/rra.70011>

Perner, P.M. and R.M. Kreiling. 2025. Winter sediment oxygen demand and sediment characteristics in Pools 4, 8, and 13 of the Upper Mississippi River, 2022: U.S. Geological Survey data release, <https://doi.org/10.5066/P13RDCGT>

Impacts Of Flowering Rush (*Butomus Umbellatus L.*) On Macrophyte Diversity and Composition in the Upper Mississippi River



Flowering rush. Photo USGS

Federal and state partners captured the early invasion impacts of an invasive flower on the Mississippi River and its National Wildlife Refuges. Within the first four years of invasion, the flower's population exponentially increased and invaded highly diverse and abundance aquatic plant beds. The invaded areas had decreased aquatic plant diversity and altered species composition. For more information contact Danelle Larson (dmlarson@usgs.gov).

Carhart AM, **Larson DM**, Froehly J, Lund E, Szura S, Fopma S (2025) Impacts of flowering rush (*Butomus umbellatus L.*) on macrophyte diversity and composition in the Upper Mississippi River. *Biological Invasions* 27: 188. <https://doi.org/10.1007/s10530-025-03643-z>

Data To Evaluate Frog Community Changes Over Time in the Upper Midwest



Blanchard's cricket frog in the Upper Mississippi River National Wildlife Refuge. Photo USGS

Mark Roth and Ryan Burner (UMESC) have released data from amphibian call surveys from the mid-2000s, as well as resurveys of these points from 2024. These datasets, covering hundreds of sites across the upper Midwest (Minnesota, Wisconsin, Iowa, Illinois), allow for a comparison of frog communities between these two time periods. One goal of the surveys was to document status and changes in the distribution of Blanchard's cricket frog (*Acris blanchardi*), a state endangered species in several of these states. For more information contact Ryan Burner (rburner@usgs.gov).

Roth, M.F., Burner, R.C., and Sadinski, W. (Retired) 2025, Amphibian nighttime call data from Midwest ARMI surveys 2003-2008: U.S. Geological Survey data release, <https://doi.org/10.5066/P1X9UBHV>

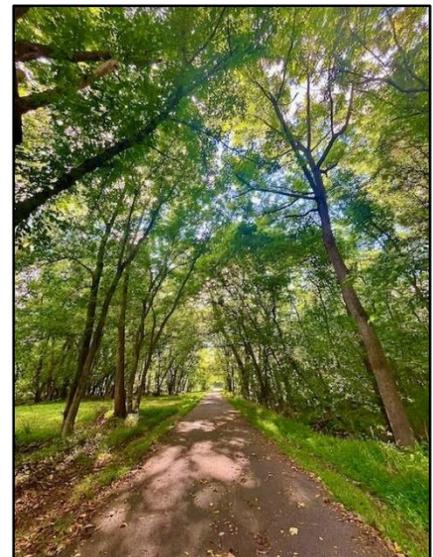
Roth, M.F., Schwonek, A.A., Tendler, J., and Burner, R.C. 2025, Amphibian nighttime call data from Midwest ARMI cricket frog surveys 2024: U.S. Geological Survey data release, <https://doi.org/10.5066/P19ZCGWM>

Trends In Richness and Occupancy of Ugandan Birds and Relation to Local Tree Cover

Ryan Burner (UMESC) and colleagues in Uganda, Netherlands, Norway, and the United States published a long-term study of bird communities. The study showed that species richness increased across almost all the 28 study sites across Uganda over several decades, and that occupancy of many species is predicted by tree cover. This manuscript and associated code release develop a novel Bayesian multi-species time-to-detection occupancy model that can be applied to a variety of ecological datasets. For more information contact Ryan Burner (rburner@usgs.gov).

Burner, R.C., Adams, E., Pomeroy, D., Tushabe, H., Kibuule, M., Rostad, L.J., Venter, Z., Sheil, D. 2025. Trends in richness and occupancy of Ugandan birds and relation to local tree cover. African Journal of Ecology, AJE70058, <https://doi.org/10.1111/aje.70058>

Burner, R.C. and Adams, E.M., 2025, Uganda bird trends: U.S. Geological Survey software release, <https://doi.org/10.5066/P1SPBYBF>



Tree cover over a walking trail. Photo USGS

Quantifying The Substantive Influence of Public Comment on United States Federal Environmental Decisions Under NEPA

Wayne Thogmartin (UMESC) and colleagues from the University of Arizona evaluated the role public comment plays on environmental review in the U.S. federal government via the National Environmental Policy Act (NEPA). Using natural language processing, the authors evaluated twenty years of NEPA reviews for the Bureau of Land Management, Federal Energy Regulatory Commission, U.S. Army Corps of Engineers, U.S. Forest Service, and U.S. Fish and Wildlife Service, finding a substantive role from public comments on final agency environmental decisions. For more information contact Wayne Thogmartin (wthogmartin@usgs.gov).

Stava, A., **W. E. Thogmartin**, R. Merideth, S. Bethard, F. Currim, J. J. Derbridge, K. Emerson, E. Laparra, A. Lien, E. McGovern, J. Pidot, M. Miller, K. Romero-Cardenas, B. Smith, C. Winnebald, and L. Lpez-Hoffman. Quantifying the substantive influence of public comment on United States federal environmental decisions under NEPA. Environmental Research Letters, early online: <https://iopscience.iop.org/article/10.1088/1748-9326/addee5>