Beaver colonization and dam building may influence trout populations and habitat in low-gradient streams of the Upper Midwest, but scientific data are lacking. This study will examine the way beavers affect coldwater streams and trout populations in ecoregions and beaver management zones across Wisconsin. Results of this study will better inform beaver and trout management strategies.

The Wisconsin DNR’s 2015–2025 Beaver Management Plan addresses the complex role that beavers play in coldwater ecosystems. It preserves beaver control as an important management tool for maintaining free-flowing conditions on priority trout streams, but it also highlights the need for studies of the ecological influence, both positive and negative, of beaver activity on trout streams of the Upper Midwest. The Office of Applied Science will lead a study in cooperation with Fisheries Management to quantify the effects of beaver activity and beaver control on salmonids in Wisconsin streams. This study will be statewide in scope, including wadeable trout streams in the Lake Michigan, Lake Superior and Mississippi River basins and across forested and agricultural landscapes. Study site selection began in 2018 in cooperation with regional DNR fisheries biologists. Researchers also plan to work with Wildlife Services, a program in the United States Department of Agriculture’s Animal and Plant Health Inspection Service that works to resolve wildlife conflicts. Study sites include streams currently colonized by beavers and streams in which beaver activity is controlled to maintain free-flowing conditions.

Initial data collection will include habitat and fish metrics. Stream habitat will be characterized by measuring water temperature and flow, as well as physical attributes such as stream width and depth, substrate composition, and beaver dam numbers, size, and distribution. Fish surveys will include measuring indices of biotic integrity, which characterize the fish community as a measure of habitat quality, and trout abundance, size structure and demographic rate parameters such as survival and reproductive rates and movement probabilities. Historical data will also be used to compare trends in stream habitat and trout population metrics in streams maintained with free-flowing conditions versus streams with no targeted beaver control efforts.

The next phase of the study will include experimentally manipulating beaver populations on study streams. Beavers will be allowed to recolonize a select number of streams that have been maintained as beaver-free. Conversely, for a select number of streams that have not been subject to beaver control efforts, beavers and beaver dams will be removed to restore free-flowing conditions. Additional streams will remain under current management protocols as control streams.

TIMELINE
Launch: July, 2018
Completion: June, 2023

FUNDING
Federal Aid in Sportfish Restoration
Federal Aid in Wildlife Restoration
Pittman-Robertson
Dingell-Johnson

EXTERNAL STAKEHOLDERS
Great Lakes Indian Fish & Wildlife Commission
USDA APHIS Wildlife Services

DNR PARTNER
BUREAU
Fisheries Management

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Monitoring Temporal Trends in Trout Populations and Base Flow in Streams

Measuring environmental conditions over time helps us understand how and why trout populations vary in response to factors like water temperature, stream flow and other habitat variables. Results from this study will inform riparian and watershed management, stream habitat development, angling regulations, trout stocking and fish health.

OAS and Fisheries Management monitor 22 Driftless Area streams that represent the region’s variety of stream habitat and watershed characteristics. We use these streams as references for water temperature, water level, trout relative abundance and biotic integrity over time.

Monitoring trout populations annually at fixed sites yields critical contextual data for streams surveyed on a three-, six-, or 12-year rotation.

We record water temperature hourly throughout the year and survey fish populations annually. We tagged trout in a subset of streams to estimate apparent survival, recruitment and population growth. We will use this data to quantify relations among water temperature, stream flow, precipitation and trout population dynamics in wadeable coldwater streams. Temporal trend data will help formulate insightful hypotheses about how and why trout populations vary over time.

TIMELINE
Launch: July 2007
Completion: June 2022

DNR PARTNER BUREAU
Fisheries Management

EXTERNAL STAKEHOLDERS
Anglers & fishing guides of WI

Key Points
» Monitoring stream environmental conditions year-round is critical to understanding how trout populations vary over time and how stream habitat development projects can help improve stream trout fisheries.

» Trout abundance generally increased from 2007 to 2012-13. Recruitment was weak in years with major spring-summer floods or following an extremely cold winter. Strong recruitment followed years with major flood events.

» Monitors captured data on major flash flood events and increased baseflow in some streams following these floods, especially where habitat development projects improved connections between streams and their floodplains.

» A gill lice infection led to recruitment failure and a decrease in adult abundance at one monitoring site. Long-term data were instrumental in understanding how gill lice affected brook trout population decline.

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For brook and brown trout, size is usually enough to identify age-0 and age-1 fish. However, stream characteristics influence size within age class, including temperature, productivity and physical habitat constraints. Maturation and competition with other trout and fish species also influence the average age-at-length for trout in a population.

OAS staff tagged age-1 brown trout with coded wire tags (CWT) in four Driftless Area streams in early spring 2010-2015. We identified age-1 brown trout by length and assessment of the otoliths (inner ear structure). We recaptured 249 brown trout one to five years after tagging and compared otolith-based aging to known age indicated by the CWT to validate the otolith aging methodology.

In 2015, we expanded the study to include brook trout in 14 streams across Wisconsin. We also implanted trout in each stream with Passive Integrated Transponder (PIT) tags to track growth of individual fish.

Key Points

» We have tagged thousands of known-age brook trout and brown trout in streams across Wisconsin to study how age and growth vary in relation to stream temperature and productivity, physical habitat, and trout density.

» We have validated the use of otoliths (inner ear structure) for estimating the age of brown trout ages 1-5 in productive streams. We have shown that multiple readers and consensus agreement can improve aging accuracy.

» We began tagging known-age brook trout in 14 streams across Wisconsin in 2015 to validate the use of otoliths for estimating brook trout age and to quantify how brook trout growth varies within and among populations.

» Age and growth data will be instrumental in modeling how angling regulations can be used to attain trout management objectives such as improving fishing for quality or trophy-sized trout.

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In June 2013, we removed 808 brown trout less than 12 inches in length from a 400-meter section of Spring Coulee Creek, transferring them downstream to Coon Creek, for an effective exploitation rate of about 69 percent. We tracked abundance, growth and recruitment of trout remaining in this stream section in subsequent years, periodically removing additional trout to maintain a lower trout density. Trout were tagged with Passive Integrated Transponder (PIT) tags to measure individual growth rates within the experimental stream section and in adjacent control sections where density remained high. Visible implant tags were also used to collect capture history data to estimate apparent survival, recruitment and movement into and out of the experimental stream section. We also used PIT tags to measure growth rates in a lower-density brown trout population in Trout Creek, a less-productive stream.

Key Points

» High brown trout densities observed in many Driftless Area streams are a testament to improved land use at the watershed scale; stream habitat development projects that have alleviated degraded stream conditions; and the inherent productive capacity of streams in regions of karst topography.

» Preliminary results show that reducing the density of small trout in highly productive Driftless Area streams can positively affect trout growth and size.

» This study will improve our understanding of how angling regulations may affect trout populations, potentially allowing for greater harvest opportunities in appropriate streams.

» This work has supported the experimental use of a harvest-oriented regulation on four Driftless Area streams beginning in 2016, which allows anglers to keep up to 10 trout per day with no minimum size limit.

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