

Wisconsin Department of Natural Resources SWIMS Project Summary

General Project Information

- Project ID:** CAP_1_2012
- Name:** Monitoring of white sucker tumors in Sheboygan AOC: testing spatial history with stable isotopes [CAP_1_2012]
- Type:** Great Lakes Restoration Initiative
- Subtype:** Toxics and Areas of Concern
- Status:** PROPOSED
- Start Date:** 04/17/2012
- End Date:** 12/31/2012
- Purpose:** In coordination with WDNR, USGS, and USFWS, this project involves capturing white suckers in the Sheboygan River AOC to assess whether the tumor BUI can be delisted. These tumors are believed to reflect long-term exposure to chemical contaminants in many AOCs. A fundamental challenge in interpreting results from migratory species—such as white suckers—is resolving whether they have resided in the contaminated area, or instead entered the area to breed after spending their lives elsewhere. Chemical tracers are a common approach for assessing the spatial history of migratory fish, and can fruitfully be applied to the Sheboygan context.
- Objective:** If suckers mix widely, we would expect isotopic ratios to be similar across wide spatial scales. By identifying which invertebrates most closely resemble sucker tissues (after correcting N ratios for trophic fractionation), we can establish where the fish are spending the majority of their time.
At a broader scale, both my previous work in northern Green Bay and studies of riverine white suckers (Doherty et al. 2011) indicate that these fish return consistently to the same watershed to spawn every year. If suckers remain close to their spawning watershed throughout the year, we would expect to observe distinct isotopic ratios among populations due to local environmental conditions. Our comparisons to other populations will test whether the Sheboygan River run of white suckers represents a local sub-population that would be exposed to toxicants only in the Sheboygan region, or instead these fish mix freely along the Lake Michigan shoreline before selecting a tributary to reproduce within.
- Comments:** Timetable:
April-May 2012: Field sampling must occur during the sucker migration
June-August 2012: Samples stored frozen at UW-Madison
September 2012: Samples dried, ground, and analyzed for stable isotope ratios
October 2012: Results received from analytical lab
November 2012: Statistical analysis and preliminary report preparation
December 2012: Final report and data provided to WDNR and USEPA.
- Outcome:** In addition to quarterly and final reports, we will provide compiled data and sampling GPS coordinates to WDNR for archiving purposes. The final report will include a full statistical analysis of the spatial scale at which suckers mix along the Wisconsin shoreline of Lake Michigan, with reference to both the Sheboygan and Fox River AOCs.
- Study Design:** We will use stable isotopes to test habitat use by migrant white suckers, thereby strengthening the potential request to delist that BUI and the Sheboygan River AOC as a whole. Stable isotopes are useful for determining habitat use because the stable isotope ratios of organisms reflect both their diets and environmental gradients. Isotope ratios of consumers reflect their diets in predictable ways (carbon isotopes directly reflect the diet, while nitrogen isotopes increase consistently with trophic level by ~3.4‰ from prey to consumer). We expect to find distinct nitrogen isotopic ratios between the stream and the open lake because agricultural nitrogen inputs create strong isotopic enrichment relative to the natural background in Wisconsin streams (Diebel and Vander Zanden 2009), and the Sheboygan River watershed is 67% agricultural by area. For carbon isotope ratios, EPA scientists (Hoffman et al. 2010) identified gradients in carbon isotope ratios along the transition from the St. Louis River to Lake Superior, and my past research has revealed sharp contrasts in carbon isotope ratios between stream biota and lake-dwelling suckers in northern Green Bay. Thus, I expect to find gradients of both nitrogen and carbon isotopes that can be used to identify whether suckers running into the Sheboygan River are residents within the river, the Sheboygan harbor, or Lake Michigan more broadly. If the suckers sampled for tumors include a mixture of river and lake-dwelling fish, we would also be able identify which individuals have spent the most time in the Sheboygan River and harbor compared to dwelling in Lake Michigan, thereby refining the tumor assessment in important ways.
- This two-pronged approach comparing Sheboygan River suckers to both macroinvertebrates from the Sheboygan region and suckers migrating into other watersheds will enable us to draw inferences about the spatial scale of habitat use by Sheboygan River suckers. Our results will aid in interpreting the significance of shifts in white sucker tumors and other BUIs in the Sheboygan River AOC. Specifically, the argument to delist the tumor BUI will be much stronger if stable isotopes indicate that the Sheboygan population is localized (and thereby subject to contaminants remaining within the river), yet still shows low tumor rates.
- QA Measures:** Stable isotope ratios are generally similar within migrant sucker populations, hence we can achieve a representative estimate of typical isotope ratios from 10 fish per site. To be absolutely sure that we effectively capture the variability in the Sheboygan River suckers, we propose to analyze isotope ratios from muscle of 40 white suckers from the Sheboygan River. Suckers feed mainly on benthic macroinvertebrates, so we will also analyze stable isotopes for macroinvertebrates from the following 4 locations to provide reference points for interpreting isotope data from suckers collected in the Sheboygan River: the river itself, the harbor at the river mouth, and the Lake Michigan shoreline north and

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south of the harbor. We would analyze five replicates of each of three invertebrate taxa at each site, for a total of 60 samples. For reference, we propose to analyze stable isotopes of 10 white suckers from each of 12 other Lake Michigan watersheds to evaluate spatial variation in sucker isotopic ratios. These sites will include 3 watersheds within the Fox River AOC, thereby providing results relevant to restoration of other contaminated areas of Wisconsin.

People

Name	Role	Status	Start Date	End Date	Organization	Comments
HRON, STACY L	TEAM_MEMBER	ACTIVE	04/17/2012		Wisconsin DNR	

Project Statuses

Date	Reported By	Status	Comments
10/10/2012	ANDREW FAYRAM	Progress: 25-50% Complete	10 white suckers from each of 12 watersheds adjacent to the Sheboygan were collected in Spring 2012. Tissues sent to laboratory for stable isotope analysis. Equipment malfunction has delayed receipt of results but they are expected by November. Approximately 40% of the allocated funds have been spent to date.
02/28/2013	STACY HRON	Complete	

Project Status Detail

Answer Set: DEFAULT

Question	Answer
1. Reporting Timeframe (Q1) (Q2) (Q3) (Q4):	
2. Amount expended this reporting period:	
3. Subcontracts or subgrants awarded this reporting period:	
4. QAPP (Project Plan) status:	
5. Local services and/or products purchased this reporting period:	
6. Number of jobs created this reporting period:	
7. Work accomplished this reporting period:	
8. Work goals for coming reporting period:	
1. Reporting Timeframe Month/Year to Month/Year (Oct-Mar or Apr-Sept):	
2. Quality Documentation status (respond NA if not required):	
3. Describe work performed during this reporting period relating to the activities from the grant workplan (Previous 6 months):	
4. GLRI Action Plan metric(s) accomplished and numerical progress during this reporting period:	
5. GLRI Action Plan metric(s) accomplished and numerical progress since project start (total complete to date):	
6. Percentage (estimate) of project work completed during this reporting period:	

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Question**Answer**

7. Percentage (estimate) of project work completed since the project start (total complete to date):

8. Is project work on schedule? If no, please explain.

9. If a problem was encountered, describe the problem and action(s) taken to correct it.

10. What work is projected during the next reporting period? (Next 6 months):

11. Will the project take longer than the approved project period? If so, have you requested an extension in writing to the grant coordinator?

12. Amount expended this reporting period (can be approximate) If no amount expended, explain why.

13. Is project invoicing/expenditures up to date? If invoicing is more than 3 months overdue, explain why.

14. Were any significant changes (>10% of the total project amount) made to the project budget? If so, have you notified the grant coordinator in writing?

Actions

Action	Detailed Description	Start	End Date	Status
Monitor AOC Beneficial Use Impairments	In coordination with WDNR, USGS, and USFWS, this project involves capturing white suckers in the Sheboygan River AOC to assess whether the tumor BUI can be delisted.	04/17/2012	12/31/2099	IN_PROGRESS

Monitoring Stations

Station ID	Name	Comments
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Assessment Units

WBIC	Segment	Local Name	Official Name
50700	1	Sheboygan River	Sheboygan River

Lab Account Codes

Account Code	Description	Start Date	End Date
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Forms

Form Code	Form Name
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Methods

Method Code	Description
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Fieldwork Events

Start Date	Status	Field ID	Station ID	Station Name
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Documents

Title	Description	Author	Published	Comments
Sucker Isotope Data		Peter McIntyre	02/11/2013	
Sucker Isotope Final Report		Peter McIntyre	02/11/2013	
Sucker Scope of Work GLRI	Monitoring of white sucker tumors in	Peter McIntyre	10/01/2012	

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Title	Description	Author	Published	Comments
Capacit Grant	Sheboygan AOC: testing spatial history with stable isotopes			
White Sucker Tumor Proposal	Initial Project Proposal	Peter McIntyre		

Budget

Combined Budgets:
Combined SLOH:
Combined Total:

Funding

Organization	Source	Type	Amount	Start Date	End Date
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