PROJECT ABSTRACT

Title: Barrier Removal Collaborative Suite (BRCS)

Abstract: BRCS is a web application that improves the user's ability to share their views on water barriers and tributaries, comment on others' views, create topics to discuss, and form shared interest groups to collaborate on barriers. BRCS is a collaboration platform that contains: interactive mapping; standardized and up to date water, barrier, and invasive species datasets; and mechanisms for users to post comments, preferences, priorities, data, and plans. BRCS is a decision support tool for users to draw on its maps, save their plans, as well as import other plans into the application. These plans can be private or shared through posts and can be commented on by other users. Also, BRCS has an integrated survey mechanism that allows users to rank important subjects and draw areas important to them. A unique feature of BRCS programming is an automatic grid heat map layer of the amount of agreement or disagreement from survey results. It is called the "Consensus Level". Overall, BRCS can raise awareness of users views, factors contributing to them, and the amount of disagreement in the community, which can lead to more informed decisions about water barriers by fishery managers.

FINAL NARRATIVE REPORT

- **Project Title:** Barrier Removal Collaborative Suite (BRCS)
- **Grantee Organization:** Great Lakes Fishery Commission and Great Lakes Commission
- **Project Team**: Peter Hrodey, U.S. Fish and Wildlife Service; Jeff McAulay, Great Lakes Fishery Commission; Lisa Walter, Great Lakes Fishery Commission; Chris Freiburger, Great Lakes Fishery Commission; David Betcher, Great Lakes Commission; Siyu Fan, Great Lakes Commission; Lisa Denys, Great Lakes Commission; Guan Wang, Great Lakes Commission; Steve Cole, Great Lakes Commission; Greg Parrish, Great Lakes Commission.
- **Contact Person**: Peter Hrodey, U.S. Fish and Wildlife Service
- **Grant Amount:** $150,000
- **Start and End Dates:** July 1, 2015 – February, 2018
- **Key Search Words:** Sea Lamprey, Barriers, Dams, Collaboration, Decision support, Michigan, Mapping,

Background/Overview

1. Briefly summarize the project description as outlined in the original proposal.

   The Barrier Removal Collaborative Suite allows stakeholders to work in a cooperative online environment and provide decision support based on best available GIS data and other data sets. A weighted overlay analysis tool built upon user survey responses is incorporated in the Suite. The results from this analysis along with user generated content can be shared with others who can provide feedback or explore additional environmental and economic alternatives.

2. Briefly summarize any significant changes to the work performed in comparison to the originally proposed and funded plan of work. If changes were made, describe how they affected your ability to achieve the intended outcomes for the work.

   A significant change was to use the SeaSketch.org service as a mechanism for user input. It was originally envisioned to create this mechanism independently but that would have needed

a large amount of customization. By including the SeaSketch service, we added a tested and proven marine planning and user input mechanism to the project and enhanced the usability of the final application.

Outcomes

3. To what extent and how (if at all) did this research project advance scientific knowledge of the issue?

   None.

4. To what extent and how (if at all) did this project contribute to the education and advancement of graduate or undergraduate students focused on Great Lakes fishery issues?

   None.

5. To what extent and how (if at all) did this work help you or others on your team build new relationships with others in the research or management communities?

   The direct partners on the project were the Great Lakes Fishery Commission (GLFC) and the Great Lakes Commission (GLC). The two agencies worked closely together throughout the development and testing of the data and the interface for BRCS. The Suite builds on existing data sharing, mapping and analysis technology used in the by both partners. Individually, both agencies are involved in data creation activities that will feed into the BRCS system over time, and also gain from its use by the other. The GLFC's sea lamprey-specific datasets proved useful in their own right. The Great Lakes Commission's regional reference data holdings fed into BRCS and they are expected to grow over time and support BRCS' currency. GLFC's and GLC's commitment to the BRCS platform is strong. The two agencies will continue to work together on sea lamprey issues in the future and BRCS helped to bring our teams together and support our work. Both agency staffs are committed to more collaboration between our teams because of the BRCS work. The BRCS project team expects to work together on future projects, ensuring that technical staff will remain available for basic maintenance activities for BRCS over the 3 years commitment.

6. To what extent and how (if at all) do the findings have action implications for fishery managers? If the research has direct management implications, do you have any knowledge of use of the findings by managers? If the research does *not* have direct management implications at this stage, to what extent did the research advance the process of identifying management responses to critical issues?

   The target audiences for the BRCS platform are the entities making decisions about barrier removal along Michigan tributaries of the Great Lakes which includes fishery managers. The BRCS Suite can be used as a decision support tool for fishery management. We think that fishery managers can use BRCS to engage: watershed groups; members of collaboratives, such as the Great Lakes Mussel Collaborative, Great Lakes Aquatic Nuisance Species Panel and other regional issue groups; recreation advocacy groups; and individual agencies such as the US Fish and Wildlife Service and the Michigan DNR.

7. Considering the above or other factors not listed, what do you consider to be the most important benefits or outcomes of the project?

   The key components of the BRCS platform are: the web-based collaboration workspaces for users to discuss and work together; and the unique weighting tool called the "Consensus Level"

map layer which is an automatic grid heat map layer of the amount of agreement or disagreement resulting from user survey responses. These components have tremendous benefits for decision-making by teams of organizations dealing with barrier management. Many organizations operate with restricted funding and other limitations, including watershed groups, county and municipal agencies, local non-profits, and some state and federal agencies. In order to collaborate effectively and make well-grounded decisions, they need the communication tools BRCS provides. The Suite provides the ability to explore data related to these groups' locale and encourages users to add their local expertise about existing conditions which can greatly improve barrier decisions. It takes that input a step further in asking users the scale of value or importance of their views. These are factored into the Consensus Level grid heat map which shows different colors for areas in agreement or disagreement. The BRCS platform supports more effective decisions by allowing the incorporation of local knowledge, transparent results arrived at by diverse decision-making teams, and consideration of factors not available to closed environments.

Related Efforts

8. Was this project a standalone effort, or was there a broader effort beyond the part funded by the GLFT? Have other funders been involved, either during the time of your GLFT grant or subsequently?

   GLFC has been, and continues, to provide ongoing support to GLC for barrier, larval maximum extent, sea lamprey trapping, and stream treatment data and mapping updates.

9. Has there been any spinoff work or follow-up work related to this project? Did this work inspire subsequent, related research involving you or others?
   None.

Communication/Publication of Findings

10. List publications, presentations, websites, and other forms of formal dissemination of the project deliverables, tools, or results, including those that are *planned* or *in process*.

    The BRCS application can be reached at this hyperlink: http://brcs.seasketch.org/

11. Please characterize your efforts to share the findings of this research with state, federal, Tribal, and interjurisdictional (e.g., Great Lakes Fishery Commission) agencies charged with management responsibilities for the Great Lakes fishery. If other audiences were priority for this research, please characterize your outreach efforts to those audiences as well. (Please note: You may wish to consult midterm reports in which specific audiences for the findings, and means of outreach to these audiences, were identified.)

12. Please identify technical reports and materials attached to this report by name and indicate for each whether you are requesting that GLFT restrict access to the materials while you seek publication. (Please note that the maximum amount of time during which GLFT will restrict access to the results of funded research is 18 months, unless notified that more time is needed.)

The BRCS project produced a training manual that is attached. The "BRCS User Guide: Barrier Removal Collaborative Suite (BRCS), August, 2017" supports users' self guided training and documents how the application functions. There are no use restrictions on this training manual.

13. Manuscripts. Grantees submitting one or more publications or pending publications in lieu of a standalone technical report must submit a cover memo that confirms that all aspects of the funded research are incorporated in the published work, and in cases of multiple publications, identifies or crosswalks the grant-funded objectives to the published article containing results.

    Does not apply for this project.

14. Compilation reports. Grantees working on several related subprojects under a single grant may submit a series of subproject reports rather than a single, integrated report. However, grantees must submit a cover sheet or introduction that outlines and crosswalks grant objectives with the location of the results in the compilation document.

    Does not apply for this project.

Discussion

The Great Lakes basin and its component watersheds encompass a large geographic area and face issues that affect many aspects of the region's environment and economy. Fishery resource management, in particular fish habitat protection and restoration, is one of those issues. A wide variety of institutions, organizations and agencies are concerned with, and in many cases mandated to protect, fishery resources and/or the health of the Great Lakes in general. Some of them entities share a common goal, others pursue separate but mutually compatible missions. This environment adds to the complexity of barrier removal decisions.

The BRCS tool seeks to neutralize and improve the fractioning forces above in barrier removal decisions by improving key components like data access, effective communication, and information sharing among partners, groups, and interested users. The BRCS platform's goal is to bridge the data complexity and facilitate discussion and information sharing. The Suite includes and integrates collaboration and discussion (forums), GIS functions (map and Data Layers), and BRCS' unique weighted analysis Consensus Level map. The platform is easy to use and has major integrations that support users moving through it. The platform is intuitive to users through a map interface and point and click navigation. A user clicks on a barrier and information and links to its discussion forum and survey are displayed for exploration, quick connectivity, and easy posting of users' views, documents, images, and plans.

BRCS platform adds a new piece to the puzzle of understanding differences of opinion. The BRCS team developed an analysis model that weights values from users' responses to surveys and measures the user's perception of the effect of a proposed action, ex. barrier removal, on five factors related to water use in a barrier's project area. The five factors, called Categories, have been chosen by the GLFC to be: Economics, Recreation, Public Safety, Connectivity/Native Species, and Invasive Species. The values assigned to each Category by users are used to score the project area which is drawn by the user or other users. The product of the BRCS analysis model is a Consensus Level map layer which is a hexagonal grid heat map. This layer visually identifies where users agree and where they disagree on the impact of the barrier and any proposed project.

The Suite works as a decision support tool built around user-driven models, an approach that allows interested parties to assign levels of importance to characteristics of the environment, combine spatial data about those characteristics and determine the impacts their decisions could have. Awareness of those impacts and the factors influencing them can lead to better informed decisions. As part of enabling the development and use of user-defined models, the BRCS platform improves the ability of groups to collaborate by providing a shared online tool with an interactive mapping interface, standard datasets that can be weighted by the user to reflect individual priorities, and the ability to add data from their own data holdings.

The backbone of the BRCS system are the datasets and map layers it provides. The GLFC maintains datasets for approximately 1,200 structures that serve as barriers to sea lamprey passage. GLFC worked with the GLC to edit and update barrier locations using GIS, match the location data to hydrography networks, and provide those map layers in BRCS. GLFC's barrier data includes attributes that would be relevant to removal decisions, such as barrier type, age of the structure, construction materials, presence of fish passages, and size of the structure (height and width). The Great Lakes Commission's regional reference data holdings fed into BRCS and they are expected to grow over time and support BRCS' currency. Both agencies are committed to continuing their dataset support for BRCS. The Suite has an additional feature that allows users to import additional data to facilitate their discussions. The Suite's flexibility for allowing these uploads is a major improvement to collaboration that facilitates the wave of crowdsourcing that is occurring at the local level, especially from the use of smart phones and citizen science.