University of Missouri FY2011
Support for the UMRS Navigation and Ecosystem Sustainability Program Science Panel
US Army Corps of Engineers
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FINAL REPORT

INTRODUCTION

This report summarizes the contributions of Dr. David Galat, Adjunct Associate Professor, Department of Fisheries and Wildlife Sciences, University of Missouri) in support of the Science Panel for the Upper Mississippi River System (UMRS) – Illinois Waterway (IWW) Navigation and Ecosystem Sustainability Program (NESP).

The Science Panel was convened to provide scientific expertise needed for adaptive management of the Upper Mississippi River System ecosystem restoration projects. Specifically, the Science Panel provides tools for integrated navigation and ecosystem restoration project planning that addresses social, economic, and environmental objectives at appropriate spatial and temporal scales. The Science Panel develops the science framework for five primary functional areas: (1) ecosystem project sequencing; (2) developing evaluation criteria for ecosystem outcomes including goods and services; (3) monitoring, including selection of response variables, adequacy of pre- and post- project monitoring, and addressing issues of scale; (4) creating tools for adaptive management such as selection of relevant ecological metrics, endpoints, and development of a 'report card' to assess ecosystem function; and, (5) integration of ecological, socio-economic, physical models and use of information technology to facilitate the decision making process.

Dr. Galat's task as a member of the Science Panel has been to provide expertise on how environmental factors influence structure and function of the UMRS. He applied his adaptive management and river restoration experience to aid developing conceptual model(s), uncertainties and opportunities for restoring secondary channels, monitoring, and adaptive management on the UMRS. He also contributed to developing guidelines for applying objective science within an adaptive management framework to river restoration programs.

Due to reduced funding allocations to the NESP program during 2011 the original Cooperative Agreement (W912HZ-11-2-0011**)** scope and budget were reduced from $21,000 to $8,321. This report summarizes contributions during FY 2011 based on the modified Scope of Work.

STATEMENT OF WORK & ACCOMPLISHMENTS (MODIFICATION NO: P00002)

Objective 1 - Web Meetings. *Task:* Participate in at least two (2) Science Panel web meetings.

Work Accomplished: Participated in 29 October 2010 and 21 January 2011 web meetings where Dr. Galat reviewed agendas, contributed to meeting topics, and reviewed draft minutes for accuracy.

Objective 2 - Adaptive Management Plans. *Task:* Participate in the production of Adaptive Management Plans for the NESP Reach Planning effort, Report Card variables and success criteria, and coordination for the 2nd Secondary Channel Restoration Science Panel Subgroup meeting with stakeholders.

Work Accomplished: Dr. Galat reviewed and provided written comments on System Objectives Report, Draft Chapter 7: Adaptive Ecosystem Management. He helped develop the agenda, design workshop components and organize schedule for 2nd Secondary Channel Restoration. Specific workshop background, goals and objectives are described in **Appendix A**.

Objective 3 – Meetings/Workshops. *Task:* Attend and participate in up to two (2) meetings or workshops on the following possible topics:

1) Attend and participate in the 2nd Secondary Channel Restoration Science Panel Subgroup meeting in Cape Girardeau, MO, with the USACE project delivery team, stakeholders, and Science Panel subgroup.

Work Accomplished: To meet this objective Dr. Galat participated as a NESP Science Panel member and facilitated one sub-group of a workshop entitled "SIDE CHANNELS OF THE IMPOUNDED AND MIDDLE MISSISSIPPI RIVER: OPPORTUNITIES AND CHALLENGES TO MAXIMIZE THE RESTORATION POTENTIAL OF A COMMON ENVIRONMENTAL MANAGEMENT ACTION" held in Cape Girardeau, MO from 9-13 January of 2011.

The goal of the workshop was as follows.
"In a collegial, interagency, and multi-disciplinary setting, develop a comprehensive conceptual model (supplemented by a decision-tree) of potential side channel functions, processes, and structures that would allow them to maximally contribute to Mississippi River restoration consistent with the system-wide goals and objectives of the UMRS (Galat et al. 2007)".

The goals and objectives and agenda for the workshop are detailed in **Appendix A**.

Workshop Organization

The workshop training session was held from noon to 5:00 PM on January 10 and attended by about 30 professionals from a variety of agencies and organizations. We will not describe the training session any further. The main workshop was held from the morning of 11 Jan 2011 until noon on 13 Jan 2011. The main workshop was separated into plenary and breakout sessions. The first plenary session began in the morning shortly after the workshop was convened and lasted about five hours. In this session, the attendees were presented with:

- historical context of the workshop culminating in a concise list of goals, objectives, and desired outcomes,
- a general description of the Middle Mississippi River,
- the restoration and management perspective of both the Corps of Engineers and the Missouri Department of Natural Resources, and
- a primer on conceptual model building.

With this background, the attendees were then given the option of how best to achieve the desired workshop outcomes. The idea of the decision-tree was dropped early and the groups decided to focus primarily on conceptual model building. After the general framework was decided the workshop organizers then allowed the attendees to sign up for one of three separate breakout sessions with each breakout group having a facilitator and recorder (see last column of Appendix D). Each subgroup was comprised of approximately 8-12 participants (the number varied slightly from day to day because of schedule demands of some of the attendees). A small amount of redistribution was necessary to prevent either a critical discipline from being underrepresented or domination by a single discipline. Such a size range is small enough to allow each participant to engage in active discussion, but large enough that multiple disciplines can contribute to the subgroups conclusions. Three senior members of the workshop "floated" amongst the three breakout sessions to answer questions or resolve procedural issues that arose during each subgroup's deliberations. After receiving their instructions, each subgroup reconvened in concurrent breakout sessions to progress towards their respective breakout group goals. Each breakout group met in their own room supported by audio-visual aids, flip charts on tripods, and computers. Deliberations were divided into 5 breakout sessions interspersed with "report backs" to the combined workshop over a 3 day period.

The subgroups convened in either plenary or breakout session as shown in the agenda (Appendix A). The smaller number of participants in a breakout group helped ensure that all good ideas could be captured and discussed. The larger number of participants in the full plenary group helped ensure the integration of ideas into a synthetic whole. Each subgroup was given substantial flexibility to self-organize to adjust to their own unique professional composition and group character so long as they made progress toward the workshop goal. The breakout subgroups reconvened in plenary session at regular intervals during the next two days to compare notes, direction, and progress. The workshop culminated in a final plenary session in which each breakout group presented their products to all of the workshop attendees with the idea that such a setting would be conducive to a multi-disciplinary, holistic synthesis of the workshop deliberations. At the end of the workshop hard copies and e-copies of all products were collected and archived for future use.

Following the Workshop Dr. Galat provided his notes as facilitator and results of his sub-group conceptual model building exercise (2/2011). Subsequently, he contributed significant time to reviewing and editing the first draft (3/2011), and second draft (6/2011) Workshop Summary prepared by Dr. John Nestler. This included multiple telecons, written comments and edits.

Appendix A. Secondary Channel Restoration Workshop Materials

WORKSHOP: DEVELOP A CONCEPTUAL MODEL AND DECISION TREE DESCRIBING THE ROLE OF SIDE CHANNEL CONSTRUCTION AND REHABILITATION IN MISSISSIPPI RIVER RESTORATION

10-14 January 2011
Cape Girardeau, MO

WORKSHOP BACKGROUND

From the 11th to the 12th of June 2009, members of the NESP Science Panel (SP) and Regional Support Team (RST) participated in the River Resources Action Team (RRAT) Annual Boat Trip to see firsthand some of the environmental activities of the Corps of Engineers in the middle (unimpounded) river. A major feature of the trip was inspection of a number of side channels along the river as well as presentations by scientists and managers working on associated environmental studies. The inspections and presentations led to subsequent discussions among the presenters (primarily Bob Hrabik of the Open Rivers and Wetlands Field Station, Missouri Department of Conservation) and several members of the Science Panel (SP - David Galat, John Nestler, and Larry Weber) and Regional Support Team (RST - Ken Cook). Early in the discussions, a meeting was proposed to continue and focus the discussions that began with the RRAT Boat Trip. Over a period of six months, the initial motivation for a meeting, driven by scientific curiosity and collegiality developed during the RRAT, converged with the broader science interests of the Science Panel and Regional Support Team to build scientific frameworks that directly support NESP system-level planning. This convergence of motivations led to a 20-21 January 2010 scoping meeting held in Cape Girardeau, MO at the Missouri Department of Conservation Regional Office in Jackson, MO attended by 19 individuals representing academia, federal agencies, and state agencies (Appendix A). During the workshop, attendees who have been involved with side channel restoration for a substantial period of time reminded the group that considerable thought and planning had been invested in the existing concepts underpinning side channel management. However, those engaged in the initial discussion acknowledged that an expanded forum could elevate the scientific foundation for side channels as a localized management tool to a system-level tool that can potentially contribute to the sustainability of the upper and middle Mississippi River.

The following general conclusions coalesced during the workshop and from discussions held both before and after the workshop:

- Side channels represent one of the few potentially effective management actions for restoration in the middle river because levees typically bound the main channel and reduce the effectiveness or physically eliminate many other restoration actions (e.g., island building and reconnecting to the floodplain).
- Side channels are also a common feature of the upper impounded river, but because the river is less levied they are considered one of a suite of restoration actions.

- In the middle river, side channel construction is typically associated with either a bend way cutoff or a break in a dike field. Upper and lower hydraulic closing structures are used to prevent the side channel from capturing excessive flow and thereby jeopardize the main navigation channel.
- In the present river, side channels are usually, but not always, temporary river features that eventually fill with sediment and become colonized by terrestrial vegetation. Therefore, over time, most side channels and the restoration potential they represent will be largely lost from the system.
- The opportunistic nature of side channel construction/enhancement, lack of understanding about large river processes, and monitoring challenges usually precluded development of detailed conceptual models of how side channels could be used to contribute to overall biodiversity enhancement in the middle Mississippi River.
- Studies to document the contribution of side channels to river biodiversity use a large –scale habitat or eco-hydrology approach to coarsely stratify each side channel into sampling units generally consistent with the way the main channel is sampled.
- Finer scale environmental fluids or biogeochemical cycling studies (ecohydraulic studies) are not conducted in side channels so that process-level information is not generally available.
- Methods to maintain side channels as a restoration feature or to control their succession (i.e., prevent their loss through sedimentation) have not been developed.
- There is a need to better understand the potential of side channels to contribute to system-level sustainability both through the analysis and integration of existing data and through the learning phase of adaptive management.

WORKSHOP JUSTIFICATION AND RATIONALE

At the end of the scoping meeting, progress made was shared with the combined SP and RST during monthly teleconferences. The SP Co-chairs recommended that these initial discussions, motivated primarily by scientific curiosity and collegiality, should be expanded and harnessed to help develop the agenda for a regional workshop on side channels, their ecology, and their potential role in system-scale sustainability and restoration. With this thought in mind, the SP Co-Chairs requested that the present members of the ongoing discussion be joined by Mike Davis of the SP and Jon Hendrickson of the RST to create an Ad Hoc working group on side channels. John Nestler was asked to be the lead for the SP, until he retired, and Ken Cook was asked to coordinate the expanded discussion between the working group and regional experts on side channels with the SP. To broaden the discussion and ensure that all important perspectives could be captured, the Ad Hoc working group was supported by a planning group comprised of Butch Atwood (Illinois Department of Natural Resources), Dave Herzog (Missouri Department of Conservation), Jon Hendrickson (St. Paul District), David Galat (Co-op Unit, Columbia, Missouri), Joyce Collins (FWS), Larry Weber (University of Iowa), Mike Davis (Minnesota Department of Natural Resources), and Nathan Caswell (USFWS). The guiding principle behind the workshop was this – there is a group of very senior scientists and managers in the region who have hundreds of years of combined experience in studying and managing the

Mississippi River. Who better to convene in a workshop setting to craft a conceptual model of how the river works as the basis of future management action and scientific investigation. The combined efforts of the Ad Hoc working group and the planning group generated the following workshop rationale and agenda to implement this guiding principle.

WORKSHOP GOALS AND OBJECTIVES

Given this background and expanded scope generated by the evolving discussions described above, we propose the following goal for the workshop:

"In a collegial, interagency, and multi-disciplinary setting, develop a comprehensive conceptual model (supplemented by a decision-tree) of potential side channel functions, processes, and structures that would allow them to maximally contribute to Mississippi River restoration consistent with the system-wide goals and objectives of the UMRS (Galat et al. 2007)".

To achieve this broad goal, the planning group proposed the following specific objectives:

1) Convene a workshop of regional experts, aided by invited stakeholders, with sufficient knowledge of the Mississippi River to develop a conceptual model describing the likely optimum contribution of side channels to Mississippi River environmental sustainability. A decision-tree will supplement the conceptual model by focusing on uncertainties. The conceptual model and decision-tree will be used as the basis for restoration decision-making by natural resource managers as well as the point of departure of models that will forecast the likely outcome of competing management actions.
2) As part of the workshop, hold ½ day of training to ensure that workshop attendees are all conversant in necessary foundational technologies. These foundational technologies include:
    a) Evolving concepts in large river ecology,
    b) Environmental fluids,
    c) Fish tagging technologies and their use in monitoring large river fishes, and
    d) Using fish monitoring data to understand and forecast the relationship of fish to the river physical and chemical environment.
3) Provide a facilitated, focused workshop environment lasting ~2.5 days that will create a first-generation consensus (or as much agreement as possible) conceptual model and decision-tree of how side channels could contribute to Mississippi River restoration. The final conceptual model and decision-tree will be prepared after the workshop is completed and distributed to workshop participants for their concurrence.

PRE-WORKSHOP TRAINING AGENDA

The following topics were considered important to successful creation of a conceptual model and decision-tree of side channel creation. We established the pre-workshop training agenda to ensure that all participants have an equal opportunity to contribute to the workshop.

MONDAY (10 JAN):

1200-1215 – Convene Meeting, Welcome, Facilities, Procedures, and Background (Dr. Robert Hrabik)
1215-1230 – Introductions, Organization, and Expectations (Dr. John Nestler)

1230-1330 - Evolving Concepts in Large River Restoration (Dr. John Nestler)

1330-1345 – Break

1345-1445 – Environmental Fluids Dynamics Primer (Dr. Larry Weber)

1445-1545 - Fish tagging technologies and their use in monitoring large river fishes (Dr. Jim Garvey)

1545-1600 – Break

1600-1700 – Using fish monitoring data to understand and forecast the relationship of fish to the river physical and chemical environment. (Dr. David Smith)

1700-1730-Questions and Discussions

1730 - Adjourn

TUESDAY (11 JAN):
WORKSHOP FIRST PLENARY SESSION AGENDA – INTRODUCTION AND BACKGROUND

0800-0815 – Convene Meeting, Welcome, Background, Facilities, and Procedures (Drs. Bob Hrabik and John Nestler)
0815-0830 – Introductions, Workshop Organization, and Expectations (Dr. Andy Casper)

0830-0900 – The Big Picture – How We Got Here and Why We Need a Workshop (Dr. Bob Hrabik)

0900-1000 – The Corps side channel restoration program of the middle and upper Mississippi River (Messers. Brian Johnson or Ken Cook) – the construction and maintenance perspective:

1000-1015 – Break

1015 – 1115 Presentation of the scientific program of the Open Rivers and Wetlands Field Station (ORWFS) (Dr. Bob Hrabik) – the management of natural living resources perspective

1015-1130 – Conceptual Modeling in Support of Side Channel (Adaptive?) Management (Dr Ken Lubinski):

1130-1200 – Summary of questions and issues identified from side-channel scoping meeting from January 2009 – (Drs. Robert Hrabik or John Nestler) (Appendix B).

1200-1300 – Lunch

1300-1400 - Getting organized (Dr. Andy Casper)

WORKSHOP BREAK OUT SESSIONS

BREAK-OUT SESSIONS – break out session facilitators will be assigned.

Suggested agenda, but each break out group can forge their own agenda so long as a product is delivered at the end of the workshop.

1300-1400 - Making sure everyone knows what to do. This is a general discussion session so people can get comfortable with each other and begin to triangulate on a productive process. Study the list of talking points, questions, and conclusions generated from the 2009 pre-meeting (attached as appendix B).

1400-1500 - Open discussion by participants in break out groups. Review likely important decisions that participants or agencies will be making in the next 5- 10 years related to side channels. List questions that need to be answered in order to answer those questions. Refer often to Appendix B. Discuss which type(s) and scale(s) of conceptual models would be most relevant to future decisions and questions. Select one kind or scale of model to start constructing in the break out group.

1500-1515 - Break

1515-1615-Plenary session: What kinds of conceptual models did the groups decide to build? Why?

All: determine if the right kinds of expertise is available in each group. Are two groups trying to do the same thing? If so, is there any value to restructuring groups? Make it possible for people to join groups where they have the greatest interest and skill.

1615-1715 – First model building session. Define the system boundary for the model. Begin listing model parts and relationships. Begin describing any uncertainties related to the relationships.

1715-1745 – Break-out session facilitator will be available to answer specific questions.

1745 – Adjourn

WEDNESDAY (12 JAN)
PLENARY SESSION:

0800-0815 – Convene Meeting (Dr. Andy Casper)
0815-1015 – Each break-out group will present their draft model product for 30 minutes (20 minutes presentation and 10 minutes discussion). This is not a session to criticize the product, but rather for each group to get an idea of where the other groups are headed and how they have addressed uncertainties.

In plenary session, discuss impressions about whether the groups seem to be heading
in a valuable direction, relative to the decisions and questions they started with.

1015-1030 – Break

BREAKOUT SESSIONS

1030-1200 – Reconvene into individual breakout sessions. Each group refines their individual
models.

1200-1300 - Lunch

1300-1600 – Reconvene into individual breakout sessions and each group will refine their individual conceptual model. Take a step back and look at the model again. Have you gone as far as you can with this model? Does it need more or less detail? Is it time to consider moving to another model or perhaps up or down to a different model scale? Final (optional) step in this session is to link the created models to the management actions that are most likely to move the modeled system in a desired direction.

1600-1700 – Return to the role of your model in adaptive management. Review the decisions and questions you started with. Has the model helped clarify which questions need to be answered and at what detail? If necessary, add questions? Then prioritize the questions. Don't forget to refer again to Appendix B. What are the great remaining challenges that prevent side channels from being a preferred management tool to restore lost or diminished function of the main channel?

1700-1800 – Extra time if needed. Organizers will make hard copies of each session product for distribution next day.

1800 - Adjourn

THURSDAY (13 JAN)

0800-0815 – Convene Meeting (Dr. Andy Casper)

0815-1015 – Each break-out group will present their product for 30 minutes (20 minutes presentation / 10 minutes for discussions).

1015-1030 - Break

1015-1200 – Integrated CM and Decision-Tree (Dr. Andy Casper)

Spokes persons will discuss the strengths and weaknesses of each CM to generate a consensus approach (or as much as possible). At the end of the day, we want to have the raw material to craft:

a) a CM for side channel restoration,
b) a reviewed common set of urgent future decisions
c) a reviewed common set of questions that could drive the research and monitoring strategies associated with side channel management.

Remember: you are the experts and we want to get at what is in your minds to guide side channel planning for the next decade.

If the integrated product is of sufficient quality we may consider submitting it for publication in one of the journals dedicated to eco restoration or water resources decision-making.

Turn in your material to the workshop organizers. The final will be prepared later by the workshop organizers for distribution to the workshop attendees for their review.

1200-1230 – Reflections on the workshop (Dr. Andy Casper).

1230 – Adjourn Workshop – Safe return for all