2009

# Missouri River Recovery Program: Emergent Sandbar Habitat

*Value Engineering Report*

# Missouri River Recovery Program - Emergent Sandbar Habitat

July 2009

**U. S. Army**
**Corps of Engineers**

*Conducted by*
**GeoVal, Inc.**

GeoVal Inc.

*Geotechnical & Value Engineering*
*Forensic Consultation*

July 17, 2009

U.S. Army Corps of Engineers Hurricane Protection Office
Omaha District
1616 Capitol Ave.
Omaha, Nebraska 68102-9000

ATTN: Richard Stricker, PE, Value Engineering Officer

**Reference: Value Engineering Study Report - FINAL**
***Missouri River Recovery Program - Emergent Sandbar Habitat***

Dear Mr. Stricker:

I am pleased to submit electronic copy of the Value Engineering Report for the above-referenced project, transmitted to your FTP site.

I enjoyed working with you and the team on this important project and hope that the findings of this report will be of benefit to the U.S. Army Corps of Engineers as the agency moves forward with a decision as to the best alternative(s) that will focus on the creation of emergent sandbar habitats as part of the Missouri River Recovery Program - Mitigation Project.

If you have any questions or comments regarding the study, please call me at (858) 484-6498.

Sincerely,

GeoVal, Inc.

Ronald J. Tanenbaum, CVS, PhD, PE, GE, F.ASCE
President

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# EXECUTIVE SUMMARY

## INTRODUCTION

This Value Engineering (VE) Report summarizes the events of the April 6-8, 2009 VE workshop facilitated by GeoVal, Inc. for the U.S. Army Corps of Engineers (USACE) Omaha District, Nebraska. The Missouri River Recovery Program - Emergent Sandbar Habitat Value Engineering Study focuses on the assessment of the Missouri River Recovery Program (MRRP) Habitat Creation Project with specific focus on the creation of emergent sandbar habitats, examining current plans and programs to seek out alternative approaches and ideas that will improve the overall performance of the program.

The MRRP seeks to mitigate near-term losses of Missouri River habitats and recover threatened and endangered species, one of which is emergent sandbar habitats (ESH) that are particularly important to the endangered interior least tern (Sternula antillarum) and threatened piping plover (Charadius melodus), two bird species provided protection under the federal Endangered Species Act (ESA). The program further seeks to sustain these species through habitat creation and restoration, species protection, and monitoring and research to prevent further declines of these species and other native species that may rely on ESH.

The purpose of the VE study is to identify potential viable alternatives to improve the overall performance and cost of creating ESH while focusing on concepts that will assist the Corps in meeting its objective to create sufficient habitat to ensure that fledge ratios and adult population goals for both bird species identified by the U.S. Fish and Wildlife Service (USFWS) in their 2003 Amended Biological Opinion (2003 Amended BiOp) on the Corps of Engineers (Corps) operation of the Missouri River Mainstem Reservoir System, Bank Stabilization and Navigation Project (BSNP), and Kansas River Projects are met. Such improvements generally look to improving function, improving quality, and reducing and/or increasing cost/performance as appropriate to improve the project value.

## SUMMARY OF FINDINGS

Below is a significant finding of the VE team with regard to alternatives that offer the most potential of meeting program objectives:

- A primary hypothesis of the 2003 Amended BiOp is that there is a positive correlation between ESH availability and fledge ratios and adult population numbers of the two bird species. The Corps' implementation of the 2003

Amended BiOp for the ESH Program focuses on creating and maintaining sufficient ESH to meet fledge ratios and adult population goals included in the 2003 Amended BiOp. ESH acreage goals identified by the USFWS in the 2003 Amended BiOp are those estimated to meet fledge ratios and adult population goals for the species based on the best available information at that time. Habitat goals are stated in terms of acres per mile and are upwards of 11,000 acres. As stated in the 2003 Amended BiOp, the intention of the acreage goal is "to create tern and plover habitat at levels seen on Segments 4, 8, 9, and 10 in 1998, a year following historically high and prolonged releases from the Missouri River Mainstem Reservoir System (System)".

Both the Corps and the USFWS have embraced the use of adaptive management as an overall strategy for implementation of the 2003 Amended BiOp. This overall strategy recognizes scientific uncertainties, provides for testing of hypotheses, rigorous research, monitoring, and evaluation, and adjustments to recovery actions based on scientific findings and societal values. The agencies are exploring clarifications and/or revisions to the 2003 Amended BiOp through an adaptive management strategy specifically directed toward the ESH Program. This adaptive management strategy, should provide empirical processes that reduce scientific uncertainties associated with fledge ratios, adult population goals, and the relationship between ESH acreage goals and these factors. Presently, the two agencies are working collaboratively to develop an agreed upon definition of what constitutes ESH, a first step in the adaptive management process.

## PROJECT DESCRIPTION

In its 2003 Amended BiOp, the USFWS concluded that provided the Corps carry out all of the measures identified in the Corps Biological Assessment (BA) of November 2003, the Corps operation of its Missouri and Kansas River projects would not jeopardize the continued existence of the interior least tern and piping plover. The Corps, through its MRRP is currently working to meet near-term requirements of the 2003 Amended BiOp for the bird species through mechanical construction and maintenance of ESH, ESH management measures, and flow modifications within the flexibility provided for in the Missouri River Mainstem Reservoir System Master Water Control Manual (Master Manual).

The interior least tern and piping plover nest on sandbars in the Missouri River. While the tern is primarily a riverine species, piping plovers will also use reservoir shorelines to nest, in addition to riverine ESH. Both species show a preference for bare sandbar habitats with little or no vegetation. In 2002, the USFWS designated areas along much of the Missouri River as critical habitat for the piping plover.

The ESH Program proposes to create sufficient habitat (naturally or mechanically developed) to ensure meeting fledge ratio goals as follows:

- Piping Plovers – 1.22 fledglings per nesting pair

- Least Tern - .94 fledglings per nesting pair

The maximum habitat to be created, as defined by the BiOp (2003 Amended) within this project is as follows:

- Below Garrison Dam – 50 acres/mile of river reach
- Below Fort Randall Dam – 20 acres/mile of river reach
- Lewis & Clark Lake – 80 acres/lake mile
- Below Gavins Point Dam – 80 acres/mile of river reach

The general study area is shown in **Figure 1**. A more detailed presentation can be found in **Appendix A.**

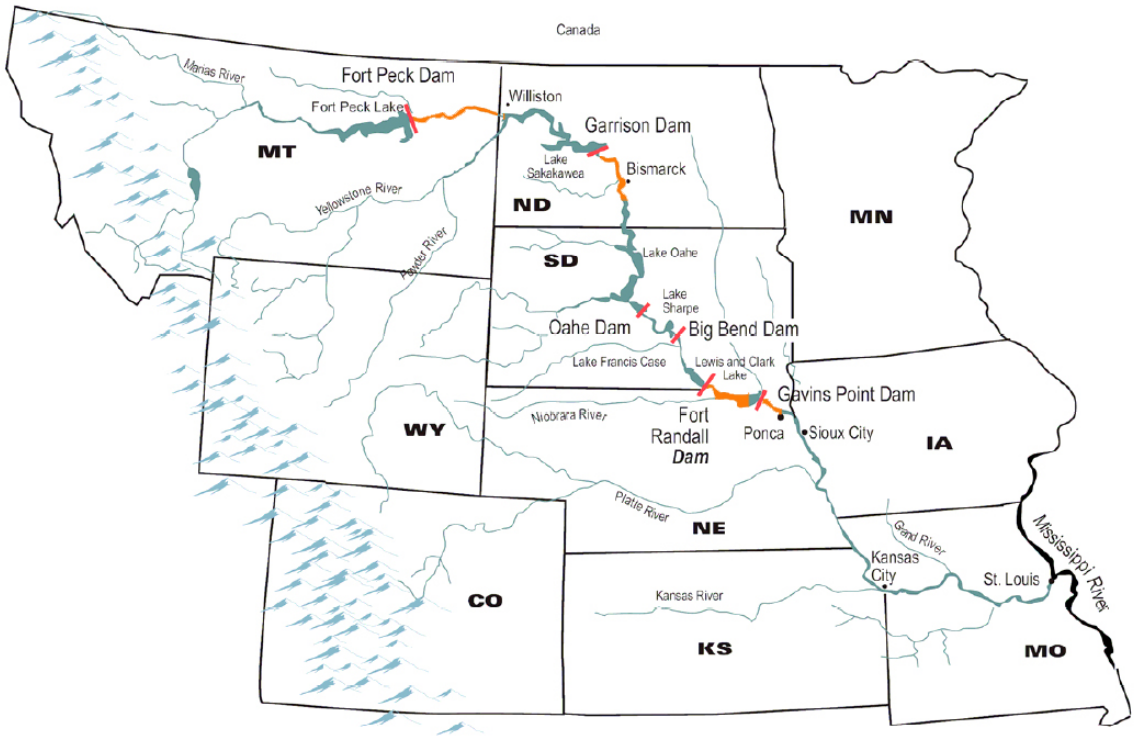


Figure 1 - Project Map for Missouri River Recovery Program - Emergent Sandbar Habitat Program

## COST ASSESSMENT

Since this workshop focused on a planning level process, the VE Team was not provided with preliminary/planning level cost estimate to use as a guide in making the general comparisons associated with individual alternatives.

## PROJECT ANALYSIS

The SAVE International VE tools and Job Plan were used by the VE team to analyze the project. The results of these analyses clarified the programmatic objectives and major project functions in terms of performance attributes developed by the team. The key performance attributes, described in detail in **Appendix A,** were:

- Accomplish Restoration Objectives
- Reduce Resource Conflicts and Create Balance
- Adherence to Schedule
- Construction Issues
- Cost Effectiveness

The team enlisted the assistance of the project managers and designers from USACE Omaha District.

### Team and Stakeholder Issues

In preparing to enter the Evaluation Process, the VE team first participated in an exercise whereby they identified critical issues they saw to be important to the project. In doing so, the team members were able to focus on these items and develop alternatives relevant to the critical issues in addition to the project functions.

Two lists were developed. The first identified project constraints and the second critical issues the VE team felt were still open where additional information would eventually be needed for a complete assessment. The Project Constraints and Critical Issues identified are presented in **Appendix A**.

## VE ALTERNATIVES

An earlier value engineering study of the MRRP Mitigation Habitat with a focus on Shallow Water Habitats (SWH) was conducted in March 2009. A number of project alternatives developed in that workshop were considered to be relevant to this value engineering assessment. As such, the alternatives from the March 25, 2009 VE report were assessed for inclusion, where appropriate, in this report.

The VE team developed, in total, 15 project alternatives that may potentially improve the project value. The alternatives and comments were developed by referring to the functional categories developed during the function analysis of the study as a stimulus to creative thinking, including: *sustain population, meet fledge ratios, support birds, and protect species.* Other significant functions include *restore habitat, create habitat, diversify habitat, protect nests and protect fledglings*. The critical issues presented in **Appendix A** were also consulted regularly during the process to assure that all concerns raised in the study were addressed.

A summary list of the alternatives is presented below. The reader should note that this list represents, in some cases, a combination of Speculation Ideas where appropriate. Detailed documentation of these key alternatives is contained in the Value Engineering

Alternatives Section of this report. It is also important to note that the listed alternatives generally represent individual concepts. Combinations of these concepts can, and should, be considered as possible additional comprehensive options. The comments and suggestions are presented later in this report.

| Alternative Number | Creative Idea Number(s) | SUMMARY OF VE ALTERNATIVES<br>Alternative Description |
|---|---|---|
| 1 | 12 | Revise current environmental specification to allow five nest protocol |
| 2 | 13, 89 | Capture individual site costs; Develop program costs |
| 3 | 31, 29, 40, 61, 63, 86 | 2015 acreage goals, total population goals, definition of ESH, fledge ratios vs. habitat, and ESH Implementation Plan |
| 4 | 43, 45 | Establish Ideas to allow for clearing and grubbing material to remain onsite |
| 5 | 54, 55, 73, 85 | Inventory lessons learned |
| 6 | 59 | Utilize nutrification of sandbars to increase piping plover foraging |
| 7 | 60 | Sequentially (annually) expand sandbars |
| 8 | 65 | Utilize Dr. Checks |
| 9 | 66 | The District Value Engineering Officer should be informed by project management of any individual ESH projects over $2 million to assess the need for an individual project VE study |
| 10 | 67 | The Project Delivery Team (PDT) should conduct face-to-face Bidability/Constructability/ Operability/Environmental (BCOE) reviews |
| 11 | 71 | Emphasize Value Engineering Change Proposals (VECP) in the contract documents |
| 12 | 74 | Subdivide the current MRRP program in the Project Management Information System (P2) |
| 13 | 91 | Develop agreed upon Project Implementation Report (PIR) Scope and Site Mitigation Plan |
| 14 | 95 | In the river reach below Garrison Dam, cut off the land connection between the sandbars and the shoreline |
| 15 | 108 | Review VE goals in 2012 |

## VE TEAM AND PROCESS

The three-day study was performed during the period of April 6-8, 2009, at the office of U.S. Army Corps of Engineers, Omaha, Nebraska. A team assessment of the developed alternatives was conducted in lieu of an exit briefing normally held at the end of the workshop. Ron Tanenbaum, GeoVal, Inc., facilitated the VE study. The VE team members are listed below (see **Appendix C** – Contact Directory and Attendance):

| | |
|---|---|
| Ronald J. Tanenbaum, CVS, PhD, PE, GE | GeoVal, Inc. |
| Richard Stricker, CCC, AVS, VEO | USACE – Omaha District |
| Teresa A. Reinig | USACE – Omaha District |
| Kelly A. Crane | USACE – Omaha District |
| Richard G. Podraza | USACE – Omaha District |
| Timothy M. Fleeger | USACE – Omaha District |
| Jeff L. Brady | USACE – Omaha District |
| Timothy J. Davy | USACE – Omaha District |
| Gregory A. Pavelka | USACE – Omaha District |

Throughout the VE session, members of the Omaha District supported the VE team.

Value Engineering is a strictly adhered-to process that follows specific steps and procedures. The specific steps in the VE process, also known as the VE Job Plan, are as follows:

*Step 1. Preparation* – developing a basic understanding of the client's/user's needs, requirements, and specific goals with an agreement on the scope of the study.

*Step 2. Information* – which is gathered prior to and during the study, and is reviewed and discussed with the team. A summary of project constraints and critical issues can be found as **Appendix A.**

*Step 3. Function Analysis* – defines the functions of the project through an organized use of the Function Analysis System Technique (FAST) diagram that shows how the functions are related to one another. A FAST diagram was developed for this study and is shown in **Appendix C.**

*Step 4. Speculation* – also known as creativity – is the application of brainstorming techniques to develop a large quantity of ideas rather than the quality of ideas. A complete list of workshop ideas can be found as **Appendix D**.

*Step 5. Evaluation* – reduces the large quantity of ideas to a few high quality ideas.

*Step 6. Development* – the concepts identified in the evaluation phase are developed into specific recommendations/alternatives that have been technically validated and quantified as much as possible.

*Step 7. Report* – containing the team's recommendations and a presentation to the management group to receive their approval of these recommendations.

*Step 8. Implement and Audit* – tracking the implementation of projects and auditing the results measure the effectiveness of the value engineering effort.

The VE Job Plan was followed to analyze the criteria/functions of the project and the issues of concern, create and evaluate ideas for change, and develop and present alternatives to the project team and stakeholders.

# VALUE ENGINEERING ALTERNATIVES

## EVALUATION PROCESS

The VE team, as a group, generated and evaluated ideas on how to represent the various major components/functions identified that would enhance decisionmakers' ability to select the best proposals that would produce a high level of performance to achieve the stated goals of the Missouri River Recovery Program (MRRP) Emergent Sandbar Habitat (ESH) as described in **Appendix A**. The idea list (see **Appendix D**) was based on the key criteria listed above and the function analysis performed by the VE team.

The team evaluated each of the ideas with respect to current conditions for each of the key performance attributes to determine whether it was better than, equal to, or worse than the status quo. The team reached a consensus on the ranking of the idea. High-ranked ideas would be developed further; low-ranked ones would be dropped from further consideration.

All of the numerous ideas that were generated during the creative phase using brainstorming techniques were recorded on the Idea Evaluation Form worksheets presented in **Appendix D**. These ideas were discussed and the advantages and disadvantages of each were debated. Once an idea was fully evaluated, it was rated as described later in this report, **Value Engineering Process**. All readers are encouraged to review the creative idea listings in the Idea Evaluation Form, because even the low-rated or rejected ideas may suggest additional ideas that can be applied to the project.

It is important to note that many of the ideas generated during creativity were found to be "Being Done" or under study by the Corps at this time, which is a significant indication that the ESH Program is progressing in a positive manner. The readers are encouraged to also review those ideas considered as "Being Done" which are contained in the list.

## VE ALTERNATIVES

Each proposal consists of a description of the suggested change with a brief narrative describing the justification for the alternative and a discussion of how the performance attributes may be affected if the proposal is implemented. A listing of the alternatives is shown in the Executive Summary.

***1. Revise current environmental specification to allow five nest protocol (Creative Idea No. 12) -***

Current contract specifications restrict contractors to a narrow construction season. By revising the Interior Least Tern and/or Piping Plovers paragraph of the environmental specification to allow for the implementation of the five nest protocol, contractors may be able to extend the construction season past the current contract completion date of April 15th.

The following revision is proposed:

> Historically, piping plovers begin arriving on the Missouri River below Gavins Point Dam in mid to late April. Between 1998 and 2008, 1,620 piping plover nests were found on the Gavins Point River Segment. Of these, 2.7% (44/1620) were initiated on or before May 1 with the earliest nest initiation being on April 21. By May 8, 14.0% (227/1620) plover nests have been initiated, by May 15 – 27.0% (438/1620) of plover nests had been initiated and by May 22 – 38.7% (627/1620) plover nests had been initiated.
>
> Therefore, during Spring Construction, the following guidelines will be observed.
>
> 1. By April 6, 20__ U.S. Army Corps of Engineers (COE) personnel will meet on site with representatives of the construction crew to educate them on piping plover identification and nesting behavior. The construction company will be provided with reference photographs of piping plovers and piping plover nests and contact information for COE biologists.
>
> 2. From April 13, 20__ onward, a construction representative will do daily cursory surveys of the construction site to determine the presence of piping plovers. If plovers are observed, the construction foreman will contact the COE biologists immediately.
>
> 3. COE personnel will conduct surveys for nests at the construction site. If a nest or nests are found, COE personnel will identify the nest location(s) to the construction foreman and delineate a restricted area around the nest site with signs and rope barrier. Further construction activities will not be allowed in the roped off area.
>
> 4. If five (5) or more piping plover nests are discovered, or by May 8, 20__ all construction activities will cease.
>
> During the fall construction period, no activity shall take place at the site prior to August 1 or until all least tern and piping plover chicks have fledged (able to fly) and all least tern and piping plover adults and fledglings have left the site. Fledge dates will be given by the Threatened and Endangered Species Section in Yankton, South Dakota 402-667-2581 or 402-667-2543.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* No significant impact.

*Reduce Resource Conflicts and Create Balance:* Blanket approval is not preferred by other agencies.

*Adherence to Schedule:* Extending the construction season could allow for the successful completion of additional habitat acres.

*Construction Issues:* Reduces contractor risks by allowing for greater flexibility in construction schedule.

*Cost Effectiveness:* No significant impact.

***2. Capture individual project site costs; develop program costs (Creative Idea Nos. 13 & 89) -***

Keeping an inventory of detailed cost breakdowns for individual projects involving mechanical creation and/or maintenance of sandbar habitat would prove useful for the execution of future contracts. Pertinent criteria would include not only the makeup of crews (in terms of labor and equipment) and material costs but the viability of habitat over time. Such a database would also attest to the ease of constructability for varying designs. Given the limited budget afforded the ESH program, tracking the effectiveness of project spending over a range of methods toward achievement of measurables would be beneficial.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Would allow more effective negotiation. Allows the Program to better reach its goals given the limited funding.

*Reduce Resource Conflicts and Create Balance:* No significant impact.

*Adherence to Schedule:* Demonstrates progress which may advance funding and hence the schedule.

*Construction Issues:* Knowledge of historic site costs would allow more efficient selection of construction methodologies.

*Cost Effectiveness:* Knowledge of historic site costs would allow more efficient assessment of future cost estimates and bids received.

***3. 2015 acreage goals, total population goals, definition of ESH, fledge ratios vs. habitat, and ESH Implementation Plan (Creative Ideas Nos. 29, 31, 40, 61, 63, and 86) -***

The VE team considered alternative means to meet the 2015 ESH acreage goals as defined in the 2003 Amended BiOp, and determined that the goals could not be met. The reasons for this are (1) logistical, and (2) financial. Logistically, the time needed to conduct all the coordination that is required by current regulations and laws is simply insufficient. Furthermore, from a budgetary point of view, the ESH Program would have to receive a far greater amount than is currently projected.

The VE team also recognizes that other issues such as population goals, fledge ratios, ESH definition, etc. are being addressed through other efforts, and does not require further discussion in this report.

**(Performance Attributes)**

*Accomplish Restoration Objectives:* Increases common understanding of success metrics.

*Reduce Resource Conflicts and Create Balance:* Promotes multi-agency approach to solutions.

*Adherence to Schedule:* Significant progress could be made in planning if targets were clearly stated.

*Construction Issues:* No significant impact.

*Cost Effectiveness:* Increased understanding and clearly defined to assist with cost control.

***4. Establish ideas to allow for clearing and grubbing material to remain onsite (Creative Idea Nos. 43 & 45) -***

The current clearing/grubbing specification does not allow for the disposal of material onsite, which increases costs. By establishing an agreeable method for allowing the disposal of clearing and grubbing material onsite, cost could be reduced while introducing additional organic material to the river, creating benefits to the habitat. For this idea to be implemented, however, processes which ensure compliance with applicable laws and close coordination with agency partners, Tribes, and stakeholders would need to take place to create implementable options.

One method for disposing of organic material on-site could be to mulch the material. By mulching the clearing and grubbing material and placing it along the water's edge (or in the river), organic material can be reincorporated into the environment, helping to increase habitat.

Note: Always attempt to leave as much organic material on-site as possible.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* An increase in organic material along the water's edge enhances the habitat.

*Reduce Resource Conflicts and Create Balance:* No significant impact.

*Adherence to Schedule:* Could help to streamline construction if less material has to be hauled off site for disposal elsewhere.

*Construction Issues:* More choices will allow for greater flexibility and increases efficiency.

*Cost Effectiveness:* Providing methods for disposal of clearing/grubbing material on site will reduce overall costs.

***5. Inventory lesson learned (Creative Idea Nos .54, 55, 73, & 85) -***

Lessons learned are currently captured on an annual basis as part of the after action review process. The proposal is to formally document the lesson learned in a database system. This would facilitate the dissemination of the lessons learned, including cross level information between personnel from design, construction, operations; and program and project managers. Several after action reviews are currently maintained; however not all existing reports are readily available at this time. Lessons are being passed informally to new team members verbally and through unconsolidated files. Recommend a lessons learned process consisting of:

- Annual one-day face-to-face meetings
- Update a cumulative lesson learned document
- Perform After Action Reviews (AARs)
- Update an inventory sheet.

Lessons learned should include, but not be limited to documentation of purpose, need, and results of modifications to completed projects, discussion of construction methods and types including contractor feedback after construction, options for side slopes, spoil, and clearing and grubbing, design criteria and constraints, biological response, sustainability, and operations and maintenance.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Implementation would enhance the knowledge base of team members, thus, enhancing habitat development.

*Reduce Resource Conflicts and Create Balance:* Face-to-face meetings and documentation of lessons would resolve/reduce potential conflicts between operations, construction and design,. Lessons learned provides a basis to reference when screening alternatives and selecting a site plan.

*Adherence to Schedule:* Potential to streamline design, avoids previous mistakes, and accelerates the learning curve for new team members.

*Construction Issues:* Improves plans and specifications with each project, integrates construction, design team and operations.

*Cost Effectiveness:* Allows for efficiencies to be achieved.

***6. Utilize nutrification to increase plover forage on sandbars (Creative Idea No. 59) -***

Researchers studying sandbars have noted evidence of agonism as well as emaciated plover chicks on some densely populated Missouri River sandbars. This proposal would seek methods to either add nutrients to sandbars which would benefit the invertebrate populations on the sandbar, which constitute the major food source for the plovers, or to directly add invertebrates to the sandbars. This process is believed to be relatively inexpensive.

By increasing the amount of food for plovers, there could be increased survivability of plover chicks which would lead to higher fledge ratios. It might also decrease competition for limited food sources which would reduce agonism amongst cohabitating birds in nesting colonies. This would also increase survivability.

One potential drawback is that adding nutrients could increase the fertility of the soil and lead to higher rates of re-vegetation. Additionally, this situation has only been noted on a small subset of bars and is not extremely common. On many of the sandbars, plover forage is not believed to be limiting. In these situations, nutrification efforts may be unnecessary.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Increased survivability of plover chicks on treated bars.

*Reduce Resource Conflicts and Create Balance:* No significant impact.

*Adherence to Schedule:* No significant impact.

*Construction Issues:* No significant impact.

*Cost Effectiveness:* No significant impact.

***7. Sequentially (annually) expand sandbars (Creative Idea No. 60) -***

Because there are milestone dates in 2005 and 2015 for acres of ESH created, the Corps is currently focusing their efforts on new construction of ESH. Although current efforts are focused on new ESH construction, opportunities to maximize existing ESH should also be explored. This may mean taking advantage of any opportunity to return to developed sites and conducting additional work where habitat was already created in order to maximize habitat use. This could be an effective means of adding ESH for the current productivity of the populations that are nesting there.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* This proposal would improve the ability to accomplish restoration objectives by maximizing the habitat produced within funding levels.

*Reduce Resource Conflicts and Create Balance:* No significant impact.

*Adherence to Schedule:* No significant impact.

*Construction Issues:* This proposal would be easier to construct because the issues such as staging areas have already been determined.

*Cost Effectiveness:* This proposal could improve cost effectiveness by maximizing habitat creation under one construction contract.

***8. Utilize Dr. Checks (Creative Idea No. 65) -***

Dr. Checks is a document and review tool for Plans and Specifications with the ability to track and document the review process. The tool provides an avenue to document the review process in one location and increases the likelihood that all comments are addressed.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* No significant impact.

*Reduce Resource Conflicts and Create Balance:* Provides opportunity for the entire PDT and programmatic members, including stakeholders to participate in the review. Assist the PM with scheduling and funding of program activities.

*Adherence to Schedule:* No significant impact.

*Construction Issues:* Provides opportunity to identify trends that may suggest a review or

incorporation into lessons learned.

*Cost Effectiveness:* No significant impact.

***9. The District Value Engineering Officer should be informed by Project Management of any individual ESH projects over $2 million to assess the need for an individual project VE Study (Creative Idea No. 66)-***

This current April 2009 program VE Study covers the Emergent Sandbar Habitat (ESH) portion of the Missouri River Recovery Program (MMRP). Engineering Regulation ER 11-1-321, Appendix D directs that VE Studies shall be conducted on Civil Works projects with CWE costs between $2 to $10 million and no later than 35% design completion. Projects exceeding $10 million shall have two VE Studies conducted. The first of the two VE Studies is to be conducted during planning stages (Plan Formulation) and the second no later than 35% design completion. It will be the responsibility of Project Management to inform the District Value Engineering Officer of any individual projects that fall within the above mentioned parameters. Projects within these cost parameters will be dealt with on a case by case basis by the Project Manager and the Value Engineering Officer whether a VE Study will be required beyond the current April 2009 program VE Study. If the Project Manager deems it necessary, they may also request that a VE Study be conducted on projects less than $2 million. The April 2009 program VE Study will be considered when evaluating each individual ESH project.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* If the project design is compatible with restoration objectives and approved VE Study recommendations, an individual project VE Study may not be necessary.

*Reduce Resource Conflicts and Create Balance:* Individual projects falling within ER 11-1-321 cost guidelines and sent to the District Value Engineering Officer for review will assure compliance with regulations.

*Adherence to Schedule:* Following this VE review procedure will help to avoid potential schedule delays.

*Construction Issues:* Construction issues addressed at the program level VE Study can be passed on for use on individual projects.

*Cost Effectiveness:* Conducting VE Studies at the program level for similar individual projects helps reduce the number of potential redundant project VE studies and thus reduces study cost.

***10. The Project Delivery Team (PDT) should conduct face-to-face Bidability/Constructability/Operability/Environmental (BCOE) reviews (Creative Idea No. 67) -***

Face-to-face design reviews could prove to be beneficial by expediting the BCOE process, making projects available for bid sooner. PDTs could use this meeting to discuss recommended changes to the plans and specifications in a timely manner, assuring their comments are included. This will ensure requirements have been incorporated prior to the project being sent out for bids, reducing the need for amendments and modifications.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* No significant impact.

*Reduce Resource Conflicts and Create Balance:* Alternatives can be discussed as a group and incorporated into the project.

*Adherence to Schedule:* Expedites the BCOE process.

*Construction Issues:* Reduces the number of amendments and modifications prior to award.

*Cost Effectiveness:* Efficiencies in all areas will help to reduce overall cost.

***11. Emphasize Value Engineering Change Proposals (VECP) in the contract documents (Creative Idea No. 71) -***

Emphasis should be placed on VECP. This gives the contractor the opportunity to be innovative and provides monetary incentives to the contractor and savings to the government. Currently on (Multiple Award Task Order Contracts) MATOC contracts, the reference to the VECP FAR 52.248-3 clause only appears on the parent MATOC construction contract and not on the individual Task Order. Each individual Task Order should have the same emphasis as the parent MATOC contract to keep VECP visible during each construction contract.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Innovative ideas may enhance Restoration Objectives.

*Reduce Resource Conflicts and Create Balance:* Innovative ideas may be more appealing to stakeholders and PDT's.

*Adherence to Schedule:* Innovative ideas may decrease construction durations.

*Construction Issues:* VECP encourages innovation on the part of the Contractor.

*Cost Effectiveness:* VECP is a cost incentive to the contractor and a cost savings to the Government.

***12. Subdivide the current MRRP Program in the Project Management Information System (P2) (Creative Idea No. 74) -***

Currently the entire MRRP is under one P2 account number for the Omaha District. Breaking out stand alone sub-features such as Shallow Water Habitat (SWH), Emergent Sandbar Habitat (ESH) and Cottonwood Reforestation may be a beneficial management tool. Consistency and clarity could assist PDT members looking directly at the P2 program as well as those utilizing other programs that are attached to the P2 program such as the Value Engineering Record System (VERS).

***(Performance Attributes)***

*Accomplish Restoration Objectives:* No significant impact.

*Reduce Resource Conflicts and Create Balance:* Proper P2 scheduling and clarity could reduce confusion and conflicts.

*Adherence to Schedule:* Separate P2 scheduling could give the PDT a better awareness of the program progress.

*Construction Issues:* No significant impact.

*Cost Effectiveness:* No significant impact.

***13. Develop agreed upon Project Implementation Report (PIR)scope and Site Mitigation Plan (Creative Idea No. 91) -***

A uniform documentation process would facilitate communication with external and internal stakeholders and team members to create a common understanding of project objectives, scope, deliverables, etc. At this time, the various program managers are working on development of a Project Implementation Report scope. This document will aid in the implementation of the program by providing common project definitions and documentation processes.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* A uniform Project Implementation Report (PIR) scope would simplify project reporting to stakeholders and other interested parties.

*Reduce Resource Conflicts and Create Balance:* Provides the PM will a better understanding of the resources necessary to complete the project and enabling opportunity for better scheduling and resource management of the program.

*Adherence to Schedule:* No significant impact.

*Construction Issues:* No significant impact.

*Cost Effectiveness:* No significant impact.

***14. In the river reach below Garrison Dam, cut off the land connection between the sandbars and the shoreline (Creative Idea No. 95) -***

Many of the sandbars in the river reach below Garrison Dam are attached to the shoreline. This provides a land bridge for terrestrial predator access. Terns and plovers choose isolated islands for nesting so they'll be safer from predators. Coyotes, foxes, skunks, opossum, raccoons and minks are speculated to be a problem for piping plovers and least terns nesting on these sandbars simply because the predators have easy access to the nests. They prey on chicks and eggs; and can cause nest abandonment, and the loss of entire colonies.

By mechanical construction methods, removing the sandbar connection and creating isolated sandbar islands can provide a natural predator break and provide better nesting habitat for the plover and the tern. These breaks need to be wide enough (~300 feet) to effectively discourage predation.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Establishes a predator break and could increase forage opportunities for the birds.

*Reduce Resource Conflicts and Create Balance:* Will need to be coordinated with partner agencies.

*Adherence to Schedule:* No significant impact.

*Construction Issues:* No significant impact.

*Cost Effectiveness:* No significant impact.

***15. Review VE goals in 2012 (Creative Idea No. 108) -***

This current April 2009 Program VE Study covers the ESH Program portion of the overall MRRP... The 2003 Amended BiOp indicates ESH acreage goals should be met by the year 2015. The next Program VE Study for the ESH Program should be conducted prior to the 2015 milestone date in ~2012. Individual project VE Studies will be reviewed and conducted on a case-by-case basis.

***(Performance Attributes)***

*Accomplish Restoration Objectives:* Conducting VE Studies at the program level checks if restoration objectives are being accomplished.

*Reduce Resource Conflicts and Create Balance:* Program level VE Studies enhance communication and coordination amongst different groups and agencies.

*Adherence to Schedule:* Conducting a program VE Study in conjunction with the 2015 upward reporting milestone helps identify issues and changes.

*Construction Issues:* Conducting VE Studies at the program level can surface construction issues that can be passed on and resolved at the individual project level.

*Cost Effectiveness:* Conducting VE Studies at the program level can help reduce the number of potential redundant VE studies at the project level thus reduces VE Study costs.

## VALUE ENGINEERING PROCESS

### GENERAL

This report section describes the procedures used during the Value Engineering Study. It is followed by the VE Study Agenda

A systematic approach was used in the VE study and the key procedures followed were organized into three distinct parts: (1) pre-study preparation, (2) VE study, and (3) post-study procedures.

### PRE-STUDY PREPARATION

In preparation for the VE study, the facilitator (CVS) and VE team members reviewed the project documents provided by the Omaha District of the USACE to become better prepared for the study. The project documents consisted of:

- *2007 Annual Report, Biological Opinion on the Operation of the Missouri River Main Stem System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System, Prepared by: U.S. Army Corps of Engineers, Omaha and Kansas City Districts, April 9, 2008.*
- *Value Engineering Study Report, Missouri River Recovery Program - Mitigation Project Including Shallow Water Habitat, Prepared by: GeoVal, Inc and the U.S. Army Corps of Engineers, Omaha District, March 26, 2009.*
- *MRRP Mission, October 2008.*
- *Corps of Engineers Worksheet for ESH Calculation Sheet, July 25, 2008.*
- *Emergent Sandbar Habitat Program Construction History,* Corps of Engineers, dated June 26, 2008.
- *Plans and Specifications for Emergent Sandbar Habitat Mile River 775, River Miles 761.4, 769.8, and 790.0, River Mile 863, River Miles 774, 777 and 791, and River Mile 775, Prepared by: U.S. Army Corps of Engineers, Omaha District.*
- *Various Reports, Articles, Fact Sheets and Presentations obtained from the following web sites:*
    - http://www.nwk.usace.army.mil/projects/mitigation/index.htm
    - http://www.morriverrecovery.org

## VE STUDY

This value engineering workshop was a three-day study effort. The SAVE International Value Engineering job plan was followed, where applicable, to guide the team in developing alternative solutions and recommendations for consideration in resolving and managing the issues and problems associated with sustaining the population of threatened piping plovers and endangered least terns as contained within the Missouri River Recovery Program – Emergent Sandbar Habitat Project.

The standard, five job plan phases are:

- Information Phase (including Function Analysis)
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

### Information Phase

At the beginning of the VE study, discussions by the Program Manager and ESH Project Lead for the USACE in Omaha presented a more detailed review of the issues associated with the creation of emergent sandbar habitats along the Missouri River, examining current plans and programs to seek out alternative approaches and ideas that will improve the overall performance of the program. The presentation, and opportunity to obtain responses to questions, further enhanced the VE team's knowledge and understanding of the issues. The discussion clarified many questions of the VE team allowing the team to focus on developing alternatives for addressing and managing the issues and problems associated with the Missouri River Recovery Program - Emergent Sandbar Habitat projects.

During this phase, the VE team further defined the project goals, key criteria, critical issues and project constraints during the information phase of the study (see **Appendix A**). This phase culminated in the team defining project functions and developing a Function Analysis System Technique (FAST) diagram (see **Appendix C**).

### Creative Phase

This VE study phase involved identifying and listing creative ideas. During this phase, the VE team participated in a brainstorming session to identify as many means as possible to provide the necessary functions within the project. Judgment of the ideas was not permitted at this point. The VE team looked for a large quantity of ideas and association of ideas. The project functions developed by the VE team are listed in **Appendix C**.

The creative idea worksheets listing all ideas suggested during the study are provided in this report (see **Appendix D**). This list should be reviewed, since it may contain ideas that are worthy of further evaluation, and may be used as the problem solutions develop. These ideas could also help stimulate additional ideas by others.

### Evaluation Phase

The purpose of the evaluation phase was to systematically reduce/combine the large number of ideas generated during the creative phase to a number of concepts/alternatives that appear promising in meeting the project objectives. The key performance criteria against which the ideas need to be evaluated were identified as Accomplish Restoration Objectives; Reduce Resource Conflicts and Create Balance; Adherence to Schedule; Construction Issues; and Cost Effectiveness. Once each idea was fully evaluated, it was rated.

Based upon the rating, ideas rated positively where the VE team could assess significant impacts were designated Value Engineering Alternatives, and documented in the Value Engineering Alternatives section of this report. Numerous ideas were found to already be contained within the ESH Program, or were actively under consideration, and were designated as Being Done. The balance of the ideas that were found to add no value to resolving the issues were dropped from further consideration.

### Development Phase

During the development phase, each idea was expanded into a workable solution. The development consisted of the recommended alternatives and a brief narrative describing the justification for the proposed alternatives. A cost estimate for this project was not available to the VE team. The alternatives are included in the VE Alternatives section of this report.

### Presentation Phase

Rather than conducting a formal presentation at the end of the study, the VE study concluded with a team review and discussion of all of the VE alternatives that were developed during the workshop, along with a summary of significant findings.

# Missouri River Recovery Program – Emergent Sandbar Habitat

## VALUE ENGINEERING STUDY AGENDA

**Monday, April 6, 2009**

8:30 Introductions / Brief Overview of the VE Process (Ron Tanenbaum)
9:00 Project History – Background, Overview, Schedule (Teresa Reinig, Kelly Crane)
*11:30 Lunch*
12:30 VE Objectives/Focus/Opportunities/Performance Attributes (Ron Tanenbaum)
1:30 Critical Issues and Constraints
2:00 Function Analysis and FAST Diagram
3:30 Creativity Session with Review of SWH Carry-Over Proposals

**Tuesday, April 7, 2009**

8:00 Team Review of Previous Day
8:15 Creativity Session (Continues)
*11:30 Lunch*
12:30 Team Evaluation of VE Alternatives; Begin Development of VE Alternatives (Items are assigned to the team member to document recommended alternatives and impacts of those alternatives)

**Wednesday, April 8, 2009**

8:00 Development of VE Alternatives (Continues)
*11:30 Lunch*
12:30 Team Review of VE Alternatives and Summary of Findings

# PROJECT DESCRIPTION, PROJECT CRITICAL ISSUES, CONSTRAINTS, AND PERFORMANCE ATTRIBUTES

## PROJECT DESCRIPTION

### Introduction

The Missouri River Recovery Program - Emergent Sandbar Habitat Project, in partnership with USFWS, is currently working to meet near-term requirements to address threatened and endangered species concerns through habitat creation, flow modifications, and monitoring and research to prevent further declines of other native species. The MRRP targets specific species populations and habitats, such as the pallid sturgeon, least tern and piping plover, along certain portions of the Missouri River.

The Missouri River extends 2,619 miles from its source at Hell Roaring Creek and 2,321 miles from Three Forks, Montana where the Jefferson, Madison and Gallatin Rivers converge in southwestern Montana, near the town of Three Forks. The Missouri River is the longest river in the United States. The Missouri River flows generally east and south about 2,321 miles to join the Mississippi River just upstream from St. Louis, Missouri. The Missouri River basin has a total drainage area of 529,350 square miles, including about 9,700 square miles in Canada. That part within the United States extends over one-sixth of the Nation's area, exclusive of Alaska and Hawaii. It includes all of Nebraska; most of Montana, Wyoming, North Dakota, and South Dakota; about half of Kansas and Missouri; and smaller parts of Iowa, Colorado, and Minnesota.

The general study area is shown in **Figure 1**.

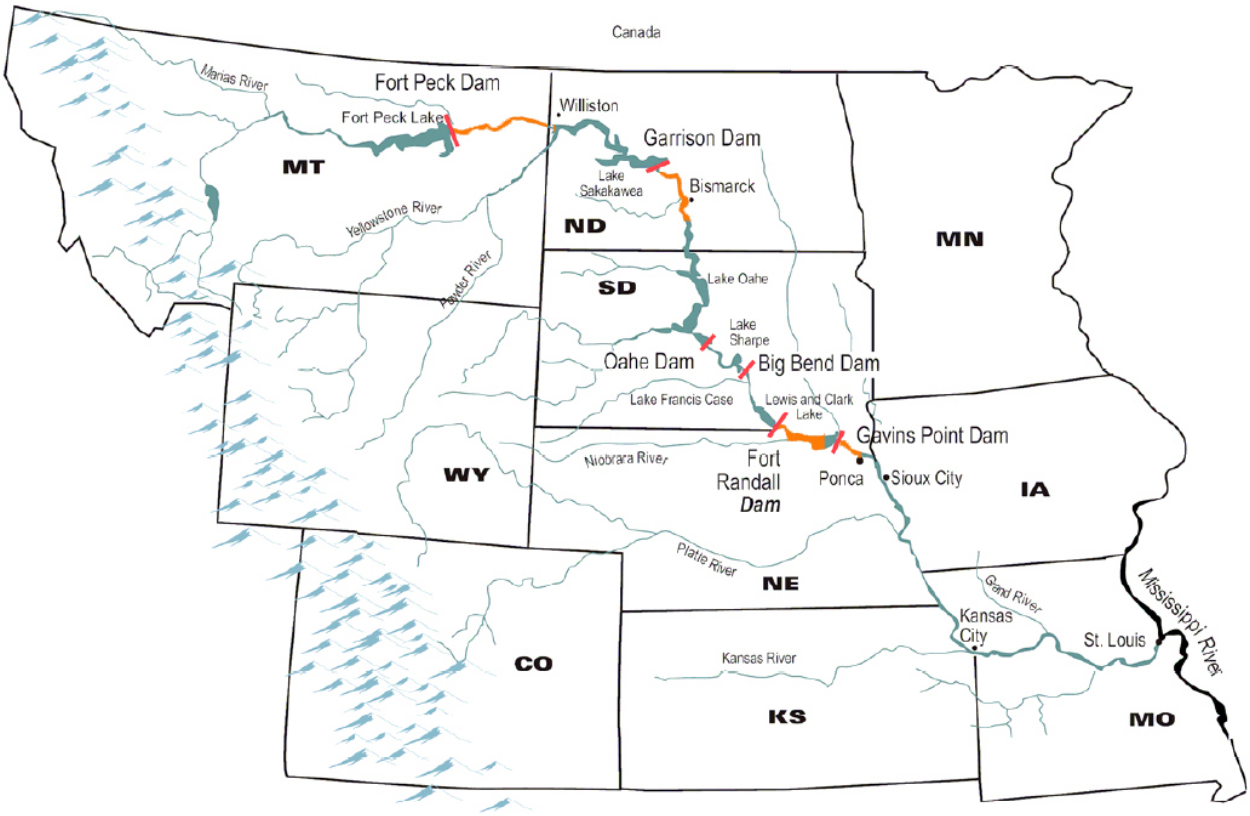


Figure 1 - Project Map for Missouri River Recovery Program - Emergent Sandbar Habitat Project

**Missouri River Recovery Program (MRRP)**

The MRRP is currently working to meet near-term requirements to address threatened and endangered species concerns through habitat creation, flow modifications, and monitoring and research to implement the 2003 Amended Biological Opinion and the Missouri River Fish & Wildlife Mitigation Project. The MRRP targets specific species populations and habitats, such as the pallid sturgeon, least tern and piping plover, along certain portions of the Missouri River. In addition, the acquisition and development of fish and wildlife habitat for the mitigation of the Bank Stabilization and Navigation Project (BSNP) continues to proceed forward.

**Mitigation Project and Emergent Sandbar Habitat Program (ESH)**

The survival of the endangered least tern and threatened piping plover is crucial to maintaining a thriving ecosystem on the Missouri River. While both shorebirds nest elsewhere as well, the sandbars of the Missouri River and reservoir shorelines are important to their overall survival. In 2002, the U.S. Fish and Wildlife Service designated areas along much of the Missouri River as critical habitat for the piping plover and least tern. Both bird species prefer bare sandbars with little to no vegetation. The Emergent Sandbar Habitat Program is part of the broader Missouri River Recovery Program, established to recover populations of endangered and threatened species and the river ecosystem. Protecting these species by creating and maintaining habitat is part of the Corps' responsibility to comply with the Endangered Species Act by implementing the U.S. Fish and Wildlife Service's 2003 Amended Biological Opinion. Recovery efforts create a healthier river ecosystem overall, which benefits the Missouri River's many uses.

In the days before Missouri River flows were regulated, annual spring flooding would clear existing sandbars of vegetation and create new sandbars that would provide habitat for the terns and plovers during their breeding season. The river flows have been altered, thus the natural process of creating breeding habitat was diminished. In addition, modifications to other river systems have reduced nesting habitat throughout the terns' and plovers' species range. The Corps objective is to protect the least tern and piping plover for future generations by maintaining and creating adequate sandbars for the birds as use of the river for other purposes continues.

Sandbars can be created, enhanced or maintained using several methods. The most common methods used by the Corps include the following:

- When river flows are higher, dredging is conducted to create new sandbars.
- After the navigation season, when the river flows are lower, construction using heavy equipment is conducted.
- Removing vegetation from existing sandbars also creates habitat the birds can use.

Emergent sandbar habitat development is planned to avoid, to the extent possible, residential areas, marinas, municipal intakes, other areas with high concentrations of recreational boating, and environmentally and culturally sensitive areas. The Corps posts restriction signs warning people to keep off sandbars during active nesting periods.

## PROJECT CONSTRAINTS AND CRITICAL ISSUES

The VE team identified the following critical issues and project constraints during the information gathering phase of the study. This information was used to guide the function analysis and speculation phases of the workshop.

### Project Constraints:

- None apparent.

### Critical Issues:

- Different agencies have different goals and strategies to meet these goals.
- ESH is not of the highest priority when it comes to funding which restricts how much habitat can be created; interest in protecting the pallid sturgeon overrides interests in protecting the piping plover and least tern because the pallid sturgeon is more imperiled.
- The BiOp habitat acreage goals are impractical to meet within the stated timeframe and budget constraints.
- The original survey used to develop the BiOp ESH acreage goals were intended to reflect the amount of habitat available on the Missouri River in 1998 but they do not accurately represent the amount of habitat on the system at that time. The goals overestimated the actual amount of ESH present in each reach by as much as 63%.
- Life expectancy of a sandbar is believed to be about 3 to 5 years; bars generally decline in overall benefits after this time due to predation, erosion and / or vegetation encroachment; predation impacts can occur within one year; in theory, vegetation should be controllable over the life of the sandbar.
- North Dakota questions creating ESH as they feel it interferes with public use of the river; the state has permitting authority related to this program through their Sovereign Lands Program.
- Created sandbars should not affect hydrology in such a way as to increase shoreline erosion and bank instability; there can be the perception that our work does cause erosion.
- Creation and maintenance of ESH is an unending effort.
- Permitting restrictions from sister agencies can impact the creation of ESH.
- Normal construction season is from September 1 through April 15, but is often shortened by December ice formation, which may continue through March.

- May need construction easements from private land owners for access and staging.
- The end-goals for the restoration are somewhat nebulous regarding the amount of acreage needed to sustain a population and what the population size should be. The BiOp contains no population goals for the Missouri River. The population goals are contained in the respective recovery plans for the two species. In theory, if we had only one pair of plovers nest on the Missouri River and they fledged two chicks, we met the BiOp goal for the Missouri River.
- Sandbars to be built adjacent to tribal lands require additional coordination.
- Construction of sandbars may impact existing wetlands creating a conflict requiring resolution.
- Recent state water quality permits have requested that the Corps mitigate for wetland losses at a 1.5:1 ratio.
- The definition of what constitutes emergent sandbar habitat, between USFWS and the Corps, is still unclear; there is also a difference in opinion as to what triggers the necessity for constructing habitat (fledge ratios).
- There may be a lack of sufficient material of desired physical properties in the Lewis & Clark Lake area for the construction of ESH.
- Other species of concern (e.g. mussels, turtles, pallid sturgeon) may be impacted by creation of ESH; gravel bars may also be impacted.
- Current management of the Missouri River limits natural sandbar formation; this may require more mechanically created sandbars than originally envisioned.

## PERFORMANCE ATTRIBUTES

### 1. Accomplish Restoration Objectives (ARO)

Alternatives recommended by the team need to be assessed as to how well the required actions and restoration objectives of the ESH Mechanical Habitat Creation program are being met. The required actions include complying with the Biological Opinion (2003 amended) as it relates to the creation of emergent sandbar habitat. Compliance will be achieved within the Adaptive Management framework. Restoration success is based on increasing the amount, quality and productivity of nesting habitat to support the tern and plover populations on the Missouri River.

### 2. Reduce Resource Conflicts and Create Balance (RRCCB)

The Missouri River environs contains numerous and varied resources. In attempting to benefit Federally-listed species, another resource may come into conflict, upsetting the desired balance between the river's ecological, social, economic and cultural resources and values. The MRRP seeks to mitigate habitat losses, recover threatened and endangered species and restore its ecosystem while maintaining a balance of values with minimal conflicts to authorized purposes.

### 3. Adherence to Schedule (AS)

Alternatives proposed in lieu of the baseline program could have several potential impacts to time-related items. The time to construct all or part of the project, and monitor the results, could be altered if the alternative is implemented. The assessment is related to the measure of the time to complete the project, where a positive outcome is one which allows the schedule to be met, and which avoids unforeseen delays in the schedule. The current project schedule, as defined by the BiOp (2003 Amended), is:

December 2005 – complete 50% of projects.

December 2015 – complete 100% of projects.

It should be noted that individual projects have been under construction for the past 5 years. The ESH Program proposes to create sufficient habitat (naturally or mechanically developed) to ensure meeting fledge ratio goals as follows:

- Piping Plovers – 1.22 fledglings per nesting pair
- Least Tern - .94 fledglings per nesting pair

The maximum habitat to be created, as defined by the BiOp (2003 Amended) within this project is as follows:

- Below Garrison Dam – 50 acres/mile of river reach
- Below Fort Randall Dam – 20 acres/mile of river reach
- Lewis & Clark Lake – 80 acres/mile
- Below Gavins Point Dam – 80 acres/mile of river reach

## 4. Construction Issues (CI)

The translation of design to construction is not always as trouble-free or consistent as the designer hopes. Thus, for this program, it is valuable to assess what is working in the field and what can be done to make the construction process better. In other words, what does the construction experience in the field tell us? To answer this question, it is beneficial to revisit the construction process, success and failures of completed and ongoing efforts and to obtain feedback from the contractors, and Corps construction/field personnel. For each proposed alternative, the VE team member should assess how the design is altered to improve the construction process within the allowed construction timeframe and enhance construction performance.

## 5. Cost Effectiveness (CE)

In suggesting a particular alternative, the VE team should make an approximate, qualitative assessment of how the recommendation might impact the overall cost of the project, in terms of first cost and life cycle costs (where appropriate). The ease with which an alternative can be implemented should be assessed as this also impacts the relative cost.

An alternative to the current design options may be assessed in two ways:

- Does the alternative produce a project at lower cost but with an equivalent or greater benefit to the current design(s)?

- Does the proposed alternative better meet the ESH Mechanical Habitat Creation objectives and schedule for the equivalent cost of the current design(s)?

A positive response to either of these options would result in an improvement in the Cost Effectiveness performance attribute.

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## MEETING ATTENDEES
***Missouri River Recovery Program - Emergent Sandbar Habitat***

| 2009 April | | | *NAME* | ORGANIZATION | POSITION | TELEPHONE | | CELL |
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|---|---|---|---|---|---|---|---|---|
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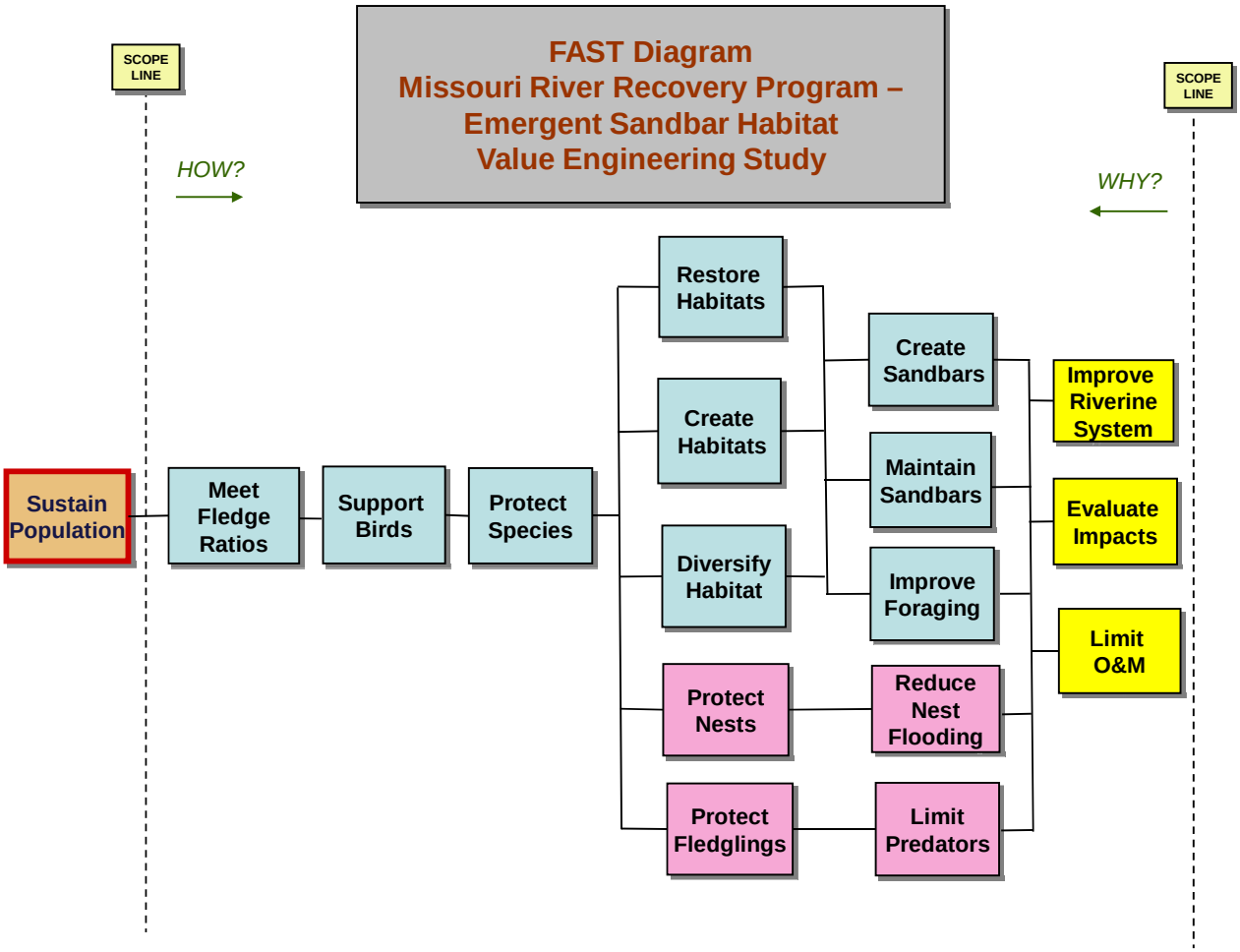
# FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM

# PROJECT FUNCTIONS

- Restore Habitats
- Protect Species
- Limit Predators
- Create Habitats
- Evaluate Impacts
- Support Birds
- Create Sandbars
- Maintain Sandbars
- Diversify Habitat
- Meet Fledge Ratios
- Limit O&M
- Improve Riverine System
- Improve Foraging
- Reduce Nest Flooding
- Protect Nests
- Protect Fledglings
- **Sustain Population**


FAST Diagram
Missouri River Recovery Program – Emergent Sandbar Habitat Value Engineering Study
SCOPE LINE
SCOPE LINE
HOW?
WHY?
Sustain Population
Meet Fledge Ratios
Support Birds
Protect Species
Restore Habitats
Create Habitats
Diversify Habitat
Protect Nests
Protect Fledglings
Create Sandbars
Maintain Sandbars
Improve Foraging
Reduce Nest Flooding
Limit Predators
Improve Riverine System
Evaluate Impacts
Limit O&M

# SPECULATION LIST/ IDEA EVALUATION

The list of ideas created during the speculation phase of the workshop was recorded by the team facilitator. The Idea Evaluation Form containing all of the ideas, and the rating method applied to each idea, is presented in the following pages.

Those ideas that were considered by the team to be feasible were then assigned a recommendation for development as follows:

- P = Proposal
- BD = Being Done or Under Consideration
- X = Rejected or Outside Project Scope

In evaluating the suggestions during the development phase, each writer then expressed the advantages and disadvantages in the individual suggestions to better describe the characteristics of the alternative. The reader is encouraged to read each suggestion independently for complete information.

The reader will note that, as the evaluation process proceeded, many of the ideas were found to have common themes, and were therefore combined.

| IDEA EVALUATION<br>*Missouri River Recovery Program - Emergent Sandbar Habitat* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Ideas*** | | **Performance Attributes** | | | | | **Advantages** | **DISADVANTAGES** | **PROPOSAL (P), BEING DONE (BD), OR REJECT (X)** |
| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 1 | Create upstream structures to trap and create sandbars | 0 | -2 | 0 | +1 | 0 | • Sand is trapped behind structures (chevrons)<br>• Could use fallen trees instead of rock structures<br>• Would create a natural sand base for future emergent sandbar construction<br>• Good if there are no suitable natural shallow submerged sand locations – such as below Garrison Dam | ♦ After time, more predators will imprint<br>♦ Park Service and North Dakota will resist rock structures<br>♦ Would need very high flows for natural sand accumulation to emerge<br>♦ Could increase erosion on banks due to flow divergence needing land purchase or bank protection<br>♦ Previously considered and rejected | X |

**Performance Attributes: Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**
**Accomplish Restoration Objectives (ARO); Reduce Resource Conflicts and Create Balance (RRCCB); Adherence to Schedule (AS); Construction Issues (CI); Cost Effectiveness (CE)**

| IDEA EVALUATION<br>*Missouri River Recovery Program - Emergent Sandbar Habitat* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Ideas*** | | **Performance Attributes** | | | | | **Advantages** | **DISADVANTAGES** | **PROPOSAL (P), BEING DONE (BD), OR REJECT (X)** |
| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 2 | Let contractors select their staging areas | 0 | 0 | -1 | +1 | 0 | • Removes responsibility from Corps<br>• Contractors can negotiate locations and price best suited to their work<br>• Land owners more receptive to contractor negotiations rather than the government<br>• Do not need to utilize overextended Corps Real Estate Division<br>• Contractor currently has this option to select another site on their dime | ♦ Places burden on contractor<br>♦ Contractor may charge for this service<br>♦ Cannot due site specific NEPA analysis until site is selected.<br>♦ Multiple bidders could annoy land owners<br>♦ Risk of delays if contractor cannot secure a staging area<br>♦ Some contractors oppose this idea and may file claims | BD |
| 3 | Create site selection maps | 0 | +1 | 0 | 0 | 0 | ♦ Know in advance candidate locations for future sandbars<br>♦ Part of site selection criteria<br>♦ Allows multi-agency participation and input | ♦ None apparent | BD |

**Performance Attributes: Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**
**Accomplish Restoration Objectives (ARO); Reduce Resource Conflicts and Create Balance (RRCCB); Adherence to Schedule (AS); Construction Issues (CI); Cost Effectiveness (CE)**

| IDEA EVALUATION<br>*Missouri River Recovery Program - Emergent Sandbar Habitat* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Ideas*** | | **Performance Attributes** | | | | | **Advantages** | **DISADVANTAGES** | **PROPOSAL (P), BEING DONE (BD), OR REJECT (X)** |
| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 4 | Build lower elevation sandbars that would be inundated by flows exceeding 50,000 cfs | 0 | 0 | 0 | 0 | +1 | • Less material needed to construct, or<br>• More acreage with same amount of material<br>• Self maintaining at high flows<br>• Currently build sandbars at multiple flow levels | • Risk of nest loss at high flows<br>• Could erode and relocate during high flows with a net loss in habitat | BD |
| 5 | Increase magnitude of Spring pulses to scour and create sandbars | +2 | -2 | +1 | +1 | +1 | • Currently doing 35,000 to 40,000 cfs pulse – but could to be higher (~70,000 cfs for 6 weeks)<br>• Couple with sediment transport out of reservoirs<br>• Could help SWH projects<br>• Worth studying at this time for possible future implementation | • Could generate flooding<br>• High public resistance<br>• Risk of eroding existing habitat<br>• More bank erosion<br>• Has not been studied – high level of uncertainty | X |
| 6 | Create sandbar complexes | 0 | 0 | 0 | 0 | 0 | • Currently being done – not doing single sandbars | • None apparent | BD |

**Performance Attributes: Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**
**Accomplish Restoration Objectives (ARO); Reduce Resource Conflicts and Create Balance (RRCCB); Adherence to Schedule (AS); Construction Issues (CI); Cost Effectiveness (CE)**

| IDEA EVALUATION<br>*Missouri River Recovery Program - Emergent Sandbar Habitat* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Ideas*** | | **Performance Attributes** | | | | | **Advantages** | **DISADVANTAGES** | **PROPOSAL (P), BEING DONE (BD), OR REJECT (X)** |
| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 7 | Inventory habitat acreage annually | +2 | +1 | +2 | 0 | 0 | • Know where we are located in the program<br>• Can verify meeting fledgling and acreage milestones<br>• Conveys to stakeholders what is achieved for money spent<br>• Supports quarterly USFWS and Corps meeting<br>• Currently being done | ♦ Sandbars are variable in acreage over time so more difficult to survey | BD |
| 8 | Remove mainstem dams | +2 | 0 | 0 | 0 | 0 | • Free river flow and sandbar creation<br>• Big Bend and Gavins Point Dam could be removed without endangering flood control or navigation. The losses would be to hydropower generation and lake recreation. | • Not practical or economical<br>• Lose hydropower, water storage, navigation, and flooding control | X |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 9 | Increase focus on reservoir sandbar habitat | +1 | 0 | 0 | -1 | 0 | • Increase area available for projects<br>• Increased options managing lake levels<br>• Less potential for erosion of sandbars<br>• Consistent with master manual unbalancing concept<br>• Could be shoreline or in-reservoir locations<br>• Been previously very productive for piping plovers<br>• Reduces number of sandbars built in national recreation river reach<br>• Corps owns the land, but only up to the high water mark; this is a concern with tribal owned land. | • Shoreline and sandbars would require vegetation control<br>• Shoreline and sandbars may require more predator control, although this appears to generally not been a problem<br>• Could interfere with fishing interests<br>• Not currently part of BiOp, so acreage would not count – but fledgling pairs do count<br>• Not as beneficial for least terns<br>• Difficult to detect predators<br>• Lakes are deep – need to locate shallow areas for sandbar base | BD |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 10 | Pursue extended construction season | +1 | -2 | +2 | +2 | +2 | • Gives more time to build sandbars<br>• Could start after July 15th<br>• Currently being investigated | • Opposed by National Park Service due to impacts to recreation<br>• Constrained by nesting season | BD |
| 11 | Inventory bird counts annually | 0 | 0 | 0 | 0 | 0 | • Currently surveyed by Corps Threatened and Endangered Species Section and published on line. | • None apparent | BD |
| 12 | Revise current environmental specification to allow five nest protocol | 0 | -1 | +1 | +1 | 0 | • Allows contractor to extend work later into the Spring, if needed, after April 15th<br>• Done once before on RM775 | • Blanket approval may be opposed by USFWS<br>• More difficult for contractor to plan work schedule<br>• Early nesting birds may avoid sandbar where construction is active | P |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 13 | Capture individual site costs | 0 | 0 | 0 | 0 | 0 | • Would support planning and budgeting<br>• Final construction cost data is available<br>• Could be part of After Action Report | • None apparent | P |
| 14 | Eliminate power peaking flows from Fort Randal and/or Garrison dams | +1 | -1 | 0 | +1 | +1 | • Decreases erosion of sandbars below these dams<br>• Potential increase in bird usage of habitats<br>• Makes construction easier if daily fluctuations in flows are redcued<br>• Would improve recreational opportunities below Ft. Randall Dam | • Increases cost of electricity<br>• Need to obtain agreement with WAPA<br>• May create a public perception problem | X |
| 15 | Reduce time needed to obtain regulatory permits | 0 | +1 | +1 | 0 | 0 | • Currently trying to get a General Permit for ESH | • None apparent | BD |
| 16 | Conduct media days | 0 | +1 | 0 | 0 | 0 | • Currently have 2 per year | • None apparent | BD |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 17 | Control vegetation on existing sandbars by discing and dredging | 0 | 0 | +1 | +1 | +1 | • Allows reutilizing existing sandbars<br>• Reduces amount of material to be placed<br>• Could be combined with an overtopping layer (say 2 feet)<br>• Currently being studied | • Vegetation may grow back – even thicker<br>• May not resolve predator imprinting | BD |
| 18 | Alter Garrison Dam flows to provide ESH | +1 | 0 | +1 | +2 | +2 | • More natural habitat<br>• No construction needed in Garrison reach<br>• Do not need North Dakota permits<br>• Habitats are sustainable<br>• Previously occurred on the Garrison stretch during certain years, though not intentionally through ESH program | • May not be practical in drought situations<br>• May create negative public perception | X |

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| ***Ideas*** | | **Performance Attributes** | | | | | **Advantages** | **DISADVANTAGES** | **PROPOSAL (P), BEING DONE (BD), OR REJECT (X)** |
| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 19 | Pursue mechanical create sandbars in North Dakota | +1 | -2 | +1 | 0 | 0 | • Increases amount of habitat<br>• Habitat Is needed in this area<br>• Currently have PDT working specifically with North Dakota | • Strong resistance from North Dakota | BD |
| 20 | Create backwaters to support foraging | 0 | +2 | -1 | -1 | -1 | • Good for least terns<br>• Benefits ancillary species<br>• Supports broader ecosystem restoration<br>• Can avoid land purchase if focus on state-owned land<br>• Supported by other agencies<br>• Currently being done in some cases<br>• Provides material source for sandbar construction | • Does not count toward ESH habitat<br>• Takes away limited funds from the program<br>• More construction and contractor oversight | BD |
| 21 | Reshape existing sandbar slopes | +1 | 0 | 0 | 0 | +1 | • Extends effectiveness and longevity of sandbar<br>• Increases habitat longevity | • None apparent | BD |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 22 | Lower summer flows out of Gavins Point and Fort Randall dams | +2 | -1 | +1 | +1 | +2 | • Increases availability of sandbar acreage<br>• May reduce predation<br>• Initiate above and beyond current water management efforts | • May have some impact on navigation<br>• Does not concur with current Master Manual | X |
| 23 | Trap predators | +1 | -1 | 0 | 0 | 0 | • Has been done<br>• Allows increased survivability of adults & fledglings | • Disrupts natural predator actions<br>• Nebraska Game & Parks Commission would prefer selective trapping as opposed to a broad trapping plan | BD |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 24 | Eliminate navigation on the Missouri River | | | | | | • Would provide for a natural hydrograph of the river<br>• Lower summer flows would provide additional foraging habitat for both species<br>• Larger nesting and foraging areas would make predation more difficult<br>• Higher spring flows would allow for habitat creation by creating new sandbars and scouring old sandbars of vegetation | • Not allowed under current interpretation of the Flood Control Act of 1944. Would require a change in the law by Congress | X |
| 25 | Provide reduced navigation season | +1 | -2 | +1 | +1 | 0 | • Consistent with authorized purposes<br>• Would allow creation of more natural habitat | • Navigation users would resist this idea | BD |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 26 | Captive-rear birds | +1 | -1 | 0 | 0 | 0 | • Would work if take eggs from nests to assure development<br>• Reduces predation | • Captive rearing was eliminated by the USFWS in the 2003 BiOp Amendment. The Service felt that captive rearing should be done only if a species if facing extinction, which is not the case for either species.<br>• Least tern chicks may not be survivable | X |
| 27 | Construct multiple, small sandbars | 0 | 0 | +1 | 0 | 0 | • Current plan for RM781<br>• Can be enlarged in the future | • None apparent | BD |

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| 28 | Allow contractors to develop sandbar layout within a given area | 0 | 0 | 0 | -1 | +1 | • Allows contractors more flexibility in meeting desired goal<br>• Design build/best value | • Corps Regulatory Group requires a more defined area for the permitting process<br>• Transfers design out of Corps<br>• More contractor responsibility<br>• More Corps reviews | X |
| 29 | Determine population goals | | | | | | • Would support idea no. 31<br>• Would allow determination of species recovery | • This is a function of the USFWS, and is in the process of being updated. | w/31 |
| 30 | Widen the top width of the river | | | | | | • Restricts future development | • Need to acquire real estate | See 107 |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 31 | Re-evaluate goals for 2015 | +2 | +2 | +2 | +2 | +2 | • May allow using fledgling pair ratio as the metric for success rather than acres created<br>• May be able to reduce the amount of mechanically constructed habitat<br>• Better match to latest science<br>• Can be accomplished through adaptive management | • Require negotiations with USFWS | P |
| 32 | Complete the EIS and select an alternative | | | | | | • Will be completed Spring 2010 | • | BD |
| 33 | Vary sandbar composition to reduce vegetation formation | +1 | -1 | 0 | -1 | -1 | • Could use additives<br>• Would extend life of habitat | • Added construction process<br>• Do not know effect on invertebrates – need a pilot study | X |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 34 | Increase winter flows from the dams to above navigation flows | | | | | | • | • | X |
| 35 | Pursue increased sediment transport from dams | +2 | -2 | +2 | +2 | -2 | • Currently being studied for Gavins Point Dam<br>• Provides more sand and sediment in the river for natural bar development<br>• Removes sand from reservoirs which increases storage and recreational opportunities | • Reduces duck hunting habitat<br>• Reduces amount of wetlands which may require mitigation<br>• May create public perception issues | BD |
| 36 | Limit future development along the river banks | 0 | -2 | 0 | 0 | -2 | • Can allow bank erosion<br>• Decreases human disturbance<br>• National Park Service supports this idea | • Requires purchase to accomplish<br>• Public opposition may exist | BD |
| 37 | Remove vegetation along the river banks | | | | | | • May reduce predators | • Could impact cottonwoods<br>• Could increase erosion | X |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 38 | Install predator fencing around sandbars | | | | | | • Reduces predators | • Not practical due to remote nature of sites | X |
| 39 | Create sandbars by river bank channelization | 0 | -1 | -1 | -1 | -1 | • Could create some shallow water habitat<br>• Would be source of material | • May require real estate acquisition<br>• Need to avoid cottonwoods<br>• Would need to be 300' wide as a minimum | BD |
| 40 | Define Emergent Sandbar Habitat | | | | | | • A common definition would allow improved communication | • | w/31 |
| 41 | Develop natural stabilization techniques in lieu of rock | | | | | | • | ♦ | See 1 |
| 42 | Perform annual maintenance program of selected constructed sandbars | +1 | 0 | 0 | 0 | +1 | • Works with 21 | • | BD |

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| 43 | Mulch all required clearing and grubbing material along river banks, do not haul off | +1 | 0 | +1 | +1 | +2 | • Potential cost saving measure<br>• Could streamline construction | • Some options may not be acceptable to all parties | P |
| 44 | Increase public awareness of benefits of ESH | | | | | | • Being done with media days | • | BD |
| 45 | Put all clearing and grubbing material in the river | | | | | | • | • | w/43 |
| 46 | Create sandbars using floating structures | +1 | -1 | +2 | +1 | 0 | • Could be moved to minimize predation<br>• May be possible today<br>• Currently being assessed by a vendor | • Tried and was not successful<br>• Not good for piping plovers<br>• Difficult to anchor<br>• Not aesthetic<br>• Need a raft of barges to create a decent area | BD |

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| 47 | Inform public of ESH progress on the web site | | | | | | • www.moriverrecovery.org | • | BD |
| 48 | Create off channel habitat (e.g. ponds with sandbars) | 0 | 0 | -1 | -2 | -2 | • Staying out of river<br>• Improved duck hunting<br>• National Park Service likes it<br>• Has been used in sandpits along the Platte River | • May require land purchase<br>• Does not count toward acreage | X |
| 49 | Increase level of funding | | | | | | • | • No control of this issue | X |
| 50 | Seek ways to reduce opposition to ESH projects | | | | | | • Media day<br>• Web site | • None apparent | BD |
| 51 | Give the Corps control of permitting | | | | | | • | • | X |
| 52 | Investigate mechanisms for eliminating vegetation while birds or nests are present | | | | | | • | • USFWS would oppose<br>• Would be considered take under the ESA | X |

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| 53 | Take action to increase survivorship of wintering birds | +1 | 0 | 0 | 0 | 0 | • Improves population sustainability<br>• Could work with coastal Corps Districts to ensure protection of plover wintering habitat | • Would need to take action outside project area<br>• Responsibility of USFWS | X |
| 54 | Inventory lessons learned | +2 | +1 | +1 | +2 | +2 | • Shares knowledge<br>• Improves project consistency<br>• Prevents repeating mistakes<br>• Helps screen alternatives<br>• Reduces learning curve for new team members | • None apparent | P |
| 55 | Continue with after-action report reviews | | | | | | • | • | w/54 |
| 56 | Get a handle on total populations for both bird species | 0 | 0 | 0 | 0 | 0 | • Information is available<br>• Piping plover international census done every 5 years<br>• Have 2005 assessment of least terns | • None apparent | BD |

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| 57 | Optimize allowable construction period | | | | | | • | • | w/10 |
| 58 | Seek ways to pre-stage equipment in advance of construction season | 0 | -1 | +1 | +1 | 0 | • Could allow contractor stage in August | • Not visually aesthetic, National Park Service may oppose | BD |
| 59 | Utilize nutrification of sandbars to increase piping plover foraging | +1 | 0 | 0 | 0 | 0 | • Improves survivability | • May not be necessary | P |
| 60 | Sequentially (annually) expand sandbars | +1 | 0 | 0 | +1 | +1 | • Increases acreage<br>• Compensates for erosion<br>• Could increase productivity | • Small contracts | P |
| 61 | Obtain ruling of BiOp acreage goals versus fledgling pair ratio | | | | | | • | • | w/31 |

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| 62 | Temporarily abandon/discourage use of sandbars experiencing predation problems | +1 | 0 | 0 | +1 | 0 | • Improves survivability<br>• Could be reused after predators move on | • May not be necessary<br>• Requires a new location for the birds<br>• This would be an active program<br>• Takes funds from creating new ESH<br>• May not be practical – discouragement techniques have not worked in the past | BD |
| 63 | Reconsult the BiOp acreage | | | | | | • | • | w/31 |
| 64 | Assemble a dedicated environmental assessment team | 0 | 0 | 0 | 0 | 0 | • Reduces learning curve<br>• More efficient operation<br>• Avoids holding up NEPA process | • Insufficient staff | BD |
| 65 | Utilize Dr. Checks | 0 | +1 | 0 | +1 | 0 | • Helps coordination and efficiency<br>• Verifies that comments are incorporated<br>• Documents that plans have been reviewed | • None apparent | P |

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| **No.** | **Description** | **ARO** | **RRCCB** | **AS** | **CI** | **CE** | | | |
| 66 | The District Value Engineering Officer Should be Informed by Project Management of Any Individual ESH Projects Over $2 Million to Assess The Need for an Individual Project VE Study | 0 | +1 | +1 | +1 | +2 | • Keeps VEO current with projects<br>• Avoids stalling project when VE is overlooked until the end | • None apparent | P |
| 67 | The Project Delivery Team (PDT) should conduct face-to-face Bidability/Constructability/ Operability/Environmental (BCOE) reviews | 0 | +1 | +1 | +1 | +1 | • Project specific QA | • | P |
| 68 | Conduct out-year planning of projects | | | | | | • | • | w/3 |
| 69 | Create site selection model | | | | | | • | • | w/3 |

**Performance Attributes: Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**
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| 70 | Develop and implement an adaptive management strategy | | | | | | • | • | BD |
| 71 | Emphasize Value Engineering Change Proposals (VECP) in the contract documents | +1 | +1 | +1 | +1 | +1 | • Include in task orders in addition to MATOC contract | • | P |
| 72 | Consider using terrestrial sources of sand | +1 | -1 | 0 | -1 | -2 | • Could be used to create backwaters | • Hauling of sand from quarries would not be popular<br>• Would add to river sediment load, but this may be good for reaches below dams that are sediment starved due to impoundment | X |
| 73 | Solicit contractor design comments after construction | | | | | | • Part of lessons learned | • | w/85 |

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| 74 | Subdivide the current MRRP program in the Project Management Information System (P2) | 0 | 0 | 0 | 0 | 0 | • OK if not extensive<br>• Decreases processing time<br>• Increases accountability | • More difficult to manage | P |
| 75 | Map potential sand bases for future sandbar locations | | | | | | • Corps has this information | • | BD |
| 76 | Maintain existing database of sensitive resources | 0 | +1 | 0 | 0 | 0 | • List exists but has not been updated | • May be lacking manpower to accomplish this | X |
| 77 | Complete the ESH accounting system | | | | | | • | • | w/7 |
| 78 | Leverage other agency programs to build ESH | +1 | 0 | 0 | 0 | +2 | • Corps is assessing if other programs exist in other agencies that would support ESH<br>• Other granting programs could be available to restore ESH | • Requires considerable negotiation and coordination<br>• Could bias goals of restoration programs | X |
| 79 | Conduct an annual float trip to plan future sites | | | | | | • | • | BD |

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| 80 | Conduct a bird banding program | 0 | -1 | 0 | 0 | 0 | • Done in the past, on a large scale for piping plovers that nest below Gavins Point Dam<br>• Allows tracking survivability<br>• Increases understanding of how and when birds select sites | • Some feel the bands may harm the birds<br>• Requires resources to accomplish | X |
| 81 | Increase signage program in upper basin | +1 | -1 | 0 | 0 | 0 | • Reduces human impacts on nesting areas<br>• Increased public awareness<br>• Improves survivability | • Difficult to enforce | X |
| 82 | Conduct semi-annual PDT briefing meetings | | | | | | • Done on an annual basis | • | BD |
| 83 | Project managers to participate in design management PDTs | +1 | +1 | 0 | 0 | 0 | • Improves coordination and communication<br>• Added tool for upward reporting<br>• Early identification of issues | • | BD |
| 84 | Conduct quarterly PRC meetings for MRRP | 0 | 0 | 0 | 0 | 0 | • More time-efficient use of personnel | • | X |

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| 85 | Establish a lessons-learned program | | | | | | • | • | w/54 |
| 86 | Create an implementation plan for the program | | | | | | • More efficient management of projects to meet goals | • Difficult since goals are not clear<br>• Hard to do for out-year planning | w/31 |
| 87 | Complete/update ESH PgMP | 0 | +1 | 0 | 0 | 0 | • Currently working on this possibly through outsourcing<br>• Clearly defines roles of team members | • None apparent | BD |
| 88 | Conduct design team meetings for ESH | | | | | | • Done on an informal basis since only effects hydrology, planning and specifications | • | BD |
| 89 | Develop program costs | | | | | | • | • | w/13 |

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| 90 | Establish inventory of willing sellers in the Missouri National Recreation River reach between Gavins Point Dam and Ponca, NE | +1 | 0 | +1 | 0 | +1 | • Data exists<br>• Could expand list in weak economy<br>• Helps prioritize project locations | • Information is sensitive and needs to handled as such | BD |
| 91 | Develop Agreed Upon Project Implementation Report (PIR) Scope and Site Mitigation Plan | +1 | +1 | 0 | 0 | 0 | • Improves consistency<br>• Easier to communicate purpose to stakeholders<br>• Documents the process | • None apparent | P |
| 92 | Make Sure Contracting Package is Complete and has been Reviewed by the Project Manager Before it Goes to Contracts | +1 | 0 | 0 | 0 | 0 | • Develop a check list | • | BD |
| 93 | Limit recreation use on islands that support nesting birds | | | | | | • | • | X |
| 94 | Consider predator traps | | | | | | • | • | BD |

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| 95 | In the river reach below Garrison Dam, cut off the land connection between the sandbars and the shoreline | +1 | -1 | +1 | +1 | +1 | • Establishes a predator break<br>• Increases forage opportunities | • May be opposed by partner agencies | P |
| 96 | Allow year-round construction | | | | | | • | • Not practical | X |
| 97 | Develop a reservoir shoreline management plan | | | | | | • | • | BD |
| 98 | Build a dam at Omaha to manage Gavins Dam | | | | | | • | • Not practical | X |
| 99 | Conduct annual hand-pulling of vegetation | | | | | | • Cost effective way to remove vegetation<br>• Part of vegetation management plan | • Very labor intensive | BD |
| 100 | Conduct annual pre-emergent spraying of vegetation | | | | | | • Part of vegetation management plan | • | BD |

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| 101 | Pursue an aggressive sloughing easement (Section 33) program | | | | | | • | • | w/90 |
| 102 | Increase coordination with tribes bordering ESH projects | +1 | 0 | 0 | 0 | 0 | • Could add more sites to project | • Added negotiation needed | BD |
| 103 | Look for opportunities to contract with tribes to construct ESH | | | | | | • Previously able to have acres created by a tribe through a grant program administered by USFWS | • Complex to manage | BD |
| 104 | Eliminate Lewis & Clark Lake reach from the ESH program | | | | | | • Eliminates wetland conflicts<br>• Resolves a difficult maintenance problem<br>• Reduces overall acreage requirement | • Does not concur with BiOp<br>• RM826 Complex shows that both species will use ESH built in the lake | X |
| 105 | Look for opportunities to restore terrestrial wetlands in tandem with ESH projects | 0 | +1 | 0 | 0 | -1 | • Could be a source of material for sandbars<br>• Helps ancillary species<br>• May count toward other mitigation needs | • May require land purchase | BD |

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| 106 | Look for opportunity to increase net benefit to ancillary species | 0 | +1 | 0 | 0 | -1 | • Could be a source of material for sandbars<br>• Helps ancillary species<br>• May count toward other mitigation needs | • May require land purchase | BD |
| 107 | Remove upstream revetment structures | | | | | | • River free to move back and forth taking farm sediment creating sandbars | • Would be under water during nesting season<br>• Could increase erosion on banks due to flow divergence needing land purchase or bank protection | X |
| 108 | Review VE goals in 2012 | +1 | +1 | 0 | 0 | 0 | • Reduce redundancy in studies<br>• Save study costs | • None apparent | P |

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