TO: **SAM Work Group and MRRIC**

FROM: **Independent Science Advisory Panel (ISAP)**

RE: **Observations on Setting Species Goals and Objectives for the Missouri River Recovery Program**

DATE: **10 June 2013**

Establishing clear goals and objectives to guide species restoration efforts is a challenging endeavor in a large, dynamic ecosystem such as the Missouri River. No model for approaching the problem sits ready to serve the Missouri River Recovery Program's (MRRP) need to articulate species objectives for pallid sturgeon, least terns, and piping plovers. However, planners and investigators in other natural resources management efforts have previously been confronted with similar difficulties in setting meaningful species objectives. We provide references below to some of those efforts, which might prove helpful in guiding the development of species objectives in the upcoming workshops devoted to that task.

Programmatic objectives should arise from a definition of the overall goal(s) of the MRRP, and should be general and measurable. An example for the listed species on the Missouri River might be – *to achieve populations of the listed species that: 1) are self-sustaining and resilient to ongoing and potential future environmental changes in the Missouri River system, 2) are distributed across as much of their historical geographic ranges within the MRRP planning area as practicable, 3) are distributed in a pattern of occupancy on riverine and upland landscapes allowing for colonization/recolonization dynamics to sustain their metapopulations, and 4) experience the full extent of naturally occurring habitat diversity (for the birds both riverine and upland circumstances), including areas that provide sufficient food, shelter, and refuge from predators and other biotic stressors.*

Species management objectives must address three issues: 1) ecological concerns, including target-species demographics, habitat-related issues, and potential use of surrogate measures or targets, 2) legal (and policy) obligations, and 3) uncertainties regarding the three listed species, and the Missouri River ecosystems that support them.

Ecological Concerns

Species objectives should be clearly stated, measurable, spatially defined, and time limited. Given the habitats used and population dynamics exhibited by the listed species within the Missouri River system, objectives might best be recognized as hierarchical in nature and described by different metrics at different spatial scales. At the overall Missouri River (or "regional") scale, for example, it might be advisable to establish species objectives in terms of the sizes and distribution of populations or metapopulations. Given dynamic year-to-year variation in occupancy rates at a sub-regional "local" scale (for example, below Gavin's Point), however, it might be more meaningful to establish local objectives in terms

of the extent and quality of habitat to be restored and maintained over predetermined periods. For the birds, local objectives might also be established for landscape-level ecological associations that experience different habitat conditions and temporal dynamics. For piping plover that could include riverine, lacustrine, and upland nesting areas in a given geographic area. Objectives stated in terms of habitat extent, condition, and temporal availability should identify the landscape category type, habitat patch sizes and configurations, and spatial arrangement of patches.

There are several important temporal aspects in setting species objectives on the Missouri River. Species objectives should specify a "time limit," that is, the MRRP might be required to achieve a predetermined population size of adult least terns by 2025, and maintain that level within predetermined bounds for a set duration thereafter. Moreover, it might be useful to have some intermediate, short-term objectives stated in spatial and temporal terms to help measure MRRP progress toward achieving longer-term programmatic objectives. An objective statement set in shorter temporal context might employ metrics that would facilitate measurement on an annual basis; for example, the recovery program might be viewed as on a successful path, if population increases are achieved in at least half of the years in a sequence. However, short-term objectives should only include metrics that are known or hypothesized to be true indicators of longer term program success. For example, successfully building habitat is not appropriate, but use of that habitat by target species may be appropriate. And, given system dynamics, certain demographic metrics that might be chosen to assess program performance, may not be meaningful to measure each year, and would better be measured or estimated over longer time frames. An example is lambda (λ), the discrete rate of population increase, which might be more meaningful as a program performance measure if estimated over ($\geq$) 5-year periods.

Surrogate measures may be invoked in setting species objectives. Unable to reliably estimate population size in least terns (or, for that matter define the operational demographic units within the MRRP planning area), resource managers have considered fledging rates for the least tern as a surrogate for population performance. Such substitute measures can legitimately be used in species objective statements, but only if they have been analytically validated; that is, it can be shown that fledging rates are usefully correlated with population dynamics at salient spatial scales, and both occur in response to the same relevant ecological conditions.

Legal Obligations

Species objectives for the MRRP must be appropriate to the Endangered Species Act and the stated intents of the program in its extensive spatial and long-term temporal contexts. The MRRP is a "recovery program" for the Missouri River and not a formal "recovery plan" for the three species. The geographic ranges of the pallid sturgeon, least tern, and piping plover extend beyond the boundaries of the MRRP; therefore, meeting recovery or delisting criteria for those species is not a reasonable or defensible programmatic objective. The objectives that will eventually be articulated in terms of demographic status for the three listed species on the Missouri River might be described as sufficient to "remove or obviate

jeopardy" in the Missouri River basin, but not necessarily sufficient to ensure recovery of the species across their geographic ranges.

The SAM previously forwarded to the ISAP draft quantitative species objectives, which were summarized from the recovery plans for the species. While these demographic targets represented a best guess, they are now more than 20 years out of date for the bird species. These recovery targets might be a reasonable first approximation for avoiding or removing jeopardy in the MRRP planning area. However, the MRRP should avoid simply adopting them for the Missouri River, absent at least a rudimentary analysis of available, salient data. A more logical approach, in the long-term, would be to use the conceptual and quantitative models currently being developed, in combination with ecologically relevant information that will have been organized for the effects analyses to inform objectives for the listed species.

Uncertainties

Much remains unknown about the ecology, habitat requirements, and population dynamics of the three listed species, as related to both historic and contemporary river conditions. The current limited understanding of essential attributes of local population and metapopulation dynamics for each of the three species effectively constrains the ability of MRRP planners to set fully defensible quantitative species objectives at this early stage in the program's implementation. Until completion of an effects analysis, which will articulate quantitative objectives (demographic and habitat-related) pertinent to operation of the Missouri River Dams, it might well be that the best near-term approach is to develop descriptive, or qualitative, species objectives. As the MRRP matures and uncertainties about the conservation needs of the listed species become better resolved, species objectives should be revisited, made as quantitative as available information allows, and refined with new information derived from research and monitoring efforts carried out under the adaptive management program.

As the MRRP advances into adaptive management, we are certain to learn much more about the metapopulation dynamics of the listed species, the habitat relationships of those species on multiple spatial and temporal scales, and the effectiveness of various management strategies. That new knowledge will likely affect the validity and credibility of the species objectives that were established at this time early in the program; accordingly, the species objectives will probably need to be modified in an adaptive manner as the program matures. Hence, we should anticipate changing species objectives through time, and be willing adjust management and restoration actions in response to those changes as it becomes appropriate.

Explicitly recognizing that many key uncertainties limit the current ability of the Missouri River Recovery Program to identify biologically meaningful, quantitative program objectives for the three listed species on the Missouri River, it may be prudent to set interim species objectives that are descriptive, and are framed such that they 1) recognize the demographic parameters appropriate to the program's spatial and temporal planning context, 2) consider habitat characteristics that are associated with locally higher rates of

occupancy, survival, and persistence by the three species, and 3) use surrogate (or indicator) measures judiciously. Such descriptive species objectives would be modified as the program is implemented, as directed analyses allow for the objectives to be quantified, and as new data collection efforts that accompany adaptive management shed light on the relationships among the individual listed species, their habitats, and management efforts designed to benefit both.

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