May 31, 2012

Michael Thabault, Chair, Governance Committee
c/o Mr. Chad Smith
Executive Director's Office
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845

Dear Chair Thabault:

This letter is the Independent Scientific Advisory Committee's (ISAC) response to the Executive Director's Office (EDO) Memorandum of 10 February 2012 outlining a request from the Platte River Recovery Implementation Program's Governance Committee for the ISAC to provide, "*input and guidance on the value of the proposed Platte River Caddisfly Response to Tree Removal Research Study Plan and additional input on how to consider this species that is included as a "Species of Concern" in the Platte River Recovery Implementation Program's (Program) Land Plan in regard to management actions and associated monitoring/research as a whole.*" Specifically, the following is our response to each of the EDO's two questions on the proposed Platte River Caddisfly (PRCF) Research Project. Additionally, a third question (**Question 3.** below) was added during the 27-28 March 2012 Adaptive Management Plan Reporting session for the ISAC to respond to.

Question 1. Will the proposed study provided adequate initial insight into the potential responses of caddisflies to woody vegetation removal, and how those responses might influence Program decision-making regarding management actions?

ISAC response: NO

Caveat: The phrase "adequate initial insight" sets the Yes-No bar quite low; albeit somewhat fuzzily. The ISAC agrees that the proposed study would provide *initial* insight; however, its adequacy remains elusive: adequate for decision making? − No; adequate to design the next science step? − arguably Yes.

Broad Considerations.

There are a number of sites where the PRCF has been extirpated, and their distribution also includes sites outside of the Program target area along the Plate River as well as other rivers in Nebraska (e.g., Loup, Elkhorn; Vivian 2010). This evidence suggests the need for a more comprehensive conceptual model, one that considers PRCF as a metapopulation with localized extirpation and recolonization over a broad geographic area. Consequently, a study that only examines one or two sites in one river seems inappropriate relative to impacts Program activities might have on the PRCF metapopulation.

Hydrology (e.g., sloughs connecting/disconnecting to main channel, water level fluctuations in sloughs, periodicity of sloughs wetting and drying) has been identified as primary controlling variable of the PRCF life cycle and population dynamics (Whiles et al. 1999, Vivian 2010). Consequently, it will be essential to understand and hold hydrology constant among any vegetation removal treatments in PRCF management experiments, or treat hydrology explicitly as a co-variate. Hydrology will almost certainly vary temporally and spatially in any field situation, so treatment as a co-variate will probably be warranted. This would require, at a minimum, monitoring of ecologically relevant surface water (see response to **Question 2** below) and soil moisture variables. For example, does the PRCF estivate if water remains in a slough all summer or is estivation an annual occurrence irrespective of slough hydrology?

Specific Design of a Management Experiment.

The proposed study (Cavallaro 2011), hereafter Proposal, has a somewhat generic objective: "*To determine PRCF response to terrestrial vegetation removal by comparing PRCF larval densities in managed (trees, shrubs, or both removed) and unmanaged plots at the McCormick and Binfield properties".* It was not clear to the ISAC what conceptual model underlies this proposal; what hypotheses are proposed to be tested; how the resulting data will be analyzed, and; what outcomes would constitute evidence changing the relative probability of these hypotheses.

The ISAC raised several unanswered questions that a well-designed and executed PRCF management experiment should address. What is the spatial variability of PRCF at individual sloughs within the central Platte River target area? It is necessary to get this information first, and then do a power analysis to determine size of effect that would be detectable to answer these questions (see Appendix A). Is one sample in the midpoint of a 50-m plot enough? Can you compare within-plot PRCF abundance with between-plot PRCF abundance with one sample? Is one D-frame sample at the mid-point of each treatment plot sufficient to detect effect sizes of interest? Are 4-quadrats per plot sufficient to detect effect sizes of interest?

Other relevant questions include the following. Is there potential confounding of the vegetation removal treatments? For example, removal of trees affects input of seston (i.e., food for PRCF) to a slough which in turn affects conditions in the 'downstream' block, impacts of livestock grazing, hydrologic changes independent of vegetation. How will the data be analyzed to account for these potentially confounding factors?

Recommendation: As part of conceptual model development (see response to Question 2.), one could undertake a simple decision analysis of alternative management actions (i.e., clear trees or don't), drivers (e.g., intra-and inter-annual hydrology; grazing), and various performance measures (% change in habitat of PRCF, % change in habitat of whooping crane, least tern and piping plover).

<u>Question 2</u>. Should additional/alternative methods, data, or study designs be considered to help the Program reduce uncertainties associated with potential Program management action impacts on the caddisfly?

ISAC response: YES

The ISAC recommends building a conceptual model for the PRCF that considers the metapopulation hypothesis above, how groundwater (including recharge of ground water as a Program water-management strategy) and river stage affect hydrology (timing, duration, frequency, etc. of wetting and drying; i.e. permanency) in sloughs, and wetlands adjacent to the Platte River.

Program area groundwater levels have recovered somewhat since 1990, and the PRCF was rediscovered in 1995. Is the PRCF tracking the groundwater level associated with river hydrology? One hypothesis is that, whereas the listed birds are following seasonal cycles of ebb and flow in river surface area, PRCF are following the rise and fall of groundwater levels. Actions to restore some semblance of river hydrology will likely have beneficial effects on the PRCF if the hypothesis of their linkage to groundwater levels is correct.

An additional/alternative study is to continue or expand the PRCF surveys. Such an approach would help answer several broader questions. How wide is the distribution of PRCF relative to lands potentially affected by Program activities? Should a PRCF survey cover all the potential properties where the Program could possibly affect the PRCF? Answering these questions would help inform the hypothesis that the percent mortality within one or two locations in one river could be irrelevant to the overall PRCF metapopulation. However, before embarking on a metapopulation analysis the ISAC believes it is critical to define, using a conceptual model, the relationships between physico-chemical variables and each PRCF life-stage response, because each life stage is so different (i.e., aerial, aquatic, and terrestrial subsurface).

Program Activities

Another important question not addressed by the present Proposal is how might Program short-duration high flows (SDHFs) affect water levels within sloughs used by PRCF? The underlying assumption here is that water levels in non-connected sloughs are largely groundwater driven and SDHFs will affect groundwater levels. This hypothesis needs to be first verified and if so, how much does an in-channel water level increase affect water levels in sloughs within the Program target area? Is there a significant correlation between in-channel water levels and slough water levels (i.e., depth and volume)? If so, then a series of PRCF questions should be considered including, but not limited to: Would the timing and magnitude of SDHFs affect PRCF movement to terrestrial areas for estivation, or the locations to where they estivate? How would dropping the high pulse affect PRCF movement? Would SDHFs have any mortality effect on PRCFs?

Before the program invests in any additional PRCF experimental studies they should conduct a risk analysis of *potential* for harm due to program activities. This could be partially accomplished as follows:

Use groundwater maps (e.g., Beorn Courtney, 2012 Adaptive Management Plan Reporting Session, Water Plan) in conjunction with recorded PRCF occupancy sites and proposed sites where the Program will, or may be proposing to remove woody vegetation to identify where program activities might impact PRCF. This yields the population of Program study sites of interest. Assess if placement of a buffer zone where no program activities would occur around these target sites (buffer width to be determined by Program needs and in consultation with caddisfly experts) would interfere significantly with whooping crane/tern/plover recovery efforts (See Question 3 for related topic). If not, then implement the buffer zone and program management actions as they should have no direct impact on PRCF and there is no further need for PRRIP to address the issue. This option expands on the recommendation of the GC at its September 2011 meeting to leave a buffer around the slough on the McCormick and Binfield properties and consider the potential impact to Program whooping crane objectives of implementing a general policy of always leaving a vegetation buffer around sloughs on Program properties proposed for tree clearing.

If this approach is not possible (e.g., FWS lists PRCF and requires PRRIP to demonstrate no effect of Program practices), then redesign the PRCF management experiment as outlined above and in Appendix A to address among site impacts within a more robust framework.

<u>Question 3</u>. Does the Program need to consider caddisfly questions in relation to whooping crane ecology?

ISAC response: YES

Caveat: The ISAC is having trouble reconciling two opposing lines of evidence relative to whooping crane habitat use within the Program target area. Background material on the whooping crane states that they forage in wet meadows for invertebrates and wetland plants. Subsequent data indicate that they largely forage for corn in cornfields (e.g., pgs. 15-16 & Figure 5 on pg. 20; PRRIP 16 March 2012).

The question of whether it is important to know how the PRCF responds to woody vegetation removal is linked to Program management objectives for wet meadows and whooping cranes. Woody vegetation removal in wet meadows would be warranted to increase foraging habitat for whooping cranes in wet meadow habitats − but only if wet meadow habitats are shown to be significant for whooping crane nutrition during migration. If existing or future data indicate that whooping cranes do not select (and therefore probably do not require) wet meadows, then purchasing and managing wet meadows for whooping cranes would unlikely be a high Program priority, and the woody vegetation and caddisfly populations currently in wet meadows could be left untouched.

Addendum. The ISAC concurs with the GC's broad issue recommendation (Final Minutes, September 2011 GC Meeting) generated from this topic that the Program consider developing an engagement policy when its actions might affect any species of concern. Hopefully, this response can contribute to drafting such a policy.

Respectfully submitted on behalf of the ISAC,

David Galat (ISAC member)
and David Marmorek (ISAC Chair)

Enc: Materials reviewed by ISAC members for this letter
Appendix A: Statistical comments on the proposed Platte River caddisfly study

Materials reviewed by ISAC members for this letter:

Cavallaro, M. (2011). Platte River caddisfly response to vegetation removal. Research proposal from University of Nebraska at Kearney, W. W. Hoback, advisor.

Email correspondence with ISAC members, 14-30 May 2012.

Executive Director's Office. 30 August 2011. Memorandum to Governance Committee. Platte River Caddisfly Research Project. Includes Exhibit A: Initial PRCF Study Plan; Appendix B: 2011 McCormick Property Work Plan; Appendix C: USFWS Letter on PRCF Impacts; Appendix D: PRCF Research Proposal; Appendix E: PPRIP/UNK PRCF Research Contract; Appendix F: USFWS/NGPC PRCF Life History Requirements Document: Appendix G: USFWS Clarifications on Bald Eagle and Whooping Crane Impacts: Exhibit H: PRRIP McCromick Tract Access Agreement. Platte River Recovery Implementation Program, Kearner, NE.

Geluso, K., M. J. Harner, and L. A. Vivian. 2011. Subterranean behavior and other notes for *Ironoquia plattensis* (Trichoptera: Limnephilidae) in Nebraska. Annals of the Entomological Society of America, 104:1021-1025.

Governance Committee. 6 December 2011. Final Governance Committee Meeting Minutes, September 2011. Platte River Recovery Implementation Program, Executive Director's Office, Kearney, NE.

ISAC member notes from March 2012 AM Reporting Session

Marmorek, D. May 2012. ISAC Minutes from March 2012 AM Reporting Session. ESSA Technologies, ESSA technologies, LTD, Vancouver, BC.

PRRIP (Platte River Recovery Implementation Program). 16 March 2012. Platte River Recovery Implementation Program Adaptive Management Plan (AMP), 2012 "State of the Platte" Report (Draft). Platte River Recovery Implementation Program, Kearney, NE.

Vivian, L. A. 2010. Updates on the distribution and population status of the Platte River caddisfly, *Ironoquia plattensis*, and an assessment of threats to its survival. Master's Thesis, University of Nebraska, Kearney

Whiles, M. R., B. S. Goldowitz, and R. E. Carlton. 1999. Life history and production of a semi-terrestrial Limnephilid caddisfly in an intermittent Platte River wetland. Journal of the North American Benthological Society 18: 533-544.

Appendix A: Statistical comments on the proposed Platte River caddisfly study. (prepared by Dr. Philip Dixon)

1) Design: The proposed study uses a traditional design, a randomized complete block design with 4 treatments and 4 blocks. However, no information is provided to justify the choice of blocks; instead they seem to be arbitrarily chosen. Blocking is effective when it accounts for unwanted sources of variation. That happens when plots within a block are similar, but plots in different blocks are quite different. The proposed blocking scheme will approximately control for a spatial trend in PRCF abundance over the experimental area, but no information provided to support the assumption of a trend, or the assumption that such a trend is the most important source of unwanted variability.

The study will be repeated at two locations (McCormick and Binfield). This is a very good idea because it reduces the chance of a bust experiment and it allows you to evaluate the generalizability of the conclusions. If there are no caddisflies at a site in the post-treatment year, the experiment is a bust. This is less likely when you study two sites. The magnitude of the treatment x site interaction tells you whether the conclusions are quantitatively similar at the two sites. Clearly, if there is an interaction, then conclusions vary, at least quantitatively, between the two sites and it is not possible to generalize from the two study sites to all sites where PRCF occurs.

2) Sample size / power: Does the study have sufficient power to detect an interesting change in abundance?

My sense is that the study does not have sufficient power to detect biologically interesting effects. Table 2.2 in the Vivian (2010) MS thesis provides data on the variability between four replicate 0.25 m^2 quadrats, expressed as $\#/m^2$ in 2009 and/or 2010. The sample locations are distributed throughout each site, so I treat them as a simple random sample of locations. My calculations below assume that the variability between randomly chosen locations in a slough is similar to the variability between randomly chosen locations within an experimental plot. In other words, I assume no spatial or other trend in abundance over the slough.

I used data from Binfield 3 (2009 sampling only) and McCormick (2010 sampling only) to calculate the standard deviation (sd) of the total count per experimental plot using the proposed sampling protocol (four 0.25 m^2 quadrats per plot). Because the interest is more in proportional change in abundance, I converted the sd of the count to the sd of the log count, given by:

$$sd(\log Y) \cong \frac{sd(Y)}{\sqrt{mean(Y)}} \qquad (1)$$

The minimum detectable difference for 80% statistical power with a 5% two-sided t-test is given by:

$$\Delta = \left(t_{0.975,df} + t_{0.8,df}\right) sd(\log Y)\ \frac{\sqrt{2}}{\sqrt{n}} \qquad (2)$$

where *n* is the number of experimental plots per treatment, the √2 arises from estimating the difference between two experimental treatments, and *df* is the degrees of freedom associated with the error variance. This equation uses the shifted-t approximation to a non-central t distribution.

For the proposed study, *n* = 4 per treatment. If the data for one sampling month are analyzed using a block design, the *df* error = 16 – 3 – 3 – 1 = 9. However, I did the power calculations are based on a completely randomized design, for which *df* = 16 – 3 – 1 = 12, because the only estimate of the error variance (from the 2009 or 2010 slough-wide sampling) does not account for the potential reduction in error variance due to blocking. The results are:

Site	**Year**	**mean count**	**se**	**sd (log Y)**	**Delta**	**Reduction**	**Increase**
Binfield 3	2009	5	1.0	0.45	0.96	0.38	2.6
McCormick 1	2010	11	4.43	1.34	2.88	0.056	17.8

The mean count and se are the values reported table 2.2. of the Vivian (2010) MS thesis. The sd(log Y) values are the estimates computed using equation (1). The Delta values are the minimum detectable differences on a log(count) scale computed using equation (2). These delta values are expressed as proportional reductions or proportional increases in population size, computed as exp(-Δ) and exp(Δ), respectively.

The proposed study has sufficient power (80%) to detect a reduction in population size to 38% of the control treatment size at Binfield and 5.6% of the control treatment size at McCormick. Alternatively, the proposed study has sufficient power (80%) to detect an increase in population size to 260% of the control treatment size at Binfield and 1780% of the control treatment size at McCormick. For example, if the mean population size in the control treatment is $40/m^2$, the study has sufficient power to detect a decrease to $15.2/\ m^2$ at Binfield and $2.2/\ m^2$ at McCormick. Changes of these magnitudes are very large treatment effects. If the treatment effect is only small to moderate, this study will not detect it. Because there is large variability in counts among samples, a very large study will be needed to get reasonable power to detect moderate effects on population size.

The proposed study does include two features that have the potential to increase the power and sensitivity. It includes sampling three times during the growing season. The power analysis done here is for a single time only. A power analysis for the mean of three sampling times requires information about the correlation of counts on an experimental plot over the three sampling times. Such information appears unavailable right now. The proposed study also includes adjusting for baseline counts on each plot in the year prior to experimental manipulation. Again, this has the potential for increasing the power, but the amount of increase depends on an unknown correlation, this time between the counts in two different years.

3) Single-site or meta-population dynamics: However, I believe that the proposed study is examining the wrong features of the population dynamics. The proposed study estimates components of the site-specific population growth rate. If the persistence of a population at a site was high, the site-specific population growth rate is a very important parameter. However, the available information suggests that persistence of a PRCF population is low. The 2009 and 2010 resurveys identified locations where populations have been extirpated. The discussion of PRCF life history indicates it is very sensitive to a slough drying out.

These features suggest a meta-population perspective will be more useful than a site-specific population perspective. In a meta-population perspective the important demographic quantities are the probability of local extinction and the probability of colonization of currently unoccupied sites. Repeated surveys of potential sites will provide this information. The proposed experiment will not.