

## **Review Comments**

### **Instream Flow Study of the Middle and Lower Brazos River: Draft Study Design**

Reviewer 4

The study design is well organized and well written. I think the authors improved on the level of detail in section three of this study design compared to the Lower San Antonio River and Lower Cibolo Creek Study Design. I hope my comments and suggestions are constructive, and please contact me or any other of the reviewers with any questions you have or clarifications on any of our review comments.

#### **General comments**

I think there should be some discussion in each study design (or cite a document where this is discussed!) regarding the focus on mussels versus other benthic macroinvertebrates, e.g., aquatic insects. I believe there are details in the TIFP Technical Overview report about the collection of benthic macroinvertebrates, but I'm not aware of any TIFP documents that include the rationale for a shift to mussels only, at least in the first two study designs. Does the focus on mussels as the only benthic invertebrate taxon to be included in the first two study designs reflect a "wholesale" shift to mussels by TIFP in all basins, or does this reflect the wishes of the stakeholders and others in each basin?

In table 11 on page 38, why not include some detailed explanations about each of the benthic invertebrate indicators listed rather than suggest that "...may be appropriate indicators?"

The authors have done a very good and systematic job at stratifying the middle and lower basin into study areas, reaches, and study sites. However, I think the authors should include more detail about the characteristics (physical and otherwise) that lead them to decisions about the selection of study reaches and study sites. For example, if two adjoining reaches in the same study area are similar, are there additional reasons other than having baseline data in one vs. the other reach that were considered in reach selection. Why not attempt to continue with a systematic approach in stratification of each study area by selecting study sites in each reach (with exception of below tidal) for the evaluation of channel form/condition, habitat complexity and quantity, and riparian vegetation to account for the variability present in each study area?

### 3.1 Study Site Selection

#### Tier 1

Will tidally influence study areas/reaches be included in any of the study designs? If not, the authors might include a discussion in this section as to why these study areas will not be included presumably because of the difficulties in linking instream flows science to the complexities of physical, chemical, and biological conditions in a tidal reach.

The authors should include some discussion about how they reduced the number of reaches from 43 (30 below Bryan and 13 between Bryan and Waco) to 10. I understand why including 43 reaches for consideration may be excessive, but a brief description of how 43 were collapsed to 10 would be helpful to the reader.

Consider including more descriptions about the proposed study reaches in Table 15 including available baseline biological data, access, etc. . . . .

#### Tier 2

In the description of each study reach beginning on page 49, does “...associated instream **flow** sampling activities...” in several of the descriptions refer to instream habitat characterization or something else? The authors should clarify this for the reader by rewording or defining what is meant by instream **flow** sampling activities.

In the selection of reach 6 vs. reach 7 (page 49-50), it is not clear to me why 7 was selected over 6 other than the presence of Mussel Shoals in 6. Is there a lack of historical fish data for 6?

#### Tier 3

If a reach is to be determined “...by a minimum of 40 times the wetted channel width or a maximum of one full meander wavelength” as described on page 51, will slight or not very sinuous meanders qualify as a full meander? This may not be an issue in the middle and lower Brazos mainstem, but we have encountered this in other rivers, particularly with more rock outcrops surficial geology, and have considered using defining a reach as having a minimum number of each type of basis hydrogeomorphic unit, and a minimum length versus a very well defined meander.

### 3.2.2. Biology

#### Reach scale habitat mapping

Will meso-scale habitats (mesohabitats) be mapped over the entire length of each reach or will this be done only in detail at each study site? Many of the reaches are 20 miles +, and mapping the entire reach by boat or kayak would be difficult. If mesohabitats are to be mapped initially by aerial reconnaissance and/or remote imagery, care should be taken to make sure that river flows at the time this imagery was obtained are similar to river flows during ground-truthing.

#### Fish surveys

The second and third sentence of the first paragraph is confusing. Will multiple gear types (electrofishing and some minimum seining effort) be used in all mesohabitats or will the most appropriate gear (electrofishing or seining) be used in each mesohabitat? Is the intent to use standardized sampling gear and equal effort in each mesohabitat or employ an “exhaustive” sampling approach in each mesohabitat? This is not clear to me from the first paragraph in this section.

More detail about what how fish vouchers will be handled is needed. Will each species collected in each study site be vouchered or will a voucher of each species collected in the middle and lower river basin be retained. Where will voucher specimens be deposited?

The authors should provide more detail about distributing “...10 effective seine hauls” in each study site. Will the 10+ seine hauls be distributed equally by mesohabitat type or distributed as needed to compliment electrofishing and other collection methods? Stating that a minimum of 10 seine hauls will be done implies so distributed effort by mesohabitat.

#### Mussel surveys

Has the collection of bulk density or some other measure of how compacted the river bed is been considered in addition to substrate type? This could be done using the random substrate cores that will be collected in each quadrat.

#### Instream habitat surveys and habitat modeling

Does “...surveys should be performed when flows are at or below median conditions...” refer to an annual median flow, seasonal median flow, or some other targeted median? This is important because seasonal or monthly median flows can vary considerably, and the type, sequence, and

area of mesohabitats will vary seasonally over a broad range of flows. The authors might consider targeting a median summer base flow (based on historical flow record) for habitat mapping and characterization.

Will and interval of 10-20 meters capture the variability expected in depth, velocity, and substrate in all reaches of the middle and lower Brazos? If there are mesohabitats smaller than 20 meters in length (e.g., backwaters and riffles), then scaling the transect intervals appropriate to the minimum size of mesohabitat present would be more appropriate. The interval length could be determined after mesohabitats have been mapped at each site. An alternative way to stratify by mesohabitat and substrate would be to use something similar to the MesoHABSIM approach (Parasiewicz, 2008) in which substrate, depth and velocity measures are distributed randomly within each mesohabitat that is mapped rather than collected along at transect or abbreviated cross-section.

Will field parameters including DO, pH, water temp., and conductivity be measured near shore, along one or more transects (appropriate for a large channel like the Brazos!), and/or in each mesohabitat? During summer low flow periods, measurements of DO and temp. per mesohabitat type (near surface in runs and riffles and vertical in pools and deeper backwaters) would be useful information in support of helping to define river conditions at or near subsistence flows.

#### Riparian habitat-baseline surveys and evaluation

What will be **stratified** in the "...stratified random approach..." that will be used at each study site to characterize riparian habitat. Will the 50m transects be distributed by mesohabitat type or be distributed at regular (non-random!) intervals at each study site?

#### 3.2.4 Water Quality

Characterizing DO at the reach or study site scale over a range of flows would be helpful. Water temperature should be collected coincident with DO as part of any point, 24-hr, or longer measurements of continuous field parameters. Collecting horizontal and diel vertical DO and temperature in the mainstem of a river the size of the Brazos in representative habitats (riffle, run and pool) over the range of base flows would be useful.

The authors should consider discussing the use of monitoring 24-hr DO and temp (+ pH and conductivity because of ease of collection with single probe) in representative study sites in each reach at least during summer base flows.