**Rivers As Social-Ecological-Technological Systems – Lesson Procedure and Exercises**

**Formative Assessment (Prior to Class – 15 minutes)**

Prior to the class each student should undertake a formative assessment using the questions in the context material. They should come to the field lesson with this assessment and draw upon it to participate in group discussion. The questions for this assessment are in the course context..

**Introduction and Initial Discussion (30 minutes)**

The instructor can begin the class by reviewing the assembled knowledge on SETS drivers of river conditions, including social, environmental, and infrastructural dimensions, as well as present what type of information is available for the river in question (using the data sheet below), and facilitate a discussion of getting different students answers to questions in the context material (from their formative assessments) (30 minutes). This information should be assembled by the instructor prior to class using the data sheet in the lesson, and students should fill out their own data sheets to the best of their availability.

**Identification of disciplinary positions of students. (15-30 minutes)**

Have each student briefly describe their background and disciplinary position/interests. This should be tailored to the size of the group, and if the group is very large (more than 30 students) you will want to split the group in half by asking those who identify primarily as social scientists vs natural scientists to split into two groups, and then shuffle about half of each one of those groups into each other. If the class is less than 15 students one group will suffice for the next activity, otherwise you will want to consider making groups of no less than 5 students and no more than 15.

**Choosing Problem and Formulation solutions (1 hour)**

This is the main event of the field course. Choose a field setting where you can experience the river and multiple aspects of it are visible. Ideally this is a setting where you can synthesize other field lessons that students have been exposed to (e.g. a mixing zone of two tributaries, a tidal confluence, a setting where different uses of the river are visible, etc…). Of the numerous problems that have been articulated, students will have to collectively choose one through simple voting. This can be done by first listing all the different issues that have been identified by the collective, combining where appropriate, and then voting on which one they should address.

Once an issue has been identified have students discuss using the data sheet:

What SETS domains influence the issue? Which ones have a direct influence on the issue? Which ones have an indirect influence? Which linkages do we have data for (from the knowledge systems analysis)? Which ones do we need more information? What social factors would need to be addressed to influence the issue? What are the environmental responses required to ‘solve’ the issue? What technologies/infrastructures would have to change to address the issue?

With the guiding questions above, students in groups will then utilize the provided data sheets and prompts to collaboratively draw a partial systems model accompanied by a short narrative describing:

1) an integrative causal understanding of the issue, SETS drivers, and a desired outcome on the issue

2) data gaps, if any, that must be addressed to improve causal linkages and monitor the effectiveness of interventions

3) proposed actions to to address the issue, including a research to action agenda that may be required to address the gaps identified in 2.

**Reporting back and next steps (30 minutes)**

If students have broken into groups have them report back to the larger group on what issue they chose, what direct and indirect SETS drivers they identified, and what actions they think should be undertaken in order to address the issue. Have each student commit to a series of next steps with their broader team to either learn more about the river, come up with a research project to fill an identified knowledge gap, or perform some type of public outreach to address the issue.

**Final Assessment (20 minutes)**

Have students reflect on their formative assessment and revisit their initial answers. How have their answers changed by participating in an interdisciplinary problem-solving exercise? How has being physically present on the river changed their perspective as compared to only doing desk based work? Are there surprising loci for action that emerge out of thinking about and discussing rivers as complex SETS? Are there new gaps in knowledge identified that would be useful for better understanding the drivers of river issues and/or solution pathways?