(MA-management action, MP-management plan, PS-pallid sturgeon, MR-Missouri River\_

3/21/17 MRNRC

**INTRODUCTION**

**Craig (USACE):**

* Monitory must include the biological opinion
* Understand population level response & effectiveness of management plan

**Wayne (USFWS):**

* determine short & long term effects of MAs on PS & their phys./boil. Requirements w/in each management area
* mainly understand how our operations of dams effect the air, water, and land for PS
* quantify and evaluate annual trends in PS pop. dyn. and structure
* quantify availability of /evaluate annual trends in native MR forage species as short-term, surrogate measure of effects of MAs on ecosystem func.
  + e.g. PS energetics, primary and secondary productivity, native fish species
* Asian carp issues

EH: 0 to 1 recruitment for what fish---this is for wild fish

AD: idea of foraging species

W: could be fish, could be…

Ancillary means outside the core objectives… to me if its linked to the objectives then it fits.

* Quantify & evaluate annual trends in movement and habitat association
  + (SK: middle and upper basin contributed to this)

DG: Is MRRP going to be MRRMP in the future?.

TH: Objectives in flux?---Not the main ones (recruitment 0-1, don’t jeopardize the fish)

Can you define jeopardy?---The core operations, maintenance of the dams jeopardizing distribution, reproduction, or population numbers….

Objectives are clear, but jeopardy is unclear.

W: USFWS has a jeopardy opinion.

**State Agencies:**

* **MT** FW&P:
  + RPMA1 important aspect until natural recruitment occurs
  + 1 size fits all not good for us
  + bottom ex for stocked fish
  + reproductive ecology of hatchery origin fish
  + foraging, pop. response, abundance
  + look at Yellowstone river upstream as far as we can
  + developing a state PS MP
* **SD**: No comments

**State Agencies (continued)**

* **NE** G&P:
* age 1 survival question is putting the cart in front of the horse, our fish are skinny and may have an adult reproductive issue
* pop/genetic matrix
* age 1 survival: age, drift, etc.
* hybridization levels that are occurring (Platte)
* invasive species (Asian carp having an upwards trophic effect)
* Wayne’s upcoming sub-objectives are similar to our current objectives---does our state management need to change then?
* **ND** NDC:
  + same as most of what has been mentioned
  + importance of tributaries and other connecting waters in influencing food production, spawning areas, and where the fish travel
* **IA**: No comments

Robb: Share draft

DG: I see tensions between the whole range of issues in recovery and a program that is addressing the ultimate objective, the population. In the future perhaps PSPAP can broaden its perspectives. I think there is a fear that hybridization, foraging, movement, etc. will get lost in PSPAP, but I don’t think this is really the case. We need to make this clear.

Robb: We are hoping to do this with our network of objectives.

**(Robb---PSPAP w/in the MRRP & MRSAMP context)**

**DISCUSSION:**

Everything is open for discussion except for the fundamental objectives and anything that comes out of the ACE with BiOp.

Not going to come out with the nuts and bolts of the monitoring. We want to come up with the objectives.

AD: How do you handle the small window when certain gears are effective to do these surges in mark-recapture.

* Depends on what power we need and what the constraints are for implementing each gear.

WD: A lot of objectives don’t have associated assumptions with them. I don’t think we are informing our partners the risk we are willing to take to achieve them. Ex. Skinny Fish. Can we identify the risk associated with the project and the assumptions going into it…and also cost estimates. Lay out the fecundity and reproductive value of fish and how these numbers going up will effect young fish stages for capture efforts and reduce cost using the 10 years of data.

* Much of this is happening at level 1 and level 2.

WD: If the numbers of Asian carp predict that there won’t be a reproductive effort this year, do we invest a lot of money to actually look for fish? This is the risk, I am referring to.

Gerald M: Is the timing right for the mark-recapture move or do we need to be working on lower level questions first. Trawling component: we are proposing a trawling program on a history of catching 3 fish and we might be looking at a lot of years of 0 before we can report anything positive. Reporting no progress is hard.

I think we are early with being able to put a number together, and we should likely postpone trawling for age 0 until we can show there is reproduction and spawning going on (until we have a better understanding of limiting factors). In the mean time, we should evaluate the current state of the population assessment and see if we are asking the right questions.

What is the role of PAP?

MW: Maybe we need pre-objects, a set of criteria you would have to meet before you can proceed with the MAs

CS: Important to get marked fish in the population now even if you don’t get good results initially, so that when you are ready to get good numbers you have some marked fish in there. Can we identify the females that are reproducing and the males that are reproducing to identify that they are the same fish every time?

EH: We don’t have all the genetics in the database (stocked fish are not in the database), so if we don’t have them we can’t identify the parents. We can determine if they were likely offspring from stocking the lower Missouri River or if they are from lower basin (likely wild) fish.

R: What percentage are adult wild fish?

TH: Upper—all.

EH: Lower—we don’t know. There has been natural recruitment in lower basin.

CS: One measure of success can be a greater number of females reproducing, instead of the same ones all of the time.

EH: Can do a genetic analysis among the larvae to see if they are related, if we get enough larvae at time.

TH: In upper Missouri we have 0 for trawling and we know where about 95% are spawning (75 miles up the Yellowstone). All the zeros have great value, but I think we would use them to not spend a lot of money where its not needed. Probability of catching 0-1 fish is so small.

GM: Trawling is an effective way to catch young sturgeon, if they are there. We caught a lot of chubs. …We have to be efficient, and I will only support continuing PSPAP 1.0 (or 2.0) if we believe it is the most efficient way to go.

MattR: Under this proposal we are missing looking at the mechanisms that look at adult fecundity and recruitment.

KW: Should reproductive readiness be part of the PAP?

Wayne: Intake—those consultations are separate pieces… they will be considered during the consultation processes.

DG: Several papers have population estimates, are these enough for getting at the numbers?

Mark (Wou and ): 4200-7500 wild, 1300- hatchery

Kirk: 50 mile region with a robust design approach wild: 4-7 per river km hatchery: ~16 per river km

.6-.9 wild fish per km 5-10 hatchery fish per km

Wayne: How do these numbers fit with pop. models?

Robb: We need a baseline with some precision to compare to later. This way we can show we are making positive changes.

DG: Are we capable of using the pop. data that is out there to assess the effectiveness of the MAs (SWH, IRC, etc)? If not, why not? Will this proposal be successful where it wasn’t?

Mark: Are we talking about numbers or relative abundance? Based on data, stocking in upper MR numbers went up (consistent), but in lower MR they did not.

Robb: This doesn’t show cause and effect. Need a better background.

DG: Maybe we need more background as W&M says.

Dane: Every year we stock fish. Every year the decision on the number and type of fish we stock is based on the data.

**(LUNCH)**

**BUILDING THE NETWORK**

**Quantify PS recruitment to age 1**

* for fish spawned in the wild (whether the parents were originally spawned in the wild or the parents were originally spawned in the hatchery, unmarked)
* Won’t we also want to also keep track of recruitment hatchery fish for info gathering?
* David: Population model---take the data and estimate what the most likely range of survival actually was.
* **(BREAK)**
* Methods: trawling--age 0, tramel net, genetic study down the road when older or other indirect method
* EH: collect free embryos (expensive but will help with effectiveness analysis and will help with hybridization information but current methods will separate into potential pallids and everything else with the everything else containing shovelnose and hybrids but maybe we could go back and sample).
* AD: Pallid sturgeon have more aggregated and synchronized spawning over a couple week period (compared with shovelnose), so you could time and collectively target sampling free embryos for pallids.
* Pallids and shovelnose are remarkably similar in genetics.

**Quantify PS recruitment to age 1 (continued)**

* Kirk: Refined inputs for calibrated PVAs could help us monitor recruitment, if you’re fine with large variances
* Will relative abundance meet the same need as absolute abundances? Wayne: For the time being I would be okay with relative abundance. Right now recruitment is more important.
* What if you know your detection probability?
* N mixture model
* WD: Gill nets have worked well for our site, but the current mesh sizes are not appropriate, we use to use a smaller mesh.
* Upper Basin you can use survival (since all fish are hatchery fish and not from wild fish…?) CJS model

**Quantify Annual PS population trend**

* for both hatchery and wild fish (and be able to differentiate)

**Estimates for PS for all size and age classes, particularly ages 2 to 3**

* Landon & Wyatt: Age 4 recruitment (across gears)—maybe need to change assessment method or focus from 2 and 3’s to 4 year olds (or change objective).
* **(BREAK)**
* EH: Need to monitor what the future hatchery additions are going to have on the population size.

**Habitat Selection and Spatial Context**

* There is a scale to habitat selection, e.g. using the Missouri River relative to the Mississippi River.
* TH: I want to be sure that this all done within a spatial context. Upper vs. Lower basin, but also a spatial component within these regions.
* (Deleting the box with, “quantify and evaluate annual trends in movement and habitat association of pallid sturgeon by life stage, including reproductively active and non-reproductively active adults.”)

**Other Comments**

* Otter Trawls age 0 okay but not until about 500mL after that.
* Direct mortality of a fish dying while capturing or studying and there is other indirect delayed mortality that is more difficult->Level 1 and 2 science
* Carrying capacity concerns arise in upper basin when a lot of fish move down to the same area within a certain short timeframe.
* You do need to know something about reproductive migrations while monitoring

**Blood work**

* Can tell us: sex ratio, some indicator of reproductive readiness, stress, contaminants
* Blood can be used to determine sex after maturity and reproductive readiness, but in the lower river this doesn’t work as well.
* **Is it feasible to take blood in the field?:** Yes, but it’s a pain. There’s a longer time requirement. Let’s not take it on every pallid we catch, but a target sample.
  + Blood sample is a lot more difficult to take than a tissue sample… can we do one and not the other?---If a tissue sample and blood would give us all the same information, then I would use a tissue sample BUT we are using blood to answer a different specific question. (RW, DS, TH)

**Blood work (continued)**

* We take blood before and after sexual maturity (but not when they are too young). From females we can get the hormone levels matched up with the eggs and also it can be used as an indicator of reproductive readiness (David).

**Tissue sample**

* Can tell us: stable isotope, disease, contaminants, genetics, age for hatchery origin fish
* **(BREAK)**
* KW: Tissue sample (fin clip, lower caudal except for disease testing we use pectoral, put it in ethanol)
* RW: Any fish that does not have a pit tag we take a fin clipping from it.

**Fin ray**

* WD: Fin ray is used for aging and microchemistry
  + (GM)– but there are some differences in survival between when we take a fin ray and when we don’t.
  + GM: We’re working with the ACE to identify strategies and protocols.

**Egg Sample**

* Can tell us: Egg quality, egg size, fecundity, reproductive readiness
* **(BREAK)**
* Is removing eggs reasonable in field? Yes.
  + 1 suture (DS) or a needle biopsy with training (AD) can be done with 5-10 minutes

**Ultrasound**

* Can identify reproductive readiness (and fecundity).
* **(BREAK)**
* Done in the field?: yes.
  + It is an art (it takes hours and hours to get good at it—need to be highly trained). Often people who are good at it became good at it by scanning and then being able to cut open the same fish. Eggs is a piece of cake, male or female is much more difficult…BUT with new technology only a week of training for reproductive age pallids. (AD, Mark, GM) $40,000 for a new machine.

**Tags**

* Radio tags vs. acoustic tags, some don’t work in certain areas
* When inserting tags, we’ve seen fish that come in and lose their reproductive cycling that year and reproduction may change from even-years to odd-years. We’ve also seen inserted tags increase stress and infection, which are related to survival/delayed mortality.
* New technology?: nothing that will likely help us this year; radio antennae will cut the range in half
* **(BREAK)**
* In the tributaries, the radio and acoustic tags have limitations due to line of sight (MP)---I believe this was in MT
* (AD) radio is not usable from Sioux City down, and noise levels are even higher after the Platte; for tags assume 100% survival (we remove tags from those fish we recapture that don’t seem to be doing well with the tags). (AD)
* Below Yellowstone there’s deeper water and its difficult to detect the signals.
* Radio the big factors are depth and conductivity. (AD)

**Is there any passive monitoring that could meet some of the fundamental objectives?**

* for edas shovel nose signal will overwhelm pallid’s
* for tiger rays issues too
* old tech we have is 125kH and not the newer 134.2 kH (or so) <- built for higher frequency pit tags Bio mark, older ones have to be air gapped and are limited to a much smaller size, otherwise can be wet and have a larger size
* No, not really

**Fecundity**

* Ultrasound in the field
* Population models, isn’t there a lot of good information out there on fecundity?
* Fecundity is number of eggs.

**Spawning & Foraging Habitat Comment**

* We know what spawning habitat looks like. R: We’ve quantified both of them, the question is whether or not it is still in use in the lower. **Use hydroacustics, dopplers.**

**(BREAK)**

**Hydroacoustic monitoring**- available? $25,000 for a top side unit, $20,000 per transducer (for Asian carp) and a skilled laborer but not every crew would need to do this, high aggregation locations.

**Lavage**

* reasonable in the field?: Yes
* 8-10 minutes per fish in field and then lab work (KW)
* results are teeth and spines and then we try to identify the genus from the pharyngeal teeth---experience needed for this part

**Stomach removal** – genetics family, labor intensive

**eDNA**

**Predation**

* Predation could have effects on carrying capacity but it sounds like cc isn’t a big issue except when there is congregation
* AD: What if the IRC habitats were particularly attractive to flathead catfish (predators of pallids)? Wouldn’t we want to study it then?

**Competition & Invasive Species**

* WD: In IL the way they have monitored the impact of carp was with plankton concentrations/density and quality over several years.
* DS: No gears to catch invasive species, at least the ones we are most concerned about.
* DG: No trophic evidence for competition with Asian carp (0-age don’t eat plankton, and chubs eat plankton at the benthic level and Asian carp eat plankton at a different level)
* AD: In some cases, e.g. dramatically reduced turbidity, there could be competition with native fish as well.

**Movement**

* **Microchemistry** gives us a continuous course geographic… i.e. movement
* EH: Are fish that are not getting caught in the gears in the Missouri or Mississippi?
* DG: paper by Phelps on microchemistry and distinctions between the different sections of the different rivers including MO, MS, and Yellowstone
  + A report was just turned in this month by a grad student. We should be able to tell if young fish have spent some time in the MS.

**Finding Fish/Picking up Signals**

* Catch effort survey was done to gather info
* Telemetry sweep survey was done to gather info
  + Logistic concerns?: In the tributaries, the radio and acoustic tags have limitations due to line of sight (MP)---I believe this was in MT
* (AD) Avoid high water periods, at least 2 times a year at low water level: pulls them out from behind wing dikes and other rock features so that detectability is higher… late summer is good, mid-winter to March. Can search ½ a river width and can do in tandem to get 90%.
* River fish don’t move for long periods of time, but then might move far to spawn.
* Upper MO river with ultra flows is difficult to run, long distances few boat ramps, lower Yellowstone is easy to run. (TH)

**Other Comments**

* AD: all these samples blood, tissues, ultrasound, fin rays are doable in the field but my biggest concern is the efficiency and the integrity of the data, if the crews don’t handle the data appropriately its no good
  + TH: but we’ve been doing these things so we have a good start on it
* Mark H: At some point we may be able to turn some of these sampling items off… how many fish do we need to catch to have an accurate estimation of sex ratio?
* Mark & Recapture: We don’t just want to ask, did I catch a marked fish?, but instead ask: Did I catch a marked fish? Did I take a blood sample earlier? Did I take it again?

**OBSERVERS COMMENTS:**

Zach (MT): Follow up.

Kirk: At what point do we need individual sub-objectives for the different basins? Is the goal of this program to have unified sub-objectives amongst the basins or will there be a divergence at some point?

* Robb: ACE and FWS issue… but I want to distinguish between the difference between the goals of the program and the goals of the population assessment.

Wayne: Most of the work is Level 1 and Level 2 so some of the monitoring that is laid out won’t lead to immediate results for the population abundance assessment… one goal is to gain more knowledge to be more successful in the future.

Robb: Success of learning vs. more pallid sturgeon in the river? Wayne: We have to help define what success is… it isn’t going to mean a lot of changes for abundance or recruitment.

DG: In the budgets for the future programs, focused research is zeroed out and level 1 and level 2 research have the funds… Will PSPAP have the funds?

* R: In the AM was the rebranding of research to level 1 and level 2 studies by making it more focused and able to directly apply to the more fundamental goals at hand. The money is almost the same.

Mark: Have a discussion with the basins separately to get the overall picture narrowed down---this will be refined differently depending on which basin you are working with due to things that are more or less important geographically