



**Adaptive Management Stakeholder Board Meeting
June 11, 2003
Session Notes**

Review the model (including available gauge modeling data)

- What can be done below Harris dam? We're here to explore alternatives

- **Objectives**
 - Use adaptive management to define suitable criteria for productive fisheries and community diversity, while accommodating economic and societal needs.

 - Determine if AM is an applicable tool for assisting with FERC relicensing of Southeastern rivers. Determine if the decision support model be used elsewhere.

- **Adaptive Flow Mgmt (AFM)**
 - Acknowledges inherent uncertainty in the system
 - Acknowledges there's a lot to learn
 - The Stakeholder team will decide initial flow
 - The Stakeholder team will determine if it worked/didn't work and recommend appropriate next steps
 - Requires testable hypotheses with measurable objectives to refine mgmt
 - Ability to embrace paradigm shifts, radical thinking—this is different than setting minimum flows
 - Requires decision-makers at the table
 - Requires baseline and reference data
 - Harris has the benefit of a lot of this and expert opinion
 - Geomorphologist input needed for erosion monitoring...don't have this now



- **NETICA: decision support software** is being used to determine AFMs
- Examples of Adaptive Flow Management
 - Striped bass on Roanoke River, VA
 - Robust redhorse sucker on the Oconee River, GA
 - Avoid ESA listings
- Management Goals
 - **These are NOT flow goals**
 - Not ONLY a habitat-based approach for establishing flow criteria for fish
 - Fish/habitat relations aren't linear, they are species-specific
 - We don't know how much, how variable or how long to specify the duration of flows
 - Adaptive Management allows for flexibility in relation to natural flows
 - AFM accommodates periods of drought and flood
 - AFM helps set biological mgmt goals
 - One size does not fit all: this learning can be applied to other projects in the future
- Manipulation/Predicted Response
 - Changes are linked to management outcomes
 - Cause and effect specified in each hypotheses
 - Provide predictable boatable flow windows---increased rec. use
 - Management goals, not flow goals
- Uncertainty
 - Model to incorporate uncertainty by generating responses of parameters and processes under alternative mgmt scenarios
 - Here we put acceptable bounds on the system and begin management experiments
 - This can be accomplished through various types of models
 - Computing power permits interrelation of variables that would have only been possible only a few years ago with a supercomputer
 - Can model very specific scenarios and leverage resources much more effectively
 - Can eliminate certain variables (i.e. no geotubes, no house) from consideration easily
- NETICA based on conditional probability
 - Allows incorporation of empirical data and expert opinion



- DSS Model
 - Doesn't incorporate AL DNR model
 - Includes fundamental SH requirements
 - Graph includes tables with conditional probabilities
 - How likely is this to happen under the status quo?
 - Expert opinion or empirical data
 - Does include multiple scenarios
 - Base case
 - Variable monthly cfs conservation flow
 - With and without stable windows

- Belief Network
 - Bayesian networks based on conditional probabilities
 - Incorporate "case" what we know about the system; generates prior probabilities
 - Learn by manipulating system; incorporate new case; generate posterior probabilities which become new priors
 - Cyclical learning that updates all probabilities as we move ahead

- The data behind the boxes
 - Reservoir inflow: based on historical record
 - Degree days: measured
 - Habitat: PHAT SIM: Freeman
 - Fish abundance: based on recent river research
 - River levels: HEC5 models
 - Boatable days: Estimated weekend days/month % of flow between specified levels
 - Power production: modeled by APC
 - 0% monthly flow is the lowest monthly flow recorded in each month

- Lots of shallow/fast; shallow/slow habitat; just not available for consistent periods of time at the required temperature for spawning
 - Implications for redbreast sunfish; they get wiped out

- Modeling Lake levels for where they fall in the rule curve can be accommodated—some years will present challenges no matter what the conditions are

- Impact to average peak generation at RL Harris
 - This will need some help from APC
 - How much will this cost?
 - This is a decision based on the constraints that will be imposed



- Spawning windows
 - As you increase hours without hydropeaking the number of little fish increases
 - The longer these can be extended the greater the chances for survival
 - Great for little bass this year in the Tallapoosa

- Can incorporate the flow proposal from ADCNRFWS in the model
 - Assessment will provide testable hypotheses and prior probabilities if initiated
 - Alternative modeling software may be used for sims (winbugs)
 - Alternate scenarios can be assessed
 - Incorporation of other variables (Objectives) is possible
 - Weekday boatable hours can be deduced from historical data

- Questions?
 - The Charter is around building a model that gives us the best picture of what is going on from a data perspective
 - How clean? How reliable? Where are the gaps?
 - Equal probabilities are assigned where we don't know
 - Gather the data, find the expert or wait until the data becomes available
 - Status quo/base 500/base variable

 - *What are the assumptions about "boatable days?"*
 - How big/how small a boat?

 - The model enables "back-figuring" of probabilities based on known data---posterior probabilities
 - It can work in both directions

 - *If you know the condition you're looking for, is there a way to input a desired future state to determine how the system might need to be tweaked to deliver?*
 - To a large degree, yes. Whatever we would like to model, Jim can build.
 - Constraints, if/thens can be incorporated in NETICA

- 2002 spawning data hasn't been incorporated yet. It will almost undoubtedly yield additional insight

- *Do we have all the boxes? Are they the right boxes?*
 - Where are the habitat/erosion assumptions?
 - Fauna for fauna's sake? Not there



- *Is there enough data to determine catfish/sucker parameters?*
 - These are tough to gather with a backpack shocker
 - Some of this could be modeled (Malcolm) with available data
 - Some of this may be contained in the small fish box

- *Could data from Sinclair and Roanoke be integrated to provide improved hypotheses at Harris?*
 - Excellent point...yes! Other data can be easily integrated into the Harris model

- *Willard: Can ADCNR's proposal could be integrated? How much work?*
 - More than 2-3 days, less than 2-3 months
 - Several weeks at minimum
 - Elyse has begun looking at preliminary means of incorporating data from the Heflin gauge. She will need help from APC engineers (Bill)
 - We want the Heflin gauge modeled based on historical data
 - *How close do we have to get to this to make any difference?*
 - Management goals are a missing ingredient
 - *How will we know if we're meeting the mgmt. goals?*
 - There could be different time steps in terms of monitoring and learning

Reviewing the Model: Box by Box

- **Base Flow Discussion**
 - **1. Status quo**

 - **2. Seasonal variable base flow (from Base 500)**
 - High spring flow, lower summer, even lower fall
 - Evaluating a constant flow rate doesn't work
 - Fish don't like it; nobody else does
 - Constants don't work

 - **3. Daily/weekly flow from the Heflin gauge (simplest)**
 - 3 variations on the AL DNR proposal from the Heflin Gauge
 - Heflin gauge including variable affects of a constant (+/- 25%) to enable an easy change of the factor and view impacts on the model



- **4. Base variable (0% flows) with alternative variation**
 - Not a pure 0% monthly flow
 - Accommodates peaking months in summer
 - Accommodates filling months in spring
 - June/July/August: peaking demand months for APC
 - March/April lake fill has to be considered
 - Nick/Stan will have some data on this—will get to Katie
 - Determine if it's OK to Model this one
- **Windows of Opportunity**
 - **Discussion**
 - 10 windows are a theory. Different species have different windows. AL DNR defines this as an assigned 2-week period in April/May.
 - Different groups/guilds of fish may affect this
 - May offer a window for specific species based on conditions and inflow available
 - No generation for multiple weeks during August need to be considered. Sometimes there isn't power generation available
 - **Model what's in Stan's proposal**
 - Assume there will be some sort of re-reg structure providing flow via baffles
 - **Elyse will review Stan's proposal**
 - 1. Status quo
 - 2. Spring/Summer
 - 2 of 3 years
 - Define summer: Late August
 - 3. Spring only
 - 4. Summer only
 - 4 a. *What about a specific October flow dedicated to rec. float fishing?*
 - *Window of opportunity or a base flow issue?*
 - *Could be Sept/October, permit a couple weekends of good float fishing opportunities*
 - *Data available for Sept? Elyse will review this to determine*
 - ***Avoid adding August to prevent unnecessary constraints on generation needs to the greatest degree possible***
 - *Typically Harris is down by the end of August, so there are longer periods of no generation in Sept/Oct.*



- **Reservoir Inflow**
 - Discussion
 - This is such a big driver we may want to expand it
 - Mother of all variables...everything links to this
 - Could this be done in an equation format? (i.e. a recorded high or a recorded low, or break the water year into fractional segments in some fashion?)
 - **This is the most important driver.** It must be understood thoroughly
 - Monthly precision is probably the best we can do here
 - We could accommodate monthly discharges for periods of record
 - We need something better than “average/normal”
 - **More granularity is needed for decision making**
 - **Technical Team Review in the next 30-45 days is needed!!**
 - Wet
 - Normal
 - Dry
- Degree Days
 - High
 - Moderate
 - Low
- **Power Production**
 - Discussion
 - ***Is more work needed? YES***
 - This is not a currency/dollar box. This is a decision function box for APC...how much are the turbines on?
 - *Regardless of what is chosen, APC will be trying to maximize power production under any of the scenarios. Is this a driver, or is this an indicator?*
 - PP could be set as a constraint: not to be run at less than X% and work backwards
 - Some of this has been provided by APC, but not under varying scenarios of wet/dry/moderate seasons
 - We all need to open up the boxes to review the assumptions that are behind each one. The Technical Working Group the team has chartered might be one way to accomplish this.
 - Individual assignments to plug holes?
 - Erosion: should this be measured as a parameter?
 - *Elyse added to the model*



- **Staging Changes: should this be a separate box?**
 - 3 ft to 10 ft vs. 5 ft to 8 ft
 - May not get at biological impacts
- Linking power generation to power needs
 - This could be very complex
 - With/without downstream structures
 - **Impact of Downstream structures?**
 - Status quo
 - Structural Options
 - Cost
 - Benefits
 - Potential impacts
 - Geotubes
 - **Structures True: Yes/No?**
 - **Rereg dam at crooked creek as proposed in Stan's proposal**
 - **Where is this box?**

- High: 81.1
- Medium: 0
- Low: 0

▪ **Boatable Days**

- Discussion:
 - The team has to define what's meant here
 - We can establish any criteria
 - Weekends/Holidays greater than 500 cfs and less than 1200 cfs based on historical data.
 - Enough to float a boat, not enough to get swept away in a canoe
 - Hourly flow rates were examined during daylight hours
 - How are daylight hours defined
 - Multiple criteria are possible
 - Civil, nautical, sunup/sundown,
 - Sunup/sundown was chosen



- Generate—no boating; Don't generate---boatable
- This has to be defined
- Boatable day subcommittee might be a way to go
- 500 cfs originated here
- Average daily flows prior to dam construction can be cross-checked
- A boatable day is 500 cfs at Waddley
- Upper limits for canoeists has to be established
- Boatable days may not be the same as fishable days
- Daylight hours/weekends at Waddley gauge
 - Further up the river you go, the less water there will be
 - Only gauge available to make judgements from
 - All depends on what the tribs are doing
 - River Rec. subcommittee?
- **We need more definitions on this to move ahead**
 - Top end of flow is most important
 - **A definitional review group is needed**
- High: > 8 days/month
 - Could this be expanded to 10 days for local residents
 - Shift to weekends/holidays for high?
 - Model is only examining weekend days
- Medium 4-7 days/month
- Low > days/month
- **Lake Levels**
 - Discussion
 - *Number of days lake levels dip below rule curve above 10 days in any year causing lake levels to drop*
 - In any year...not consecutive days
 - ***It may be more intuitive to invert this scale***
 - ***Low is good!***
 - ***Do a better job of defining the metadata descriptors***
 - Bill will provide the ppt slide to nail this
 - Better reflects rule curve and reality
 - What is the rule curve? Lake levels determined by the Corps
 - Spawning levels (esp. crappie is important to consider) Make certain this is a component. Different reservoirs behave different ways...there is no one size fits all solutions to all of these.



- APC stabilizes Harris levels during the crappie spawn. Does this coincide with other spawns downstream?
 - We're less concerned about the rise than the fall
 - Do the Harris windows affect other spawns adversely downstream?
 - Can you model downstream spawns, below the dam?
 - *We will use small fish abundance to address all fish monitoring*

- High: 61.2
- Moderate: 15
- Low: 23.8

- **Flow Through Pools**
 - Discussion
 - An increase in base flow should diminish temperature fluctuations...good hypothesis
 - How happy is your river?
 - Is there a correlation to elevation/gradient?
 - Will we ever get a flow rate that gets us to high?
 - **Where is the threshold for the pool flow to register "high" at the Heflin gauge?**
 - **The superconglutinate number!**
 - High: over ½ pool cells flowing 20 cm/s (will verify this figure)
 - Medium: over 26-50% Pool cells
 - Low: lower than 26%

- **Degree Days**
 - Discussion
 - Addresses cold water discharge at the dam
 - Can the baffle be adjusted?
 - Many unknowns here---reregs may help this
 - More flow may have a big effect
 - Does this include hot rocks?
 - All set at 30/30/30 due to incomplete data
 - We don't know what will happen if we increase the base flow yet
 - High
 - Moderate
 - Low



- Shallow Fast Amounts
 - High
 - Moderate
 - Low
- Slow Cover Amounts
 - High
 - Moderate
 - Low
- **Small Fish Abundance**
 - Discussion
 - Catfish growth could be a potential addition
 - Sucker guild
 - Spring spawning of nesting centracharids
 - Shoal Lilly box for biology
 - Other criteria/boxes?
 - Fishable days....
 - Data is available on catch rates prior to dam construction
 - Could engage the public to assist on data collection
 - Fishable days could be a potential mgmt objective measure
 - High: >50 per 100 grid units of young
 - Moderate: 20-50 per 100 units
 - Low less than 20 per 100 grid units
- Bass Recruitment
 - High
 - Moderate
 - Low
- Redbreast sunfish spawn
 - High
 - Moderate
 - Low



Next Steps

- **Appoint a technical review committee**

- **Elyse on needs**
 - **Need Bill Dykes for non-fish stuff**
 - **Malcolm will represent on biology**
 - **Need Jim Peterson for modeling (Maureen Walsh)**
 - **Jeff Garner may be available to assist on mussel work**

- **Moved and accepted by the team**

- **We need better definition of boatable days**
 - Need specificity on the high end
 - Address if this is the same as fishable days
 - Consider measurable catch rates in place of fishable days



Next meeting:

Monday August 4, same location

Alabama Power will present a review of the AL DNR proposal at 3 p.m.

At 5 p.m. impacts on the proposals then be modeled
We will review the model definition by definition



From Last Meeting

Agree on:

- Our goal is to optimize stakeholder objectives on a long-term basis to the maximum extent practicable.
- Key stakeholders must be represented.
- The Tallapoosa River is a public trust resource.
- Operations of R.L. Harris Dam continue to negatively affect aquatic and terrestrial organisms.
- The level of impact diminishes downstream from R.L. Harris Dam.
- R.L. Harris Dam provides substantial economic and public benefits.
- All stakeholders need to be aware of the substantive reservoir operational constraints.
- The Adaptive Management process and output must comply with all legal requirements.
- The Adaptive Management process should embrace flexibility and should not be excessively prescriptive.
- There are levels of uncertainty regarding various solutions and needs to be addressed as part of the adaptive management process
- The results of changes to the operations of the dam need to be carefully monitored.

Disagree on:

- Flows need to be increased.
- There needs to be a continuous minimum flow from Harris.
- Two-unit peaking without ramping should not be acceptable.
- NEW STUFF

Uncertain of:

- We do not know what specific times will be best for the spring steady flow window of 2 weeks. Different species may need windows at different times.