

INTRODUCTION

Management of regulated rivers, like that of most natural resources, is confounded by two primary difficulties: 1) multiple, often conflicting, management goals and 2) inherent uncertainty in the system (Williams, et al. 2002; Irwin and Freeman 2002). River regulation and water development are two of the foremost problems threatening fishes and other aquatic biota in the United States (McCully 1996; Poff et al. 2003). Dams constructed primarily for power generation and water use have impounded more than half of the mainstem rivers in the Southeastern U.S., altering and fragmenting miles of critical riverine habitat (Folkerts 1997; Lydeard and Mayden 1995). Yet dams are a flexible source of power, provide flood control, and contribute to the economic growth of local communities through real-estate and recreation (Poff et al. 2003; Reuss 2005). Such conflicting interests can pull management in many directions impeding progressive action. In addition, managers suffer from a lack of knowledge about the present system, its potential responses to management actions, and its future political, economic, and environmental context (Walters 1986). Together, these obstacles make effective management difficult.

Through 2010, the United States Fish and Wildlife Service (USFWS) will evaluate the relicensing of more than 200 dams in the Southeastern U.S. licensed by the Federal Energy Regulatory Commission (FERC). These appraisals could provide an excellent opportunity to develop strategies for minimizing or mitigating the impacts of dam operation, and may be critical for the persistence and recovery of imperiled aquatic biota in the Southeast and throughout the United States. Current approaches to evaluating the effects of dams, however, rely entirely on expert opinion or best available information; hence, evaluations are not quantifiable, spatially or temporally explicit, and can vary from project to project. Through the Southern Rivers Integrated Science Initiative, the USFWS has recognized a critical need for new tools to evaluate the relicensing of dams in the Southeast. Specifically, the USFWS needs to develop a rigorous, statistically valid approach that incorporates both existing and new data, multiple management objectives (e.g., flexible power generation and sustainable fish populations), and is useful for decision-making.

With its assurance to incorporate multiple management goals and address uncertainty, adaptive management (AM) has become a widely-used tool among natural resource managers (Walters 1986; Walters 1997; Williams and Johnson 1995; Williams et al. 2002). Its appeal lies primarily in its methodology for overcoming management difficulties. First, to effectively address management goals, AM strives to include all stakeholders in management discussions (Walters 1986). While traditional management planning tends to be exclusive to scientists and agencies, AM seeks to be inclusive, so that all individuals and groups who have an investment in the system – including landowners, private corporations, government agencies, and non-governmental organizations – may have a part in management discussions. Second, AM seeks resource optimization – to incorporate and optimize the competing objectives of all stakeholders (Walters 1986; Williams and Johnson 1995). Third, the uncertainty that is inherent in natural resource conflict is explicitly addressed by AM through quantitative reduction via knowledge acquisition (Walters 1986; Williams and Johnson 1995, Irwin and Freeman 2002). In the adaptive management process, knowledge is gained through monitoring responses to management actions, comparing responses to modeled predictions, adjusting management strategies appropriately, and continuing this “monitor-compare-adjust” process until all management goals have been reached. Therefore, instead of negotiating a final solution, stakeholders negotiate a point from which to start, changing management strategies as knowledge is gained. This provides management strategies with flexibility, allowing future improvement of management as managers continually learn how to optimize the resources.

Despite the claims of AM, reaching this starting point may not be easy given the AM framework alone. Complicated decisions with multiple decision options and complex relations between variables and hypotheses threaten to throw the management ball back into the private

court of scientists and agencies, defeating efforts for stakeholder inclusivity throughout the AM process. To overcome the threat of stakeholder abandonment, managers need a tool to provide a structured framework for stakeholders to visualize and process decisions; decision analysis (DA) is such a tool. Decision analysis is well-suited for use in conjunction with adaptive management in that it allows incorporation of sources of uncertainty, multiple values and objectives, empirical data, and expert opinion. Through evaluation of such inputs, decision-makers may examine the expected effects of different management strategies on the system under study (Clemen 1996, Peterson and Evans 2003). However, we must emphasize that the decision remains a task of the stakeholders; decision analysis is a tool, not a replacement, for the decision-maker (Clemen 1996).

Most previous attempts to manage adaptively have not moved beyond planning phases (Johnson 1999). Therefore, the USFWS and other stakeholders do not have the experience nor a template on which to base efforts to incorporate decision analysis and adaptive management into the FERC relicensing process. This project has created such a template by developing a model for the implementation of adaptive flow management for R.L. Harris Dam on the Tallapoosa River, Alabama. To develop this model, we addressed the following objectives:

- 1) determine stakeholder values and objectives;
- 2) develop models relating aquatic community (specifically, fishes) responses to changes in habitat and flow regime;
- 3) develop decision models for evaluating the impacts of current and alternative dam operating procedures on stakeholder valued outcomes; and
- 4) develop explicit recommendations for alternative dam operating procedures that will produce the information for resolving key uncertainties about the effect of dam operation on the aquatic community.

METHODS & RESULTS

Study site and management context

The Tallapoosa River below R.L. Harris Dam is a strongly flow-regulated reach located in the Piedmont region of east-central Alabama. The system under study is a 78-km reach of the Tallapoosa beginning at Harris Dam and terminating in the headwaters of Martin Reservoir (Figure 1). Harris was constructed primarily as a hydropower facility, with other potential benefits including flood control, recreational opportunities on the reservoir created by the dam, and economic growth associated with the reservoir. The generation capacity for this 2-turbine facility is 135 mega-watts, and accounts for about 10% of the total capacity of the 11 privately-owned hydropower dams in the eastern Mobile River drainage. Since going into service in 1983, Harris Dam has been operated primarily as a hydropeaking facility, such that water is released in pulses, usually 4-6 hours in duration, through one or two turbines, each with the capacity to pass 226 m³/s. Generation typically occurs once or twice daily, five days a week. As a result of the hydropeaking operation, the flow regime through the study reach typically fluctuates between extreme low flows and high flows corresponding to one- or two-turbine generation (Figure 2). During non-generation periods, the FERC license for Harris Dam requires that flow as recorded at the USGS stream gage at Wadley, Alabama (22 km downstream from the dam) is not to fall below the pre-dam historic record low-flow of 1.27 m³/s.

Management issues in the study reach below Harris Dam revolve around the effects of the hydropower operation on values associated with the general health of the Tallapoosa River ecosystem. The primary conservation concern is that the regulated flow regime threatens to extirpate native biota. The study reach represents one of the longest and highest quality segments of Piedmont river habitat remaining in the Mobile River drainage, one of the most biologically diverse river drainages in North America (Lydeard and Mayden 1995; Freeman et al. 2005). Extensive areas of shoal habitat, river features that typically support high faunal diversity and that have been replaced by impoundments throughout much of the Southeast, are

characteristic along this portion of the river. The native fish assemblage includes at least 57 species, including at least five species endemic to the Tallapoosa River system. The invertebrate fauna is less well-known; however, the fine-lined pocketbook (*Hamiota altilis*), which is listed as Threatened under the Endangered Species Act, and at least two endemic species of crayfishes occur in the piedmont reach (Irwin et al. 1997). Shoals in the downstream portion of the study reach support populations of shoal lily (*Hymenocalis coronaria*), a river species that has been eliminated from portions of its native range by impoundment. Prior to construction of Harris Dam, the study reach also supported productive sport fisheries for basses (*Micropterus* spp.) and catfishes (primarily channel catfish *Ictalurus punctatus* and flathead catfish *Pylodictis olivaris*) (D. Catchings; ADCNR, personal communication). A decline in sport fish populations and the loss of access to the river because of changes in flow regime have been major concerns since construction of Harris Dam. Conversely, altering the peaking operation could threaten the power utility's flexibility to provide and sell electricity on demand during periods of peak consumption. Changes in dam operation could also affect water levels and thus values for users in the reservoirs, particularly at Harris Reservoir.

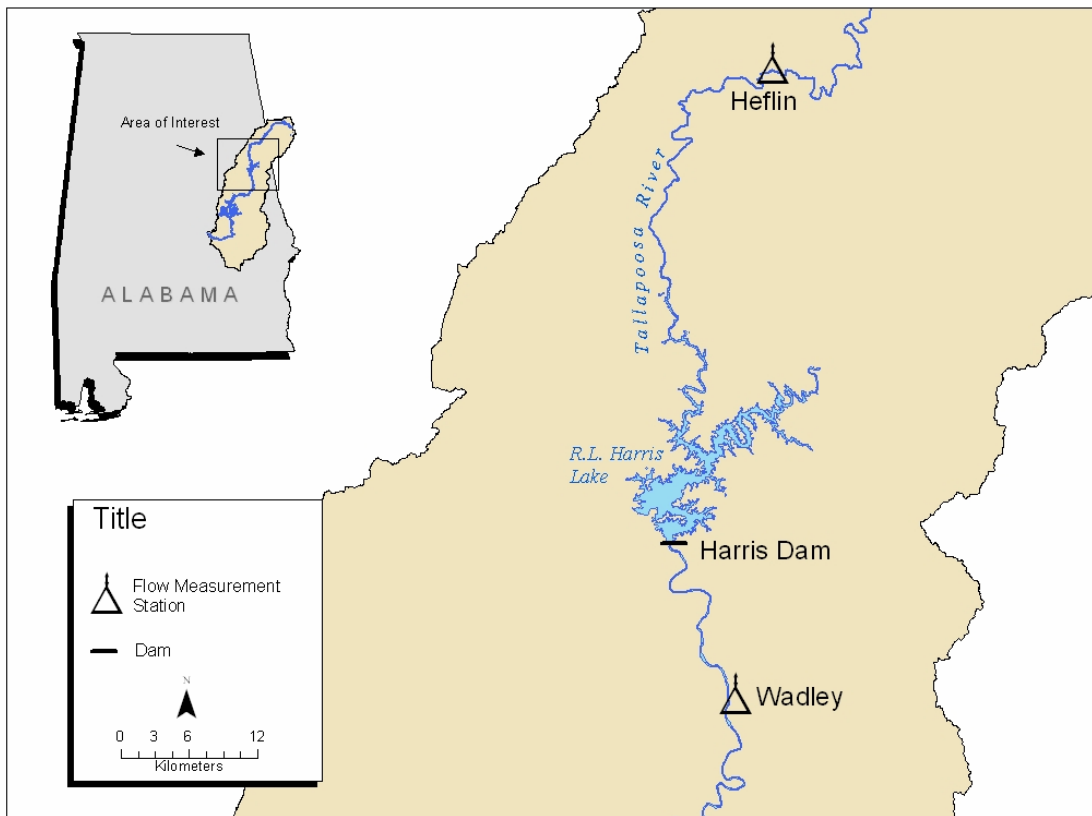


Figure 1.-Location of study site in the Alabama portion of the Tallapoosa River Basin. The river is regulated below Harris Dam, and unregulated above R. L. Harris Lake. United States Geological Survey gages are maintained at Heflin and Wadley, Alabama.

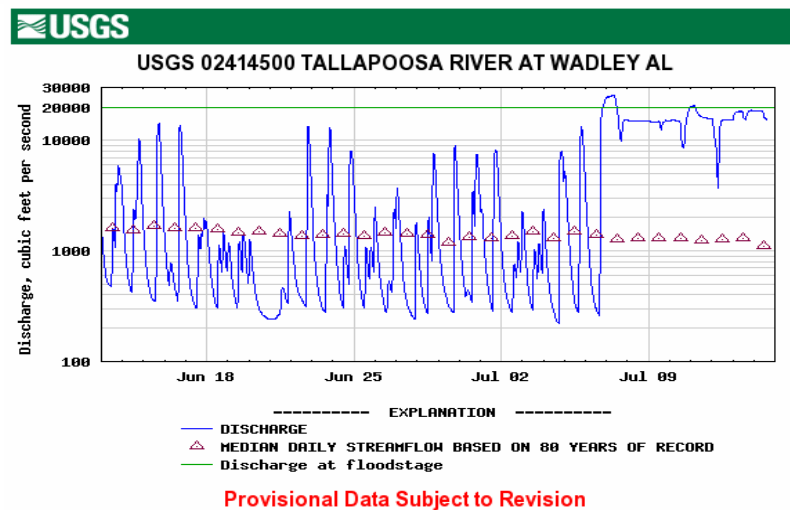
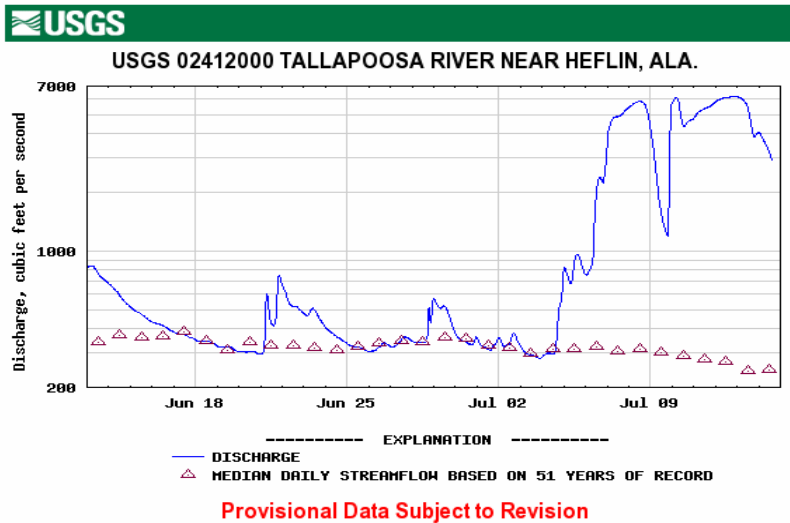


Figure 2.- Tallapoosa River discharge measured at USGS gage 02412000 (top panel-naturally occurring flows) located near Heflin, Alabama and USGS gage 02414500 (bottom panel-regulated by Harris Dam) located in Wadley, Alabama, 22km below the dam (14 June-14 July 2005; <http://waterdata.usgs.gov>). The first flow experiment calls for passing daily volumes of water equivalent to or greater than those recorded by the Heflin gage which is located above the reservoir and measures flows that amount to approximately 50% of inflows into the reservoir. Note the flood conditions associated with Hurricane Dennis beginning on 7 July 2005.

Stakeholders Objectives

Stakeholders have been involved in active debate over the allocation of resources in the middle Tallapoosa basin since Harris Dam was proposed. Whereas such stakeholder involvement is detrimental to the success of adaptive management, all parties involved must also come to an agreement on proposed management objectives. From April 29 through May 1, 2003, we conducted a workshop for all stakeholders in the middle Tallapoosa basin to introduce the concept of adaptive management and to create an open discussion for building consensus on management objectives and values (see www.RiverManagement.org and Appendix I).

Following a series of presentations by experts in the field of adaptive natural resource management, professional facilitators (www.groupsolutions.us) conducted an interactive session, beginning with an open forum for all workshop participants to suggest and discuss potential values and objectives. Suggested objectives were judged in an electronic poll by one representative from 23 participating stakeholder groups. From the poll results, a tentative list of fundamental objectives was drawn for discussion among stakeholders.

Fundamental objectives were as follows:

1. Maximize economic development
2. Maximize diversity and abundance of native fauna and flora
3. Minimize bank erosion downstream from Harris
4. Maximize water levels in the reservoir
5. Maximize reservoir recreation opportunities (e.g., angling, boating, swimming)
6. Maximize boating and angling opportunities downstream from Harris
7. Minimize total cost to the power utility
8. Maximize power utility operation flexibility
9. Minimize river fragmentation
10. Minimize consumptive use

Stakeholders ultimately agreed upon these fundamental objectives as complete and representative of the interests of all parties involved. In addition, stakeholders agreed to adopt the concept of adaptive management as a framework for future discussions and management decisions. Appendix I is the report from the workshop provided by the facilitators.

Objectives established at the workshop were then used in the development of a decision support model to assist stakeholders in making the complex decisions necessary to change the flow regime below Harris Dam. To conduct the decision analysis, we followed the basic steps outlined by Clemen (1996): 1) formed hypothesized relations between flow and system response; 2) constructed a basic model outlining these hypotheses; 3) parameterized the model; 4) determined the optimal decision from the model results; and 5) conducted sensitivity analysis to determine which components of the model had the greatest influence on the decision.

Hypothesized faunal response

Using existing knowledge, expert opinion and empirical data, we constructed hypothesized relations of faunal dependence on flow regime. Studies in the system have contributed to our knowledge of how fauna may respond to specific flow features in the system. Irwin and Freeman (2002) hypothesized that 1) depleted low flows, 2) flow instability, and 3) thermal-regime alteration were the features most likely to affect faunal response in the system.

Published findings indicate that hydrologic alteration in the river has affected various biological processes. Irwin and Hornsby (*submitted*) repeated Swingle's 1951 rotenone survey (Swingle 1953) in the regulated river near Horseshoe Bend and reported a major shift in community composition (from specialists to generalists) and declines in overall fish numbers and biomass. In 1951 the community was comprised of catfishes (46%) and minnows (47%) and in 1996 the community was dominated by black basses and sunfishes (51%); whereas, catfishes and minnows comprised 22 and 5 percent of the community, respectively. With the exception of the recorded absence of longear sunfish *Lepomis megalotis* (see Irwin and Hornsby, *submitted*; Andress 2002), fish species composition appears to be stable; yet, Freeman et al. (2001) reported that persistence of fishes in the flow-regulated section depended, in part, on periodically stable shoal habitat conditions that allowed reproduction and juvenile survival. Irwin et al. (1997) and Andress (2002) reported disrupted spawning for sunfishes including spotted bass *Micropterus punctulatus*, Coosa bass *M. coosae* and redbreast sunfish *L. auritus*. Nest success for redbreast sunfish was negatively related to both peaking power generation and depressed water temperatures (also caused by the dam; Andress 2002). Table 1. provides a list of some hypotheses related to flow features in the river.

Once we established hypothesized relations between flow and biotic response, we incorporated these relations, along with various other management objectives, into an influence diagram (Figure 3a) where relations between decision components are explicitly represented in graphical form (Clemen 1996). In this case, decision elements (or nodes) are represented by rectangles, consequence (or utility) nodes by hexagons, and uncertainty (or chance) nodes by

rectangles with rounded corners. Influence diagrams provide explicit representations of individual decision components and their dependencies.

Table 1.-Stated *a priori* hypotheses (not exclusive) regarding how fishes and habitat will respond to specific flow conditions.

Hypothesized biotic response	Hypothesized flow linkage
Presence of fluvial specialists will be highest at unregulated sites.	Unregulated flows provide more stable conditions for habitat specialists.
Habitat persistence will be greatest at unregulated sites positively affecting recruitment processes.	Highly regulated flows negatively affect persistence of habitats critical for fauna because of rapidly changing stage.
Spawning success will be highest in years when spawning windows are provided.	Stable flows provided for spawning will increase recruitment of multiple fish species.
Filter feeding invertebrate populations will respond positively to increased base flow.	Increased base flow dampens magnitude of disturbance on shoal habitats and increases flow through pools.

Decision Support Model

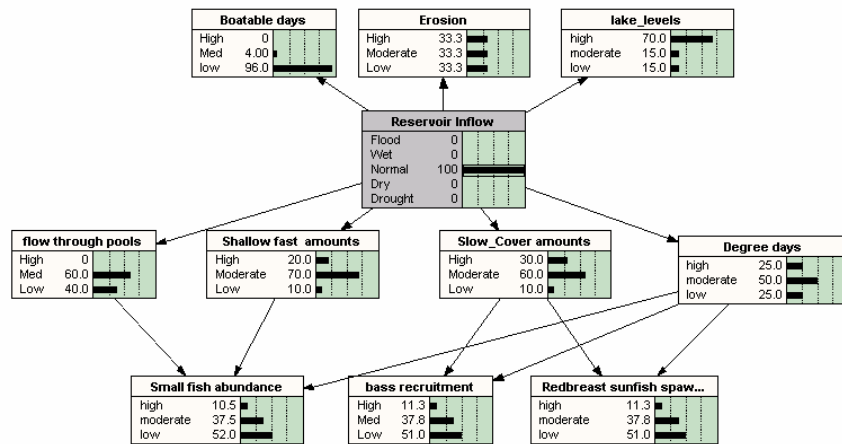
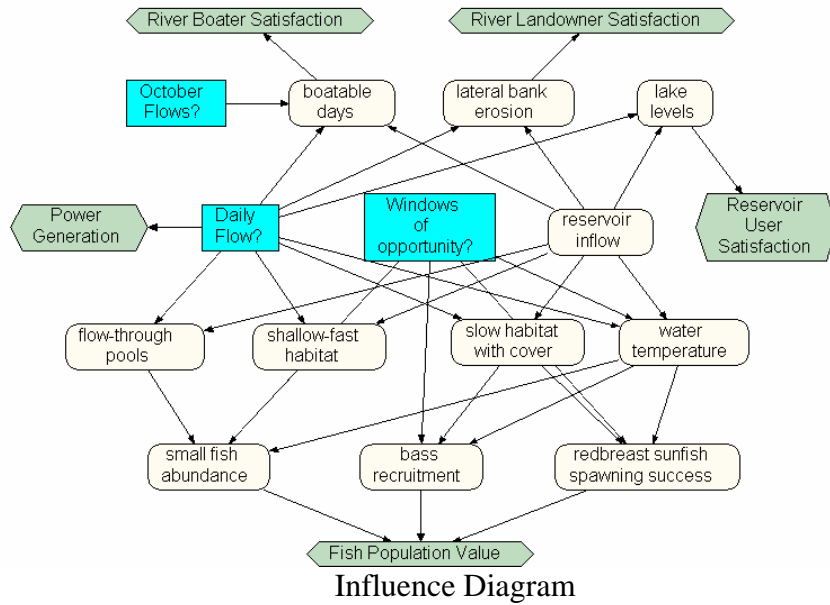
We constructed a Bayesian network for use as a decision support model using Netica 1.12 (Norsys Software Corp. 1998) to both quantify uncertainty regarding the response of state variables to management actions and to make hypotheses relative to predicted response (Figure 3b and c).

Decision elements

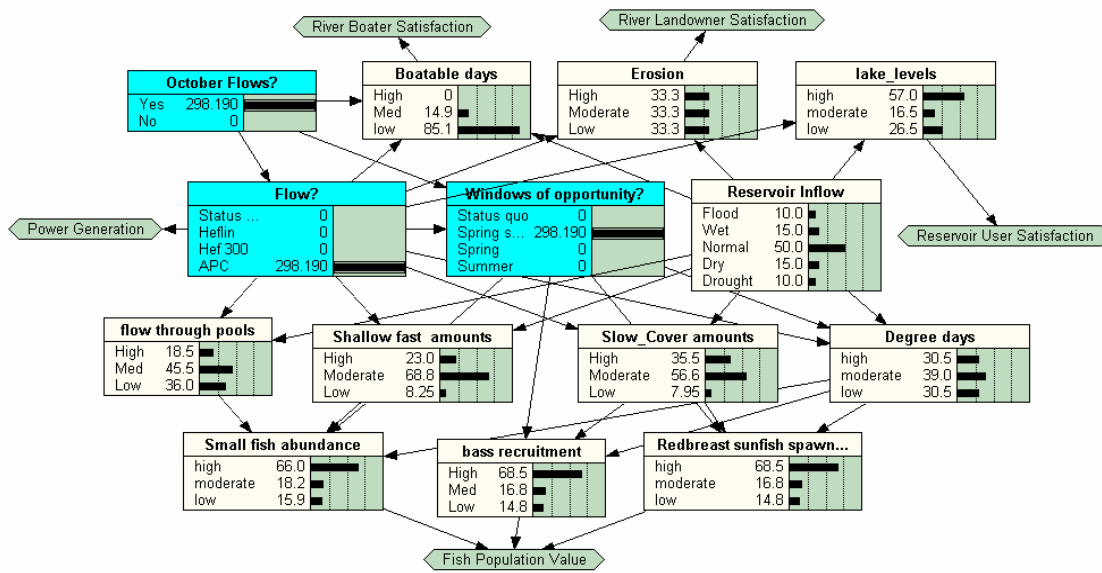
Modeled decisions included four alternative primary flow regimes, the provision of spawning windows (periods during which flows are minimized to allow for hypothesized increased spawning success), and increased weekend flows in October for recreational boating. Relations between flow and system response were modeled using probabilistic dependencies derived from long-term empirical data from multiple projects and expert opinion, while relations between system response and stakeholder satisfaction (i.e., utility values) were modeled using probabilistic dependencies based upon stakeholder opinion. The optimal decision was determined by examining the expected value associated with each alternative decision, which was the sum of the probability-weighted utility values. The decision with the highest value was considered the optimal decision; in this case, to provide flows as measured at the USGS Wadley gage (22 km below Harris Dam) that matched flows at the Heflin gage (located above Harris Reservoir), via pulsing operations supported by peak generation, as well as to supply spring and summer spawning windows and October recreational boating flows.

Three decisions were included in the model (Figure 3c; blue boxes). They were: type of daily flow regime (4 potential options), provision of spawning windows (4 potential options) and provision of October recreational flows (yes or no).

- 1) The primary decision concerned daily flow operations from the dam. Based on our hypotheses, increasing the flow level during nongeneration periods should have positive effects on the abundance, diversity, and growth of fishes (and likely other flow-dependent biota). We examined four alternative decisions to the primary decision. The first was no change: keep the system at status quo. The other alternatives were based upon the concept of mimicking the flow regime recorded at the USGS gage in Heflin, at Wadley, 22 km below the dam. The Heflin gage measures flows in the unregulated upper portion of the Tallapoosa (Figure 1 and 2); stakeholders hypothesized that mimicking these flows at the dam would allow for some natural flow variability in the regulated portion of the river. The first of these decisions was essentially modeled as a constant flow from the dam to maintain the Heflin target at Wadley, which consisted of minimum flows plus any necessary generation flows. The second was similar, except the flow from the dam was to never reach levels below 300 cubic feet per second (cfs).



Bayes' Belief Network



Decision Support Model

Figure 3.-Influence diagram, Bayes belief network and the decision support model developed to define the decision context for Harris Dam flows.

The third was an option proposed by the power utility, in which at least 75% of the Heflin target was maintained by two daily pulses, one at 0600 and one at 1200.

- 2) A second modeled decision concerned spawning windows. Based on our hypotheses, periods of stable flow without hydropeaking should increase opportunities for fish to spawn and larvae to develop successfully. Alternative decisions included no change, spawning windows in both spring and summer, spring windows only, and summer windows only.
- 3) A third decision was whether or not to provide recreational boating flows on weekends in October, a traditionally popular time to float the river.

Utility functions

Following the example of Peterson and Evans (2003), the consequence nodes were representative of the satisfaction of stakeholders involved in the decision. In this way, the model remains flexible as knowledge is gained and changes occur in means objectives and their relations to stakeholder values. We narrowed stakeholder satisfaction into five categories: river boater satisfaction, river landowner satisfaction, reservoir user satisfaction, fish population value, and power generation. The river boater, river landowner, and reservoir user satisfaction values were based upon feedback from individual stakeholders. River boaters were most satisfied with high numbers of boatable days (as were available during the pre-dam flow record), river landowners with low rates of lateral bank erosion, and reservoir users with lake levels at or above the established rule curve. Fish population value increased with high incidences of small fish abundance, bass recruitment, and redbreast sunfish spawning success, and decreased with low values of these influencing variables. The values incorporated for power generation were estimates of flexibility provided by the power utility.

Uncertainty nodes

We modeled hypothesized relations by way of a probabilistic network, also known as a Bayes' network, in which relations among the uncertainty nodes were modeled using probabilistic dependencies derived from empirical data and expert opinion (Figure 3). The nodes were closely linked with stakeholders objectives and values and parameterized using empirical data or expert opinion. The nodes are described below.

Reservoir inflow. The input for reservoir inflow was based on the 10%, 25%, 75%, and 90% exceedence flows for the combined Heflin and Newell (Little Tallapoosa River) gages for the period of record. Flood conditions were equated to flows with > 1700 cfs, wet conditions were flows between 1500 and 1700 cfs, normal conditions were flows between 1000 and 1500 cfs, dry conditions were flows between 600 and 1000 cfs, and drought conditions had flows less than 600 cfs. Using the period of record we assigned conditional probabilities to each inflow condition as follows: flood: 0.10; wet: 0.15; normal: 0.50; dry: 0.15; drought: 0.10.

Lake levels. These probabilities were derived from the lake level data and were tied to the number of days in a year that lake levels fell below the rule curve. High lake levels were years that the lake fell below the rule curve less than 10 days, moderate was years when lake levels fell below the curve 11-20 days and low was greater than 21 days below the rule curve. For the period of record from 1983-2001, lake levels were high, moderate and low, 57, 16.5, and 26.5% of the time, respectively. This node was dependent on reservoir inflow.

Boatable days. Boatable days were based on the number of consecutive weekend days per year when flow was between 450 and 2000 cfs at the Wadley gage for the period of record through September 1974. Weekends were considered Saturday and Sunday, but also included Columbus Day, Memorial Day, the Friday or Monday closest to July 4 (if on a Wednesday, the day within the flow bounds was chosen; if both Friday and Monday were within the flow bounds, Monday was chosen), and Labor Day. High number of days was >70 days/year; medium number of days

was 40 - 70 days/year; low number of days was < 40 days/year. For the period of record before the dam, 80% of the time, there were between 40 and 70 boatable days a year, 10% of years had more than 70, and 10% had less than 40.

Erosion. The erosion node is parameterized with three levels, high, moderate and low; however, because we had no data on erosion, we gave equal weight to the levels (all 33.3%). This parameter was important to stakeholders, and probabilities will be updated pending data.

Shallow-fast habitat. This node was directly dependent upon reservoir inflow. The probabilities we used to link these variables were based upon both the flow record since the dam was built, and on physical habitat simulation models (PHABSIM) developed by the USGS (M. Freeman, Z. Bowen and K. Bovee). PHABSIM models were constructed at the Wadley site and depth/flow measurements were recorded along transects at high and low flows. Therefore, we were able to estimate the percent of shallow-fast habitat (depth < 45 cm; flow > 45 cm/s) in the channel during a flood, wet, normal, dry, or drought year; we did this for April-July based on importance of habitat during spawning periods. For example, in a normal year, there was a 20% chance of having high amounts of shallow-fast habitat, 70% chance of having moderate amounts, and 10% chance of having low amounts.

Slow-cover habitat. Again, this node was dependent on reservoir inflows and was calculated based on PHABSIM models. Percent slow-cover habitat (flow < 20 cm/s; cover present) was estimated in the channel for flood, wet, normal, dry, or drought years, during April-July. For example, in a normal year, there was a 20% chance of having high amounts of shallow-fast habitat, 70% chance of having moderate amounts, and 10% chance of having low amounts.

Flow-through pools. We used PHABSIM to estimate flow in pool habitats during flood, wet, normal, dry, or drought years. High flow in pools equaled when discharge was great enough that > 50% of pool habitats had flows > 20 cm/s. Medium flow was when discharge provided 26-50% of pool habitats with flows > 20 cm/s and low flow in pools had < 20% of habitats with the target flow.

Degree days. This node was included because thermal effects were thought to be important for reproduction development of certain faunal groups. We parameterized the node based on the number periods where cumulative degree days were greater than 64 (Andress 2002).

Small fish abundance. We used our long-term (6 years) prepositioned electrofisher (grid) data to parameterize this node. This node was directly linked to shallow-fast habitat, degree days, and flow through pools (i.e., production of food). We considered abundance to be high if > 50 individuals were captured in 100 grids. Medium abundance was 20-50 and low was < 20 individuals captured in grids.

Bass recruitment. We used backpack electrofishing data and expert opinion to parameterize this node which was linked to slow-cover habitat, degree days and flow through pools. High bass recruitment was equal to more than 20 juveniles collected in a sample, medium levels of recruitment was 10-19 juveniles and low levels equaled < 10 juveniles.

Redbreast sunfish spawning success. Similar to bass recruitment, we used backpack electrofishing data and expert opinion to parameterize this node which was linked to slow-cover habitat, degree days and flow through pools. High success was equal to more than 60 juveniles collected in a sample, medium levels of success was 30-60 juveniles and low levels equaled < 30 juveniles.

Modeling the optimal decision

We then incorporated the decisions and utility functions into the model, and used Netica computer software to find the optimal decision. We determined the optimal decision by examining the expected value associated with each alternative, which is the sum of the probability-weighted utility values.

The decision with the highest value was considered the optimal decision; in this case, to provide flows as measured at the USGS Wadley gage (22 km below Harris Dam) that matched flows at the Heflin gage (located above Harris Reservoir), via pulsing operations supported by peak generation, as well as to supply spring and summer spawning windows and October recreational boating flows.

Sensitivity Analysis

The final step before making a decision was to conduct a sensitivity analysis on the decision model. Sensitivity analysis examines the relative influence of model components on each utility value, and therefore on the modeled decision(s). We used methods outlined in Clemen (1996).

Because the power generation utility value was directly correlated to the daily flow regime decision, it could not be evaluated via sensitivity analysis. In addition, lack of current data for lateral bank erosion also eliminated the river landowner satisfaction value from sensitivity analysis. Therefore, the analyses were limited to reservoir user satisfaction, river boater satisfaction, and the fish population utility value. In the decision model, reservoir user satisfaction was dependent upon the single variable of lake levels, which in turn was linked to reservoir inflow and the daily flow regime from the dam.

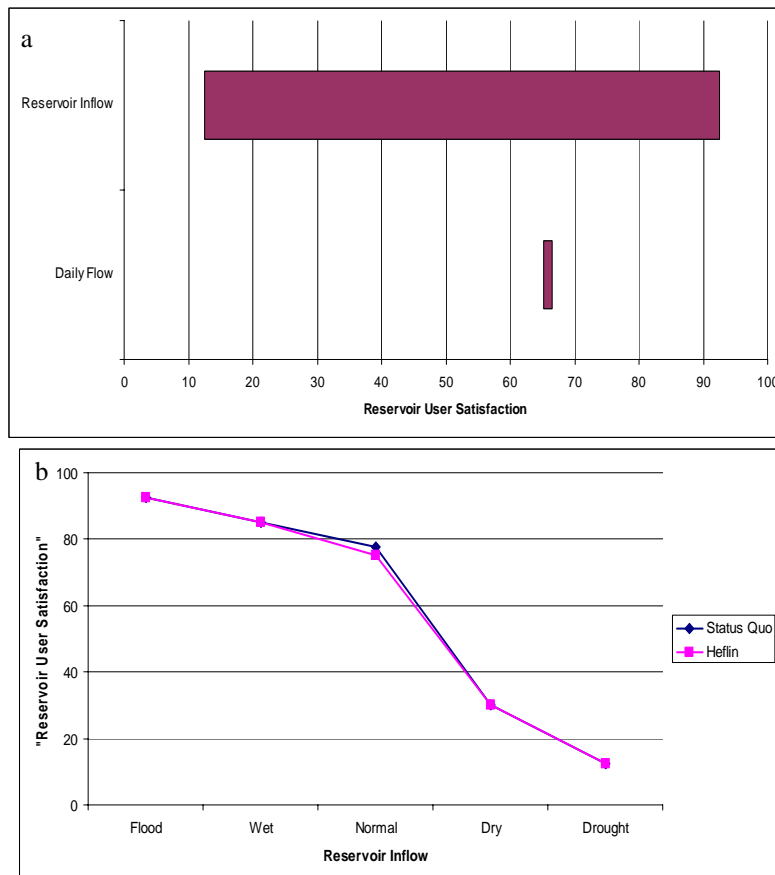


Figure 4.- Tornado diagram of one-way sensitivity of “Reservoir User Satisfaction” to influencing variables (a), and two-way sensitivity of “Reservoir User Satisfaction” to the daily flow regime under different reservoir inflow conditions (b).

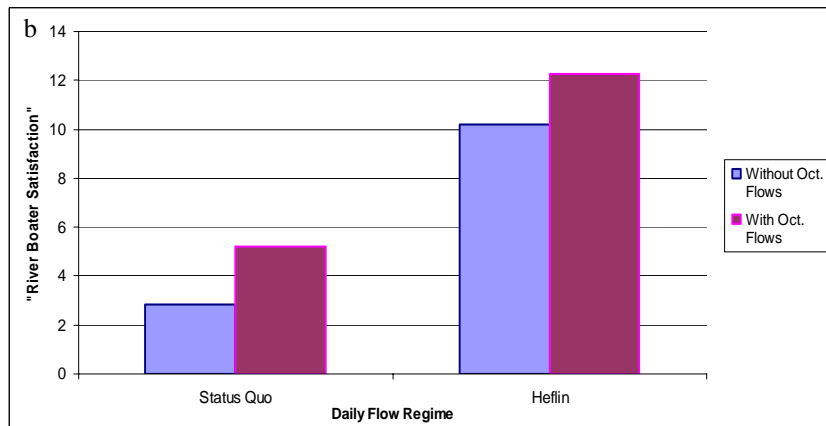
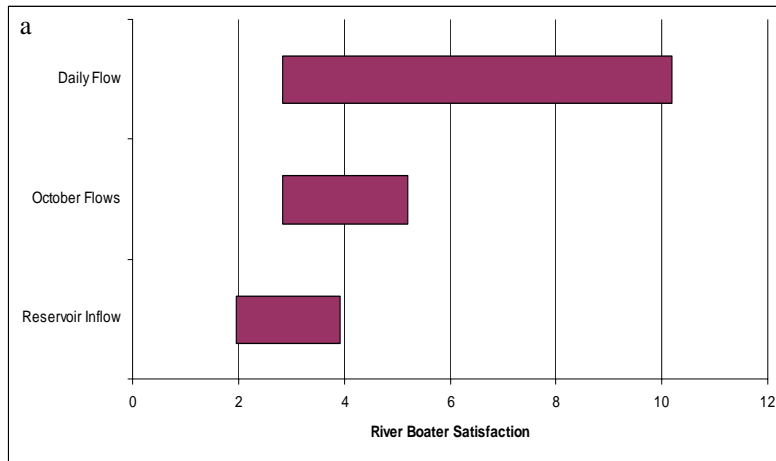


Figure 5.- Tornado diagram of one-way sensitivity of “River Boater Satisfaction” to influencing variables (a), and two-way sensitivity of “River Boater Satisfaction” to the daily flow regime with or without October flows (b).

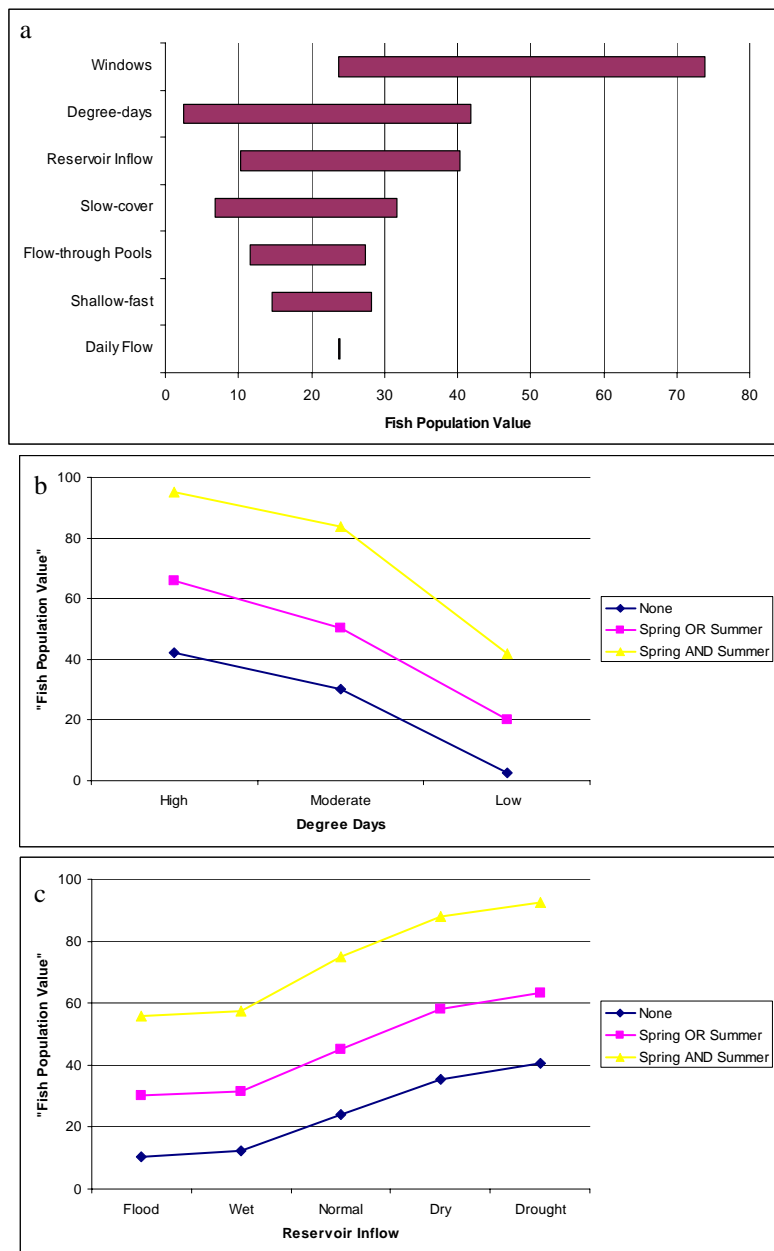


Figure 6.- Tornado diagram of one-way sensitivity of “Fish Population Value” to influencing variables (a), and two-way sensitivity of “Fish Population Value” to presence of spawning windows under different numbers of degree days (b) and to presence of spawning windows under different reservoir inflow conditions (c).

One-way sensitivity analysis revealed very little change given different flow scenarios from the dam under any given reservoir inflow (range: 65.3% - 66.5% estimated satisfaction) (Figure 4a). In contrast, reservoir user satisfaction was highly sensitive to changes in reservoir inflow, from relatively low during a drought year (12.5% estimated satisfaction) to relatively high during a flood year (92.5% estimated satisfaction). Two-way sensitivity analysis comparing the change in reservoir user satisfaction to varying reservoir inflow conditions and different flow scenarios displayed a slight increase in satisfaction during normal water conditions under status quo (Figure 4b).

River boater satisfaction was dependent upon the daily flow regime, October recreational flows, and reservoir inflow. Examination of the range of satisfaction from each variable showed that changes in the daily flow regime had more impact than the presence or absence of October recreational flows or reservoir inflow (Figure 5a). However, compared to pre-dam flows, river boaters still lack adequate boating flows, with an estimated maximum satisfaction of just over 10%. Two-way sensitivity analysis demonstrated no changes in the optimal decision across all values (Figure 5b).

Fish population value had several influencing variables in the model. One-way sensitivity analysis revealed minimal sensitivity to changes in daily flow regime, but high sensitivity to opportunities provided by spawning windows (Figure 6a). This utility value was also sensitive to the number of degree days, which is intuitive because both spawning windows and degree days are related to periods of low flows. Similarly, fish population value is linked to reservoir inflow, which is an influencing variable for both spawning windows and degree days. Two-way sensitivity analysis showed no change in the optimal decision across values of the most influencing variables (Figure 6b and c).

DISCUSSION

Use of adaptive management for solving resource dilemmas in multiple-use systems has become a goal for many agencies. However, procedures for implementation of the process are lacking; this project provided a template for adopting adaptive management for learning how regulated river systems respond to manipulation of flow regimes. Historically, flow decisions are made based on negotiations that often take years (e.g., FERC relicensing), and although they are based on expert knowledge and data, one-time fixed flow regimes are often the net result. This approach does not allow for adjustment of management relative to system response and gained knowledge, nor comparisons with *a priori* hypotheses (Irwin and Freeman 2002). The development of an adaptive management template during this project was successful to the point that based on the model developed by stakeholders, a decision was made to adjust flow at R.L. Harris Dam; active adaptive management began in March 2005.

This project provided the framework for incorporating stakeholders objectives and values into decisions regarding flow modification in regulated river systems. Adaptive management often fails because of lack of stakeholder involvement (Johnson 1999); the workshop was a formal forum for involvement and provided for development of a governance structure (i.e., The R. L. Harris Stakeholders Board; hereafter, the Board) for future involvement (Appendix I and II). The professional facilitators were of high value in the process because the use of computer based anonymous polling allowed for uninhibited interaction among stakeholders. Interestingly, stakeholders commented on the presence of commonalities in their objectives and values. In addition, objectives that were of value to individual stakeholders were included in the model and were transparent (i.e., nodes were specific and visible), including objectives for which parameterization was not possible (e.g., erosion). Stakeholders seemingly grasped the concept that information gained through monitoring would ultimately improve the effectiveness of the model for representation of system processes. The modeling process that we used was easy for the stakeholders to understand based on the visual nature of the Netica software. These

characteristics of the process will be important during future stakeholders meetings where new knowledge is incorporated, thereby reducing system uncertainty.

Freeman et al. (2001) called for flow manipulations in an adaptive management context, coupled with continued biological monitoring to “elucidate how hydrologic variation influences species persistence.” Although alterations in flow regimes affect fish populations and communities, functional relations among flow parameters (e.g., frequency, duration, magnitude) and fish populations are not well defined. Key uncertainties relative to how dam operations affect aquatic communities need to be resolved. Our hypotheses revolved around the following flow features, base flow (Travnichek et al. 1995), periods of stable flow (Freeman et al. 2001), and thermal regime (Andress 2002). The governance structure that was developed by the stakeholders allowed for Technical Advisory Groups (TAGS: Appendix II, Chapter III). The Board appointed a Science TAG and tasked them with developing a monitoring plan for the adaptive management project. These groups serve in advisory capacity and report to the Board so that appropriate actions are taken relative to decisions. The Science TAG developed a monitoring plan based on many of the uncertainty nodes in the decision support model and implemented it in Spring 2005. Decisions regarding *what* parameters to monitor were made dependent on 1) relevance to stakeholders objectives and 2) ability of the scientists to collect adequate (i.e., meaningful) and reliable (e.g., bias minimized) data to use in updating model probabilities. Monitoring is ongoing to evaluate the effects of the flow regime on aquatic communities and habitat.

We have used sensitivity analysis to make recommendations to the managers (i.e., water and natural resource) relative to allocation of resources for monitoring because the analysis identifies what variables influence stakeholder satisfaction. For example, under flow conditions that match the Heflin target, managers can expect the satisfaction of reservoir users to remain constant or even decline during a normal water year, and to change consistent with changes in reservoir inflow. On the part of river recreationists, managers must not expect boaters to be satisfied to the degree they would have been under pre-dam conditions, but they will likely experience positive feedback from this stakeholder group under the alternate flow conditions. Sensitivity analysis was also beneficial for fisheries management in that, given the empirical data, periods of stable flows appear to be most beneficial for the integrity of the fish populations.

Although adaptive management was successfully implemented in the Tallapoosa River, other systems may have impediments preventing the process. One of the things that became apparent in the decision analysis process was inflexibility in the flow delivery mechanism. Specifically, the dam was not engineered to release small amounts of water continuously. Consequently, delivery of base flow in the system is provided by pulsing flows from the turbines. When applying this template to other systems, decision elements regarding flow from dams will have to incorporate facility-specific engineering constraints.

Overall the development of the template for applying adaptive management and decision support was successful in the case of the Tallapoosa River, thus far. Key elements for success were: 1) use of a professional and neutral facilitator to engage stakeholders in objective and value identification; 2) use of a visual decision support model that allowed for stakeholder input and optimization of values associated with various decisions; 3) development of a governance structure for future involvement and ownership in the process; and 4) recognition of a long-term commitment to learning the effects of management through system monitoring and adjustment of management regimes. The monitoring program associated with the project is labor intensive both in terms of field and laboratory days, and is therefore costly. However, we have experienced active stakeholder involvement in the collection of field data and much patience relative to reporting of results. Future success will depend upon these elements and continued stakeholder involvement and support.

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ACKNOWLEDGEMENTS

The authors would like to thank the many Stakeholders that contributed to this project. They are listed at www.rivermanagement.org. The project would not have been successful without the involvement of our facilitators, Vern Herr and Brett Boston; many hats off to them. The project was funded by USGS as a FWS Science Support Partnership Program Project (FWS SSPP # 02-R4-08) and administered through Alabama CFWRU RWO 86. The Alabama Power Company also provided funding for portions of the workshop and for facilitation of Board meetings. The Alabama CFWRU is sponsored by USGS; the Alabama Agricultural Experiment Station, Auburn University; the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries; the Wildlife Management Institute and the USFWS.

APPENDIX I

Transcripts from the
Adaptive Management Workshop
30 April – 1 May 2003

Adaptive Management Workshop Session Transcripts

*April 30, May 1 2003
Auburn Conference Center
Auburn, Alabama*

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GARP

1. Membership

Stakeholders must be identified and represented. I note that some groups are not represented

GP: New stakeholders should not expect process to start over. The process has begun

Stakeholders for future project

Membership should include anyone that believes they have something at stake that could be potentially affected by the outcome.

*** GP: All stakeholders should commit to stay engaged*

How do we ensure that the membership selected for this group reflects the decision-making process in the real world? EG. How do we recognize that there are certain regulations and people that are going to carry veto power? Can we weight our membership to reflect these realities?

*** ESA examples cited here. How does this play into the decision process? The model will contain broad representation, but can not solve every problem. It's a starting point for further refinement and development, not a finished product.*

*** Core or fringe issue?*

*** If regulatory component trumps other interests this could become critical. To be determined in our object evaluation segment*

*** Need to ensure we include representatives who have regulatory veto power: ESA Service/FERC/others. Got to consider this list carefully to be certain it is complete and inclusive.*

The middle Tallapoosa group does not appear to be represented

Georgia Power?

State & federal natural resource management agencies

Does this group include owners of land along the river reach?

We need to identify the problem(s) we want to address. If you have not been a part of the process you don't have a good idea of what the process is about.

Recreational boating groups

East Alabama Regional Planning Commission

Emerald Mountain Triangle (realtors)

All city and county governments of Clay, Randolph, Tallapoosa (river region)

If some interested group is not represented today, it is their own fault because this process has been ongoing and there was ample information and time for any interested



parties to participate

Municipalities.

Consumptive & nonconsumptive recreational users of the river

Membership should be based on

- A) Who wants to be a part of the governing structure,
- B) Inclusionary group representation (are some groups not included . . . river residents, for instance?!?),
- C) A vote that should be taken for representation on governing body after nominations are made . . .

Fishing organizations

Chambers of Commerce

Office of Water Resources

State Fisheries Division

River recreationists (i.e. canoe fans, fishermen)

Lake homeowners

Chamber of Commerce

Clean Water Partnership (Rep) for Middle Tallapoosa Basin

APC

FERC

Middle Tallapoosa Conservation Association

Alabama Office of Water Resources

As a tech person, I am here to provide tech input on adaptive mgmt, and as an observer (to learn more about how to develop goals and dm processes in other problems). So I don't know that I really have a vote on how the process should work. I do have some opinions.

1. A core group of stakeholder needs to be identified and included.
2. A tech group might also be included either formally or on an ad hoc basis. These would not necessarily be voting' members
3. Since I haven't been part of this process I can't really comment further about who should or should not be included.

Speaking of who might not be here today . . . it might be interesting to first hear how current attendees heard about this workshop.

Membership should be an evolving process and never be exclusive. Membership can include multiple individuals from a particular agency or group, keeping in mind that some agencies may often be over represented because some agencies or groups have more resources (e.g. staff and money).

All stakeholders effected by the operations of Harris Dam. Some of whom would be Alabama Power Company, Fish and Wildlife Service, Alabama Department of Conservation and Natural Resources, Lake Harris Homeowners, Property owners downstream of Harris Dam, Local and State economic development authority, local



businesses that may be affected by a change in reservoir operations, local county commissioners and mayors.

Membership:

1. Representative of Randolph County Commission
2. Representatives of Towns of Wedowee and Wadley
3. Randolph County Chamber of Commerce
4. Randolph County Industrial Board
5. Education community of Randolph County

Should the Army Corps of Engineers be involved in the early development of this discussion?

There needs to be an identification of key stakeholders for the decision making process, however, all interested parties are invited to the table. The "carp type issue" given as an example will slow the process down. How do we allow these ideas to flow but keep the main goal in focus?

The Army Corps of Engineers should definitely be involved in the process.

The Upper Tallapoosa Watershed Committee has representation here and should be included.

Facilitation, facilitation, facilitation . . .

As a "stakeholder" it is your responsibility to be here, if you are not here and playing an active role should your voice be recognized?

How are stakeholders that represent large groups vote? One vote? Many votes?

Many of the stakeholders have "real jobs" and can not get away for a three day meeting. They still should be included!!!

I heard about this workshop because I was asked by colleagues to attend to provide tech input. I do think that stakeholders should be included (invited) at any time. just because someone didn't participate up till now should not be grounds for exclusion-- quite the opposite-- BECAUSE 1) players change, 2) word spreads 3) some stakeholders might have felt marginalized and need to be reached out to 4) if you don't include them & they are critical they will not support decisions made by the group & may attempt to derail them

Alabama Power Company

Membership definitely should not be exclusionary; however we have seen over time that common goals and objectives exist among stakeholders and large groups without facilitators are not productive. Sub-groups or committees need to be formed.

What "authority" would be designated to implement or enforce the adaptive management plan agreed upon?

Rate payers and stockholders of APC

It is hard to set aside time for such meetings. what about doing some of this remotely (via the internet)? tech-wise we should be able to if needed sit in our offices and type in

responses just like we're doing here

Do we double count stakeholders because they are members of two or more user-groups?

*** Open door membership concerns were expressed. We wouldn't want participation from other States*

*** Members should be directly affected*

*** What's "directly affected?" how should this be defined?*

*** Proximity, use or benefit? AL/GA, or property owners?*

*** Recreational/ownership/use/economic interests are possibilities*

*** Agency/NGO interests*

*** Membership within the State*

*** Shareholders to industries (very indirect connection)*

*** Agency/NGO with direct mgmt or interest in these natural resource issues (BASS/Trout Unlimited/others)*

*** Consider choosing to expand the group gradually*

*** Is this an "invite only" group, or should there be some limits?*

*** Citizens of 2 States*

*** Economically affected parties*

*** Landowners*

How many of the attendees today are employed by Alabama Power. If many, will their input today skew the process?

*** What about including shareholders in the group? Discussion thoughts:*

*** Direct customers would be a better criteria: the people who will have to pay for decisions*

*** Consider the possibilities of scope creep here: could be virtually unlimited (rate increase concerns)*

*** Customers of marina/fishing guides*

*** LOCAL CONSUMING CUSTOMERS may provide an alternative*

Would the actual customers have to be involved, or could it just be an objective of the power co. to minimize rate increases to customers?

*** Use Alabama customers to replace local in our wording*

*** County Commission model? Is this a potential blueprint for governance?*

*** This gets complex quickly...we need some sort of Board/trustee/Executive Committee that makes the actual decisions/votes. Representative opinions need to be funneled through stakeholder groups.*

*** Board/Authority to represent key stakeholders recommended. this would include input from affected interest groups*

- ** *Should meetings be open to interested parties even if they can't vote?*
- ** *What would a Board/Authority look like?*
- ** *Appointed by affected interest group (NGO/homeowners/property owners/Industry)*
- ** *The group recognizes them as a representative (no lone rangers, please)*
- ** *Agencies who work in the area*
- ** *Specifically impacted groups (fishing guides, marina operators)*
- ** *Customer representatives (AL Power/Forestry)*
- ** *Staggered Boards in uneven numbers to enable tie breaking*
- ** *Let the Board appoint a Chair to head it up*

- ** *Open-ended public participation and input have to be considered*

- ** *Distinguish between technical input and decision making here. The policy and management group might be separate from the technical review team and model builders from yesterday's presentations*

- ** *Technical Working Group? Could separate the decisions from the science.*

- ** *Science HAS to be included in Board make-up. An Auburn rep or other specialist would almost have to be a Board member.*

- ** *A neutral ombudsman, familiar with the biology should be on the Board. Concerns about "lowest common denominator" solutions if the Board is made up ONLY of affected interests.*

- ** *Consider a Board Trustee who would represent the Biology/Ecology exclusively to address this concern and potential conflicts of interest.*

- How formal should the structure of the board or authority be?

- What would the board/authority be empowered to do?

- ** *Should an Economist be a designated Board slot? User impact/economic implications would be this perspective. YES! says Willard*

- ** *Agricultural specialty.*

- ** *Economist should also be a neutral person, not representing a specific interest group.*

- ** *Biologist/Economists as Board members or Technical Working Committee: where are they most appropriately positioned?*

- ** *Scientist/Economists as non-voting trustees discussion? Would they really be expected to be impartial or non-involved? Do these roles/responsibilities belong on the Board or as a component of some other Technical Working Committee.*

- ** *Make this decision as the process needs become clearer. Board members or Technical Advisors? We're leaning more in the direction of TWG*

- ** *Broader Board (15-20 members would encourage compromise)*

- ** *Calls*

*** Board*

*** Open forum for stakeholder input and comment*

*** Decisions will be made by a Board*

*** TWG will be comprised of technical advisors/biologist/economists*

*****TIME/TALENT/TREASURE DISCUSSION***

*** ALP has committed to providing a facilitator to move the process forward. ALP has also committed to assisting with funding biological studies to HELP resolve key UNCERTAINTIES that are resulting from the model.*

ALP will also share hydrological modeling results as well as any independent scientific analysis of existing or future modeling

*** Certain Agencies can play because they are mandated to be at the table.*

Research, fish inventories can be built into ongoing monitoring and survey efforts. USFWS, USGS can participate.

*** County assets: time to play. What about staff or other warm bodies? All of this is contracted out, some planning consulting expertise may be leveragable*

*** NGO: can commit to seeking additional funding sources as well as time/talent*

*** Board membership is connected to bringing SOMETHING to the initiative. Should we make this a requirement (to the degree they can) for participation as a GP?*

Show up

Bring time/talent/treasure you can

Membership means more than being there

Each Board member is represented/selected by some group/team;

The board should be a two pronged structure: a.) advisory members(large in scope); and b.) voting members(limited in scope).

2. Rules of Engagement: How will we work together?

By consensus, not a majority rule in order to ensure that no one is excluded. Everyone gives a little to get to a solution that all can accept.

Listen to what people are saying and don't interrupt

Need to define who the whole are if the needs of the few are not to be met at the expense of the whole

There are legal statues which will have be recognized as possible scenarios are discussed.

*** Law/regulatory mandate and economic realities of each stakeholder must be paramount*

*** The Board does not supersede any of these for any partner*

Facilitation will be important

We need to define the limits of the process in terms of the scope of the "issues" there are overriding things such as the status of the water compact negotiations, West Georgia reservoir, which can have direct impact but are beyond the reach of any stakeholder participating in this process

*** GP: recognize by all participation that while we're making evaluations and exploring alternatives other "shaping forces" are out there too. i.e. the MOU between GA/AL specifies development of a drought mgmt plan. Outside events will have to be incorporated into our thinking and models. We have to be real about this.*

Realize that stakeholders sometimes have constraints due to their respective agency/organization.

Clear opportunities for each stakeholder group or their designate to voice their position. It's important that values not be discounted because they aren't science-based.

Nothing brought out today will be new. Issues were discussed and voices heard during the licensing process.

Stakeholders/members need to commit to looking at issues objectively, considering various views and evaluating possible solutions. Avoid "us" and "them" posturing, and look for solutions that meet stakeholders objectives to the maximum extent practicable.

Not let current practices (policies) limit possible alternatives

*** Are recommended changes to regulatory policy a possible outcome?*

*** This is certainly a possibility for the Board to have effective impact*

*** This won't change NEPA/ESA, but may be able to influence other constraining parameters*

There needs to be a clear definition how it will be determined when a particular group's position is "out of bounds." That is, when someone is asking the unreasonable, unethical, or illegal.

*** Ideas for this: (out of bounds concept?)*

*** Ignoring ESA*

*** Draining the lake to maintain minimum flow*

*** We recognize that extreme win/lose solutions will be totally appropriate. Balancing benefits to all stakeholders must be considered*

It is important that we recognize how we got here, that is, how and why was R L Harris developed the way that is was and the regulatory processes that were in place at that time. Equally important is what has changed 'regulatory' and otherwise since R L Harris was developed.

There will be new and good ideas brought out today. We must stay open minded, and sometimes take leaps of faith, for this process to truly work and be adaptive.

Facilitation, facilitation, facilitation

Be open-minded and give everyone an opportunity to express there needs which they would like to see met and the needs that must be met.

Everyone needs to listen to others and attempt to understand their needs and goals for the lake and downstream river

We need to set bounds on issues and limits of operations

Do we create a forum where everyone gets to voice an opinion, or the representative gets to voice an opinion? Too many voices can be problematic, time-wise.

*** Ground rules and requirements to play include....*

*** Adequate time for data analysis and fully evaluate all available science before making choices (Service)*

*** If new data becomes available, all parties will have adequate time to assess it before any decisions are made as fairly as possible*

*** Board members must be active participants or dropped from the Board. Need guidance for replacing non-participating Board members. They have to show up prepared and not miss more than 2 meetings.*

*** Caveat that if/when somebody has to be replaced, they come from the same organization or interest group*

*** The amount of time required for participation has to be defined up front so Board members can know what to expect. 3-day workshops are tough for many to attend.*

*** Structured agendas, clearly communicated with clear expectations of roles/responsibilities*

*** What will be our policy on alternates?*

*** This can be essential for securing continuity.*

*** Some mechanism should be provided (Homeowners)*

*** The key is to avoid wasting the time of other Board members...alternatives have to be grounded in concepts to play*

3. Decision Making

There are myriad issues to discuss that are equally important. What will be the process for determining that we have had enough discussion, and that it is time to ask for a vote/consensus?

Before determining percentage of group agreement necessary to make any particular decision (i.e., 80% agreement), we must agree that all stakeholders are equally represented

As many stakeholders as possible with a 75% or better agreement

Is 75% a realistic goal???

Some stakeholders have asked others to make decisions for them

Do not need to vote to reach a decision.

Each party should recognize that there are outer "limits" for each group and decisions which completely ignore those cannot be successful a decision must be one that can be



moved forward.

If we don't use voting to make decisions, how will decisions be made in a way that incorporates values and needs of all stakeholders?

We cannot set a % number for decision making. It is necessary that decisions pass the test of legal and physical constraints

We need to include only those elements that are relevant to the decisions at hand. e.g., upstream land practices may influence communities, but are not under the control of decision makers downstream.

If we do not vote at least for representation on a governing body, then who gets to make the decisions?

Consensus. Not by vote. Everyone strikes a reasonable compromise.

Consider incremental change as an option.

This not a popular vote process.

Decisions on some key issues will require consultation with higher levels within the agency before committing resources or to an agency position.

We may not be able to have a percentage and a final vote if a particular decision goes against an agencies legal requirements (e.g., species protection) or abilities (e.g., drain the lake to maintain minimum flow)

Avoid mechanisms that might let one stakeholder group load the deck.

Incremental change can be an option, but it is still a change, which may require consensus

APC knows the numbers of flow and economic impact . . . they need to share them with everyone . . . what numbers can they live with v. the best positive reinvestment of biological life.

Reaching a decision will be different for each project. I don't think that rigid percentages can be set.

Impacts to support of Navigational and downstream flows as well as flood control purposes at R L Harris needs be recognized.

Potential reservoir operational changes need to consider the impacts or enhancement to the transition from winter pool elevation to full summer pool.

**** WHAT IS A DECISION AT THE BOARD LEVEL ?**

=====

*** If it's fundamental at odds with any Board member (ESA/legal requirements/NGO charter) the decision has different weight than other choices/selections the Board will have to make.*

**** If it's not legal or possible, the Board can't outvote itself, or membership**

*** Defining different levels of Board decision making recommended*

*** For routine decisions: (opinion/model choices based on science)*

A simple majority should be adequate (half + 1)

Decision making around the model and "level one" decisions

Is this too low a level of consensus...it seems weak to some

2/3rds majority to 75%?

*** The Board should not have a vote on EVERY component of the plan*

*** We will not dictate cost issues to ALP; another "can't outvote" example on a rate structure*

*** Minority perspectives should be captured for dissenting positions*

Objectives & Potential Missing Objectives

- 1. Economic Development: Maximize water for development**
- 2. Economic Development MO (means objective): Maximize growth rates**
- 3. FO Maximize revenue opportunities for Local and County governments**
- 4. Agencies: Maximize native fauna diversity and abundance**
 - Protecting imperiled species might fall under some other category such as maximizing native fauna diversity but that is an Agency concern.
 - Maintaining and protecting native species
 - Maximize Native Fauna and diversity & abundance (NGO's)
- 5. Agencies: Maximize Native vegetation (e.g. shoal lily)**
 - Restoring pre-impact vegetative communities" might better reflect the biological perspective than simply "maximizing native vegetation."
- 6. Agencies MO: Maximize fish populations**
- 7. Agencies MO: Maximize reproductive success**
- 8. Agencies MO: Maximize spawning habitat**
- 9. Landowners: Minimize bank erosion**
- 10. Landowners: Maximize property values**
- 11. Landowners MO: Minimize daily radical fluctuations**
- 12. Landowners MO: Implement ramping routine**
- 13. Reservoir Users: maximize water levels**
 - Reservoir Users - Stabilize Water Levels instead of maximize water levels
- 14. Reservoir Users: Maximize water available for consumption**
- 15. Reservoir Users: Maximize water quality**
- 16. Reservoir Users: Maximize recreational angling and boating opportunities**
- 17. Reservoir Users MO: Minimize water drawdown**
- 18. River Recreation: Maximize recreational angling opportunities**
 - Maximize recreational angling Success (River Recreation) -may need to define "angling opportunities" clearly to include "success" I.e. more and bigger fish.
- 19. River Recreation: Maximize recreational boating opportunities**

20. River Recreation MO: Maximize prey production
21. River Recreation MO: Maintain flow in pools
22. APC: Minimize total cost
23. APC: Maximize operational flexibility
24. APC MO: Minimize flow requirements
25. MO: Minimize downstream flooding/economic loss (Agencies/APC)
26. NGO: Minimize river fragmentation
27. NGO: Maximize water quality
28. NGO: Minimize consumptive uses (net loss)
29. (NGOs) Conserving water for the future
30. MO: where licenses permit, generically examine the role of high water events (that don't trigger flood control events) in floodplain forest health, fish spawning, and invertebrate food base production

We won't go outside any of the requirements specified in any operating license

31. Guiding Principles and Other Thoughts

Regulatory agency: needs the outcome to be enforceable

MO: Mitigation for losses due to low/inadequate flows

APC MO: Compensation for lost generation revenue

Ocoee river user fees paid for water releases

MO: Minimizing impervious surfaces

Maximize waterfowl hunting opportunities (Reservoir users/River Recreation)

Synchronize series of reservoirs and dams so that the entire system functions more naturally

Mimicking seasonal flow patterns, etc., all are important in attempting to achieve a natural flow regime

The terms "Maximize and Minimize" are too positional -- perhaps "Equalize" is more appropriate

Objectives Poll I

Voting Results

10-Point Scale (Allow bypass)

Number of ballot items: 31

Total number of voters (N): 23

Mean

8.18	1. Reservoir Users: Maximize water quality
8.14	2. NGO: Maximize water quality
7.77	3. Reservoir Users: Maximize recreational angling and boating opportunities
7.09	4. MO: Minimize downstream flooding/economic loss (Agencies/APC)
7.05	5. Reservoir Users: maximize water levels
7.00	6. Reservoir Users MO: Minimize water drawdown
7.00	7. MO: where licenses permit, generically examine the role of high water events (that don't trigger flood control events) in floodplain forest health, fish spawning, and invertebrate food base production
6.91	8. Agencies MO: Maximize spawning habitat
6.91	9. NGO: Minimize consumptive uses (net loss)
6.90	10. APC: Maximize operational flexibility
6.86	11. (NGOs) Conserving water for the future
6.86	12. Agencies MO: Maximize reproductive success
6.82	13. Agencies: Maximize native fauna diversity and abundance
6.68	14. FO Maximize revenue opportunities for Local and County governments
6.68	15. APC: Minimize total cost
6.64	16. Landowners: Minimize bank erosion
6.59	17. Agencies: Maximize Native vegetation (e.g. shoal lily)
6.59	18. River Recreation: Maximize recreational angling opportunities
6.59	19. Agencies MO: Maximize fish populations
6.48	20. Economic Development: Maximize water for development
6.48	21. Economic Development MO (means objective): Maximize growth rates
6.41	22. River Recreation: Maximize recreational boating opportunities
6.36	23. Landowners: Maximize property values
6.27	24. Reservoir Users: Maximize water available for consumption
6.14	25. River Recreation MO: Maximize prey production
6.14	26. Landowners MO: Implement ramping routine
6.14	27. Landowners MO: Minimize daily radical fluctuations
6.05	28. NGO: Minimize river fragmentation
6.00	29. River Recreation MO: Maintain flow in pools
5.95	30. APC MO: Minimize flow requirements
3.86	31. Guiding Principles and Other Stuff

Number of Votes in Each Rating

	10	9	8	7	6	5	4	3	2	1	Total	STD	n
1. Reservoir Users: Maximize water quality	7	2	8	1	1	3	0	0	0	0	180	1.71	22
2. NGO: Maximize water quality	7	3	7	1	0	3	1	0	0	0	179	1.88	22
3. Reservoir Users: Maximize recreational angling and boating opportunities	7	1	5	3	1	5	0	0	0	0	171	1.95	22
4. MO: Minimize downstream flooding/economic loss (Agencies/APC)	6	1	3	1	2	8	1	0	0	0	156	2.22	22
5. Reservoir Users: maximize water levels	6	1	3	2	2	4	4	0	0	0	155	2.34	22
6. Reservoir Users MO: Minimize water drawdown	6	1	2	2	3	5	3	0	0	0	154	2.29	22
7. MO: where licenses permit, generically examine the role of high water events (that don't trigger flood control events) in floodplain forest health, fish spawning, and invertebrate food base production	7	0	6	0	0	3	1	0	0	3	140	3.23	20
8. Agencies MO: Maximize spawning habitat	5	0	6	0	2	6	3	0	0	0	152	2.22	22
9. NGO: Minimize consumptive uses (net loss)	5	1	5	1	0	7	2	1	0	0	152	2.35	22
10. APC: Maximize operational flexibility	8	0	2	0	1	8	0	0	1	1	145	2.9	21
11. (NGOs) Conserving water for the future	5	0	6	0	1	7	3	0	0	0	151	2.25	22
12. Agencies MO: Maximize reproductive success	5	1	5	1	2	4	3	0	0	1	151	2.53	22
13. Agencies: Maximize native fauna diversity and abundance	7	0	3	0	2	5	4	1	0	0	150	2.58	22
14. FO Maximize revenue opportunities for Local and County governments	5	0	3	1	2	10	1	0	0	0	147	2.15	22
15. APC: Minimize total cost	6	1	2	2	1	8	0	0	0	2	147	2.78	22
16. Landowners: Minimize bank erosion	3	0	8	2	0	5	3	0	0	1	146	2.34	22
17. Agencies: Maximize Native vegetation (e.g. shoal lily)	5	0	4	0	3	5	5	0	0	0	145	2.32	22
18. River Recreation: Maximize recreational angling opportunities	6	0	2	1	1	8	4	0	0	0	145	2.4	22
19. Agencies MO: Maximize fish populations	5	0	5	0	2	6	3	0	0	1	145	2.54	22
20. Economic Development: Maximize water for development	5	1	3	1	0	9	2	2	0	0	149	2.45	23
21. Economic Development MO (means objective): Maximize growth rates	3	0	4	3	0	9	2	0	0	0	136	1.99	21
22. River Recreation: Maximize recreational boating opportunities	4	0	3	3	1	6	5	0	0	0	141	2.2	22
23. Landowners: Maximize property values	5	1	1	1	1	11	1	0	0	1	140	2.5	22
24. Reservoir Users: Maximize water available for consumption	5	0	2	1	1	10	1	1	1	0	138	2.45	22
25. River Recreation MO: Maximize prey production	4	0	2	3	0	7	5	1	0	0	135	2.29	22
26. Landowners MO: Implement ramping routine	2	1	7	1	2	1	6	0	0	2	135	2.62	22
27. Landowners MO: Minimize daily radical fluctuations	3	0	7	2	0	3	4	0	1	2	135	2.78	22
28. NGO: Minimize river fragmentation	4	2	4	1	0	4	2	1	1	3	133	3.17	22
29. River Recreation MO: Maintain flow in pools	4	0	2	2	2	5	6	0	0	1	132	2.47	22
30. APC MO: Minimize flow requirements	4	1	4	1	0	3	5	2	0	2	131	2.94	22
31. Guiding Principles and Other Stuff	0	0	0	0	0	5	0	0	0	2	27	1.95	7

Governance Guidelines

Mean

- 3.78 1. Board members will commit some level of time, talent or treasure (resources) to the effort
- 3.77 2. Members will communicate openly and honestly about their needs
- 3.74 3. Board members will be appointed, elected or clearly-identified spokespersons for their interest group
- 3.74 4. Regular agendas and meeting times will be posted well in advance to enable maximum participation
- 3.70 5. Scientific findings will be distributed well in advance of Board meetings to allow adequate preparation by Board members
- 3.67 6. Board members will make every effort to be flexible, open to new ideas and listen to the ideas of others
- 3.59 7. The Board will not vote on regulatory, legally-mandated, license or other fundamental economic issues as part of this process
- 3.56 8. A facilitator will be used in the early stages of model development
- 3.56 9. Board members can bring alternates and technical advisory staff as non-voting members
- 3.52 10. No extreme positions (dramatic win/lose proposals) will be introduced into Board discussions (i.e. draining the lake)
- 3.50 11. Board meetings will be scheduled at a time and location convenient to all (evenings preferred)
- 3.48 12. Public input will be part of ongoing meetings and operations, but this input will be non-voting
- 3.44 13. GP: All Board members commit to be engaged for the long-term (5-7 years minimum)
- 3.44 14. Technical advisor team consisting of model builders, technical experts, a neutral biologist and a neutral economist will be established
- 3.44 15. Technical advisory team will be concerned with science and not policy management
- 3.41 16. Alternates can vote if the designated member is not present, provided they have regularly attended Board sessions and/or well informed on Board issues
- 3.41 17. GP: The process is underway, we don't back up for new members
- 3.37 18. Big outside regulatory, legal, and government agreements (i.e. tri-state water compact and the like) will need to be folded into the agreement as they occur
- 3.33 19. The Board will elect a Chairperson
- 3.33 20. A quorum will be established based on the number of members attending Board meetings
- 3.30 21. Minority positions (after a decision has been made) will be captured for later review
- 3.23 22. A project manager is needed to coordinate activities
- 3.23 23. Board members missing 2 (two) consecutive meetings will be asked to resign (alternates excepted)
- 2.96 24. Proxy voting will be acceptable within very strict guidelines (to be determined)
- 2.70 25. The Board will seek consensus in all decisions, but when a vote is required a 2/3rds majority can make decisions on the model and basic objectives
- 2.63 26. The Board will seek consensus in all decisions, but when a vote is required 75% majority can make decisions on the model and basic objectives
- 2.11 27. Proxy voting will be acceptable
- 1.96 28. The Board will seek consensus in all decisions, but when a vote is required a simple majority can make decisions on the model and basic objectives
- 1.85 29. Only 100% should be acceptable for Board decisions



	4 Strongly Agree	3 Agree	2 Disagree	1 Strongly Disagree	Total	STD	n
1. Board members will commit some level of time, talent or treasure (resources) to the effort	21	6	0	0	102	0.42	27
2. Members will communicate openly and honestly about their needs	20	6	0	0	98	0.43	26
3. Board members will be appointed, elected or clearly-identified spokespersons for their interest group	20	7	0	0	101	0.45	27
4. Regular agendas and meeting times will be posted well in advance to enable maximum participation	20	7	0	0	101	0.45	27
5. Scientific findings will be distributed well in advance of Board meetings to allow adequate preparation by Board members	19	8	0	0	100	0.47	27
6. Board members will make every effort to be flexible, open to new ideas and listen to the ideas of others	18	9	0	0	99	0.48	27
7. The Board will not vote on regulatory, legally-mandated, license or other fundamental economic issues as part of this process	19	6	1	1	97	0.75	27
8. A facilitator will be used in the early stages of model development	15	12	0	0	96	0.51	27
9. Board members can bring alternates and technical advisory staff as non-voting members	16	10	1	0	96	0.58	27
10. No extreme positions (dramatic win/lose proposals) will be introduced into Board discussions (i.e. draining the lake)	15	11	1	0	95	0.58	27
11. Board meetings will be scheduled at a time and location convenient to all (evenings preferred)	14	11	1	0	91	0.58	26
12. Public input will be part of ongoing meetings and operations, but this input will be non-voting	14	12	1	0	94	0.58	27
13. GP: All Board members commit to be engaged for the long-term (5-7 years minimum)	12	15	0	0	93	0.51	27
14. Technical advisor team consisting of model builders, technical experts, a neutral biologist and a neutral economist will be established	12	15	0	0	93	0.51	27
15. Technical advisory team will be concerned with science and not policy management	13	13	1	0	93	0.58	27
16. Alternates can vote if the designated member is not present, provided they have regularly attended Board sessions and/or well informed on Board issues	11	16	0	0	92	0.5	27

17. GP: The process is underway, we don't back up for new members	13	12	2	0	92	0.64	27
18. Big outside regulatory, legal, and government agreements (i.e. tri-state water compact and the like) will need to be folded into the agreement as they occur	10	17	0	0	91	0.49	27
19. The Board will elect a Chairperson	9	18	0	0	90	0.48	27
20. A quorum will be established based on the number of members attending Board meetings	11	14	2	0	90	0.62	27
21. Minority positions (after a decision has been made) will be captured for later review	8	19	0	0	89	0.47	27
22. A project manager is needed to coordinate activities	8	16	2	0	84	0.59	26
23. Board members missing 2 (two) consecutive meetings will be asked to resign (alternates excepted)	10	13	2	1	84	0.76	26
24. Proxy voting will be acceptable within very strict guidelines (to be determined)	6	16	3	2	80	0.81	27
25. The Board will seek consensus in all decisions, but when a vote is required a 2/3rds majority can make decisions on the model and basic objectives	6	10	8	3	73	0.95	27
26. The Board will seek consensus in all decisions, but when a vote is required 75% majority can make decisions on the model and basic objectives	6	8	10	3	71	0.97	27
27. Proxy voting will be acceptable	2	8	8	9	57	0.97	27
28. The Board will seek consensus in all decisions, but when a vote is required a simple majority can make decisions on the model and basic objectives	1	6	11	9	53	0.85	27
29. Only 100% should be acceptable for Board decisions	2	2	13	10	50	0.86	27

Lessons Learned and Recommendations

1. Include definitions section to get members on same frame of reference
2. Stress & Re-stress definitions of maximize and minimize
3. Adequately advertise and contact potential stakeholders to encourage participation by a wide variety of groups and foster an atmosphere of inclusion.
4. Make sure there are equal number of participants from all stakeholders groups.
5. Clearly define the difference between objectives and actions,
6. Identify protocols for electing chairpersons and selecting facilitators/project managers
7. One board rep per agency
8. Do not allow over-representation when setting goals/objectives
9. Equity of stakeholder representation - voting skewed by many reps representing one entity (i.e. APC)
10. Short overview of modeling
11. Meetings should be face to face (not phone conferences) as much as possible to maximize effectiveness of meetings.
12. When developing or discussing a "generic" plan or model you should not let a real life issue become confused with it.
13. Stress the fact that identification of objectives is not synonymous with the valuation (e.g. rankings) of objectives. Also stress that the valuations will be conducted by the board.
14. Identify available data
15. Alabama Office of Water Resources should be key player/pivot
16. All data should be shared in advance of meeting.
17. Cannot over-emphasize the importance of good facilitation.
Good job, B.
18. Stress the fact the modeling will only begin after the identification of objectives and decision alternatives.
19. Identify extreme/unreasonable requests
20. No attorneys
21. Don't try to pretend that the "smelly" dead moose is not on the table; deal with the issue.
22. Be Reasonable

Proposed Purposes of the Board (1.1)

- Managing and improving a single source Adaptive Management Model for science-based decision-making
- Providing a forum for judging the success of the Adaptive Management process that will continuously improve and refine the model
- Balancing river restoration with hydropower generation and reservoir needs
- Examining and recommending consensus-based modifications to operations from RLH that improves river conditions below the dam
- Exploring and communicating issues that could be impacted by recovering the river below the dam

Recommended Guiding Principles

- Membership on the Board will never preclude a member from exercising their rights (individually or on behalf of the group they represent) and acting independently
- The model is a tool, not a decision package that produces automatic outcomes. Ultimate choices will be made by participating resource agencies and members. The Board will influence these decisions, but will not have authority to impose them.
- Recommendations of the Board need to carry weight. Speaking with a strong, unified voice is recognized as the chief means of accomplishing this. Strongly supported, consensus-based recommendations will be a guiding principle. Such positions will provide credibility and help avoid court-imposed solutions that are unsatisfactory to all.
- Strong, consensus-based recommendations will gain attention and respect from FERC. This must be considered as well.
- The Board will be a very long-range project continuing over time. 5-7 year participation should be expected from member organizations
- Board members will strive for a more candid discussion of difficult issues in face-to-face situations and less public confrontation in the media. Confrontational approaches are recognized as generally unproductive to the process.
- Board members may want to agree to specified "wait and see" period (6-months?) that will enable the process to get established. During this period, members will agree not to toss any legal "bombs" or initiate new post card campaigns.
- Early tangible progress will enable some Board members to demonstrate positive results. This will enable and encourage continued participation.

A draft will be prepared and submitted at the next Board meeting by Katie Mickett

Harris Objectives (Version 1.1)

1. Maximize water for economic development

2. Maximize economic development opportunities

3. Maximize native fauna diversity and abundance

4. Maximize native floral diversity and abundance

5. Minimize bank erosion downstream from Harris

Planned - controlled growth in the watershed area for ag, retail, commercial and industrial areas

6. Maximize reservoir water level

Minimize bank erosion UPSTREAM from Harris was proposed

This CAN be included in the modeling, but potentially, this is a huge issue. Modelers advise considering thoroughly the scoping implications if this is added to AM objectives

Boat traffic a key factor

The precision of cause/effect has a lower degree of confidence for the model builders

7. Maximize water (economically) available for consumption

8. Maximize reservoir water quality

9. Maximize reservoir angler/recreation opportunities

Swimming access opportunities at Lake Wedowee are limited and largely confined to boat docks & ramps. Flat Rock is the only alternative for many residents.

Swimming access to the lake would be useful to some homeowner associations.

10. Maximize boating opportunities downstream from Harris

Maximizing boating opportunities upstream from Harris suggested as well

11. Maximize angler opportunities downstream from Harris

This needs further discussion and clarification. It could mean either access or angler success. Not everyone baits their hooks when they go fishing. Need to agree to agreement on the assumptions here. What are the opportunities downstream?

12. Minimize total cost to APC

13. Maximize APC operation flexibility

14. Minimize river fragmentation

15. Maximize water quality downstream from Harris

This may present an opportunity for increased monitoring of water quality coming into the reservoir. This is already covered in objective 8.

16. Minimize consumptive uses (net loss)

Harris Governance Guidelines

- 1. Guiding Principal: The process is underway, we don't back up for new members**
- 2. Guiding Principal: All Board members commit to be engaged for the long-term (5-7 years minimum)**
- 3. Board members will be appointed, elected or some other clearly-identified spokesperson for their interest group**
- 4. All Board members commit some level of time, talent or treasure (resources) that will be contributed to the effort**
- 5. Board members may bring alternates and technical advisory staff to participate as non-voting members**
- 6. Board alternates may vote if the designated member is not present, provided they have regularly attended Board sessions and/or well informed on Board issues.**
- 7. The Board will not vote on regulatory, legally-mandated, license or other fundamental economic issues as part of this process**
- 8. Minority positions (after a decision has been made) will be captured for later review**
- 9. Public input will be part of ongoing meetings and operations, but any such input will be strictly non-voting**
- 10. Regular agendas and meeting times will be planned and posted well in advance to enable maximum participation**
- 11. Scientific findings will be distributed well in advance of Board meetings to enable adequate technical preparation by Board members**
- 12. Commitment to participate is crucial. Board members missing 2 (two) consecutive meetings will be asked to resign (alternates excepted)**
- 13. A technical advisory team (or teams) will be chartered by the Board. This team will include model builders, technical experts, a neutral biologist and a neutral economist and others as needed to address Board-chartered issues.**

The technical advisory team is not a decision-making body. Membership is not restricted to the functions listed

There is no limitation to a single technical advisory team. Multiple teams may be established as determined and chartered by the Board.
- 14. The technical advisory team will focus on specific technical issues, not policy management**
- 15. The Board will seek consensus in all decisions, but when a decision is required a 2/3rds majority will constitute a decision on the model and basic objectives**

Quorum will consist of 50% of attendees +1
- 16. A facilitator will be used to guide the early stages of model development**



- 17. The Board may elect a Chairperson in the future**
- 18. Members will communicate openly and honestly about their needs**
- 19. Board members will make every effort to be flexible, open to new ideas and listen to the ideas of others**
- 20. A project manager is needed to coordinate activities. Katie Mickett will fulfil this role for the next year.**
- 21. Big outside regulatory, legal, and government agreements (i.e. tri-state water compact and the like) will need to be integrated into the AM model as they occur**
- 22. No extreme positions that would result in dramatic win/lose proposals for Board members will be introduced Board discussions (i.e. draining the lake)**
- 23. Board meetings will be scheduled at a time and location convenient to all (evenings preferred)**
- 24. A quorum will be established based on the number of members attending Board meetings**
- 25. Proxy voting will be acceptable on issues determined by the Board**

5/1 Discussion Notes

Missing members from the Board discussion that will be included in the future will include:

AL Parks & Recreation
Office of Water Resources
Middle Tallapoosa (x)
Clay County Commissioner

- Governance discussion: we agree to one person, one vote for Board decisions
- **Assume 15 to 18 Board members; what's a quorum?**
 - 1 more than half would equal 9 for a simple majority. This is typical for most 5013c corporations. Avoid a specific number for now. Brett recommends 1 + 50% for a quorum or 51%
 - Can't call a vote with less than half the Board members present at any meeting
- Governance is about the objectives and assumptions that the model will take in providing management choices. It should provide a mechanism for working together. This will guide the assumptions that go into the technical model.
- Strong Majority for decisions? What's a choice?
- Worst case would be 9 present with 6 in favor. Meeting could take place in this case, but decisions could NOT be made. Since we're allowing proxies there should be few problems in the future with low turnout.
- Is it OK to teleconference in for a Board meeting? What about a situation where USFWS might get called out for an emergency situation? Agreed that this will be acceptable under special circumstances for exceptional situations.
- If a situation is well-defined and communicated well in advance, proxies could be sent out in advance for discussion and voting, proxies will be OK. Last minute call-ins, or e-mail proxy votes are to be discouraged. We want full participation at the meetings.
- Quorum is a majority of members +1. The Board can have a discussion at any time, but 2/3 majority of membership will be required for a decision.
- Selecting a Chair should be defined. The role of the Chair would be to keep order, maintain an orderly flow of agenda (to organize, but not control), and distribute meeting minutes. A neutral, (nonvoting) manager/Chair was discussed. Counterpoint is it can be difficult to find a 3rd party with sufficient energy
- If a facilitator is used, it may not be necessary to have a Chair for the committee. Organizing, meeting setup/scheduling dates and calendars neutrally managing sessions, conducting the meetings and moving agendas forward could be potential roles for this person. The team chose to start with this format.
- Central project scheduling and project management has been a past weak link in keeping this project organized. Everybody agrees this is important, but without a central coordinator this is tough. There could be separate roles from the facilitator. The role of making sure the data is moving and calendars are coordinated and communication flows is critical.

- It is possible that the facilitator could be the same as the project manager
- Any candidates for potential Project Managers? Katie's position is funded for the year. This could be an alternative for coordination. Can the grant be renewed beyond one year via Auburn University? This provides a full year of organization for moving ahead. Katie will provide website, coordination and calendaring for a year
- APC agrees to sponsor a reasonably-priced facilitator, as needed for a year.
- Proxy voting will be acceptable on issues determined by the Board

Objectives Discussion Notes

- Separate capital cost and operating costs could be helpful from some Board members to understand the issues. A clearer understanding of the hard numbers was requested. Capital costs vs. loss percentage. Dollar figures on the operating costs of lost hydropower generating would be beneficial in the model
- Swimming access for Lake Wedowee is limited. Primarily restricted to boat ramps
- There may be value in dividing up the 47 miles of river reach into segments. Not all of it is in the same condition. Not all has the same potential for restoration (or associated cost). Brad proposes 3 segments:
 - Harris dam to Crooked Creek
 - Crooked Creek to Wadley
 - Wadley downstream.
- Does this make sense from a feasibility perspective? From a practicality standpoint, biological data isn't available for all of these segments yet. Other factors (hydrology) could be modeled though.
- Stan: degradation downstream from the dam is a given. Partition of impact might make sense for this reason. Increased flows could come from the dam and other structures. A long-term issue
- The FERC perspective: the AM model is extremely helpful. If in the context of the Board/Stakeholder team FERC can see local decisions made at a local level it's much more likely FERC can support the recommendations. Outside influences can potentially present problems to FERC. Understand that they are an independent commission that makes their own choices. There are strong trends, but no guarantees. The stronger the recommendations the Board can make, the greater the chance that the Commission will listen and support them.
- **A draft of the Board's charter will be prepared for the next meeting**
- What's a reasonable length of time? Brad thinks 2 months is adequate time to develop a plan to put water back in the river. The model is not a panacea to guide decision making, it will not be accepted uncritically. If progress is being made toward the goal Brad's team will modify pressure tactics.
- Uncertainty is one of our biggest challenges for all partners. Establishing a starting point will enable the Board to move ahead. We can assume that whatever choice we make on the model initially will be wrong. We won't get the first edition perfect.

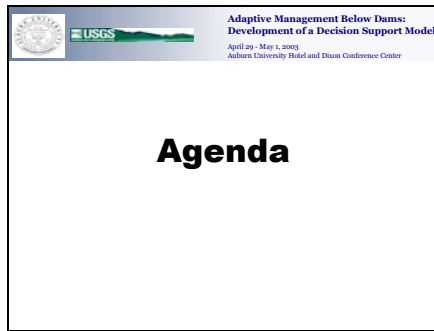
- Building trust on the Board is a key component. Steps to overcome this baggage have to be taken. Board members need to be accessible to the media, but controlling public discord and having fewer discussions/conflicts in the media would be useful. We can't bring back the post cards that are out there already.
- Overstatement of claims (ecological desert) has damaged trust and credibility. Sensationalizing the Tallapoosa river headlines needs to be countered to the degree the Board can agree on the facts and situational analysis
- Requests for quick action are appreciated, but immediate response may be too optimistic at Brad's 60 day target. Something needs to start to happening and tangible results need to be shown. A 6 month trial period was recommended.
- What did we agree on today? What progress was made? Being able to say the same thing is a huge advantage when we go to the media.
- The Board agreed to pend a decision on electing a Chair the future
- How will members be appointed to the Technical committee? The Board will look for expertise for answering specific issues and sanction specific technical committees to address them.
- The Board is not expecting one model; there is room here for competing beliefs (Duck model is a good example).
- A joint statement on state of the river/reservoir and challenges would be valuable. For next meeting, each Board member will prepare a list setting forth:
 - This is what we think the facts are; what we think we agree on
 - What where we disagree
 - This is where we agree there is uncertainty
- A starting fact sheet of agreement/uncertainties and disagreements will be prepared by Katie
- Stan updated the team on other factors in the works. A process began in 1998 and has changed direction several times. Players have been come and gone. This meeting is an attempt to resurrect these efforts more formally and pick up the pace. Today's meeting doesn't mean that past work is invalid or should be ignored. AL DNR will soon present a concept paper to ALC on what we believe we can live with. This process will not be slowed or halted. ALC can determine if they would like to address the proposal or incorporate it into Board agenda for discussion. The proposal will contain 2 segments (concept and figures).
- AL DNR is a proponent of both the river and the reservoir. It can't operate on the premise that the model will drive the solution. Agency expectations are that it may not help at Harris, but could be when Harris comes up for relicensing.
- AL DNR wants to support the AM Board and is willing to share the recommendations with the Board. ALC needs to approve. USFWS supports...doesn't want to wait 5-7 years to see results.
- **ALC: Strawman has to be evaluated by the Board and modelers and will be shared. ALC will respond.**




- FERC: this is a tremendous opportunity to listen to a broadband of stakeholders and make a call at the local level vs. the Federal level. The Commission almost always recognizes this as a preferable way to go.
- A communication strategy for Board members needs to be developed. Homeowner representatives especially want to be involved. Some feel they haven't participated fully in DNR's process. Discussion revealed that there are multiple reasons for this...all easily addressed.
- Brett recommended a future meeting norm that very little positive is served by reliving the past. Agreeing, as a team, to leave past issues behind would be productive.
- Calendar Discussion: Next Board meeting may need to be scheduled quickly enough so complete digestion of the ALDNR proposal won't be possible.
- **Next Meeting scheduled for Alabama Power, Roanoke facility, Wednesday 5/21 at 6 p.m. (approximately 3 hours)**
- **Agenda items:**
 - Each group will assemble a version of the starting point that will enable the team to develop a joint communiqué. Bullets please on what we agree on, disagree and areas of uncertainty. Send to: Katie Mickett (mickekd@acesag.auburn.edu) 334-844-9318. www.ag.auburn.edu/alcfwru/fisheries
 - A draft purpose statement will be distributed in advance that will enable the Board to write a charter. This specify the "ins and outs" of what the Board will stand for.
 - Some form of the AL DNR model proposal will be presented for discussion. It may separate into concept and figure segments. APC agrees it is OK to distribute whatever is available to the team. Modeling review will take time at APC, so figures may not be part of the package. Some form of overview of the concept piece will be presented.
 - Formal approval of Board membership, governance and operating guidelines

Appendix: Pre-session Feedback Results

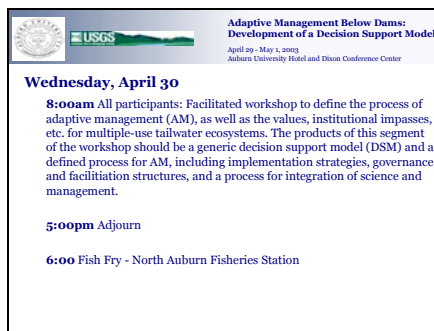
Slide 1





**Adaptive Management Below Dams:
Development of a Decision Support Model**
April 29 - May 1, 2003
Auburn University Hotel and Dioxin Conference Center

Agenda

Slide 2




**Adaptive Management Below Dams:
Development of a Decision Support Model**
April 29 - May 1, 2003
Auburn University Hotel and Dioxin Conference Center

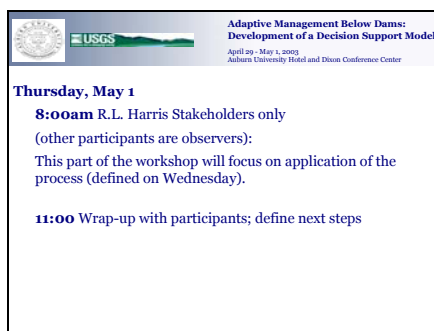
Wednesday, April 30


8:00am All participants: Facilitated workshop to define the process of adaptive management (AM), as well as the values, institutional impediments, etc. for multiple-use tailwater ecosystems. The products of this segment of the workshop should be a generic decision support model (DSM) and a defined process for AM, including implementation strategies, governance and facilitation structures, and a process for integration of science and management.

5:00pm Adjourn

6:00 Fish Fry - North Auburn Fisheries Station

Slide 3




**Adaptive Management Below Dams:
Development of a Decision Support Model**
April 29 - May 1, 2003
Auburn University Hotel and Dioxin Conference Center

Thursday, May 1

8:00am R.L. Harris Stakeholders only
(other participants are observers):
This part of the workshop will focus on application of the process (defined on Wednesday).

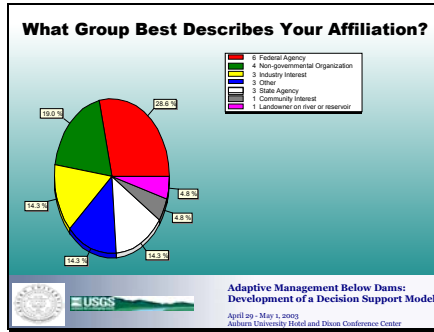
11:00 Wrap-up with participants; define next steps

Slide 4

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Pre-session Feedback Summary

Slide 5



Slide 6

Key challenges


- Lack of trust between partners
- Lack of understanding about what adaptive management is/isn't
- Balancing adequate flows to protect the fauna of the river without serious economic impacts to Alabama Power Company
- Participation from a representative group of all stakeholders
- Agreement that proposals will be based on sound science
- Willingness to compromise on individual benefits for the broader health of the river system
- Lack of easily accessible support data or information for decisions
- Past animosity

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Key Challenges

- Willing sources of funding
- Uncertainty what power generators may be asked/required to do or what it will cost
- Complex/expensive performance monitoring requirements for each round of the adaptive management process. Unknowns of what they might be or become.
- Limited understanding of hydrological or geomorphological processes
- Lack of agreement on management objectives (Winners/Losers)
- Lack of future-oriented thinking; too profit-centered




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Slide 8

Factors that could be part of a Win/Win

- We are at the table talking to each other, so there must be some value in it.
- Clearly understanding operational constraints
- Compromise: accepting everyone won't get everything they want
- Understanding the difference between needs and positions
- Building trust that allows a more objective look at the data by partners
- Diverse stakeholder representation and participation
- Federal Law
- ID of the key environmental and economic parameters that can be measured
- More/better communication between all parties




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Factors that could be part of a Win/Win

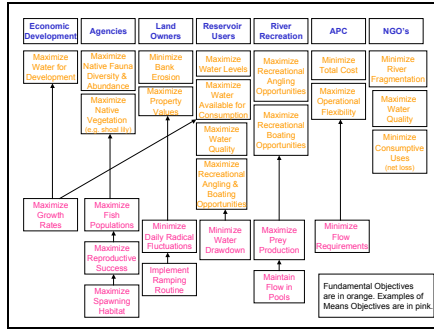
- Definition of clearer goals for all parties involved
- A belief that knowledgeable water managers and biologists are not as far apart on the issue as some might fear
- The scientific understanding of river systems has increased, along with our ability to model and study them, and produce convincing scenarios that benefit a broad range of users.
- Flexibility for future generations to make adjustments and develop revised solutions that will fit the altered conditions which will exist then.
- Desire of most stakeholders to seek a compromise solution satisfactory to the majority.



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Slide 10



Slide 11

Missing Objectives?


- The terms "Maximize and Minimize" are too positional -- perhaps "Equalize" is more appropriate.
- Maximize revenue opportunities for Local and County governments
- Regulatory agency: needs the outcome to be enforceable
- Compensation for lost generation revenue
- Meeting resource management goals and objectives should be considered in attaining objectives
- The role of flooding in floodplain forest health, fish spawning, and invertebrate food base production
- The role of flooding in reducing property values and causing economic loss.


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Slide 12

Missing Objectives?


- The goal of many NGO's relative to river management is the maintenance and recovery of biodiversity, and to naturalize ecosystem function relative to current operational regimes.
- Restoring a natural system to include a functioning aquatic ecosystem to enhance all aquatic creatures not just fish.
- (NGOs) Conserving water for the future
- Maintaining and protecting native species
- Minimizing impervious surfaces
- Other Federal agencies such as the Corps of Engineers would be interested in balanced various resource uses such as flood control, navigation, hydropower generation, fish and wildlife conservation (reservoir and river), M&I water supply, water quality


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Missing Objectives?

- Federal Maritime Administration would be interested in barge navigation (flow support for downstream areas on the Alabama River, etc.
- Maximize Native Fauna and diversity & abundance (NGO's)
- Maximize recreational angling Success (River Recreation) -may need to define "angling opportunities" clearly to include "success" i.e. more and bigger fish.
- Maximize waterfowl hunting opportunities (Reservoir users/River Recreation)
- Maximize safe swimming opportunities (Reservoir Users/River Recreation)
- Minimize downstream flooding/economic loss (Agencies/APC)
- Synchronize series of reservoirs and dams so that the entire system functions more naturally (Agencies/APC/NGO's)




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Missing Objectives?

- Maintaining a continuous instream flow of sufficient quantity and quality.
- Limit the number of hydropeaking events per day
- Mimicking seasonal flow patterns, etc., all are important in attempting to achieve a natural flow regime.
- Many of the objectives which fall under NGO's or land owners (habitat fragmentation, habitat stability or bank erosion, etc.) would also fall under the concerns of Agencies.
- Protecting imperiled species might fall under some other category such as maximizing native fauna diversity but that is an Agency concern.
- Restoring pre-impact vegetative communities" might better reflect the biological perspective than simply "maximizing native vegetation."
- Reservoir Users - Stabilize Water Levels instead of maximize water levels

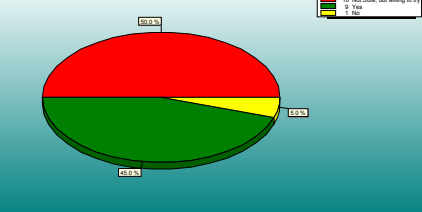


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Do you believe it is possible to create an Adaptive Management Plan acceptable to all parties?



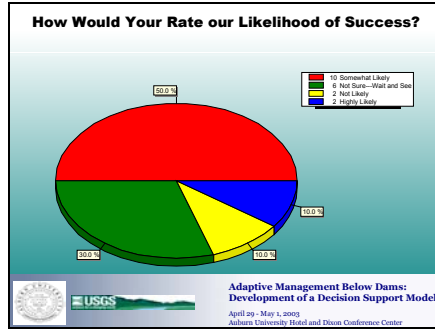
Response	Percentage
Yes	70%
No	20%
Not sure	10%



**Adaptive Management Below Dams:
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Slide 17

- Ingredients of a Productive Workshop**
- Objectivity and fairness
 - Good initial ground rules
 - We need to be aware there are many very complex issues and a stakeholder with a single issue can slow the process down when discussing very technical issues. Can Stakeholders and issues be grouped to expedite reaching a solution?
 - A genuine desire to remain engaged
 - Development of "trust" relationship between involved stakeholders
 - Partners should be able to support their positions with science, whether arguing for consistent lake levels or naturalized river regime.
 - Agreement the needs of the whole are greater than needs of the few
 - A clear understanding there is value in the long view.
- Adaptive Management Below Dams:
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- Ingredients of a Productive Workshop**
- Clear definition of what the "long view" means
 - Getting each group to clearly define their needs
 - Agreement for all groups to listen
 - Participants need to trust that the data will lead to answers
 - The idea that the adaptive management does not have to be open ended will help some parties.
 - This workshop premise must be enforced in fairness to all participants
- Adaptive Management Below Dams:
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Ingredients of a Productive Workshop

- Encouraging folks to get to know others on a more personal level who are not in their "categories". Encourage everyone to break bread.
- Get all stakeholders represented/involved in the process (including this workshop and subsequent dialogue/email/meetings).
- Make good faith offers for meaningful changes
- Willingness to accept tradeoffs
- Start with a clean slate
- Be creative with solutions
- Be armed with facts that are accurate and trusted by all(most) partners.
- Facilitate without bias



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Ingredients of a Productive Workshop

- Don't hold nothin' back. Get everything out in the open
- Open-mindedness & frankness
- Key stakeholders must be present
- Candid and above board negotiations from all stakeholders




**Adaptive Management Below Dams:
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Additional Thoughts

- Open, honest dialogue during and after the workshop is a must
- Balance stakeholder representation and participation in a theoretical exercise that does not overshadow, represent or anticipate an actual reality
- I welcome an opportunity to shape river operations toward more natural conditions, and do away with rigid artificial regimes based on comfort, laziness, and fear.
- Protect and enhance aquatic resources of impounded and riverine waters.
- Mutual respect for opinions. Consensus on issues.
- Linkage to Corps mission
- Funding to support participation




**Adaptive Management Below Dams:
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Other Thoughts

- Willingness for all participants to be able to compromise to reach a solution.
- Willingness of Alabama Power company to accept some economic impact to facilitate a solution that is favorable to the enhancement fauna diversity and recreational flows.

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Let's Get Busy

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**Adaptive Management Workshop
Process Objectives**


- The purpose of this process will be to engage the Tallapoosa stakeholders to determine if a consensus-based recommendation that can be accepted and adopted by Alabama Power Company for managing flows on the river.
- For the Adaptive Management recommendation to be successful, Management Objectives of the power company and the Resource Objectives of stakeholders must be evaluated to determine if a "common ground" can be identified that will satisfy the greatest number of constituents.



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Adaptive Management Process Challenges

- Criteria from all stakeholder for buy-in and commitment to the decision needs to be gathered up front
- Trust of each party in the purpose and process must be determined
- Willingness to follow the pre-negotiated guidelines and process is imperative
- Belief that a stakeholder supported solution is possible is a guiding tenet for engagement
- The alternative of "avoiding" FERC & doing nothing must be equally valued by all participants
 - Do nothing
 - FERC re-licensing
 - Adaptive Management

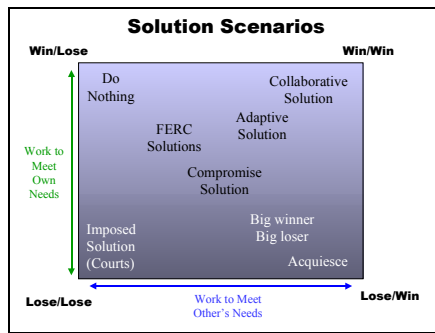


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Scenarios



Slide 27




Slide 28

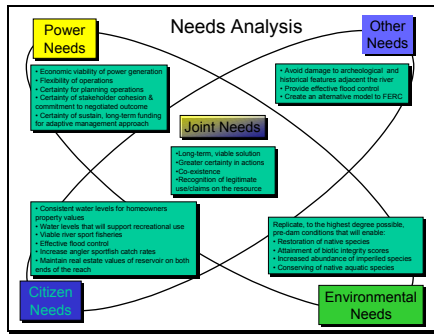
Needs Analysis

Perceive Disagreements

- Relative priority "value" of each need
- Some needs appear competitive and mutually exclusive (zero-sum)
- Willingness of "others" to grant legitimacy of need
- Likelihood of creating an agreement, relative to investment of time



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Appendix: Session Attendees

Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Akridge	Mike	Southern Company Generation	rmakridg@southernco.com	(205) 257-1398	(205) 257-1596	P.O. Box 2641, Birmingham, AL 35291-8180	
Bowers	Willard	Alabama Power	wlbowers@southernco.com	(205) 257-4090	(205) 257-4349	P.O. Box 2641, Birmingham, AL 35291	*
Carl	Bethany	Mobile Bay Watch	bcarl@mobilebaywatch.org	(251) 433-4229	(251) 432-8197	5 North Jackson Street, Mobile, AL 36602	
Clark	Dave	Lake Wedowee Property Owners' Association		(256) 357-4272		1640 Co Rd 499, Woodland, AL 36280	*
Conroy	Mike	GA Cooperative Fish and Wildlife Research Unit	conroy@forestry.uga.edu	(706) 542-1116	(706) 542-8356	School of Forest Resources, UGA, Athens, GA 30602	
Cook	Stan	Alabama Dept. of Conservation & Natural Resources	scook@dcnr.state.al.us	(334) 242-3471	(334) 242-2061	64 N. Union St., Montgomery, AL 36130	*
Duncan	Will	University of Georgia	wduncan@uga.edu	(706) 549-2522		UGA, Institute of Ecology, Athens, GA 30602	



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Dykes	Bill	Alabama Power Company	wcdykes@southernco.com	(205) 257-3585	(205) 257-4349	600 N. 18th St. Birmingham, AL	
Finch	Bill	Mobile Register	bfinch@mobileregister.com	(251) 219-5630			
Freeman	Mary	USGS Patuxent Wildlife Research Center	mary_freeman@usgs.gov	(706) 542-5181	(706) 542-1235	Institute of Ecology, University of GA, Athens, GA 30602-2202	
Glasier	John	Environmental Insight	jglasier@bellsouth.net	(256) 825-1752		P.O. Box 190, Dadeville, AL 36853	
Grand	Barry	ALCFWRU	grandjb@auburn.edu	(334) 844-9237		AL Coop Unit, 108 White Smith Hall, Auburn University, AL 36849-5418	
Hammett	D.J.	Randolph County Industrial Relations	djhammett2@aol.com	(256) 357-9834		Box 397, Wedowee, AL 36278	*
Harper	Patric	U.S. Fish and Wildlife Service	patric_harper@fws.gov	(251) 441-5857	(251) 441-6222	P.O. Drawer 1190, Daphne, AL 36532	



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Heinzen	Dave	Coalition of Associations at Lake Martin	drheinzen@hotmail.com	(256) 825-2642		316 Magnolia Dr., Dadeville, AL 36853	
Hess	Brent	Georgia Department of Natural Resources	brent_hess@mail.dnr.state.ga.us	(706) 845-4180	(706) 845-4182	4738 Mooty Bridge Rd, LaGrange, GA 30240	
Hoggle	Tom	Alabama Power Company	twhoggle@southernco.com	(256) 354-5784	(205) 257-1121	2761 Co Rd 100, Lineville, AL 36266	
Hooton	Matt	Emerald Triangle Commission	matthooton@charter.net	(256) 396-9328		P.O. Box 8, Lineville, AL 36266	*
Irwin	Elise	AL Cooperative Fish and Wildlife Research Unit	eirwin@acesag.auburn.edu	(334) 844-9190	(334) 844-9208	119 Swingle Hall, Auburn University, AL 36849	
Jolley	Jeffrey	AL Cooperative Fish and Wildlife Research Unit	jollejc@acesag.auburn.edu	(334) 844-9318	(334) 844-9208	103 Swingle Hall, Auburn University, AL 36849	
Knight	John	AL Cooperative Fish and Wildlife Research Unit	knighjr@acesag.auburn.edu	(706) 424-2495		208 E Samford Ave, Auburn, AL 36830	



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Mansfield	Ray	Lake Wedowee Property Owners Association	raymansf@aol.com	(256) 357-2863	(256) 357-2863	2028 County Road 235, Wedowee, AL 36278	
May	Bob	Lake Wedowee Property Owners Association	bmay767er@hotmail.com	(256) 357-2656		132 Geheld's Point, Wedowee, AL 36278	
McKitrick	Ronald	Federal Energy Regulatory Commission	ronald.mckitrick@ferc.gov	(770) 452-3778	(770) 452-3810	3125 Presidential Parkway, Suite 300, Atlanta, GA 30340	
McLane	Bradford	Alabama Rivers Alliance	bmclane@alabamarivers.org	(205) 322-6395	(205) 322-6397	2027 2nd Ave North, Birmingham, AL 35203	
Mickett	Katie	AL Cooperative Fish and Wildlife Research Unit	mickekd@acesag.auburn.edu	(334) 844-9318	(334) 844-9208	203 Swingle Hall, Auburn University, AL 36849	
Nichols	James	USGS, Patuxent Wildlife Research Center	jim_nichols@usgs.gov	(301) 497-5660	(301) 497-5666	Patuxent Wildlife Research Center, Laurel, MD 20708	
Nichols	Nick	Alabama Division of Wildlife & Freshwater Fisheries	nnichols@dcnr.state.al.us	(334) 242-3883	(334) 242-2061	64 North Union St., Ste 551, Montgomery, AL	



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Palmer	Alice	US Fish and Wildlife Service - Georgia Ecological Services	alice_palmer@fws.gov	(706) 613-9493 ext 22	(706) 613-6059	247 S. Milledge Ave, Athens, GA 30605	
Peeples	Alan	Alabama Power Company	alpeeples@southernco.com	(205) 257-1401		600 N. 18th Street, Birmingham, AL 35291-8180	
Peterson	Jim	GA Cooperative Fish and Wildlife Research Unit	peterson@smokey.forestry.uga.edu	(706) 542-1166	(706) 542-8356	Warnell School of Forest Resources, UGA, Athens, GA 30602	
Pool	Gleason	Upper Tallapoosa Watershed Committee		(256) 363-3586		1089 Wright Way Dr., Wedowee, AL 36278	*
Poppe	Wayne	Tennessee Valley Authority	wcpoppe@tva.gov	(423) 751-7333		1101 Market St., Wedowee, AL 36278	
Raughton	Larry	Randolph County Commission	l&sfarm@acs\isp.com	(256) 357-2353	(256) 357-2365	2324 Co Rd 498, Woodland, AL 36280	*
Reynolds	Melissa	ALCFWRU	mejor1@yahoo.com	(334) 844-9267		1107 Wallace Ave, Opelika, AL 36801	



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Roy	Luke	AL Cooperative Fish and Wildlife Research Unit	royluke@acesag.auburn.edu	(334) 844-9318	(334) 844-9208	103 Swingle Hall, Auburn University, AL 36849	
Sides	Amy	Alabama Rivers Alliance	asides@alabamarivers.org	(205) 322-6395	(205) 322-6397	2027 2nd Ave. North, Suite A, Birmingham, AL 35203	*
Sim	Bill	Alabama Power Company	wasim@southernco.com	(205) 257-4136	(205) 257-4349	600 North 18th St., P.O. Box 2641, Birmingham, AL, 35291	
Smith	Sheila	Alabama Power Company	sosmith@southernco.com	(256) 396-5093	(256) 396-5446	P.O. Box 488, Wedowee, AL 36278	
Tapley	David	Conservation Unlimited	conservationunlimited@hotmail.com	(334) 546-4060	(334) 262-5040	P.O. Box 5101, Montgomery, AL 36104	*
Thompson	Ralph	USFWS	ralph_thompson@fws.gov	(251) 441-5858	(251) 441-6222	P.O. Drawer 1190, Daphne, AL 36526	*
Waites	David	Alabama Power Company	dgwaites@southernco.com				



Last Name	First Name	Affiliation	Email	Phone	Fax	Address	Primary Stakeholder
Walsh	Maureen	OK Cooperative Fish and Wildlife Research Unit	wmauree@okstate.edu	(405) 744-6342	(405) 744-5006	404 LSW, OK State U, Stillwater, OK 74074	
Wright	Lathonia	Randolph County Commission	pastorljwright@hotmail.com	(334) 863-2500 (256) 357-4980		2658 Co Rd 65, Wadley, AL 36276 / P.O. Box 228, Wedowee, AL 36278	

CHARTER

of the

R.L. Harris
Stakeholders Board

CHAPTER I

PURPOSES AND PRINCIPLES

Article 1

The Purposes of the R.L. Harris Stakeholders Board are:

- 1. To seek a balance between river restoration, hydropower generation, and reservoir needs through the implementation of an Adaptive Management Model for information-based consensus decision making;**
- 2. To improve and refine this model through long-term, continual examination of decision model results and impacts.**

Article 2

The Board Members, in pursuit of the Purposes of the Board, shall act in accordance to the following Principles.

- 1. Membership on the Board shall not preclude the ability of Members to act independently and to exercise their rights (individually or on behalf of their represented group).**
- 2. Established and newly created laws, regulations, and other legal agreements will be respected and incorporated into discussions and decisions.**
- 3. The decision process will be long-term and continuing; Members of the Board will make commitments accordingly.**
- 4. Board Members will seek to communicate openly and honestly about the needs of their interest groups. If needs are not addressed, they will not be served.**
- 5. Members of the Board will strive for candid discussion of difficult issues in face-to-face situations. Confrontational public approaches will be recognized as generally unproductive to the process.**
- 6. Board Members will make every effort to be flexible and open to new ideas and to the input of fellow Members. No extreme positions that would result in dramatic win/lose proposals for Board Members will be introduced into Board discussions.**

CHAPTER II

MEMBERSHIP

Article 3

- 1. The Members of the R.L. Harris Stakeholder Board shall be appointed, elected, or clearly identified spokespersons for their respective interest groups. There shall be one spokesperson per interest group.**

Article 4

- 1. Membership in the R.L. Harris Stakeholder Board will be open to all groups who have a direct interest in the decision process, i.e. specific recreational, economic, or ecological interests in the water resources impacted by the R.L. Harris Dam.**
- 2. The process will not regress due to the entry of new Members. New stakeholders will familiarize themselves with the process-to-date and contribute to the discussion from their point of entry.**

Article 5

A Member of the R.L. Harris Stakeholder Board who has missed two (2) consecutive meetings, and who has not provided an adequate Alternate, will be asked to resign.

CHAPTER III

RULES OF ENGAGEMENT

Article 6

- 1. Members of the Board will make at least a five- to seven-year commitment to stay engaged in the decision process.**
- 2. Board Members will commit some level of time, talent, or treasure (resources) to the effort.**

Article 7

- 1. A Technical Advisory Group (or Groups) (TAGs) will be established. The TAGs will consist of model builders, biologists, economists, and other technical experts as seen fit by the Board.**
- 2. The TAGS will not act as decision-making bodies, but will solely serve an advisory role.**

Article 8

- 1. A facilitator will be employed to guide the early stages of model development.**
- 2. A project manager will be sought to coordinate Board activities.**
- 3. A Board Chairperson may be elected in the future if the Board deems it necessary.**

Article 9

- 1. Regular agendas and times for Board meetings will be planned and posted well in advance to enable maximum participation.**
- 2. Before being incorporated into decision-making, scientific findings will be distributed well in advance of Board meetings to enable adequate technical preparation by Board Members.**

CHAPTER IV

DECISION-MAKING

Article 10

1. **The Board will seek consensus in all decisions, but when a vote is required, a two-thirds (2/3) majority will constitute a decision on the model and basic objectives.**
2. **A quorum will consist of more than half (1/2) the Membership of the Board. With quorum, meetings may take place, but decisions will always require two-thirds (2/3) majority of the Membership.**

Article 11

1. **Members of the Board may bring Alternates or Technical Advisors as non-voting participants.**
2. **Alternates may vote if the Board Member is not present, provided the Alternate has attended Board sessions regularly and/or is well informed on Board issues.**

Article 12

Post-decision minority positions will be captured for later review.

Article 13

1. **Proxy voting will be acceptable only on issues pre-determined by the Board. An alternate vote will not be considered a proxy vote.**
2. **Teleconferencing will be acceptable only under special circumstances, as determined by the Board.**

Article 14

Public input will be part of ongoing meetings and operations, but any such input will be strictly non-voting.

CHAPTER V
RATIFICATION AND SIGNATURE
