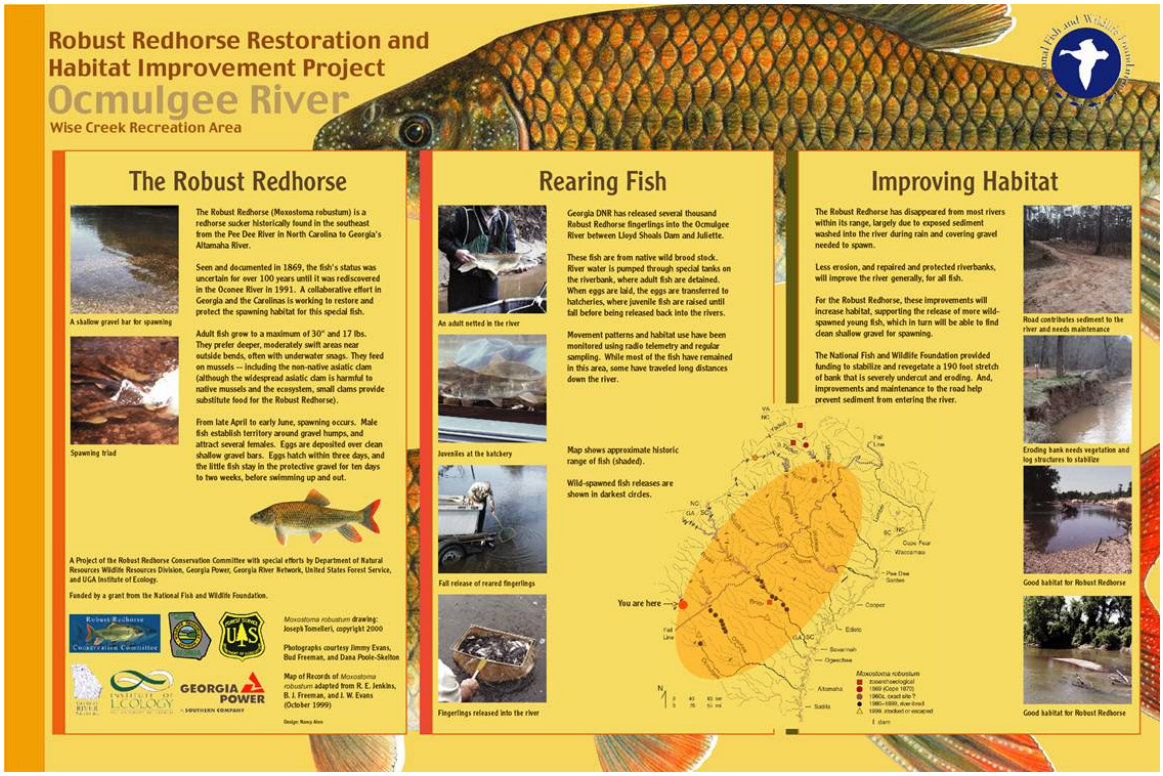
REPORT OF THE

ROBUST REDHORSE CONSERVATION COMMITTEE ANNUAL MEETING

HICKORY KNOB STATE RESORT PARK
McCormick, South Carolina
October 14 - 16, 2003



Meeting facilitated by Adam Saslow, Consensus Solutions, Inc.
under contract with the United States Fish and Wildlife Service
Report compiled by Jaclyn Zelko

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

ACRONYMS & ABBREVIATIONS

CPLC	Carolina Power and Light Company
CVIOG	Carl Vinson Institute of Government
DPC	Duke Power Company
FERC	Federal Energy Regulatory Commission
GA Coop	University of Georgia Cooperative Fish & Wildlife Resource Unit
GA DNR	Georgia Department of Natural Resources
GPC	Georgia Power Company
GRN	Georgia River Network
GWF	Georgia Wildlife Federation
NC WRC	North Carolina Wildlife Resources Commission
NCS MNS	North Carolina State Museum of Natural Sciences
NYU	New York University
SC Coop	South Carolina Cooperative Fish & Wildlife Research Unit
SC DNR	South Carolina Department of Natural Resources
SCEG	South Carolina Electric and Gas
SCA	South Carolina Aquarium
UGA	University of Georgia
USACOE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey (Biological Resources Division)

FTC	Fish Technology Center
NFH	National Fish Hatchery
SFH	State Fish Hatchery
WMA	Wildlife Management Area

CCAA	Consolidated Conservation Agreement with Assurances for the Ocmulgee River
Excom	Former Technical Advisory Group to the RRCC+
GIS	Geographic Information System
IT TWG	Information Technology Technical Working Group
MOU	Memorandum of Understanding
PIT	Passive Integrated Transponder Tags
RRCC	Robust Redhorse Conservation Committee
TAG	Technical Advisory Group
TWG	Technical Working Group

AGR	Artificial genetic refuge
C	Celcius
cfs	Cubic feet per second
cm	Centimeter
g	Gram
kg	Kilogram
km	Kilometer
m	Meter
mg/l	Milligrams per liter
mm	Millimeter
MWe	Megawatts of electrical output
m3/s	Cubic meter per second
N*e*	Effective population size
ppt	Parts per thousand
rkm	River kilometer
RM	River mile
TL	Total length
YC	Year class
YOY	Young of year

E X E C U T I V E S U M M A R Y

The robust redhorse recovery effort, in its 9th year, encompasses management activities and research and conservation efforts undertaken by members of the Robust Redhorse Conservation Committee (RRCC), university scientists, and other affiliates. The RRCC, established by a Memorandum of Understanding (MOU) signed in 1995, is responsible for developing and managing a recovery approach for the imperiled robust redhorse (*Moxostoma robustum*). The effort and expertise applied to the questions of recovery are brought together at the annual meeting of the RRCC. This report summarizes updates on management activities, research findings, and conservation efforts and documents decisions made at the 2003 RRCC Annual Meeting. Below are highlights of the meeting held October 14 – 16, 2003 at Hickory Knob State Resort Park in McCormick, South Carolina.

In 2003, there was a continued emphasis on robust redhorse status surveys in selected rivers in the historic range. As with the flooding conditions experienced throughout the Southeast during the spring, boat crews were unable to put in and sample sections of the rivers. South Carolina DNR attempted to conduct status surveys on the Savannah, Broad, Lower Broad, Congaree, and Wateree rivers. High water made sampling difficult and no fish were collected. Efforts were also made on the Ocmulgee River in part to support the implementation of a Candidate Conservation Agreement with Assurances (CCAA) for a portion of the river; but crews were unsuccessful at capturing robust. Status surveys continued in North Carolina on the Pee Dee River system, resulting in the collection of 4 total individuals collected since 2000.

Three robust redhorse were collected from the Oconee River in 2003 on days of low flow as provided by Georgia Power. The overall electro-fishing catch rate was 0.23 fish per hour, the lowest annual broodfish capture rate to date. No studies were undertaken with robust redhorse eggs this year, and the annual production goal was not met. Sperm from one Oconee River male was cryopreserved and added to the repository.

Research to assess the reproductive and recruitment success in the Oconee River was continued and a one-year study of population dynamics to help determine the long-term status and fate of the Oconee River population was conducted in 2000. This was the first year that research in supplemental breeding design was conducted to enhance breeding protocols for maximum genetic diversity. Research on the population structure and genetic diversity in robust redhorse from the Oconee, Savannah and Pee Dee rivers was continued. The RRCC engaged in a rich dialogue on the implication of management activities for the maintenance of genetically distinct strains of robust redhorse. Particularly critical to the discussion of management options and the final management decisions is the tension between managing for the survival of the species and managing for the preservation of individual robust redhorse populations.

A search for a new vice-chair was conducted by the Nominating Committee (Cecil Jennings, USGS-GA Coop; Dave Coughlan, Duke Power Company; Jimmy Evans, GA DNR; and Greg Looney, RRCC Chairman). The selected candidate serves as vice-chair

for one year then takes over the duties as chairman for the following two years. The Nominating Committee selected Ross Self, Assistant Chief of Fisheries, South Carolina Department of Natural Resources, as a candidate for vice-chairman. The Committee presented its choice for vice-chair to all participating members. Mr. Self was unanimously approved by the participating members of the 2003 RRCC Annual Meeting. He will begin his term as chairman from 2005 to 2006 and serve as vice-chair in 2004.

The Memorandum of Understanding established the RRCC and allows the RRCC to establish operating guidelines. The current MOU expires at the end of December, 2004. The new version would operate from January 1, 2005 to December 31, 2010. Several language modifications were discussed including changing the language in the MOU document to reflect wording in the RRCC Policies. Any changes discussed would be revised and available for additional discussion at the 2004 Annual Meeting.

The "Excom" committee has replaced the Technical Advisory Group (TAG) originally founded at the 1997 Annual Meeting. This committee includes the RRCC chairperson, the Vice Chair/Immediate Past Chair. Members also include representatives from Georgia Department of Natural Resources, South Carolina Department of Natural Resources, North Carolina Wildlife Resources Commission, U.S. Fish and Wildlife Service, U.S. Geological Survey, utility companies, and academia.

Due to the increase in multi-agency robust data collection and data management, an Information Technology Technical Working Group (TWG) was established to guide efforts under the direction of the RRCC. Significant concern was raised about coordination and responsibility of managing such a large set of data. The IT TWG is charged with maintaining data sets, website revisions, and converting all robust data into one master database.

The Oconee River Technical Working Group has finished a draft of the Oconee River Management Plan. It is currently under review by the TWG members. A final version should be ready for the RRCC in February, 2004. This plan will serve as a template for management plans for the other river basins.

The Habitat Technical Working Group submitted a draft Habitat Management Plan that addressed the short-term goals of the Habitat TWG. The TWG is responsible for developing guidance that both prioritizes sites for restoration and facilitates suitable habitat restoration activities that can be applied to specific river basins.

I N T R O D U C T I O N

Historically, the robust redhorse (*Moxostoma robustum*) inhabited Atlantic slope drainages from the Pee Dee River system in North Carolina to the Altamaha River system in Georgia. The first scientifically confirmed sighting of robust redhorse since naturalist Edward Cope described the species in 1869 occurred when the fish was re-discovered in the Oconee River in Georgia in 1991. The species is presently known to exist in a relatively short reach of the Oconee River between Sinclair Dam and Dublin, Georgia and in a short upper Coastal Plain section of the Ocmulgee River in Georgia. Individuals also have been found in the Savannah River (the boundary river between Georgia and South Carolina) in the Augusta Shoals area as well as below the New Savannah River Bluff Lock and Dam. In addition, four specimens have been captured in the Pee Dee River below Blewett's Falls Dam in North Carolina. The robust redhorse appears to inhabit specialized areas of large rivers, which are difficult to sample but regardless of the absence of sightings, small numbers are usually found when species-targeted surveys are conducted.

River impoundments, predation by introduced nonnative species, and significant deterioration of habitat due to sedimentation and water pollution are believed to have contributed to the decline of the species. The complex and diverse problems facing the robust redhorse require an interdisciplinary approach, using a broad spectrum of experience, expertise, and management authority to maintain and restore this imperiled species. In addition, it is essential that recovery efforts include a process that works closely with the private sector as well as government agencies potentially impacted by and interested in robust redhorse conservation.

The Robust Redhorse Conservation Committee (RRCC) was established by a Memorandum Of Understanding (MOU) signed in 1995 to develop and manage a recovery approach for the robust redhorse (*Moxostoma robustum*), previously a Category 2 candidate for Federal listing under the Endangered Species Act. The RRCC is actively committed to the recovery of the imperiled robust redhorse throughout its former range. It identifies priority conservation needs for the robust redhorse and its habitat and coordinates implementation of research and management programs for addressing those needs.

The ninth annual meeting of the RRCC was held October 14 – 16, 2003 at the Hickory Knob State Resort Park in McCormick, South Carolina. Approximately 40 representatives of the signatory agencies to the MOU, university research affiliates and other interests attended the meeting (Attachment 1 Participants of the 2003 RRCC Annual Meeting). The 13 signatory agencies include: Georgia Department of Natural Resources, South Carolina Department of Natural Resources, North Carolina Wildlife Resources Commission, Georgia Power Company, Progress Energy (formerly Carolina Power and Light Company), Duke Power Company, South Carolina Electric and Gas Company, U.S. Fish and Wildlife Service, U.S. Geological Survey (Biological Resources Division), U.S. Forest Service, U.S. Army Corps of Engineers, Georgia Wildlife Federation, and South Carolina Aquarium. University research affiliates include:

I N T R O D U C T I O N

University of Georgia Warnell School of Forest Resources, University of Georgia Institute of Ecology, University of Georgia Cooperative Fish and Wildlife Research Unit, Roanoke College Department of Biology, University of Georgia Carl Vinson Institute of Government, University of Georgia Department of Genetics, Cornell University Department of Molecular Biology and Genetics, Clemson University Cooperative Fish and Wildlife Research Unit, New York University School of Medicine Institute of Environmental Medicine, and State University of West Georgia. In addition, representatives of other concerns with interest in recovery of the robust redhorse include: Santee Cooper Power Company, Georgia River Network, PBS & J, Fort Stewart Environmental and Natural Resources Division, and the North Carolina State Museum of Natural Sciences. The success of the recovery effort, to a large extent, depends on the willingness of RRCC members and others to participate in the annual meeting and to continue to support recovery throughout the year.

The RRCC identifies priority conservation needs for the robust redhorse and its habitat as well as coordinates implementation of research and management programs for addressing those needs. The annual RRCC meeting satisfies partial requirement for conservation of the species as designated in the MOU. It also represents the only scheduled time for all interests to assess progress and to establish management directions that guide recovery efforts in the upcoming year and beyond. The annual meeting is the occasion to explore the scientific and management implication of research results and new data, to debate philosophical viewpoints, and to gather the collective expertise of fisheries and environmental management professionals. This dialogue includes the best available science on the robust redhorse, which forms the basis of the RRCC's recovery and policy decisions. Although a consensus decision-making approach is sought at the annual meeting, consensus is not always possible due to divergent points of view on the interpretation of preliminary findings, differing comfort levels with acceptable risk or to enduring responsibility related to the consequences of certain decisions. Therefore, some decisions may need to be made by representatives of the administrative agencies that have legal purview for the management decision.

The RRCC has formalized roles to increase efficiency in the management of the recovery process including a robust redhorse project manager and a RRCC chair, vice-chair and an executive committee (Excom). Jimmy Evans, a biologist with the Georgia Wildlife Resources Division of the Department of Natural Resources, is the robust redhorse project manager and served from 1997 to 1998 as the first RRCC Chairman. Mr. Evans oversees coordination of hatchery and spawning efforts. Scott Hendricks, a fisheries biologist with Georgia Power Company and second RRCC Chairman from 1999 to 2000, provided overall administration of the recovery approach including coordination of the TAG. Ms. Terry DeMeo, an environmental policy analyst with the Carl Vinson Institute of Government, The University of Georgia was elected and served as Chairman from 2001 to 2002. Greg Looney, a fishery biologist with the U.S. Fish and Wildlife Service, is the spawning coordinator for robust redhorse on the Oconee River. He also assists in recovery efforts on the Savannah River and executes cryopreservation of robust redhorse

sperm. Mr. Looney's two-year tenure as chairman will expire at the end of the 2004 RRCC Annual Meeting.

A search for a new vice-chair was conducted by the Nominating Committee (Cecil Jennings, Dave Coughlan, Jimmy Evans, and Greg Looney). The selected candidate will serve as vice-chair for one year then will take over the duties as chairman for the following two years. The Nominating Committee selected Ross Self, Assistant Chief of Fisheries, South Carolina Department of Natural Resources, as a candidate for chairman. Mr. Self was unanimously approved by the RRCC and he will serve as chairman from 2005 to 2006.

This report summarizes updates on management activities, research findings, and conservation efforts and decisions made at the 2003 RRCC Annual Meeting. The RRCC Annual Meeting Reports have become important documents of research, science, management, and recovery that are often referred to and cited. The format of this year's report closely follows the format of previous reports and it provides a more accurate record of activities. The report notes discussion points, questions, main ideas, and/or notes recorded by the meeting facilitator and participants.

The RRCC identifies and prioritizes work items during the annual meeting. The following work items (in italics) were identified at the 2002 annual meeting and completed during 2003.

1. *Develop a Management Plan for the Oconee River.*
   The Oconee River Technical Working Group has finished a draft of the plan. It is currently under review by all TWG members and not ready for broader distribution. A final version should be ready for the RRCC in February, 2004.

2. *Continue to collect data for use in the development of a Management Plan for the Yadkin-Pee Dee River in 2004.*
   The Yadkin-Pee Dee Technical Working Group has continued to gather data for future use in the development plan. The progress is slow because no robust redhorse were collected during the 2003 spring survey. This was most likely related to higher river flows due to the above average precipitation during the spring months. The TWG will not begin plan development until 2004 to allow for sufficient data collection on the system.

3. *Committee Chair will refine the Policies according to the recommendations of the Committee.*
   The Committee Chair has revised the Policies according to recommendations of the RRCC members from discussions held at the 2002 Annual Meeting. Updated electronic copies of the Policies have been sent to all members of the RRCC.

4. *Increase the functionality of the web page.*
   The Information Technology TWG, formed at this year's annual meeting, has taken over the responsibility of maintaining the web page. The web page has been updated with several layout and content modifications. The web page is accessible and functioning.

5. *Develop a taxonomic identification key for suckers.*
   Stuart Carlton, GA Coop has continued his development of a larval key for *Moxostoma* species. The key is in the testing phase and should be published and available for use by May, 2004.

6. *Develop a Management Plan for the Broad River, SC.*
   The Lower Broad River Management Plan will be sent out to members in late October, 2003. No changes have been made to the document since 2002.

Progress was made on the following 2002 work items but they remained largely unfinished at the time of the 2003 meeting.

7. *Continue to assess the results of the stockings and telemetry efforts in the Ocmulgee River.*
   GA Power, GA DNR, and the Georgia Cooperative Fish & Wildlife Research Unit at UGA continue their collaborative annual sampling efforts on the Ocmulgee River to collect data to assess past stocking and telemetry activities.

8. *Develop management planning proposals for the Ogeechee River.*
   The Ogeechee Management TWG has proposed a prospective date of October, 2004 for a draft or outline for a Management Plan that can be reviewed by RRCC members.

9. *Monitor activities on the Broad River, GA.*
   These activities include stocking of Savannah River off-spring into the Broad and coordination of a "round-up" to determine the success of past stockings and any spawning that may be occurring.

10. *Continue the efforts to fund and host a genetics workshop.*
    The RRCC continues to seek funding for, coordinate, and conduct a robust redhorse genetics workshop to discuss genetics information on robust redhorse to date, discuss implication and develop recommendations.

11. *Determine the survival rates in the Oconee and Broad Rivers, GA.*
    Observations of fish in the upper reach of the Broad River, Georgia suggest that the 32,189 fish stocked between 1993 and 1998 are surviving. Surveys need to be undertaken during spring spawning season as well as the fall to monitor the reproductive and recruitment success.

12. *Determine the stability of the Oconee River population.*
    Georgia DNR personnel continue to sample several times of year in the Oconee River and record new wild fish and recaptures to determine population stability.

The 2004 RRCC Annual Meeting will be held at a site in South Carolina or Georgia from October 12 to 14, 2004. Ross Self, SC DNR, and Jimmy Evans, GA DNR, have volunteered to scout out alternative sites that would have the required facilities for the meeting. It was also suggested that the meeting follow the Southeastern Association of Fish & Wildlife Agencies Conference being held October 31 – November 3, 2004. The RRCC could present a robust redhorse symposium but the timing is not right for hatchery managers that need to stock fish according to the Committee's recommendation prior to that date. Mr. Self and Mr. Evans will present location possibilities at the next Excom meeting, and after a final decision is made, the information will then be distributed to all RRCC members.

Opening Remarks

Mr. Greg Looney, RRCC chairperson, opened the 2003 annual meeting by welcoming everyone and thanking sponsors: PBS & J for providing funding for refreshments, the U.S. Fish and Wildlife Service for providing facilitator funding, and the South Carolina Department of Natural Resources for coordinating much of the meeting logistics. He also gave special thanks to Ross Self for providing the Low Country Boil (Beaufort Stew) food and reception.

Mr. Looney reviewed the decision rules as per the Robust Redhorse Conservation Committee's policy document. Decisions for management or for the internal workings of the committee are made via a "consensus" vote of all attendees. If there is no consensus, official voting by representatives of each signatory will take place. He also noted that the Georgia River Network (GRN) no longer wishes to be a signatory but will continue their support of the RRCC's goals as a cooperator.

The "Excom" committee has replaced the Technical Advisory Group (TAG) originally founded at the 1997 Annual Meeting at the direction of the RRCC. This committee includes the RRCC chairperson, and Vice Chair/Immediate Past Chair. Members also include representatives from Georgia Department of Natural Resources, South Carolina Department of Natural Resources, North Carolina Wildlife Resources Commission, U.S. Fish & Wildlife Service, U. S. Geological Survey, Utility companies, and Academia. The Excom exists for the purpose of efficiency and provides guidance on and assists the day-to-day work of the project manager and chair. It acts as a decision body in lieu of the full RRCC and makes recommendations for the RRCC's consideration.

I N T R O D U C T I O N

Mr. Looney introduced the meeting facilitator, Adam R. Saslow, president of Consensus Solutions, Incorporated. Mr. Saslow explained his role, set some ground rules for the session, and conducted introductions of the participants. He also reviewed the agenda and code of conduct.

South Carolina Department of Natural Resources Three-Panel Display – Ross Self, South Carolina Department of Natural Resources

Ross Self, SC DNR, showed a three-panel robust redhorse display. The panel was printed on a wide printer and laminated for durability. It can be easily modified and updated as needed. The panel is available to borrow on request.

Robust Redhorse Spawning Triad Skin Mount – Jimmy Evans, Georgia Department of Natural Resources

Jimmy Evans, GA DNR, showed participants a display of skin mounts of a robust redhorse spawning triad. The display was put together at a cost of $1,500 paid for by the GA DNR. The triad of robust is displayed over a bed of gravel and has some movement. The display is available to borrow for educational purposes. Also available is the single mounted robust redhorse display.

Portable Net Cages – Haile Macurdy, Warm Springs National Fish Hatchery, U.S. Fish and Wildlife Service

Haile Macurdy, USFWS, brought a portable net cage as an example of a tool that could possibly be used in future recovery efforts. One use of the net cage is for holding fish at a stream-side facility. It is available to borrow upon request.

Robust Redhorse Fact Sheets – Mike Nichols, Georgia Power Company

Mike Nichols, GPC, gave an update on the status of the robust redhorse fact sheet (Attachment 2, 3 Robust Redhorse Fact Sheet Part A, B). It has been updated and has current contact information. Georgia Power produced copies of the sheet in house. An electronic copy of the fact sheet will be uploaded to the robust redhorse website. Once loaded on the website, it will be available to download. Anyone needing hard copies of the fact sheet can request them from Mike Nichols or Mike Abney.

Clemson University American Fisheries Society T-Shirt – Tim Grabowski, Clemson University

Tim Grabowski, Clemson University, announced to the committee that an image of robust redhorse appears on the new Clemson American Fisheries Society group tee-shirt.

Georgia River Network Quilt

Georgia River Network recently received first prize in a quilt contest. The quilt has images of various fish species.

"Rise to the Future" U. S. Forest Service Meeting – Liz Caldwell, U.S. Forest Service

Liz Caldwell, USFS, notified the committee of a Forest Service meeting on November 3, 2003. It will be an opportunity to potentially get resources from Washington. The Regional Forester will be attending the meeting called "Rise to the Future" for fisheries management and recreational aquatic biologists. All are welcome to attend.

South Carolina Department of Natural Resources Re-Structuring – Ross Self, South Carolina Department of Natural Resources

Ross Self, SC DNR, gave a brief narrative regarding the re-structuring and re-designation of DNR offices throughout South Carolina. The DNR has closed 17 facilities and consolidated it into 4. Two hatcheries have been closed, and approximately one-third of the money was cut from the fisheries budget.

Robust Redhorse Website Update – Terry Demeo-King, UGA Carl Vinson Institute Of Government

Terry Demeo-King reviewed the home page (Attachment 4 Screen shot of the Robust Redhorse Conservation Committee Website) of the Robust Redhorse Conservation Committee, www.robustredhorse.com. The committee will need to package any changes and give it to the existing webmaster for uploading to the website. Ms. Demeo-King will hand a CD with all pertinent information on to Cecil Jennings for delivery to the webmaster. Website maintenance will be part of the IT TWG domain of responsibility.

Ms. Demeo-King proposed the handout (homepage) with new logo and hotlinks to points of information and/or organizations. Items that need to be added or linked to the webpage include: hotlinks to all MOU signatories, pictures of Sinclair Dam on the Oconee River, hotlink to the latest version of the Robust Redhorse Fact Sheet.

Several documents need to be added including: the final versions of the 2000, 2001, and 2002 RRCC Annual Reports, the Habitat TWG Restoration Management Plan, FERC reports, and several research reports (Freeman and Freeman and Spawning Habitat). Updates to the signatory list, accurate credit on photos and maps, contact information, and range map are required to keep the webpage current. Changes to the design and

layout are also needed. A navigational bar and keyword search were suggested by participants as advantageous items that would make it easier to navigate the site. There are also plenty of opportunities to add photos to the gallery and submissions would be appreciated.

RRCC 10th Annual Meeting Anniversary Items – Rebecca Cull, GA Coop, Cecil Jennings, USGS – GA Coop, Jay Troxel, USFWS, and Jeff Isely, SC Coop

The 10th Annual Meeting will be held in October 2004. Rebecca, Cecil, Jeff, and Jay have volunteered to develop a plan for anniversary items that can be handed out at the meeting. The logo from the website may be used as a potential design on items such as tee-shirts, bumper stickers, or pens. They will investigate cost and availability from several vendors.

PBS & J Report – Andrew Labay and Dennis Logan, PBS&J

PBS & J have recently aimed to expand their ecology and fisheries services in the east and now have 67 offices and 3000 employees. Research projects include habitat advancement, utilization, and increasing generating capacities. Their research also includes effects on aquatic populations, modeling, and risk assessments. PBS & J continues to be an integral supporter of the RRCC and its goals.

Vice-Chair Elections – Nominating Committee

A search for a new vice-chair was conducted by the Nominating Committee (Cecil Jennings, USGS-GA Coop; Dave Coughlan, Duke Power Company; Jimmy Evans, GA DNR; and Greg Looney, RRCC Chairman). The selected candidate serves as vice-chair for one year then takes over the duties as chairman for the following two years. The Nominating Committee selected Ross Self, Assistant Chief of Fisheries, South Carolina Department of Natural Resources, as a candidate for vice-chairman. The Committee presented its choice for vice-chair to all participating members. Mr. Self was unanimously approved by the participating members of the 2003 RRCC Annual Meeting. He will begin his term as chairman from 2005 to 2006 and serve as vice-chair in 2004.

Revisions to the Memorandum of Understanding

The MOU establishes the RRCC and allows the RRCC to establish operating guidelines. The current MOU expires at the end of December, 2004. The new version would operate from January 1, 2005 to December 31, 2010. Because of the organizational structure of the signatories, it was important that revisions and/or updates to the MOU be discussed at the 2003 meeting. Any changes discussed would be revised shortly and available for additional discussion at the 2004 meeting. The new document would be approved at the 2004 Annual Meeting and then sent to all signatories for approval.

Several language modifications were discussed including changing the language in the MOU document to reflect the wording in the RRCC Policies Document. Specifically, the word “species” in used the MOU and the word “ESU” is reflected in the policies. Several participants argued that changing the wording to “ESU” is potentially raising the stakes and possibly making success more difficult to achieve. A reluctance to change language by some members was expressed especially in light of a detailed Policies Document that does refer to “ESU” in several instances, whereas, the language of the MOU reflects the broader goal of maintaining a higher level of species preservation. The Policies are written to address objectives (which may work toward the ESU level) and certainly do not preclude ESU level efforts. The Policies Document can be used by directors and representatives to manage ESU’s in a manner analogous to federal/state environmental law.

Several participants also expressed opinions for including language involving the terms, “preservation of genetic integrity.” This language keeps the definition of population open to interpretation but also shows the importance of an ESU. The following language was adopted for inclusion in the next draft of the MOU.

> “Preserving genetic integrity as and where appropriate, when possible and as resources allow.” (to be added to section IV, subsection A)

Modifications of the following elements of the MOU were also discussed. The Excom was charged with making these and other minor editorial changes (including changing language and bullets but not changing content):

1. Include in Section II, 2nd paragraph "natural populations have historically been found in Ocmulgee, Oconee, Savannah, and Pee Dee (NC, SC) Rivers. The Broad River (GA) and Ogeechee River populations were established via stocking."

2. An addition of Section III (E) was discussed to recognize the Excom and nominating committees as part of the RRCC. Participants voted that Section III (E) is not needed in this document because the structure of the RRCC is already reflected in the Policy Document.

3. Dialogue also included a discussion on the language "establish captive breeding populations (broodfish)." Several participants argued that it be eliminated from the MOU because it is a tool listed within a range of conservation tools. The language seems redundant and is considered a last resort option. It was agreed to leave the language is this section as is because the fewer the changes the better.

S U P P L E M E N T A L B R E E D I N G

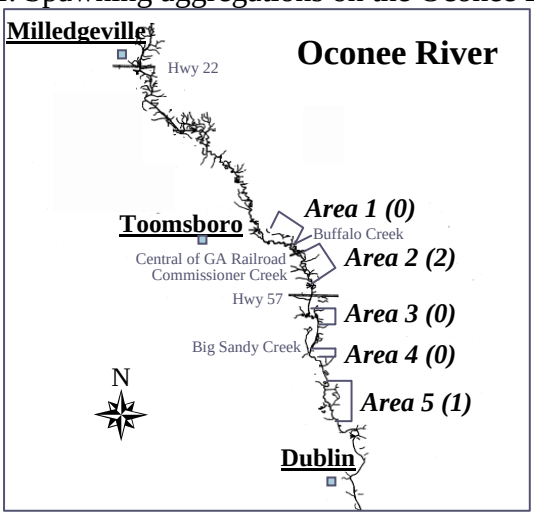
Broodfish Collection on the Oconee River, 2003 – Jimmy Evans, GA DNR

The spring broodfish collection effort was conducted on the Oconee River between Toomsboro and Dublin, Georgia to provide broodfish for hatchery production for robust redhorse fingerlings. The collection was planned over a 3 week period but efforts were only conducted on May 6 and June 4, 2003. High flows were present during the peak of spawning period making 2003 the most difficult sampling year so far. The causes for low catch rates are partly due to the impossibility of sampling fish during spawning.

One female (33%) and two males (67%) were collected by electrofishing (total of 3 individual fish). The river flows were almost normal on collecting dates due to reduction of flows. The low number of females collected was attributed to abnormal temperature fluctuations during April, which may have disrupted egg maturation and interfered with the onset of typical spawning behavior. Temperatures ranged from 21˚ to 23˚C during sampling efforts. High flows also may have disturbed spawning habitat, which in turn may have interrupted natural groupings of spawning aggregates over gravel beds.

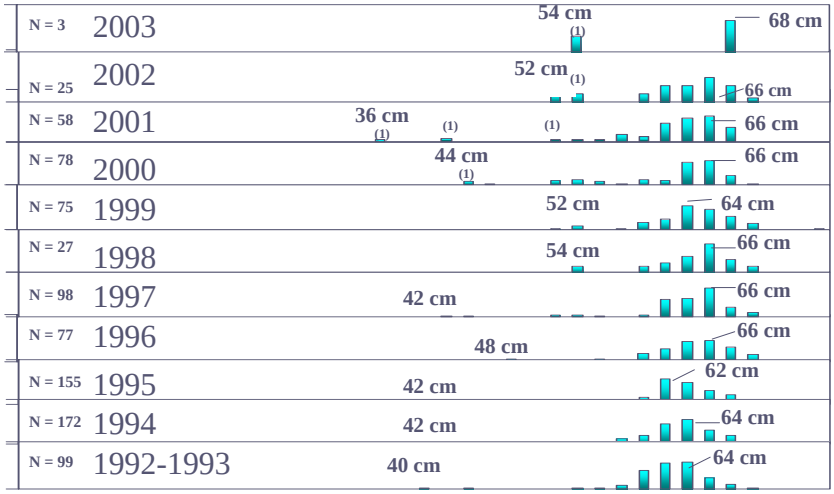
A total of one broodfish (50%) was a recapture of a naturally, wild spawn. One fish captured this year had been stocked into the Oconee River between Milledgeville and Dublin in 2000. This fish was a 1995 year class fish raised in ponds at Walton State Fish Hatchery before being stocked on Feb 23, 2000. The overall electrofishing catch rate was 0.23 fish per hour, the lowest annual broodfish capture rate to date. As in previous years, 5 known spawning aggregations were sampled (Figure 1). These areas constitute approximately 60% of the known potential spawning habitat on the Oconee River. No fish were collected in Areas 1, 3, and 4. Two fish were collected from Area 2 and one fish from Area 5. Seven porpoising fish were visually observed at the spawning habitat at Avants during the low flow events provided by Georgia Power Company.

Figure 1. Spawning aggregations on the Oconee River, 2003.



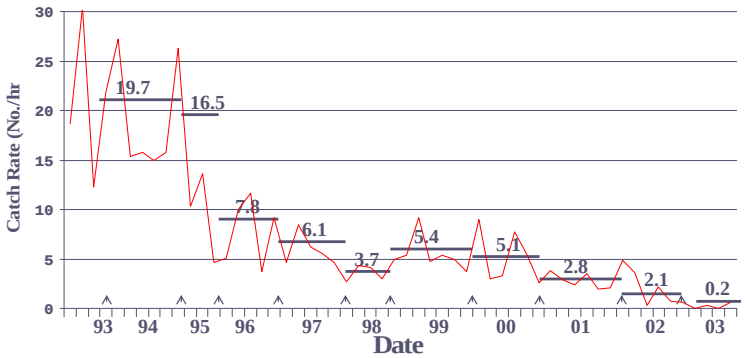
The modal length of the length distribution of captured broodfish in 2003 was 68 cm. An apparent shift toward larger fish is noted when comparing annual length distributions for each year during the 1994 - 2003 period (Figure 2). This may indicate an aging population during this 10-year period. Size structure has remained relatively constant, however, for the last several years.

Figure 2. Annual length distributions, Oconee River, 1992 - 2003.



The 2003 electrofishing catch rate of 0.23 fish per hour was the lowest on record for broodfish sampling on the Oconee River (Figure 3). The highest catch rates were 19.7 and 16.5 fish per hour in 1994 and 1995. The catch rate declined dramatically to 7.8 fish per hour in 1996 and declined further during the 1997 – 2003 period (6.1 to 0.2 fish per hour). Analysis for variance indicated that the 1994 and 1995 catch rates were significantly higher than those for 1997 – 2000 and that 1996 represented a transition year between periods of higher and lower catch rates. Although the lowest on record, the 2003 catch rate of 0.23 fish per hour was not significantly lower than those for 1997 – 2000.

Figure 3. Electrofishing catch rates on the Oconee River 1993 – 2003.



SUPPLEMENTAL BREEDING

Spring 2003 Spawning Results – Jaci Zelko, USFWS

A total of 3 robust redhorse were captured on the Oconee River during the spring 2003 season. High water conditions made it impossible to effectively sample for robust during the spawning season that usually runs from late April to mid-June. Attempts were made over a 5-week period but GA DNR and FWS personnel were unable to sample on the river except for four days. Sampling on the Oconee River occurred May 5th – 6th, and June 3rd and 4th.

One male was captured on May 6, 2003 near Beaverdam Wildlife Management Area. This male was running ripe at the time of capture. This tagged male appeared in good spawning condition with 40% mucus loss and tubercles over the entire body. A total of 25 ml of sperm was collected and placed on ice for transport to the Fish Technology Center. The male was released back into the river after milt collection and fin tissue collection for genetic analysis. The sperm, initial motility of 50%, was cryopreserved and 30 straws were added to the Robust Redhorse Sperm Repository held at Warm Springs Fish Technology Center. This male was previously captured during the 2001 spawning season and was running ripe at that time also.

A second attempt to sample the Oconee River near the area of Balls Ferry, where fish have been captured in the past was attempted in early June. One male, previously tagged, was captured on June 4th, 2003 and was running ripe. This male had no mucus loss and tubercles on the nose and anal fins. Approximately 6 ml of sperm was collected with an initial motility of 95%. The sperm sample was not cryopreserved. The fish was released back into the Oconee River after fin tissue was collected for genetic analysis and a new Floy tag was injected. It was determined that this male was a 1995 year class fish that was raised at Walton State Fish Hatchery and stocked in the Oconee River on February 23, 2000.

The female captured near Balls Ferry on June 4th, 2003 had not been captured in previous years. Pit tags and Floy tags were injected. Fin tissue was collected for genetic analysis. The female had less than 5% mucus loss and did not appear to be in good spawning condition probably due to the water temperature extremes and flow fluctuations, so it was released back into the river.

2003 was not a successful year for spawning and a more concerted effort will be attempted next year dependent on river conditions. No studies were undertaken with eggs of robust redhorse this year.

Cryopreservation Activities Update – Jaci Zelko, USFWS

The focus of activities in 2003 was to continue to deposit cryopreserved sperm into the robust redhorse sperm repository for long term storage for future conservation and

restoration work. Sperm samples from wild-raised males are cryopreserved according to established protocols.

Sperm from only one male was suitable for inclusion in the repository in 2003. The robust male was collected on May 5, 2003 in ripe spawning condition. Approximately 25 ml of sperm was collected. The sperm sample was taken to Warm Springs Fish Technology Center and 30 straws (0.5 ml) were cryopreserved and placed in storage dewars. The initial motility of the sperm was 50% and equilibrium motility was at 20% at time of freezing. If this fish is collected in future spawning efforts, sperm will once again be cryopreserved in hopes of gaining better sperm quality.

Sperm samples from Savannah River fish were not available for 2003 because no fish were captured during the spring broodfish sampling season.

Fingerling Distribution and Fry Production – Jaci Zelko, USFWS

There was zero fry and fingerling production during 2003. Only one female robust was captured from the Oconee River and she wasn't in spawning condition nor did she produce any eggs.

Establishment of Computerized Inventory of Cryopreserved Sperm – Jaci Zelko, USFWS

Jaci Zelko has inventoried all straws held in six storage dewars at Warm Springs Fish Technology Center. The repository holds cryopreserved sperm mixtures from 15 different fish species as well as vials of blood and ovarian samples. There are several size straws stored in the dewars including straws that can hold 0.5, 2.5, or 5 ml of sperm mixture. An Access database tracks the straws in the repository as well as information on the males (morphometrics, genetics, capture data, etc.).

The repository currently holds 751 robust redhorse straws from 31 Oconee River and 10 Savannah River males that were cryopreserved between 1997 and 2003 (Table 1).

Table 1. Robust redhorse repository straws frozen from 1997 – 2003.

Year	# of Oconee Research	# of Oconee Repository	# of Savannah Repository
1997	13	5	------
1998	179	10	------
1999	------	100	70
2000	------	88	50
2001	158	------	------
2002	------	48	------
2003	------	30	------
Totals	**350**	**281**	**120**

P O P U L A T I O N D Y N A M I C S

Reproductive and Recruitment Success of Robust Redhorse in the Oconee River – Cecil Jennings, USGS – GA Coop, and Rebecca Cull, GA Coop

An update was given for the analysis of samples collected in 2002. Dr. Isaac Wirgin, NYU Department of Environmental Medicine, analyzed 137 samples. Of those 137 samples, 96 were notch-lipped, 28 unknown (either spotted or hog suckers), and 13 were robust redhorse. Size of samples ranged from 14 to 15 mm. Both the notch-lipped and robust suckers had less numbers than 2001 samples caught, probably due to drought.

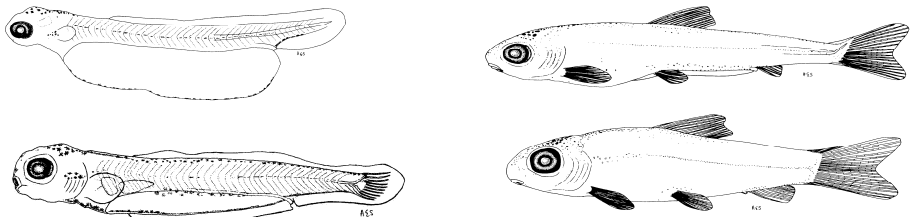
No reproduction was found in 2003 but final analysis of all samples is not complete. In 2003, water levels were extremely high and dangerous making it hard to sample. Numbers of all fishes were terribly low. Some sucker reproduction was found in the Oconee but no robust redhorse (out of 13 total suckers caught). The seine net was the only gear that was successful at catching fishes even though light traps, benthic light traps, and push nets were also deployed.

Reproductive success of suckers is poor during extreme dry periods of drought and is nonexistent in very high water seasons. Two large floods occurred in 1998 and 2003 with a 5-year drought in between. Reproductive success is not efficient during very high flow events during spawning and rearing season. However, relatively stable flows in 1999 and 2000 was correlated to high robust production indicating robust do well in intermediate or stable flow seasons. Georgia Power IFIM Modeling for flows suggests about 2,000 to 3000 cfs at Dublin (low normal range) for spawning.

Taxonomic Identification of Larval Moxostoma Species, Robust Redhorse Identification Key – Stuart Carlton, GA Coop, Cecil Jennings, USGS – GA Coop

The rationale for this study is that larval keys present unique challenges in identification. *Moxostoma robustum* and *M. collapsum* have similar-looking larvae which compounds on the challenge of identifying sucker larvae. Adult keys are generally size-dependent and this should apply to larval keys because the larvae are still developing. Also, in years of rapid spring warming, hatch can overlap and many larvae of similar size (Figure 4) currently can only be identified genetically which is costly and time-consuming.

Figure 4. Larval pictures of robust.



For this identification key, each size class will be treated like a separate "*species*." *Moxostoma collapsum*, *Minytrema melanops*, and *Scartomyzon* spp. broodstock were collected via electrofishing and gill-netting during the spring spawning season. Adults not spawned in the field were brought back to Whitehall Lab for hormonally-induced artificial spawning (Figure 5 and 6). Broodstock were injected with Ovaprim to induce ovulation or sperm production. Females were given Ovaprim at the rate of 0.5ml/kg of body weight (10% primer, 90% resolving dose), males given 1 dose at 0.05ml/kg of body weight. Ripe males and females were strip-spawned and eggs were manually fertilized. Induced spawning was successful in *Minytrema melanops* (yield ca. 5000 eggs). Induced spawning not successful in *Moxostoma collapsum* or *Scartomyzon* spp. possibly due to male/female asynchrony or weather/photoperiod issues. Data on basic morphometrics (body proportions) were taken of sampled larvae and of a reference collection of *M. robustum*.

Figure 5. Holding tanks at Whitehall Lab.

Figure 6. Artificially inducing spawning.

Results showed that there is apparently a major difference in size-at-development in 3 species. Ongoing research includes statistical analyses. If characters measured are insufficient, more difficult ones need to be added. The key should be finished in May 2004. It will be published and used in subsequent work.

Discussion Points

Use of this key will likely increase the numbers of robust redhorse identified in collections. Historically genetic testing is too costly. Historically "SWAG" method is conservative and underestimates the number (this has been proven) because the fish collected have been a bit smaller than expected. The key will be relatively precise except in cases where the species are hybridized. Blind testing will be undertaken and then more precisely tested by genetic confirmation.

Robust have pigmentation on the jaw at 14mm size. Gill arches have a series of melanophores. *Moxostoma collapsum* hatches larger and has fins. Larvae were reared at the same temperature but control and varied testing was not used since they did not have enough study material. They used one control group at one temperature.

Jenkins Excel Spreadsheet Conversion to Access – Jaci Zelko, USFWS

Jaci Zelko updated the members on the status of the robust redhorse Excel spreadsheet. Dr. Bob Jenkins designed and drafted the spreadsheet, adding each year's capture data. The spreadsheet contains information including capture date, location, etc., for fish captured in the Oconee River. The file had not been updated with annual capture records since 2001 until recently. With the help of Jimmy Evans and Tim Grabowski, Ms. Zelko had added the missing data as well as adding a new sheet for Savannah River captures. Even though the majority of the information collected on each capture is located in the spreadsheet, it is difficult to use. The columns are hard to sort and not all information collected on the robust is contained in the file.

Following several discussions at previous Excom meetings, it was suggested that the data be converted into an actual database that can sort, query, and summarize the data. The Excom decided to convert the existing Excel spreadsheet into a FileMaker Pro or Access Master Database. Warm Springs FTC is a possible repository for the master database that will eventually include all robust redhorse information that is subdivided by basins.

Several members conveyed sensitivity to ownership interests since the original spreadsheet was developed and maintained by Dr. Jenkins. Members also expressed that the Committee has ownership of the data and can direct management of the data as needed.

Discussion Points

During the course of the presentation, significant concern was mentioned about coordination and responsibility of managing such a large set of data. Members clearly agreed that having a team would be useful. It was decided an Information Technology ("IT") Technical Working Group would form and the master database repository would be housed at Warm Springs FTC with a designated manager. Jaci Zelko will chair the TWG. River basin data managers including Jimmy Evans, John Crutchfield, Scott Lamprecht, plus Cecil Jennings, Tim Grabowski, Alice Palmer, Haile Macurdy and Brett Albanese will support the TWG. Visionary RRCC members are also invited to participate.

Members also suggested several improvements for the newly formed IT TWG. Public access was raised as a concern and as an agenda item. Members would prefer that the database be as "FOIA-proof" as possible. The TWG will develop a policy on FOIA as well as QA/QC. The IT TWG will be charged with drafting a policy and data protocol, sharing the data will all organizations, solving FOIA obstructions, linking the most up-to-date information from each river basin, identifying a point person for Data Management for each river basin, cross-referencing with ArcView, and maintaining data points in the GIS Database.

Seasonal and Diel Movements of Robust Redhorse in the Savannah – Tim Grabowski, Clemson University

The objectives of this study were to characterize the movement of Savannah River robust redhorse and identify preferred habitat for further evaluation. Adult robust redhorse aggregate to spawn in late spring/early summer on main channel gravel bars of the Savannah River but nothing is known of their behavior during the remainder of the year. Individuals were anesthetized (MS-222) and a pulse coded radio transmitter (Figure 7) was surgically implanted into the body cavity (Figure 8).

Figure 7. Pulse coded radio transmitter

Figure 8. Making incision in body cavity.

Robust redhorse are significantly more active in spring on the Savannah River, though there is no sex or size effect on total movement. Overall mean distance of movement was 29.95 +/- 5.12 km. The fish is largely sedentary spending most time in deep water (>4 m) in swift current associated with woody debris (Figure 9). Robust does not move a whole lot at night. There is no relationship between diel movement and flows. Seasonal data has not yet been supplied by USGS (temp, flow period, etc.) so it is impossible to correlate environmental cues that drive long distance migrations.

Figure 9. Woody debris associated with robust redhorse habitat.

The robust located above the New Savannah Bluff Lock and Dam (Figure 10) is sedentary and they have no seasonal downstream movements. Two fish were caught above the Lock and Dam. Robust were located in water about 12 to 15 feet deep. South Carolina DNR personnel were unsuccessful at electro-shocking at that depth even though it seems that you can get close to the fish.

Figure 10. New Savannah Bluff Lock and Dam.

There was no gravel in areas where the robust spent the rest of the year outside of the spawning season in the Savannah River. Gravel is found in the areas utilized year-round by robust in the Oconee River. Cecil Jennings mentioned that in the Ocmulgee River, robust were probably using the gravel areas for feeding and then moving over to the woody debris when not feeding.

Discussion Points

Radio tagged fish can be detected from 200 to 500 meters away. The possibility of using surgically sterilized radio tagged fish as sentinel fish was discussed. The robust seem to get spooked by the outboard motor, banging into rocks, etc. It may be difficult to get close enough to capture these easily spooked fished.

There are similar findings on the Ocmulgee River on habitat and movement as well as small communal behavior (2-5 fish). The adult movement patterns are also comparable to razorback sucker behavior. It appears there is sufficient adult habitat in the Savannah River. Future research should focus on whether the availability of or access to spawning habitat is limiting the Savannah River robust redhorse population. Robust redhorse use almost the entire length of the Savannah River below New Savannah Bluff Lock and Dam necessitating whole system management.

Dredging in certain areas may show gravel deposits even outside of the spawning season. Perhaps there is feeding and/or foraging areas within the gravel substrate. This may be a

preferable feeding area relative to woody places for robust in the Savannah River. There is no correlation between day and night movements in either basin but data is minimal.

Oconee River Status – Jimmy Evans, GA DNR

Only 3 fish were collected during the spring spawning season with a catch rate of 0.23 fish/hour. The low catch rates could be explained by high flows preventing Georgia DNR from going out and electro-shocking. The fish might have also gone out into the floodplain during the spawning peak as reported by telemetry data on the Savannah River during the high flow events. It was predicted that more fish will be caught next year, dependent on river conditions. Flow on a given day does not appear to be the reason for the low catch rate.

There are some gravel areas between Milledgeville and Avant and near Sinclair Dam that can be checked. If sufficient numbers of broodfish are not caught next year in the Oconee River, then broodfish sampling could be moved to another river system to meet production goals. Jimmy Evans said that the Georgia DNR does not have a high level of comfort with the population estimate. If fish are not seen soon, we may abandon Oconee River for the Ocmulgee River for collections. Even though wild fish are preferred to stocked fish, another possible collection site would be Broad River, Georgia. There is a need for a gravel survey to compare to surveys conducted in 1992 to document habitat changes (gravel) over the past ten years.

About one-third of the fish captured in the Oconee every year are new captures. It appears that the population is aging. The size of captures between 1992 and 2003 ranged from 36 to 68 cm (mode around 60 cm).

Catch rates have declined since 1992 but is conceivable that fish moved to other areas of the river. The adult population estimate over the years has been 180 to 450 individuals. These numbers represent the fish from between Toombsboro and Dublin, although there are more fish in the Oconee River upstream of Avants that are never sampled. A population model predicts a sustainable population at a low density, but does not take into account environmental variability or genetics, etc. The population decline could have been produced in the late 70's or early 80's. The decline does correlate with the introduction of the flathead catfish. In 200 modeling simulations, the population never once crashed over a 100 year horizon. This raises many questions. Are the fish spawning limited? Are the juvenile fish limited? Is it predation limited (increased mortality)? Something is going on that has reduced recruitment. And we are not collecting the kind of information that allows us to answer "Why."

There should be an increase in broodfish numbers in 2004 from 1999 and 2000 reproduction but the efficiency rate of electro-fishing of fishes that are greater than 400 mm is not known.

GIS Database – Alice Palmer, USFWS

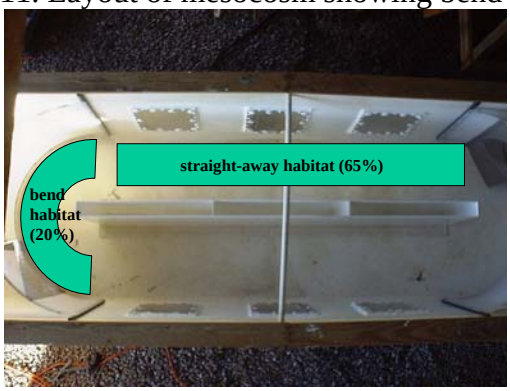
U.S. Fish and Wildlife Service GIS specialist, Steve Holzman, has been given the past robust redhorse collection data and will transfer it into ArcView or ArcMap as a Robust Redhorse GIS Database. However, some of the data points are outside the current river banks (the river could have migrated). There are also discrepancies in the written descriptions of site locations which need to be updated. Jimmy Evans will be working with Mr. Holzman to accurately place the individual points and correct the descriptions. The transfer is in progress. The final disposition of the GIS database will not be placed on the web. Historically, Georgia and South Carolina have withheld this data from the public in order to preserve the species. The decision of the final disposition of the database and information availability has been deferred to the Excom Committee.

Habitat Selection of Juvenile Robust Redhorse in an Experimental Mesocosm – Diarra Mosley, GA Coop and Cecil Jennings, USGS – GA Coop

The objective of this study was to determine habitat use preference for juvenile robust redhorse housed in an experimental mesocosm. Juvenile robust redhorse (~25 – 410 mm TL) have not been collected in the Oconee River. More data on juvenile habitat preference is needed to direct current sampling efforts in the Oconee River as well as other river systems. There are also several questions regarding their absence in rivers as it is related to habitat use or possibly sampling inefficiency. The results will help evaluate status of Oconee River population.

Thirteen pond-reared juvenile robust redhorse from Piedmont National Wildlife Refuge were obtained for this experiment. These fish were exposed to three simulated habitat types (bend, straight-away, and backwater) in a 16’ X 4’ experimental mesocosm (Figure 11). The average size of the fish was 22 cm TL (range 18 to 25 cm TL).

Figure 11. Layout of mesocosm showing bend and straight-away areas.



The experiment was conducted in 5-day trials and the fish (individually marked with colored tags) were observed for the first 10 minutes of each hour between 8 A.M and 6

P.M. Position (via grid) and depth (via viewing window) of each fish in tank was recorded. Fish were conditioned for one week before placed into study tank.

The study will continue using other year-class and size fish and results will be distributed as they become available.

Discussion Points

Feeding may accumulate food in specific areas or the fish may congregate near feeding spot, which may affect results. The fish are fed at the completion of the experiment, not during the observation period.

David Wilkins reported that the robust held at the South Carolina Aquarium will feed at the top of the water when food is placed in the tank.

Wild-produced juvenile robust redhorse may or may not behave analogous to hatchery-reared juveniles. The results of this study may be used to make inference to habitat used by fish in the wild for fish of similar size and year class in comparable habitats.

Oconee and Ocmulgee Rivers – Temperature Data and Project Operation – Mike Nichols, GPC

Sinclair Dam on the Oconee River can't control river flows above 8000 cfs. The max generation is 45 Mwe with a normal operating range of 338 to 340 feet. Normal peaking occurs between December and February with minimum flows of 500 cfs. March to April is limited peaking at 1500 cfs. The month of May is run-of-river operations. June 1 through 10 continues with run-of-river operations unless electric system demands necessitate normal peaking. June 11 through November is normal peaking at a minimum of 700 cfs. The total drainage fro the Oconee River is 2,910 square miles. A diurnal difference in temperature occurs in the spring but this is not due to peaking. The temperature and dissolved oxygen profiles behind the dam do not stratify in the spring. Daily dissolved oxygen average below the dam is now 5 mg/L after reductions in phosphorous levels (Figure 12). Flow modifications were first initiated in 1997. River water temperatures in the Oconee first reached 19 to 20 ºC in mid to late April (Figure 13).

Lloyd Shoals Dam on the Ocmulgee River operates at a minimum flow of 400 cfs year-round and has a smaller drainage area of 1295 square miles. The hydraulic capacity is 3000 cfs. Lloyd Shoals stratifies in the spring. An oxygenation weir downstream of the dam to brings up dissolved oxygen levels.

Sinclair and Lloyd Shoals Dams differ is design and stratification and river water temperatures vary by location, possibly reflecting contribution by tributary streams. Georgia Power Company will continue to collect data on operations at both dams.

Figure 12. Sinclair dissolved oxygen and temperature profiles 2003.

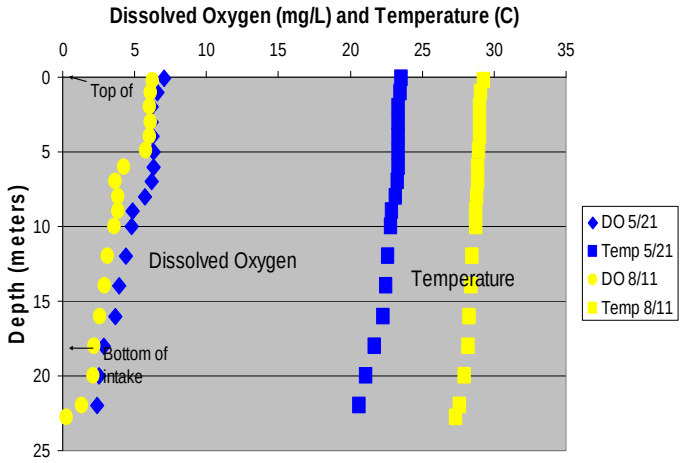
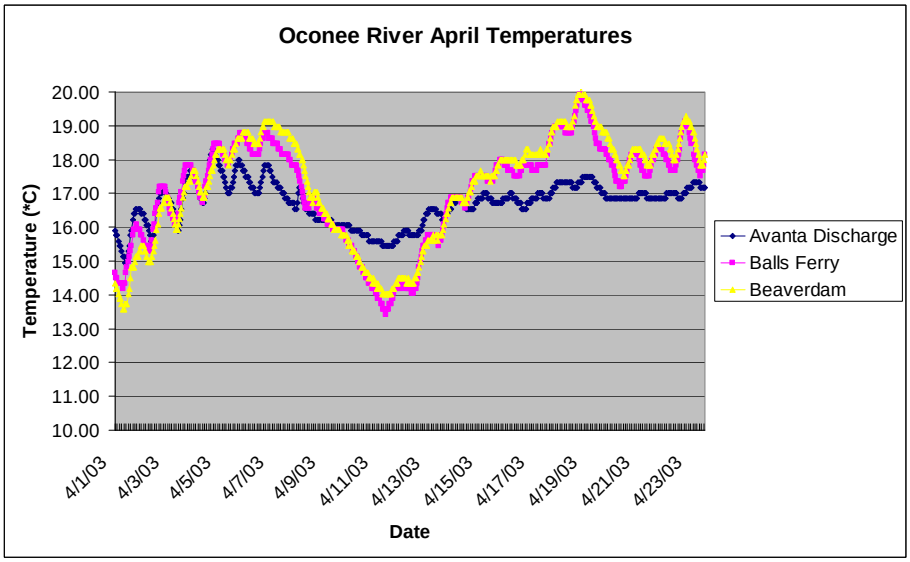


Figure 13. Oconee River April temperatures, 2003.



Ocmulgee River Surveys – Mike Nichols, GPC and Jimmy Evans, GA DNR

No surveys were conducted in the spring due to flooding, personnel and time constraints.

Surveys are tentatively scheduled for the week of October 27 to honor the conservation agreement to sample fish that were introduced. Cecil Jennings, Jimmy Evans, and Mike Nichols need to determine a date.

Savannah River and Broad River Surveys – Ross Self and Forrest Sessions, SC DNR

Spring plans were washed out on the Savannah River even though there was one "window" of opportunity. No fish were caught. Surveys were also attempted on the Congaree, Wateree, and Lower Broad River but high waters made it impossible to launch the boats. A survey was also attempted in August, but with no luck.

A fall survey will be conducted during the week of October 27, before commencement of the stocking program. The Lower Broad was sampled in September of 2002 and several sucker species (but no robust) were seen. Ross Self will send the Lower Broad River Management Plan to committee members in late October. The document has not changed since 2002 and is as finished as it gets.

Wise Creek Bank Stabilization Grant – Liz Caldwell, USFS

An update of the bank stabilization project was given by Mrs. Caldwell. This project is part of larger watershed study associated with the Candidate Conservation Agreement with Assurances signed in 2002. The bank stabilization on the Ocmulgee using vegetative stone revetments is starting soon, as a second effort. It may be transferred into the Ocmulgee Greenway and thus public space and should therefore be aesthetically pleasing. The presentation included before (Figure 14) and after (Figure 15) photographs of the placement of cribbing used in the stabilization. A grant of $300,000 given by the National Fish and Wildlife Foundation was used for this work. $50,000 of the total grant went to the Oconee Ranger District and $25,000 was used for the cribbage, equipment, supplies, and labor for the Wise Creek area. Even though a lot of the resources were used for other associated projects, the stabilization effort still relates to robust issues on the Ocmulgee River. Mr. Evans said that there is also a stabilization project also going on in the Ocmulgee River above Macon related to the decommissioning with Plant Arkwright.

Figure 14. Wise Creek before restoration. Figure 15. Wise Creek after restoration.

Mrs. Caldwell also provided the committee with a list of foundations, organizations, and institutions that provide grants for restoration work. This list includes U.S. Fish and Wildlife Service (flex funds, Landowner Incentive Programs, state and Tribal Wildlife grants, and Partners for Fish and Wildlife Program), USDA Forest Service (Challenge Costshare Agreements), and non-profit organizations (Turner Foundation, Ducks Unlimited, Trout Unlimited, Farm AID, River Network, SRA International, the National Science Foundation, and The Foundation Center). She also provided a list of website links to sources of information on technologies on erosion control, seeding specifications, and watershed restoration (Attachment 5 Restoration Work and Grant Provider Websites).

Walton State Fish Hatchery Spawning Effort – Jaci Zelko, USFWS

Georgia DNR sampled one pond at Walton State Fish Hatchery, Fort Valley, Georgia on May 29, 2003. Out of 27 specimens collected from that pond, 3 fish (two males and one female) were held in raceways for examination. FTC personnel were called in to examine the fish for a determination of spawning condition and sexual maturity. Any gametes collected would be used for research purposes. Greg Looney feels that the three fish held for examination were 1998 year-class fish.

The captively reared males were running ripe and sperm samples were collected. Initial motilities were checked for each sample taken (80%, 95%) but the sperm was not cryopreserved. Although the males were producing sperm, they did not have tubercles or mucus loss.

The female that was collected had secondary signs of sexual maturity including 40% mucus loss and red fins. FTC personnel injected the female with the hormone, Ovaprim at 0.5 ml/kg of body weight, in trying to induce her to spawn. The female was examined two days later but had lost her spawning condition. The female did not release any eggs. All three fish were implanted with PIT tags and had fin tissue removed for genetic analysis before being returned to the pond.

Refugial Populations – Jimmy Evans, GA DNR

One management goal of the RRCC was to establish a pond and riverine refugial populations program in 1996 to 1) provide broodstock 2) replace extirpated wild Oconee population in case of a catastrophic event and 3) rear large juveniles for research and stocking. The program has been generally successful and has completed some of the goals set by the RRCC even though the program was reduced in 2002.

Robust were originally stocked in 5 up-land ponds totaling 29 acres in Piedmont National Wildlife Refuge in 1996. These ponds are stocked annually with all available year classes and in large numbers. Initially, good growth and survival was experienced in the ponds even though the ponds are considered unmanageable. Water quality monitoring had been minimal until a 2001 analysis revealed poor dissolved oxygen levels during the summer months caused the ponds to be unsuitable for broodstock rearing. Piedmont NWR staff, based on recommendations from the RRCC, intensified monitoring efforts in 2001 by conducting weekly surveys of water quality conditions (including dissolved oxygen, temperature, pH, and turbidity) as well as vegetation and predator observations.

The pond refugial population program at Piedmont NWR was reduced in 2002. It was decided at the 2002 Annual Meeting to reduce the amount of stocking in Piedmont since there are refugial populations elsewhere and the ponds were unacceptable for satisfying the Broodfish objective (at least in part). This decision was based on problems that arose

in several ponds including predation by otters, low population levels, and an overflow event into the Ocmulgee River during a heavy rainfall. However, the fish in the ponds have some good growth (to 400+mm) and survival. Although the on-going program has been reduced from 5 to 3 ponds and 29 to 11 acres, Georgia DNR will continue to stock a small number of fish in the ponds from every year class (dependent on the size of the pond and carrying capacity). 22,000 fish from seven year-classes have been stocked since 1996 even though the program is limited.

The refugial ponds at Piedmont have been a source for 99 out of the 177 hatchery-reared fish released back into the Oconee River. Piedmont raised fish from six year-classes have also been stocked in 2002 into the Ocmulgee River per the Candidate Conservation Agreement with Assurances. Georgia DNR will sample the Piedmont ponds again in November 2003 as an assessment of the status of the pond populations.

Central Georgia Branch Station was once used to hold Broodfish but was discontinued due to pond unsuitability. The manager has also expressed disinterest in the program.

Walton State Fish Hatchery continues to hold broodfish and is stocked annually with fry produced during the spring spawning season.

A refugial pond was established at Fort Gordon after a Savannah River population was discovered in 1997. That pond, designated for Savannah Ecological Significant Unit robust has very few fish left even though there is food growth and some survival. The first stocking in that pond was a failure but the second stocking was successful. The pond at Fort Gordon will be maintained until more information is gained from the Savannah River population status.

The riverine refugial populations have not been extensively monitored but still serve to reduce the risk of extinction. As of 2003, there has been no documented reproduction with the stocked riverine populations.

The refugial population program is reduced in size and scope but still plays important part of saving the species. The program does provide valuable research fish. We need to retain the program for now; there may be a day when we can eliminate it all together.

Fingerling Distribution and Fry Production

A presentation summary on fingerling distribution and fry production was not submitted.

Stocking History – Jimmy Evans, GA DNR

The Oconee River has been stocked with Phase II or larger fish (all fish marked with PIT Tags) with 6 year-classes (Table 2) since 1995. A total of 240 fish, the quantity based on genetic diversity considerations, have been stocked in 4 selected sites between Milledgeville and Dublin, Georgia. Only 6 of these fish have been recaptured (3%), and there is 50% new recruitment of stocked fish. It seems that once the fish are moved from ponds to the river, the growth rate increases to about 2.5 – 3 lbs/year if an excellent food source is available.

Table 2. Year-class of fish stocked in the Oconee River 1995 – 2001.

Year	# Fish Stocked
1995	46
1997	67
1998	6
1999	59
2000	41
2001	21
Total	**240**

The Ocmulgee River was stocked in 2002 between Lloyd Shoals and Juliette Dams at Lloyd Shoals tailrace, Smith Mill, Wise Creek, and Hwy 83 with 2,999 robust. The stocking of fish in the Ocmulgee River is a continuation of the implementation of reintroduction of robust as set forth by the Candidate Conservation Agreement with Assurances signed by Georgia Power, Georgia Department of Natural Resources, and the U.S. Fish & Wildlife Service. A total of 6,692 robust have been stocked. This includes fish from 6-year classes (Table 3). Additional fish from the 2003 year class will be stocked in the fall.

Table 3. Year-class of fish stocked in the Ocmulgee River 1997 – 2002.

Year	# Fish Stocked
1997	528
1998	633
1999	577
2000	415
2001	1540
2002	2999
Total	**6692**

The Ogeechee River has received the most stocked fish than in any river in Georgia. All stocking occurs at Mayfield, Jewells Mill, and Hwy 88. A total of 38,795 fish from six year classes (Table 4) have been stocked. There is low sampling effort to assess reintroduction efforts but some recaptures occur.

Table 4. Year-class of fish stocked in the Ogeechee River 1997 – 2002.

Year	# Fish Stocked
1997	1762
1998	876
1999	10328
2000	8025
2001	7541
2002	10263
Total	**38795**

Robust were stocked in the Broad River, GA between 1993 and 1998. The fish were stocked at North Fork, Middle Fork, South Fork and Hudson sites. A total of 32,189 robust consisting of 4 year classes (Table 5) from Oconee River spawning broodstock were stocked but was halted after a wild population was found in the Savannah River. Observers have seen an aggregation at Anthony Shoals every year, near the mouth of the Broad River that could possibly be spawning.

Table 5. Year-class of fish stocked in the Broad River, Georgia 1993 – 1998.

Year	# Fish Stocked
1993	545
1995	1424
1997	27482
1998	2738
Total	**32189**

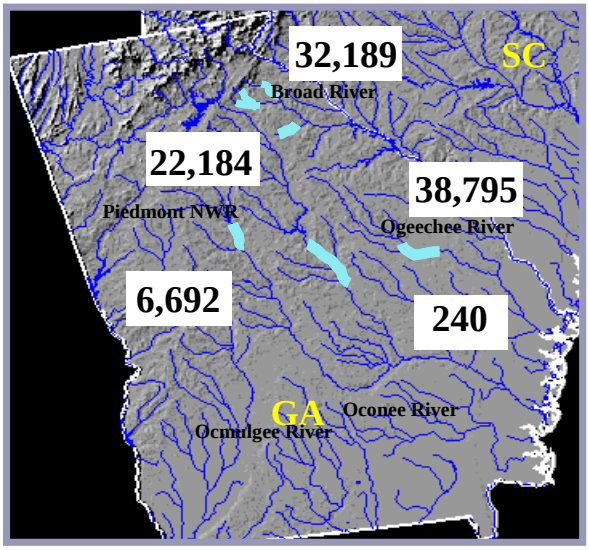
Piedmont National Wildlife Refuge ponds have been stocked with 22,184 robust from 7 year classes (1996, 1997, 1998, 1999, 2000, 2001, and 2002). The fish are stocked annually in the refugial ponds at Piedmont as part of the refugial population program.

A total of 100,100 robust including Phase I and II fish have been stocked. 78% of the robust have been released into rivers and 22% of the fish have been stocked in ponds (Figure 16). A summary table of the 2002 fingerling harvest and stocking numbers can be found in Attachment 6 (Robust redhorse harvest and stocking summaries for Burton, Walton, Richmond Hill, and McDuffie hatcheries, October – December 2002).

Discussion Points

The Canoochee River may be a very hospitable environment for the robust redhorse. Gravel substrate is available for habitat and appropriate temperatures are seen during normal spring flows. Jimmy Evans stated that we need to sample there in the spring. Jimmy Evans and/or Greg Looney will coordinate sampling efforts with Tom Bryce, Ft. Stewart.

Figure 16. Distribution of Hatchery-Reared Robust Redhorse Stocked in Georgia Waters, 1993 – 2002.



Stocking Recommendation for the Oconee River – Anthony Fiumera, Cornell University

Georgia DNR will be stocking 30 fish from the 2002 year-class from the Piedmont ponds into selected sites in the Oconee River to try to maximize the effective population size based on genetic risk assessments provided by Anthony Fiumera.

TECHNICAL WORKING GROUP REPORTS

Oconee TWG – Jimmy Evans, GA DNR, Bud Freeman, UGA, Cecil Jennings, USGS – GA Coop, Alice Palmer, USFWS, and Mike Nichols, GPC

The Oconee River Technical Working Group was formed at the 2002 RRCC Meeting. The Oconee TWG was charged with the Robust Redhorse Management Plan for the Oconee River. A 60-page draft is in process and will likely evolve to 80 pages. The Management Plan is under review by the TWG members and is not ready for broader distribution at this time. A finalized version of the draft should be ready for distribution to the RRCC in February of 2004 with a comment period thereafter to follow.

Discussion Points

Any conflict within the TWG will re resolved by compromise. Members expressed concern whether a TWG can or cannot write implementation plans. The Oconee TWG has not written and implementation plan for the Oconee River. Historically, a research agenda has been determined and the RRCC has matched researchers with tasks and money. On information collection (a part of implementation), the RRCC has been effective at implementation. Beyond that, we've been good in implementing genetics management (supplemental breeding protocols merged on the ground). Broader participation is needed concerning habitat issues (which are huge and largely unknown) and engagement of watershed groups. If the RRCC came up with direction on restoration policy implementation it would be taken more seriously and likely find the resources. Management plans are the driving force to help implement ideas and help other agencies prioritize.

Yadkin-Pee Dee TWG – Dave Coughlan, DPC, John Crutchfield, CPLC, Danielle Pender, NC WRC, Wayne Starnes, NCS MNS

The Yadkin-Pee Dee TWG has very significant representation from North and South Carolina hailing from all sectors. Efforts, to date, include spring and fall surveys, visual surveys of spawning habitat, and water quality monitoring. Data collection has been the cornerstone thus far and a management plan will be written after more information is obtained about the robust in the Yadkin and Pee Dee Rivers.

The long-term conservation goals of the TWG are to:

- ensure one viable, self-sustaining population in the river basin, and
- determine characteristics of population size, genetic variability, and recruitment and mortality rates.

The short-term conservation goals of the TWG are:

- consistent collection of robust redhorse in basin,
- locate the extent of wild populations,
- determine candidate sites for presence of wild populations (habitat and reach specific),

- determine habitat and life history requirements, and
- identify and facilitate gathering of information to develop goals.

The members have captured 4 total robust redhorse since 2000. Three of these were caught by electro-shocking, and one by gill netting. Two females, 1 juvenile female and 1 unknown juvenile have been captured (Attachment 7 Summary of Robust Redhorse Information Collected from the Pee Dee River 2000 – 2002).

The 2003 spring collection efforts caught no robust, most likely related to higher river flows due to the above average precipitation during the spring months, even though they logged 57.6 hours of peddle. Twenty-two participants representing 3 resource agencies, 2 research institutes and 2 power companies sampled for robust. A summary of spring collection efforts can be seen in Attachment 8 (2000-2003 Spring Sampling Effort on the Pee Dee River).

The 2003 fall collection efforts in 72 miles between Blewett Falls, NC and Darlington, SC were also unsuccessful even with 25 hours of peddle time.

The next Yadkin-Pee Dee TWG meeting is scheduled for Feb 2004.

Habitat TWG – Bill Bailey, USACOE, Alice Palmer, USFWS, Liz Caldwell, USFS, Rebecca Cull, GA Coop, and Danielle Pender, NC WRC

The Habitat Restoration Policy charges the Habitat TWG to 1) identify critical habitat needs, 2) establish guidelines for evaluating habitat, and 3) establish guidelines for evaluating restoration activities. The TWG is responsible for developing guidance that both prioritizes sites for restoration and facilitates suitable habitat restoration activities that can be applied to specific individual river basins.

Short-term goals of the Habitat TWG are to develop a comprehensive guidance document that will provide a methodology for prioritizing sites for restoration and facilitate and describe suitable robust redhorse restoration activities. The goals should be reached between 2002 and 2004. Long-term goals are to promote habitat restoration activities that support the Strategy's long-term goal to establish or maintain at least six self-sustaining robust redhorse populations distributed throughout the historic range, provide a guidance document that describes a suitable methodology for prioritizing restoration activities within river basins, provide a list of grant opportunities for funding robust redhorse habitat restoration activities, and provide a list of appropriate habitat restoration activities for southeastern river systems (at this time addressing sedimentation and associated pollutants).

The RRCC members commended the TWG on the newly drafted Habitat Management Plan that addresses the short-term goal of the Habitat TWG. The Plan gave ideas for

habitat research including research on restoration techniques in the Oconee River because of the stable population, and a photo review and field assessment of river systems for likely sources of sediment (GIS Mapping). A Compendium of Habitat-Related Research of Robust Redhorse was also compiled to obtain all completed and current research in regards to robust redhorse and habitat (Table 6).

Table 6. Summary of Research Topics by Life-Stage.

RESEARCH TOPIC	EGG	LARVAE	JUVENILE	ADULT
Fine sediment				
Metal toxicity				
Pulsed, high-velocity water flow				
Swimming performance				
Physicochemical responses				
Mesocosm				
Radio telemetry (hatchery)				
Radio telemetry (hatchery and wild)				
Spawning habitat				

The dynamic plan currently deals largely with sedimentation issues but will be revised when new data is obtained on restoration issues. Implementation was not specifically included because it is under the various management plans for any given river. The Habitat TWG would need someone with the requisite engineering experience to begin implementing as each river system might have different problems. Habitat augmentation and its equivalency to restoration are also discussed in the document but literature suggests that this action is expensive and the effectiveness is uncertain. The Habitat Management Plan is a framing document that can help identify main-stem threats in a river (Table 7) but it is up to the implementation plans to prioritize the threats within that river system.

Table 7. Potential Factors identified by the Habitat TWG that could affect robust redhorse in several river systems.

Sediment & other pollutants	Water flow alteration
Agriculture & urban runoff	Surface & groundwater withdrawals
Dredging & filling	Water diversion
Impervious surfaces	Instream & floodplain mining
Near-water & floodplain development & land cover alteration	Surface mining
Riparian losses and alterations	Dams, culverts, & other barriers
Waste treatment plant discharge & industrial discharge	Infrastructure placement & crossings
Nutrient loading	Non-native species
Atmospheric emissions	Disease

Discussion Points

The Habitat TWG needs opinions, feedback, agreement on research agenda, and additional information before proceeding with grant procurement. It was agreed that the RRCC should take 30 days to digest the material and identify top suggestions for the next charge to the Habitat TWG pending a review of research priorities. Comments should be sent to Bill Bailey and Greg Looney sometime prior to November 1, 2003. The Excom will consider all suggestions and re-charge the Habitat TWG, which will revise and finalize the Habitat Management Plan accordingly.

Formation of the Information Technology Technical Working Group

Increased concern of data management and responsibility for robust redhorse information over several river basins and jurisdictions led to the creation of the Information Technology TWG. The group is charged with two main responsibilities 1) develop an easily-accessed database that can be used by all persons working with robust and 2) maintaining the RRCC website www.robustredhorse.com. Jaci Zelko, Warm Springs FTC was voted Chair of the TWG. Other river basin data mangers include Jimmy Evans, John Crutchfield, Scott Lamprecht, plus Cecil Jennings, Tim Grabowski, Alice Palmer, Haile Macurdy and Brett Albanese.

The IT TWG will be charged with drafting a policy and data protocol, sharing the data will all organizations, solving FOIA obstructions, linking the most up-to-date information from each river basin, identifying a point person for Data Management for each river basin, cross-referencing with ArcView, and maintaining data points in the GIS Database.

A list of items to be added or edited on the website was recorded during the presentation of the newly designed website. The IT TWG will be responsible for making those specific changes and maintaining the website. The list includes linking to several reports, adding a search engine, acknowledging credits on maps and photos, and updating contact information.

Priority Work Items for 2004

Each year the RRCC develops a list of work items that are a priority to accomplish in the forthcoming year and charges the Excom with the authority to coordinate or complete the work items to the best of its ability. The RRCC established the following work items for the coming year.

- Develop a robust redhorse database and have a working draft by the next annual meeting. The Information Technology TWG will also continue to manage the website and make the database available on CD for use by other researchers.

- Update the MOU consistent with those changes listed herein and send the document out for review. The document should be finalized at the 10th RRCC Annual Meeting and will take effect in December 2004.

- The Habitat TWG will work on two pathways: 1) focus on sediment issues and work with individual river basins, get the restoration person involved in the effort, or 2) start working on another threat in the list. Habitat Management Plan comments by members should be sent to Bill Bailey and Greg Looney sometime prior to November 1, 2003.

- Management Plans for individual rivers are as follows:

    - Complete and distribute the Oconee River Management Plan due by 2004.
    - Distribute the completed Broad River, SC Management Plan.
    - Develop a draft and outline for the Ogeechee River Management Plan by 2004.
    - Address the need for Broad River, GA and Savannah Management Plans dependent on time and additional data.
    - CCAA is currently functioning as the plan for the Ocmulgee River.
    - Additional data is needed for the Broad River, GA and Savannah River before plans can be drafted.
    - Ogeechee TWG, including members Jimmy Evans, Alice Palmer, and Cecil Jennings, will have draft or outline for a Management Plan.

- Greg Looney, Chairman, will contact Tom Bryce at Ft. Stewart to see if they want to take a more formal position within the RRCC, participate in the Ogeechee TWG, and assist with the Canoochie River surveys.

Research Priorities for 2004

During this discussion, new and continuous research needs are reviewed as well as work items. The RRCC reviewed the document entitled "Prioritized Research Needs for Robust Redhorse Recovery" (Attachment 9). It undertook a process by which participants went through each research element and assigned TWO ratings:

a) Low (1); Medium (2) or High (3) based upon a constrained resource environment
b) Low (1); Medium (2) or High (3) based upon a unconstrained (i.e., unlimited) resource environment.

This was not a scientific vote and meant only to develop a barometer of research priorities (Attachment 10 Voting Results of Prioritized Research Needs) that the Excom can use to prioritize the efforts that have been identified. The following lists the research and management priorities for 2004 established at the 2003 RRCC Annual Meeting.

- Continue to assess the results of the stockings and telemetry efforts in the Ocmulgee River.
- Determine the electro-fishing capture efficiency for adult robust.
- Determine the cause of reduced recruitment in the Oconee River.
- Determine if the Oconee population is spawning, juvenile or predation limited.
- Survey Oconee gravel sites and quantities compared to 1992 levels.
- Evaluate and test *Moxostoma* larval taxonomic identification key.
- Determine micro-satellite allele frequencies for silver redhorse that can be applied to robust redhorse.

- Determine any bottleneck in robust redhorse populations by use of micro-satellites.
- Determine if there is passage of any robust redhorse through Clarks Hill Reservoir.
- Determine the survival rates in the Oconee and Broad Rivers, GA by monitoring the reproductive and recruitment success.
- Determine the stability of the Oconee River population.
- Determine juvenile habitat preferences.

Status Surveys for the following rivers are needed:

- Broad River, SC
- Oconee River – from Dublin to the confluence.
- Savannah River – Steven's Creek to salt water – to determine abundance and distribution
- Ocmulgee River– Warner Robins to Hawkinsville
- Pee Dee River– Blewett Falls, NC to Florence, SC
- Broad River, GA – monitor activities to determine if spawning is occurring in fish that were previously stocked
- Ogeechee River
- Altamaha – no surveys planned at this time
- Catawba/Wateree systems - sampling will be considered for this year in conjunction with re-licensing efforts.

A T T A C H M E N T S

Attachment 1. Participants of the 2003 RRCC Annual Meeting

Abney, Michael, Fisheries Biologist, Environmental Lab, Georgia Power Company
Albanese, Brett, Georgia Department of Natural Resources
Avalos, Jerry, Fort Stewart Fish and Wildlife
Bailey, William, Planning, Savannah District, U.S. Army Corps of Engineers
Bowers, Mark, Raleigh Field Office, U.S. Fish & Wildlife Service
Bowles, Tom, South Carolina Electric and Gas Company
Caldwell, Liz, Oconee National Forest Office, U.S. Forest Service
Carlton, Stuart, Georgia Cooperative Fish & Wildlife Research Unit, UGA
Coughlan, Dave, Environmental Center, Duke Power Company
Cull, Rebecca, Georgia Cooperative Fish & Wildlife Research Unit, UGA
Dakin, Beth, Department of Genetics, University of Georgia
DeMeo-King, Terry, Carl Vinson Institute of Government, UGA
Evans, Jimmy, Fisheries Biologist, Georgia Department of Natural Resources
Fiumera, Anthony, Department of Molecular Biology and Genetics, Cornell University
Grabowski, Tim, South Carolina Cooperative Fish & Wildlife Research Unit, Clemson University
Hill, Amanda, Charleston Field Office, U.S. Fish & Wildlife Service
Isely, Jeff, South Carolina Cooperative Fish & Wildlife Research Unit, Clemson University
Jennings, Cecil, Georgia Cooperative Fish & Wildlife Research Unit, UGA, U.S. Geological Survey
Labay, Andrew, Biologist, PBS & J
Lamprecht, Scott, Dennis Wildlife Center, South Carolina Department of Natural Resources
Logan, Dennis, Biologist, PBS & J
Looney, Greg, Retired Fishery Biologist, Chairman
Macurdy, Haile, Warm Springs National Fish Hatchery, U.S. Fish & Wildlife Service
McLean, Tavis, Georgia Cooperative Fish & Wildlife Research Unit, UGA
Mosley, Diarra, Georgia Cooperative Fish & Wildlife Research Unit, UGA
Nichols, Mike, Environmental Lab Manager, Environmental Lab, Georgia Power Company
Pacut, Josh, Fort Stewart Fish and Wildlife
Palmer, Alice, Ecological Services, U.S. Fish & Wildlife Service
Pender, Danielle, Habitat Conservation Program, North Carolina Wildlife Resources Commission
Quertermus, Carl, Biology Department, State University of West Georgia, Georgia Wildlife Federation
Saslow, Adam R., Facilitator, Consensus Solutions, Incorporated
Self, Ross, Assistant Chief of Fisheries, South Carolina Department of Natural Resources
Session, Forrest, Dennis Wildlife Center, South Carolina Department of Natural Resources
Slack, Rick, Cheraw State Fish Hatchery, South Carolina Department of Natural Resources
Summer, Steve, South Carolina Electric and Gas
Troxel, Jay, Atlanta Regional Office, U.S. Fish & Wildlife Service
Wilkins, David, Freshwater Aquarist, South Carolina Aquarium
Zelko, Jaci, Warm Springs Fish Technology Center, U.S. Fish & Wildlife Service
Zimpfer, Steve, Georgia Cooperative Fish & Wildlife Research Unit, UGA

Attachment 2. Robust Redhorse Fact Sheet Part A

Robust Redhorse Fact Sheet

The Mystery Fish

The robust redhorse (*Moxostoma robustum*) is a large, long-lived member of the redhorse sucker family. Adults can reach 30 inches in length and weigh up to 17 pounds, although the average length in sample populations is 25 inches and the average weight is 9 pounds. The maximum known age is 27 years. The fish has a thick, robust body with rose-colored fins and a fleshy lower lip.

The robust redhorse was discovered in the Yadkin River North Carolina and first described by Edward Cope in 1869. Yet the fish remained a mystery, unknown to scientists until individuals were captured in the Oconee River, Georgia in 1991. Historically, the robust redhorse was abundant in large Atlantic Slope rivers from the Altamaha River in Georgia to the Pee Dee River in North Carolina. Wild populations are now known to exist in the Ocmulgee and Oconee rivers (Georgia), the Savannah River (Georgia/South Carolina), and the Pee Dee River (North Carolina). Small populations have been established by stocking in the Ocmulgee, Broad, and Ogeechee rivers in Georgia.

Robust Redhorse Conservation Committee

The Robust Redhorse Conservation Committee (RRCC) was created in 1995 to improve the status of the species throughout its former range. The RRCC is a cooperative, voluntary partnership formed under a Memorandum of Understanding (MOU) between state and federal resource agencies, private industry, and the conservation community. RRCC members to the MOU include:

GA Department of Natural Resources
SC Department of Natural Resources
NC Wildlife Resources Commission
US Fish and Wildlife Service
US Army Corps of Engineers
USGS - Biological Resources Division
US Forest Service
Georgia Power Company
Carolina Power and Light Company
Duke Power Company
South Carolina Electric and Gas Company
Georgia Wildlife Federation
South Carolina Aquarium

In addition to the signatory members, the North Carolina Museum of Natural History and the Georgia River Network are cooperating members. As well, many university research facilities participate as affiliate members.

Attachment 3. Robust Redhorse Fact Sheet Part B

Threats to the Species' Future

While much has been learned about the fish since its discovery, many questions about its habitat, life history, and threats to its survival remain. The robust redhorse is difficult to sample and may be easily overlooked or misidentified as a closely-related and more common fish. Non-spawning adults prefer deep, moderately swift areas of the river, often near woody debris. Spawning occurs over clean, shallow gravel deposits in swift current. Adults feed on bivalves, including the asiatic clam (*Corbicula*) and have molariform pharyngeal teeth to crush shells.

Threats to the species' future are believed to include:

- Limited range of known populations;
- Low rate of recruitment to the population;
- Predation from the nonnative flathead and blue catfish;
- Reduced water quality from erosion resulting from land disturbances; and
- Habitat loss and disruption of spawning migrations resulting from dams and impoundments.

Partnership Accomplishments

The RRCC is currently facilitating recovery efforts and conservation measures by conducting research to answer scientific questions and address management needs including:

- Early life history, population dynamics and genetics research,
- Supplemental breeding and reintroduction programs, establishment of refugial populations, and field surveys for other populations, and
- Educational efforts on the fish, its habitat and the wonders of the natural world.

In addition, the RRCC has devised a Conservation Strategy that establishes short- and long-term conservation goals and management actions and has developed Policies that describe the current understanding of the robust redhorse and the processes under which the partnership operates.

If you believe you have seen or captured a robust redhorse or want more information, contact:

Jimmy Evans, Fisheries Section
Georgia Department of Natural Resources
1014 Martin Luther King Boulevard
Fort Valley, Georgia 31030
478-825-6151
jimmyevans@cstel.net

Ross Self, Freshwater Fisheries Section
South Carolina Department of Resources
Post Office Box 167
Columbia, South Carolina 29202
803-734-3808
rself@scdnr.state.sc.us

Ryan Heise, Nongame Section
North Carolina Wildlife Resources Commission
201 Trillingham Lane
Cary, North Carolina 27513
919-462-9390
ryan.heise@earthlink.net

John Crutchfield, Harris Energy and Environment Center
Carolina Power and Light Company
3932 New-Hill Hollerman Road
New Hill, North Carolina 27562
919-362-3557
john.crutchfield@pgnmail.com

Attachment 4. Screen shot of the Robust Redhorse Conservation Committee Website

A T T A C H M E N T S

Attachment 5. Restoration Work and Grant Provider Websites

http://www.erosioncontrol.com erosion control association
http://www.stormh2o.com Stormwater magazine - surface water quality
http://www.landandwater.com Land & Water - mgmt and restoration
http://www.ieca.org International Erosion Control Association
http://www.nrvma.org Natl Roadside Vegetation mgmt Association
http://grants.fws.gov/state.htmlI USFWS Website
http://www.turnerfoundation.org/grants/index.asp Turner Foundation, Inc
http://www.asafishing.org/content/conservation/fishamerica/ DNR-Fisheries
http://www.epa.gov/epahome/grants.htm Environmental Protection Agency
http://www.farmaid.org/org/mission/grants.asp FARM AID
http://www.grants.gov/index.html Grants.gov
http://www.lib.msu.edu/harris23/grants/2sgalpha.htm Grants For Nonprofits
http://www.nfwf.org/programs/grant_apply.htm Nat'l Fish and Wildlife Foundation
http://www.rivernetwork.org/howwecanhelp/index.cfm?doc_id=94 River Network
http://www.srainternational.org/newweb/grantsweb/index.cfm SRA International
http://fdncenter.org/for_individuals/funding_for/index.html The Foundation Center
http://www.nsf.gov/home/grants.htm The National Science Foundation

A T T A C H M E N T S

Attachment 6. Robust redhorse harvest and stocking summaries for Burton, Walton, Richmond Hill, and McDuffie hatcheries, October – December 2002

HATCHERY	POND	POND SIZE (AC)	DATE STOCKED	NO. STOCKED	STOCK RATE (NO/AC)	YEAR CLASS	DATE HARV.	NO. HARV.	AVE. LEN. (MM)	AVE. WT. (G)	SURV. (%)	TAGGING/ HAUL MORT. (%)	NO. STOCKED	LOC. STOCKED
Burton	4[1]	0.3	31 May 02	2,926	9,753	2002	21 Oct 02	2,359	133	25	81	>1	2,359	Ocmulgee@ - Smith Mill (842) -Hwy 83 (842) Piedmont NWR@ -Pippins Lake (675)
	6[1]	0.3	31 May 02	2,926	9,753	2002	21 Oct 02	1,315	136	27	45	>1	1,315	Ocmulgee@ -Lloyd Shoals (1,315)
Walton	5[2]	0.45	12 Jun 02	5,000	11,111	2002	20 Nov 02	1,117	131	23	22	0	1,117	Ogeechee@ -Hwy 88 (1,117)
	12[2]	1.25	12 Jun 02	10,000	8,000	2002	20 Nov 02	9,390	87	6	94	2.6	9,146	Ogeechee@ -Hwy 88 (9,146)
Richmond Hill	C13[3]	0.3	29 May 02	4,800	16,000	2002	4 Dec 02	182	169	53	4	>1	182	Piedmont NWR@ -9A (91) -11A (91)
	C14[3]	0.3	29 May 02	4,275	14,250	2002	4 Dec 02	1,076	138	24	25	>1	1,076	Piedmont NWR@ -9A (538) -11A (538)
McDuffie	9A[2]	0.42	15 May 02	175	417	2001	16 Dec 02	150	269	226	86	>1	150	Oconee@ -Hwy 57 (21) Ocmulgee@ -L. Shoals (40) Piedmont NWR@ -Pippins (29) -9A (29) -11A (30)
	11A[2]	0.50	22 May 02	7,930	15,860	2002	16 Dec 02	2,841	130	22	36	>1	2,841	Piedmont NWR@ -Pippins (947) -9A (947) -11A (947)
Totals	-	-	-	**38,032**	-	-	-	**18,430**	-	-	**48**	-	**18,186**	**Ocmulgee -2001 yc (40) -2002 yc (2,999) Ogeechee -2002 yc (10,263) Oconee -1997 yc (1) -2001 yc (21) Piedmont NWR -2001 yc (88) -2002 yc (4,774)**

A T T A C H M E N T S

Attachment 7. Summary of Robust Redhorse Information Collected from the Pee Dee River 2000 – 2002

Date	River Mile	Latitude	Longitude	Sex/Status/Age	Lgth (mm)	Wght (g)
26-Apr-00	184.0	34º56'06.56"	79º51'44.46"	Female, mature, 6 years	605	3200
2-May-01	177.2	34º42'24.15"	79º52'29.88"	Female, ripe, 11years	692	5600
29-Nov-01	164.7	34º 86' 19.7"	79º 89' 07.8"	Juvenile, female, 2+ years	413	805
10-May-02	133.0	34º28'35.46"	79º43'59.04"	Juvenile, sex unknown, 3+ years	430	1125

Attachment 8. 2000-2003 Spring Sampling Effort on the Pee Dee River

River Reach	Year	Electrofishing Effort (hours)/ Number of river miles covered	Water Temperature (ºC)	Power Plant Discharge (cfs)
Below Blewett Falls	2000	22.5 hours/23 miles	Mean = 17.2 (16.0-18.2)	9,000
Below Blewett Falls	2001	24.2 hours/23 miles	Mean = 20.3 (19.1-21.8)	7,000
Below Blewett Falls	2002	50.1 hours/62 miles	Mean = 24.3 (21.5-26.1)	4,000-5,000
Below Blewett Falls	2003	57.6 hours/72.1 miles	Mean = 20.4 (19.7-21.0)	3,500-13,000
Below Tillery	2001	17.5 hours/14 miles	Mean = 16.7 (15.4-19.6)	4,000-5,000
Below Tillery	2002	15.7 hours/14 miles	Mean = 18.4 (17.3-21.9)	4,000-5,000

Attachment 9. Prioritized Research Needs for Robust Redhorse Recovery

I. Culture Techniques
   A. Propagation
      1. Use of hormones to induce ovulation.
      2. Incubation techniques.
      3. Water quality requirements, temperature sensitivity.
      4. Egg and fry handling techniques.
      5. Fry dietary requirements, growth trials.
      6. Maximizing genetic diversity.
   B. Rearing
      1. Dietary requirements of Age-0 and Age-1 fingerlings.
      2. Growth trials on various diets in ponds.
      3. Growth and survival at various stocking rates in ponds.
      4. Food habits/preference of fingerlings in ponds.
      5. Intensive culture in raceways, tanks, and cages.
      6. Pond preparation.
      7. Rearing techniques for larger juveniles and adults.

II. Early Life History Habitat Requirements
   A. Egg viability in redds, substrate characteristics necessary for viability. Impacts of turbulence and rapid changes in current velocities.
   B. Depth, current velocity, substrate, and cover preferences (larval to advanced fingerling stage). Impacts turbulence and rapid changes in current velocities.
   C. Swim-up survival and fry disposition.
   D. Juvenile habitat requirements.

III. Monitoring the Oconee River Population
   A. Annual electro-fishing catch rate comparisons.
   B. Age and growth studies.
   C. Population estimation.
   D. Adult spawning and non-spawning habitat requirements.
   E. Spawning site delineation and characterization.
   F. Long-term migration patterns.
   G. Daily, monthly, and seasonal movement patterns.
   H. Larval and YOY sampling.

IV. Monitoring Stocked Populations

   Evaluation of sampling methods. Determination of growth, survival, reproductive success; relationships between predator types/densities and survival.

V. Post-Stocking Behavior

   Telemetry investigations of Age-1 and, if possible, Age-0 fingerling behavior for a several week or month period immediately after stocking. Important in identifying suitable stocking sites and potential for migration out of stocking sites.

A T T A C H M E N T S

VI. Tagging Studies

Coded-wire tag retention for Age-0 and Age-1 fingerlings at various tag insertion locations. Suitable tag length, diameter, etc. Effectiveness of various field detection techniques. Evaluation of tagging methods for identification of individual fish.

VII. Predator Control

Techniques for reducing flathead catfish densities. Focus on the Oconee River, but applicable to stocked rivers.

VIII. Population Genetics

Genetic heterogeneity (mDNA and electrophoretic techniques); Oconee River population as well as populations or individuals which might be collected from other drainages in the future.

IX. Distribution History

A. Additional surveys to determine if other populations or isolated individuals exist in Georgia, South Carolina, or North Carolina.
B. Investigations into historical occurrence and distribution.
C. Correlation between changing land and water use patterns and species decline.

X. Behavioral Studies of Adults

Focus on spawning and feeding behavior, behavioral responses to rapidly changing flow.

XI. Evolutionary Biology

Establish phylogenetic relationships.

XII. Physiology

Thermal biology, endocrinology, reproductive biology, etc.

XIII. Habitat Restoration

A. Restoration Techniques – mostly sedimentation issues.
B. Photo Survey – review and field assessment of river systems.

Attachment 10. Voting Results of Prioritized Research Needs

No.	Research Element	Limited Resources			Unlimited Resources		
		1 Low Priority	2 Med. Priority	3 High Priority	1 Low Priority	2 Med. Priority	3 High Priority
I.A.3	WQ Reqts	16	6	4	1	13	7
I.A.5	Fry Dietary	20	8	0	7	20	3
I.B.1	Dietary Reqts	20	7	3	4	18	6
I.B.2	Growth Trials	21	6	1	8	19	2
I.B.3	Growth and Survival	23	5	1	7	20	3
I.B.5	Intensive Culture	21	7	1	7	16	6
I.B.7	Rearing Techniques	15	12	3	2	20	8
II.A	Egg Viability	1	15	4	0	3	26
II.B	Depth, Current Velocity	0	13	17	0	3	27
II.C	Fry Disposition	4	15	12	0	8	22
II.D	Juvenile Habitat	0	1	29	0	0	30
III.A	Annual Electrofishing	3	14	12	0	12	19
III.B	Age and Growth	6	15	10	1	11	17
III.C	Population Est.	0	11	17	2	1	27
III.D	Adult Spawning	0	11	19	0	3	27
III.E	Spawning site	0	11	18	0	3	27
III.F	Long term Migration	1	17	12	0	5	25
III.G	Daily, monthly and	1	19	10	0	10	20
III.H	Larval and YOY	0	12	18	0	0	30
IV.	Eval of sampling	0	16	13	0	4	26
V	Post Stocking Behav'r	5	18	7	1	10	17
VI.	Tagging Studies	21	8	2	7	20	3
VII.	Predator Control	15	8	7	5	14	11
VIII.	Population Genetics	5	16	9	5	14	11
IX.A	Additional Surveys	0	12	17	0	5	25
IX.B	Investigations into Hist'l Occurrences	14	15	2	7	15	8
IX.C	Correlation between changing lands	7	12	12	3	8	18
X.	Behavioral Studies of Adults	2	20	6	0	8	22
XII.	Physiology	11	14	3	2	14	12
XIII.A	Restoration Techniques	4	18	8	1	11	18
XIII.B	Photo Survey	3	18	9	1	7	23