Quarterly Public Meeting

Saluda Hydroelectric Project

FERC Project 516

July 31, 2008

Agenda

- Introductions – Alan Stuart Kleinschmidt
- Land Rebalancing Proposal -
  Tommy Boozer/David Hancock SCE&G - Randy Mahan
  SCANA Services
- Questions
- Other Comments

Efforts of the Lake and Land TWC

- **20 members including state agencies, Non-governmental Orgs. and Homeowner groups**
- **Convened over 40 meetings**
- **Generated in excess of 225 pages of meeting summaries**
- **Generated in excess of 1,100 emails**
- **Expended over 7,000 man-hours in addressing Lake and Land Issues**

Re-Balancing

Project & Non-Project Lands

FERC Project 516

July 21, 2008

Project 516

- **SCE&G PROPOSES to PROTECT FROM RESIDENTIAL AND COMMERCIAL DEVELOPMENT**

9,190 ACRES

185 MILES

Re-Balancing

- Current Project Lands
  - Future Development
  - Management Plan
- Recreation
  - Project & Non-Project
- Lower Saluda River Lands
- Non-Project Lands (Large Tracts)

Re-Balancing

Project Lands

SCE&G Future Development

Where Did We Start?

SCE&G
Management Prescriptions
June 2008

SCE&G Management Prescriptions June 2008

Lake Murray	Acres	Miles
75-Foot Setback	263.77	29.95
Causeway	4.16	1.23
Commercial Recreation	114.28	6.05
Natural Areas	42.17	1.57
Easement	7943.93	386.38
Easement w/75-Foot Setback	299.13	0
Forest Management	3570.23	100.13
Future Development –FDID 1-348	1818.10	90.84
Project Operations	1057.53	1.63
Public Recreation	765.47	37.78
	15,878.77	655.56

Re-Balancing of Classifications

	ACRES	MILES
Natural Areas	464.06	21.01
Forest Management	206.16	9.46
Recreation	189.70	9.26
Sub-Total	859.92	39.73
Future Development	958.18	51.11
Total	1818.10	90.84

SCE&G Management Prescriptions by Acres

Lake Murray	Current Acres	Proposed Acres
75-Foot Setback	263.77	263.77
Causeway	4.16	4.16
Commercial Recreation	114.28	114.28
Natural Areas(Conservation Areas)	42.17	506.23
Easement	7943.93	7943.93
Easement w/75-Foot Setback	299.13	299.13
Forest Management	3570.23	3776.39
Future Development –FDID 1-348	1818.10	958.18
Project Operations	1057.53	1057.53
Public Recreation	765.47	955.17
	15,878.77	15,878.77

SCE&G Management Prescriptions by Miles

Lake Murray	Current Miles	Proposed Miles
75-Foot Setback	29.95	29.95
Causeway	1.23	1.23
Commercial Recreation	6.05	6.05
Natural Areas (Conservation Areas)	1.57	22.58
Easement	386.38	386.38
Easement w/75-Foot Setback	0	0
Forest Management	100.13	109.59
Future Development –FDID 1-348	90.84	51.11
Project Operations	1.63	1.63
Public Recreation	37.78	47.03
	655.56	655.56

RECREATION

LAKE MURRAY & LOWER SALUDA RIVER

RECREATION

- EXISTING PUBLIC PARKS
- EXISTING FUTURE PARK SITES
- ISLANDS
- EXISTING LOWER SALUDA PARKS
- NEW FUTURE RECREATION SITES
  - LAKE MURRAY (Inside & Outside PBL)
  - LOWER SALUDA RIVER
- NON PROJECT TIMBER TRACTS

Existing Park Sites

Site Name (Site Number)	**Acres**	**Shoreline**
Billy Dreher State Park (1-11)	348	12Miles
Dam (1-8)	6.8	1388Ft
Higgins Bridge (1-13)	1.1	375Ft
Hilton (1-7)	4.4	1219Ft
Kempson Bridge (1-14)	2.93	600Ft
Lake Murray Estates (1-22)	7.5	910Ft
Macedonia Church (1-12)	4.8	2491Ft
Murray Shores (1-3)	1.6	1016Ft
Parksite (1-1)	17.9	2271Ft
River Bend (1-4 & 4-A)	11.6	2720Ft
Rocky Point Creek (1-6)	1.7	258Ft
Shull Island (1-2B)	0.36	115.5Ft
Shull Island / Larry Koon (1-2)	1.8	434Ft
Sunset 1-(5)	2.3	640Ft
Total	**412.79**	**14.8 Miles**

Existing Future Sites

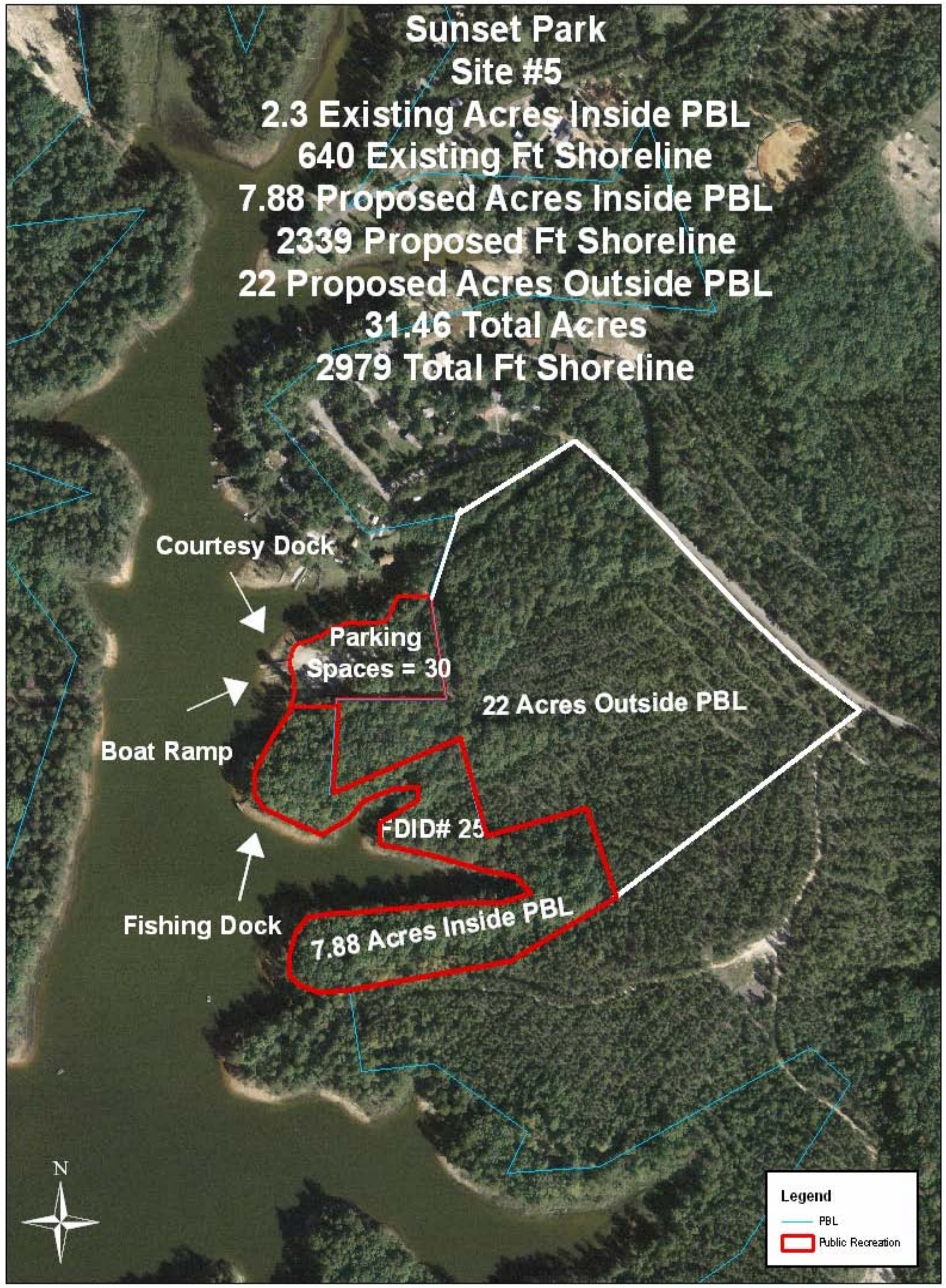
Future Sites	**Acres**	**Shoreline**
Shull Island (1-2A)	22.4	0
Simpson's Ferry (5-A)	11.58	3247Ft
Long Pine (6-A)	31.4	1.81 Miles
Hilton (1-7A)	27.86	1755Ft
Water Treatment Plant (16)	4.3	1429Ft
Stone Mountain (17)	26.47	1.94 Miles
Cloud's Creek (18)	3.04	3765Ft
Big Creek (19)	22.34	2613Ft
Little Saluda Point (20)	15.4	3765Ft
Bundrick Island (21)	87.89	2.23Miles
Total	**252.68**	**9.12 Miles**

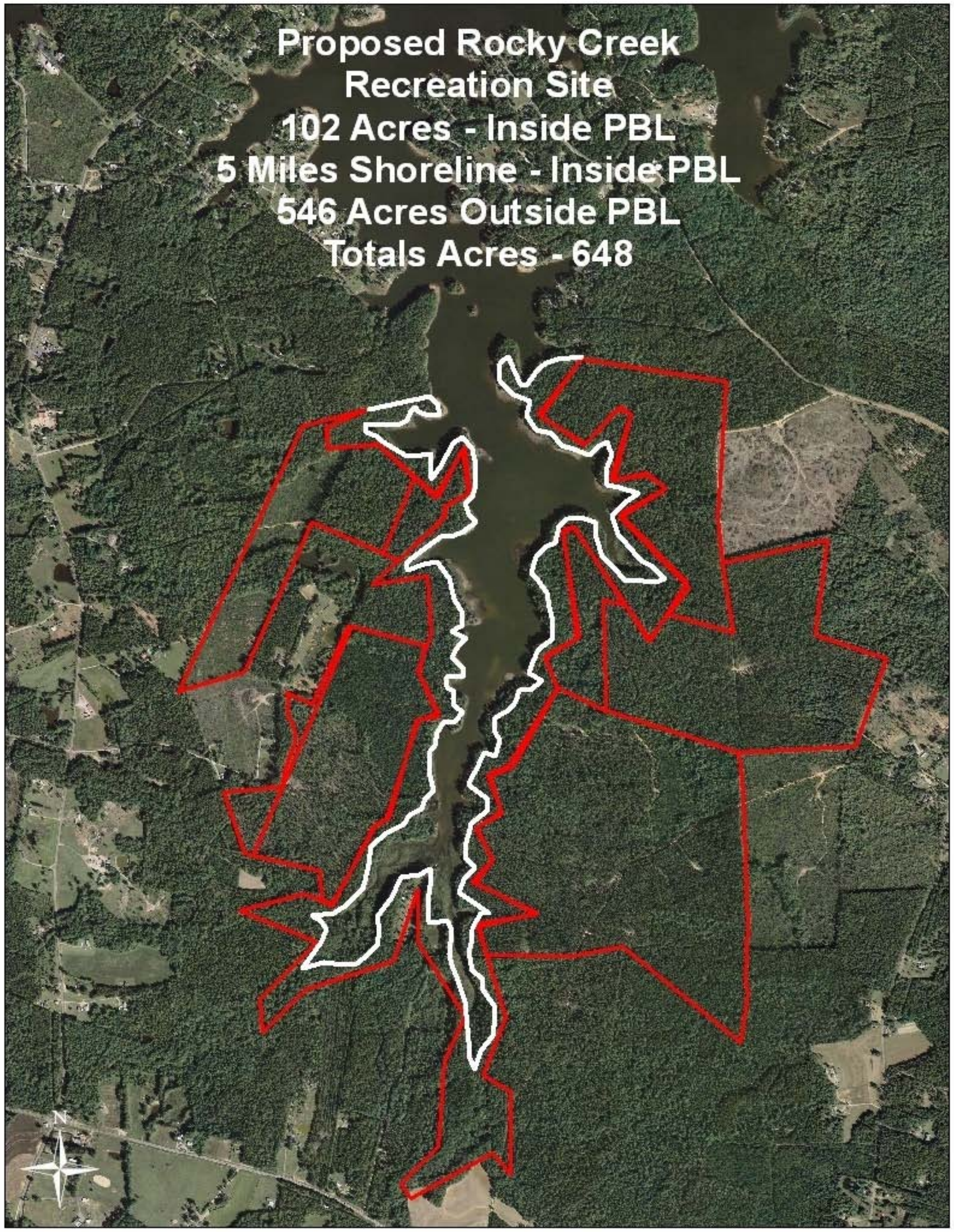
Islands and Lower Saluda River Existing Recreation

Site Name (Site Number)	Acres	Shoreline
Islands (62)	**100**	**13.81Miles**
Lower Saluda River		
Hope Ferry - Metts Landing (1-10)	1	150Ft
Saluda River Canoe Portage (1-15)	4.7	210Ft
Saluda Shoals Park (1-9)	160	1.3Miles
Total	**165.7**	**1.36 Miles**

New Future Recreation Sites	**Acres Outside PBL**	**Acres Inside PBL**	**Shoreline**
River Bend	0	5.87	787Ft
Sunset	22	7.88	2339Ft
Big Creek	15	0	0
Little Saluda River – Harmon's Bridge	0	2.83	432Ft
Shealy Road Access	12	15.62	1.5 Miles
Crayne's Bridge Park	38	9.9	3710Ft
Shealy Tract	3.2	36.9	1.5 Miles
Little Saluda Point	0	14.18	1147Ft
Rocky Creek	546	102	5 Miles
Old Corley Bridge Road Canoe Access	2	0	150Ft
Long Pine	20		
Candy Lane	0	3.08	400Ft
12 Mile Creek	0	52	1240Ft
Total	**658.20**	**250.26**	**9.93 Miles**

TOTAL PROPOSED ACRES = 908.46


Sunset Park
Site #5
2.3 Existing Acres Inside PBL
640 Existing Ft Shoreline
7.88 Proposed Acres Inside PBL
2339 Proposed Ft Shoreline
22 Proposed Acres Outside PBL
31.46 Total Acres
2979 Total Ft Shoreline
Courtesy Dock
Parking
Spaces = 30
22 Acres Outside PBL
Boat Ramp
FDID# 25
Fishing Dock
7.88 Acres Inside PBL
N
Legend
PBL
Public Recreation


Proposed Rocky Creek
Recreation Site
102 Acres - Inside PBL
5 Miles Shoreline - Inside PBL
546 Acres Outside PBL
Totals Acres - 648
N

SUMMARY

	Acres	Shoreline Miles
Existing Recreation Sites	**412.79**	**14.8**
(Includes Billy Dreher Island)		
Existing Future Sites	**252.42**	**9.12**
Islands	**100**	**13.81**
Lower Saluda Recreation Sites	**165.7**	**1.06**
Sub-Total	**930.91**	**38.79**
New Future Recreation	**853.38**	**9.62**
(Lake Murray Sites)		
New Future Recreation	**55.08**	**0.31**
(Lower Saluda River)		
Total	**1839.37**	**48.72**

Lake Murray State and Regional Parks

- Billy Dreher Island State Park 348 acres 12 miles
- Saluda Shoals Regional Park 240 acres 1.3 miles
- Rocky Creek State Park 648 acres 5 miles
- Bundrick Island Park 88 acres 2.23 miles

Total 1324 Acres 20.53 Miles

<u>SCE&G SALUDA RIVER PROPERTY</u>

SCENIC RIVER EASEMENT

SCE&G PROPERTIES

SCENIC RIVER

- SCE&G proposes to classify 14 tracts totaling 275.14 acres plus the 45.04 acres already in the Scenic River as recreation, bringing the total of these tracts to 320.18 acres along the Lower Saluda River

Saluda River Property

ID#	SCE&G Tract Name	Total Acreage
1	E.P. Corley	4.3
2	Kleckley	16.3
3	Kleckley	4
4	Corley	26.09
5	Gardendale	56
6	Gardendale	73.12
7	Drafts	7.5
8	Mathias	26.6
9	Meetze	36.36
10	Trapp	27.1
11	Richland Power Co.	25
12	M. Hook -(Island)	12
13	W. Hook	4.07
14	B. Hook	1.74
Total Proposed		**320.18**

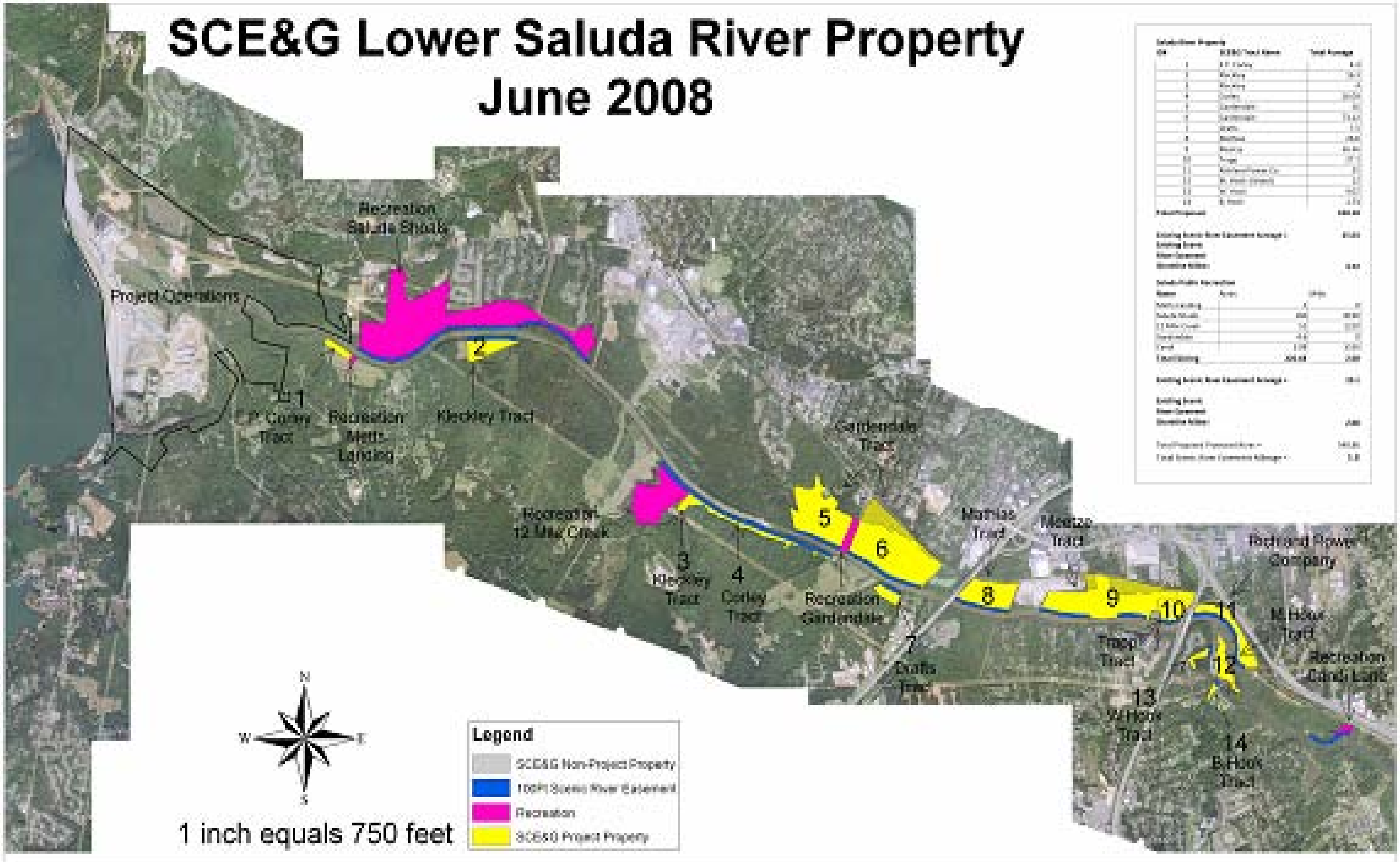
Existing Scenic River Easement Acreage =	**45.04**
Existing Scenic River Easement Shoreline Miles=	**3.72**

Saluda Public Recreation

Name	Acres	Miles
Metts Landing	**1**	**0**
Saluda Shoals	**160**	**8190**
12 Mile Creek (Future)	**52**	**1220**
Gardendale	**4.7**	**0**
Candi Lane (Future)	**3.08**	**1526**
Total Existing & Future	**220.69**	**2.08**

Existing Scenic River Easement Acreage =	**25.1**
Existing Scenic River Easement Shoreline Miles=	**2.08**

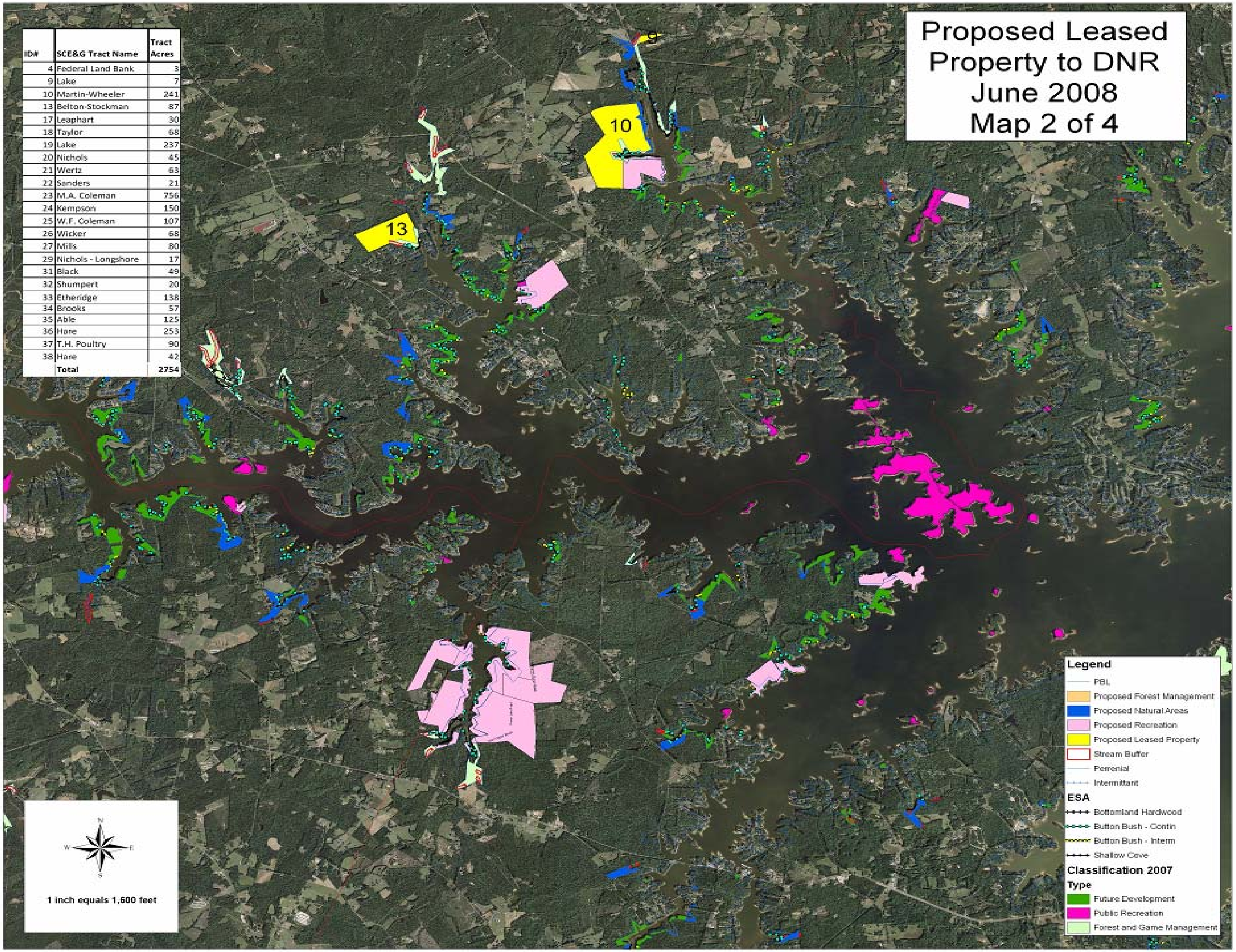
Total Proposed Protected Acres =	540.86
Total Scenic River Easement Mileage =	5.8


SCE&G Lower Saluda River Property
June 2008
Recreation Saluda Shoals
Project Operations
1
P Corley Tract
Recreation Metts Landing
2
Kleckley Tract
Gardendale Tract
Recreation 12 Mile Creek
5
6
3
Kleckley Tract
4
Corley Tract
Recreation Gardendale
7
Drafts Tract
Mathias Tract
Meetze Tract
8
9
10
11
Richland Power Company
Trapp Tract
M Hook Tract
12
Recreation Candi Lane
13
W Hook Tract
14
B Hook Tract
N
W
E
S
1 inch equals 750 feet
Legend
SCE&G Non-Project Property
100Ft Scenic River Easement
Recreation
SCE&G Project Property

NON-PROJECT TIMBER TRACTS

- 24 Timber tracts totaling 2754 acres located in the upper regions of Lake Murray
- Lease Tracts to SCDNR
- Properties could be in the SCDNR WMA

ID#	SCE&G Tract Name	Tract Acres
4	Federal Land Bank	3
9	Lake	7
10	Martin-Wheeler	241
13	Belton-Stockman	87
17	Leaphart	30
18	Taylor	68
19	Lake	237
20	Nichols	45
21	Wertz	63
22	Sanders	21
23	M.A. Coleman	756
24	Kempson	150
25	W.F. Coleman	107
26	Wicker	68
27	Mills	80
29	Nichols - Longshore	17
31	Black	49
32	Shumpert	20
33	Etheridge	138
34	Brooks	57
35	Able	125
36	Hare	253
37	T.H. Poultry	90
38	Hare	42
	Total	**2754**



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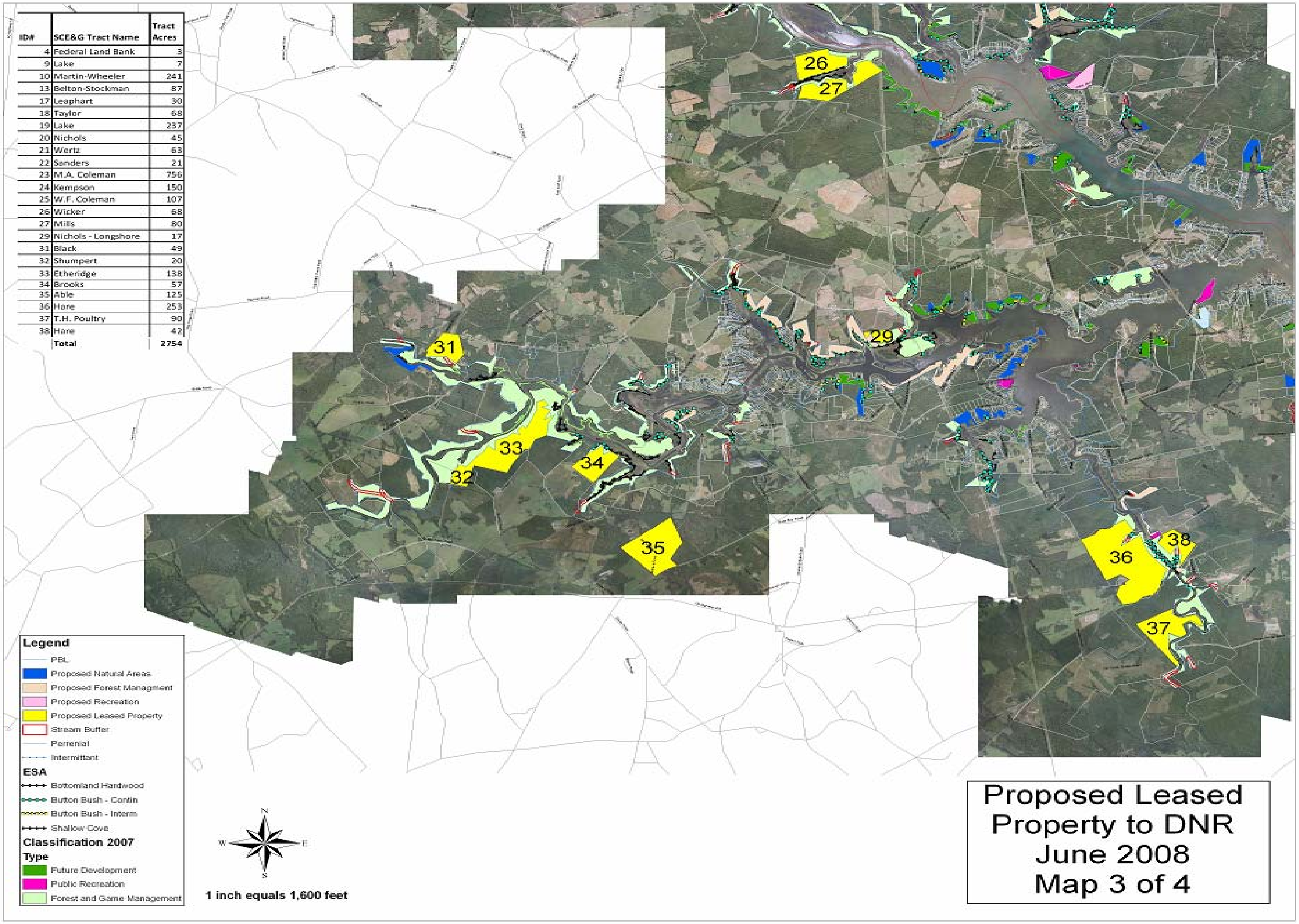
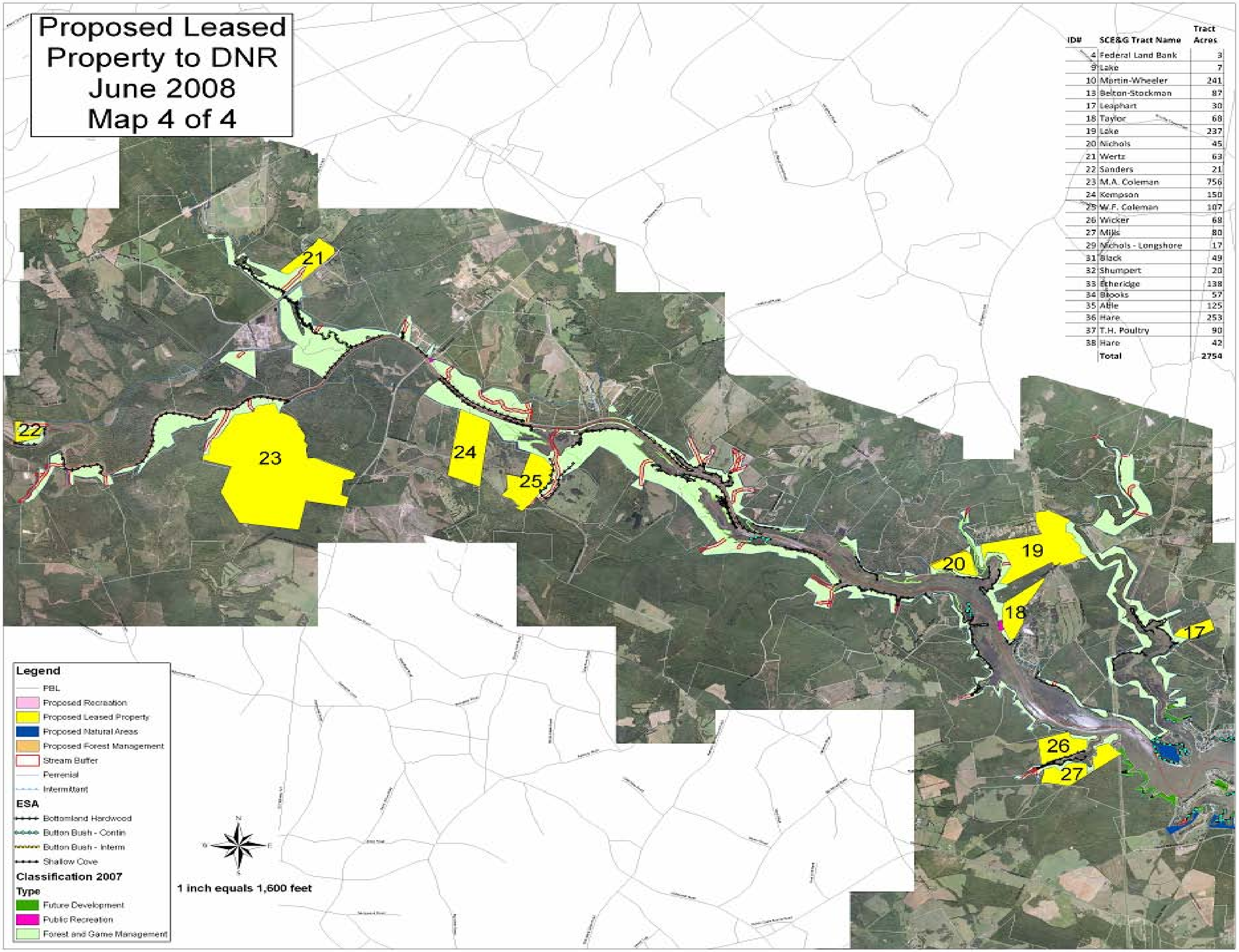


Proposed Leased Property to DNR
June 2008
Map 3 of 4

Proposed Leased Property to DNR
June 2008
Map 4 of 4



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38	Hare	42
	Total	2754

RE-BALANCING SUMMARY ACREAGE

	Natural Areas	Forest Management	Recreation	Lease to SCDNR
Lake Murray Protected Acres	506.23	3776.39	955.17	
Non Project Lands			658.2	2754
Lower Saluda River			540.86	
Sub- Totals	506.23	3776.39	2154.23	2754
Grand Total	To Be	Protected	From	Development
	Lake Murray	and the	Lower Saluda	River
		9,190.85		

RE-BALANCING SUMMARY MILES

	Natural Areas	Recreation	Forest Management	Lease to SCDNR
Lake Murray Protected Shoreline	22.58	47.03	109.59	
Non Project Lands				
Lower Saluda River		5.8		
Sub-totals	22.58	52.83	109.59	
Grand Total	Of	Protected	Shoreline	Miles
		185 Miles		


WHAT HAVE WE HEARD
FOR 2 ½ YEARS?

Recommendations

- Increase Lot Size
- Multi-slip docks in lieu of individual docks
- Non disturbance buffer zone
- Establish a full 75' Buffer Zone
- Establish Natural Areas
- Restrict development within the PBL
- Protect additional Forest Management & Recreation Lands

Recommendations Cont.

- Manage remaining Future Development Property under restrictive and protective plan
- Dock Policy for Forest Management Lands
- Support Hunting by participating in the SCDNR WMA program
- State Park on the Lexington Side of Lake Murray

Recommendations Cont.

- Protect property on Lower Saluda River
- Provide additional recreational properties on Lake Murray and the lower Saluda River
- Update and improve existing Park Sites

Management Plan

- Land Sales & Dock Permitting Policy

Management Plan

- Applies to remaining SCE&G-owned Future Development property on Lake Murray
- Allows SCE&G to continue with Fringe Land Sales
- Reflective of agency and committee interests
- Promotes protection of the environmental and scenic values of the project

Management Plan

- Plan would keep current 75-Foot setback requirement
- Allow sale of fringe land greater than 75 Feet to back property owner with deeded restrictions.
- Maintain environmentally protective deed restrictions for all purchased fringe land
- Non-development and vegetation management restrictions included in each deed
- Purchasers must acknowledge their understanding of deed restrictions before being granted permits for shoreline amenities such as docks and paths
- Permitting shoreline amenities will continue to be dependent on all other conditions specific to those amenities

Management Plan

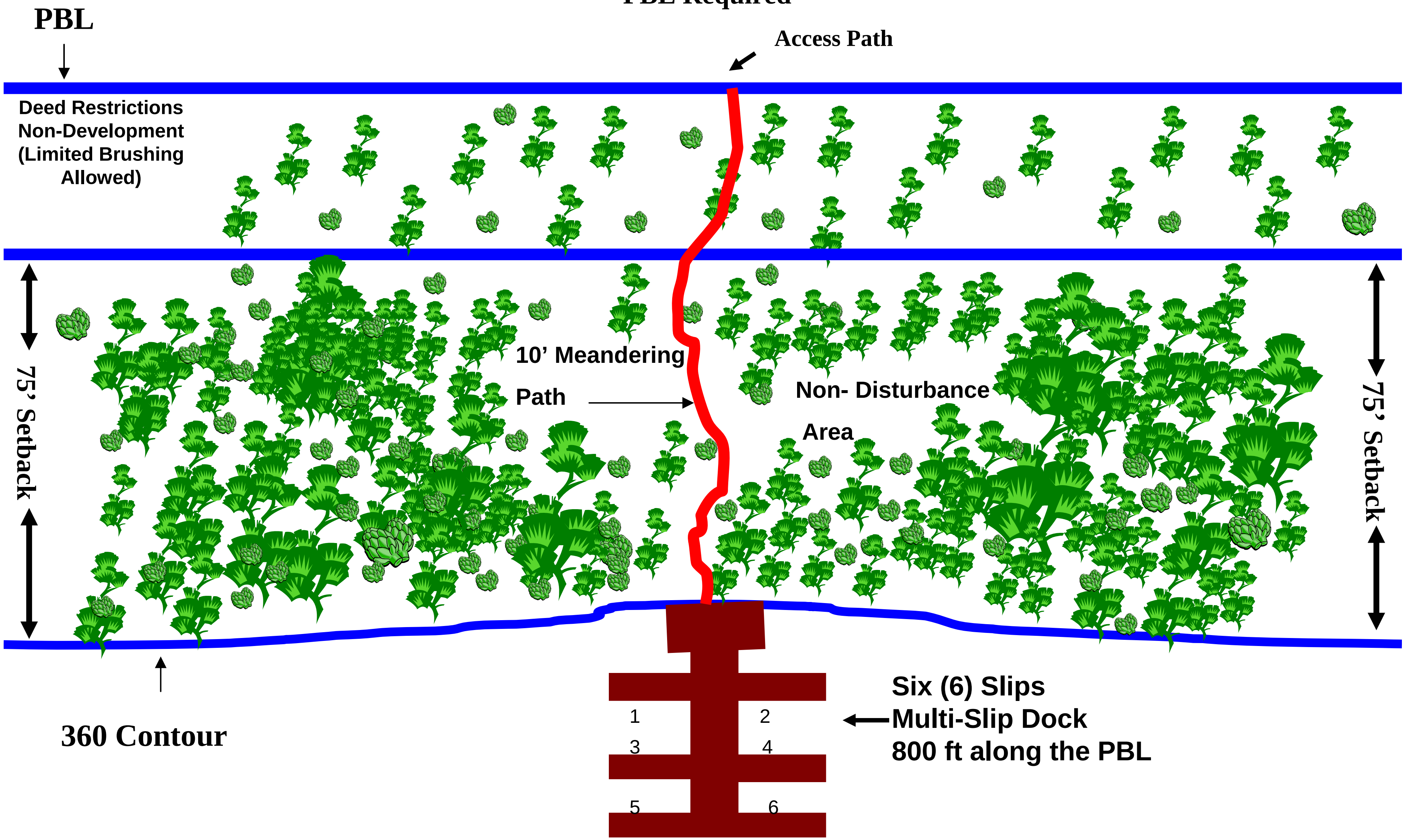
- Establish a uniform 75-Foot non-disturbance Buffer Zone
- Back property owners who have less than 75 feet in depth to the 360 contour would be required to deed SCE&G so much of their property to create a uniformly 75-Foot deep Buffer Zone
- After this condition is met, SCE&G will consider permitting a dock along the shoreline, if the property qualifies for a dock location and all other dock permitting requirements are met

Multi-Slip Docks

- Will be required in lieu of individual docks in appropriate circumstances
- One and one half (1 ½) slips would be approved for each 200 feet of property along the PBL
- One (1) ten foot (10 ft) wide meandering path will be allowed through the Buffer Zone to access a multi-slip dock

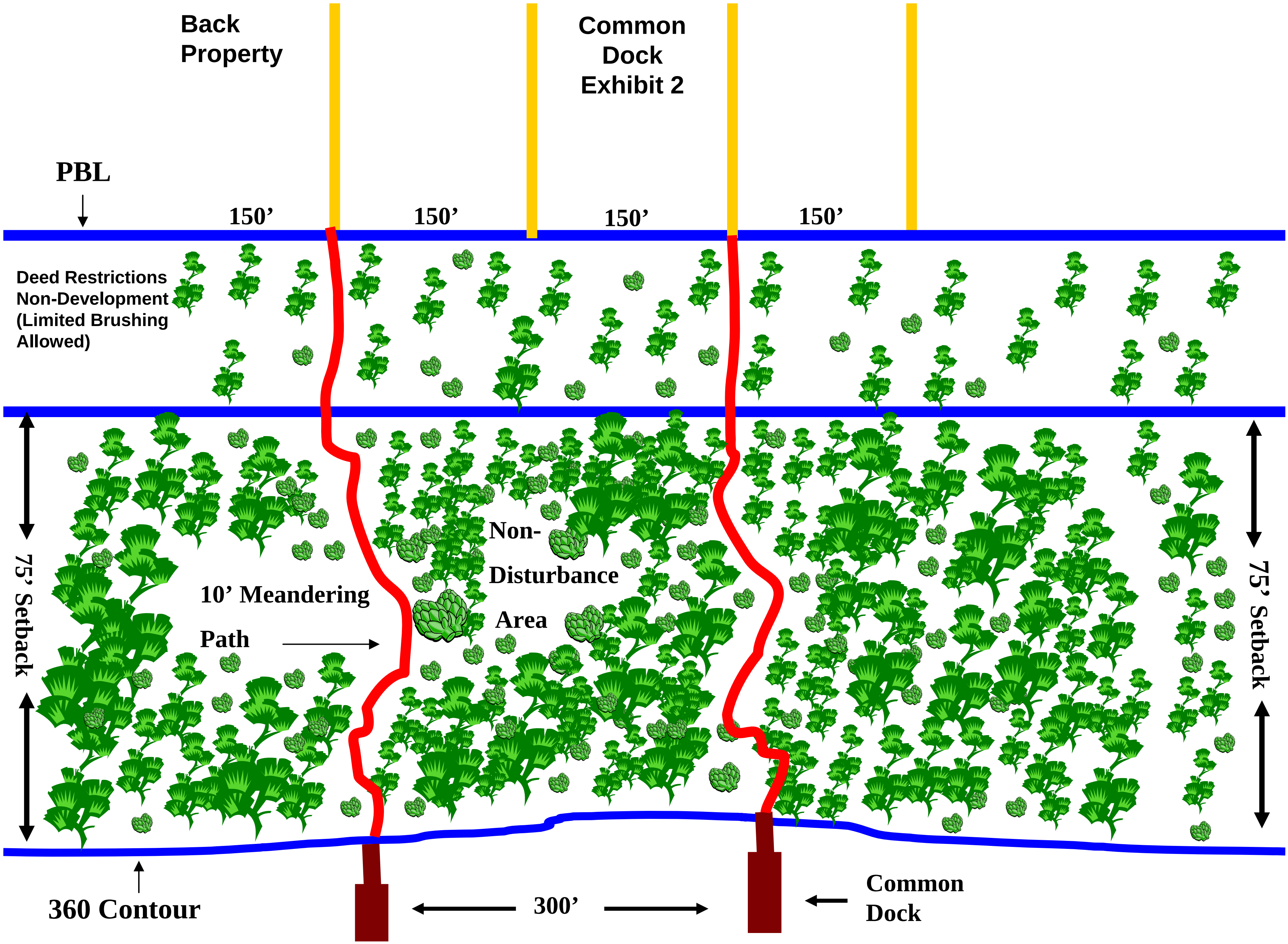
Multi-slip
Docks
Exhibit 1

800 ft. of Property on the SCE&G
PBL Required



Common Dock

To qualify for a common dock to be shared by two single family dwellings, each lot must have a minimum width of 150 feet, measured on the Project Boundary Line



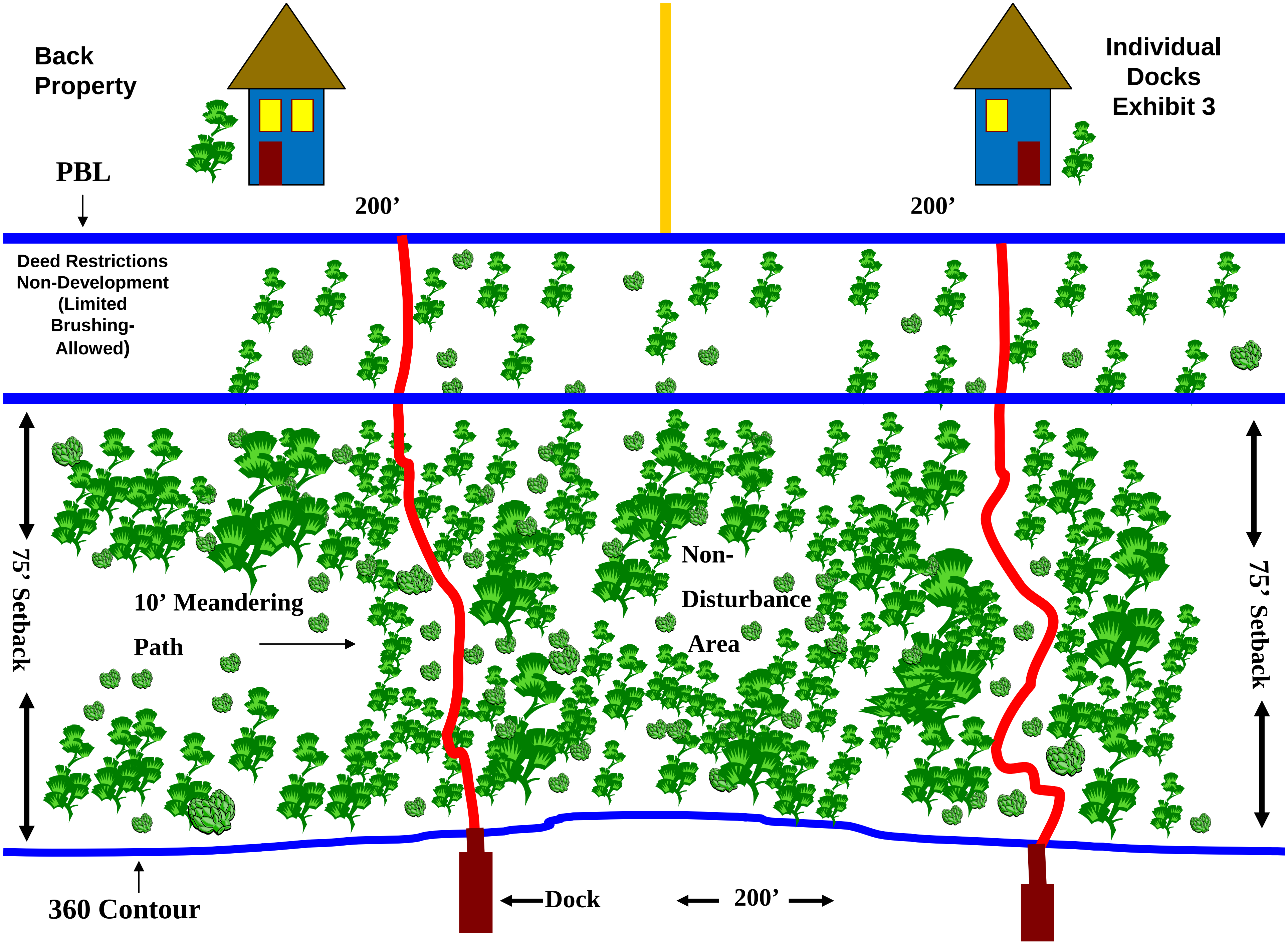
Back Property
Common Dock Exhibit 2
PBL
150’
150’
150’
150’
Deed Restrictions Non-Development (Limited Brushing Allowed)
75’ Setback
75’ Setback
Non-Disturbance Area
10’ Meandering Path
360 Contour
300’
Common Dock

Individual Docks

To qualify, a lot for a single family dwelling must have a minimum width of 200 feet, measured on the Project Boundary Line

Fringe land that has less than 400 feet, measured on the PBL, may qualify for individual docks

Fringe land that exceeds 400 feet will be required to participate in a multi-slip dock if all permitting requirements are met



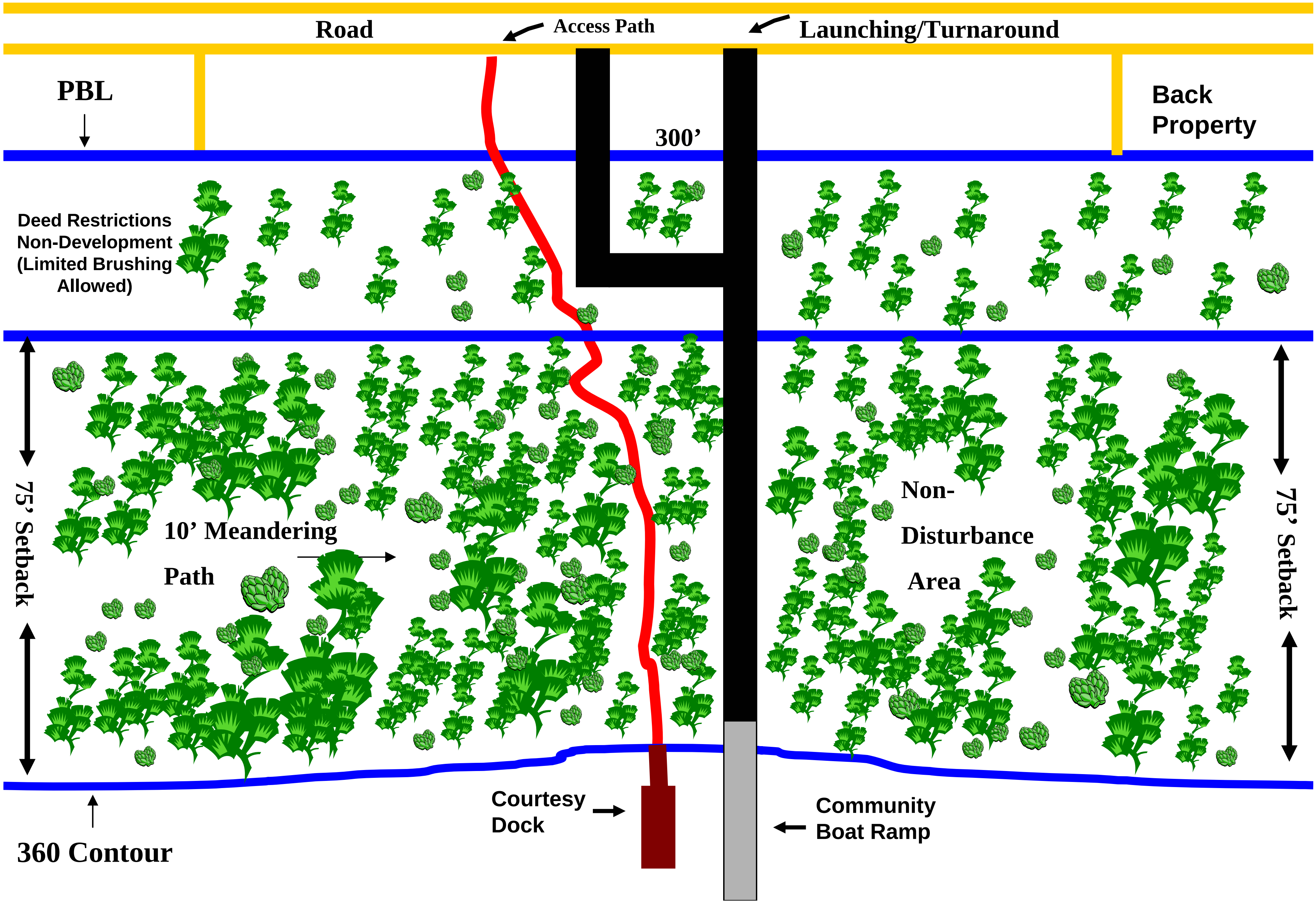
Back Property
Individual Docks Exhibit 3
PBL
200’
200’
Deed Restrictions Non-Development (Limited Brushing- Allowed)
75’ Setback
10’ Meandering Path
Non- Disturbance Area
75’ Setback
360 Contour
Dock
200’

Community Boat Ramp and Courtesy Dock

- A common access lot must have a minimum of three-hundred foot (300 ft) width, measured on the Project Boundary Line

- Qualification for a Community Boat Ramp will be heavily influenced by evaluations of any necessitated impact to existing trees and other vegetation as well as the distance from the PBL to the 360 contour

Community Boat Ramp &
Courtesy Dock
Exhibit 4



75-Foot Buffer Zone Management

- Will be a non-disturbance area except for such clearing necessary and approved for installation and maintenance of approved shoreline amenities
- No clearing of trees, shrubs or vegetation will be allowed
- Will allow clearing for a single, ten foot (10 ft) wide meandering access path to a permitted dock from adjacent back property owner's land
- Path must not encourage erosion and must protect the aesthetics of the shoreline
- Trees larger than 8 inches at breast height may not be removed within path
- Lake Management representatives will work with property owners to lay out access paths

Ground Rules for Questions

Please follow all rules, unruly behavior will not be tolerated

- **Please no personal attacks, be respectful**
- **Please wait until moderator recognizes you**
  - **Speak Clearly and please project your voice (you will be speaking into a dead microphone for the videographer and not a house microphone)**
  - **State your name and organization you represent (if in individual homeowner then please state so)**
  - **Limit to one question per person when recognized to speak**


SOUTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES


Gill Maggots

What is it?

- Gill maggots
- parasitic copepod in the genus Achtheres

Photo by Jim Negus, TWRA, Norris Reservoir Striped Bass, December 2003

Parasitic copepod from Cherokee Reservoir, TN largemouth – Jim Negus

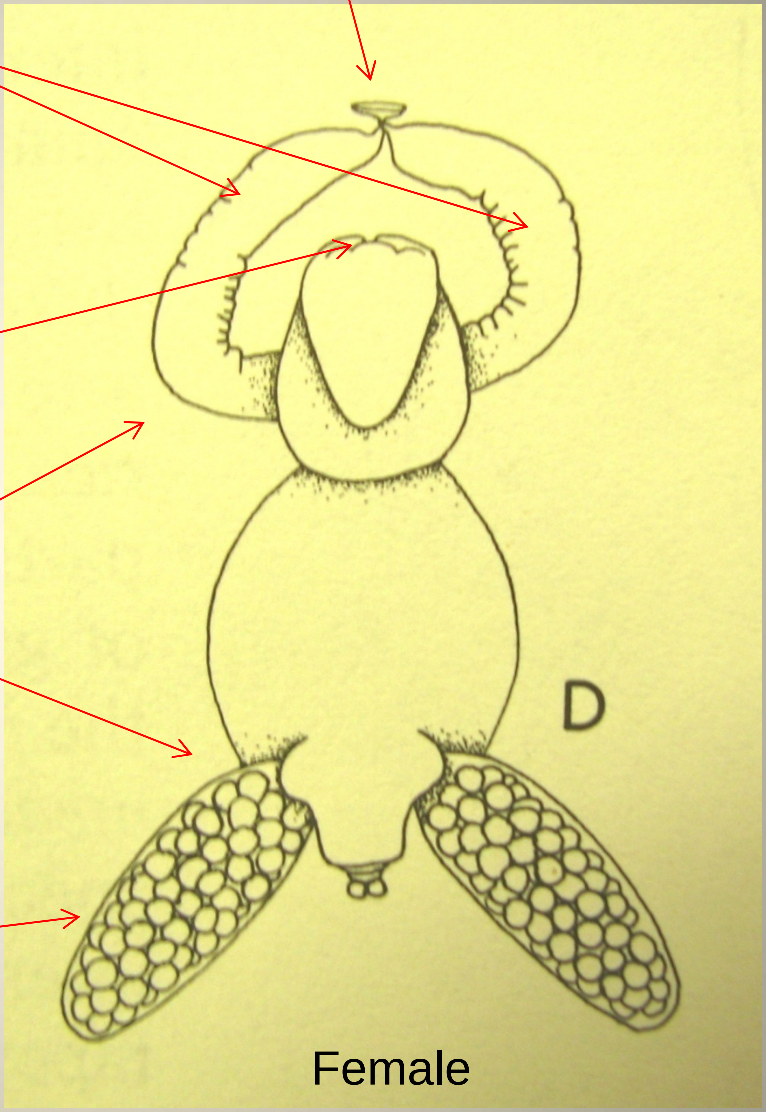
Umbrella shaped bulla

Modified maxillae

Reduced mouth parts

No legs and little segmentation

Egg sacs



* Mature males are much smaller and are free swimming

Life Cycle

- Females produce eggs in eggs sacs
- Nauplii stages are passed within the egg sac
- First copepodid stage is released from the egg sac and is free swimming plankter.
- After a short while they attach to fish and mature to adults
- Females remain attached, males mature and become free swimming.
- Free swimming males attach to females during copulation.

Recent Reported Infestations

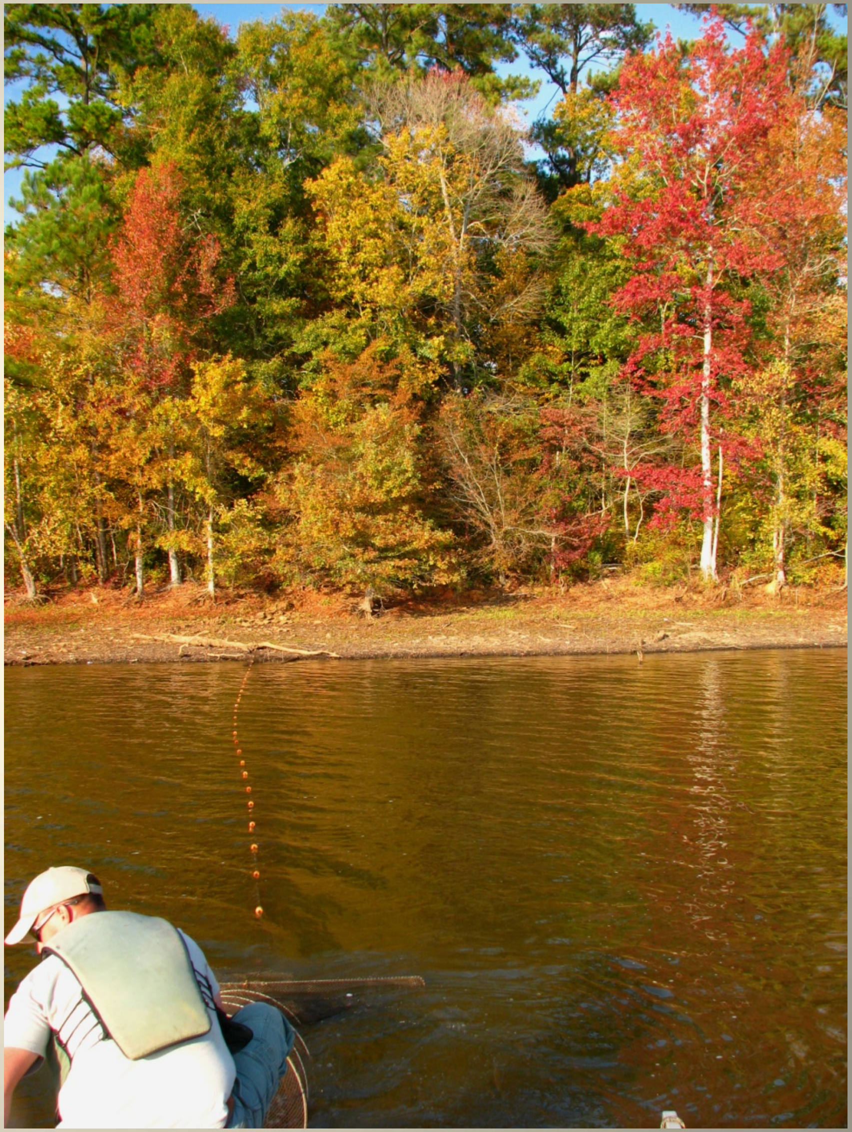
2000 Watts Barr Reservoir, TN - striped bass
2000 Tim's Ford Reservoir, TN - striped bass
2001 Melton Hill Reservoir, TN - striped bass
2001 Watauga Reservoir, TN - 1 smallmouth bass
2002 Old Hickory Reservoir, TN - striped bass
2002 Norris Reservoir, TN - striped bass
2002 Smith Mountain Lake, VA - striped bass
2003 Kerr Reservoir, VA - striped bass
2003 Leesville Reservoir, VA - striped bass
2004 Lake Norman, NC - striped bass
2004 Gaston Reservoir, NC - striped bass
2004 Tellico Reservoir, TN - 1 striped bass
2004 Smith Mountain Lake, VA - largemouth
2005 Congaree & Saluda Rivers, SC striped bass
2005 Cherokee Reservoir, TN - white bass
2006 Ouachita Lake, AR - striped bass
2006 Fort Patrick Henry Reservoir, TN - striped bass (angler report)
2006 Keowee Reservoir, SC – spotted bass
2007 Cherokee Reservoir, TN - striped and hybrid striped bass
2007 Holston River - Cherokee Res. tailwater, TN - striped bass
2007 Santee Cooper, SC - striped bass
2008 Lake Murry, SC - striped bass

Myths

1) They kill fish. NOT!

2) They render fish non-eatable. NOT

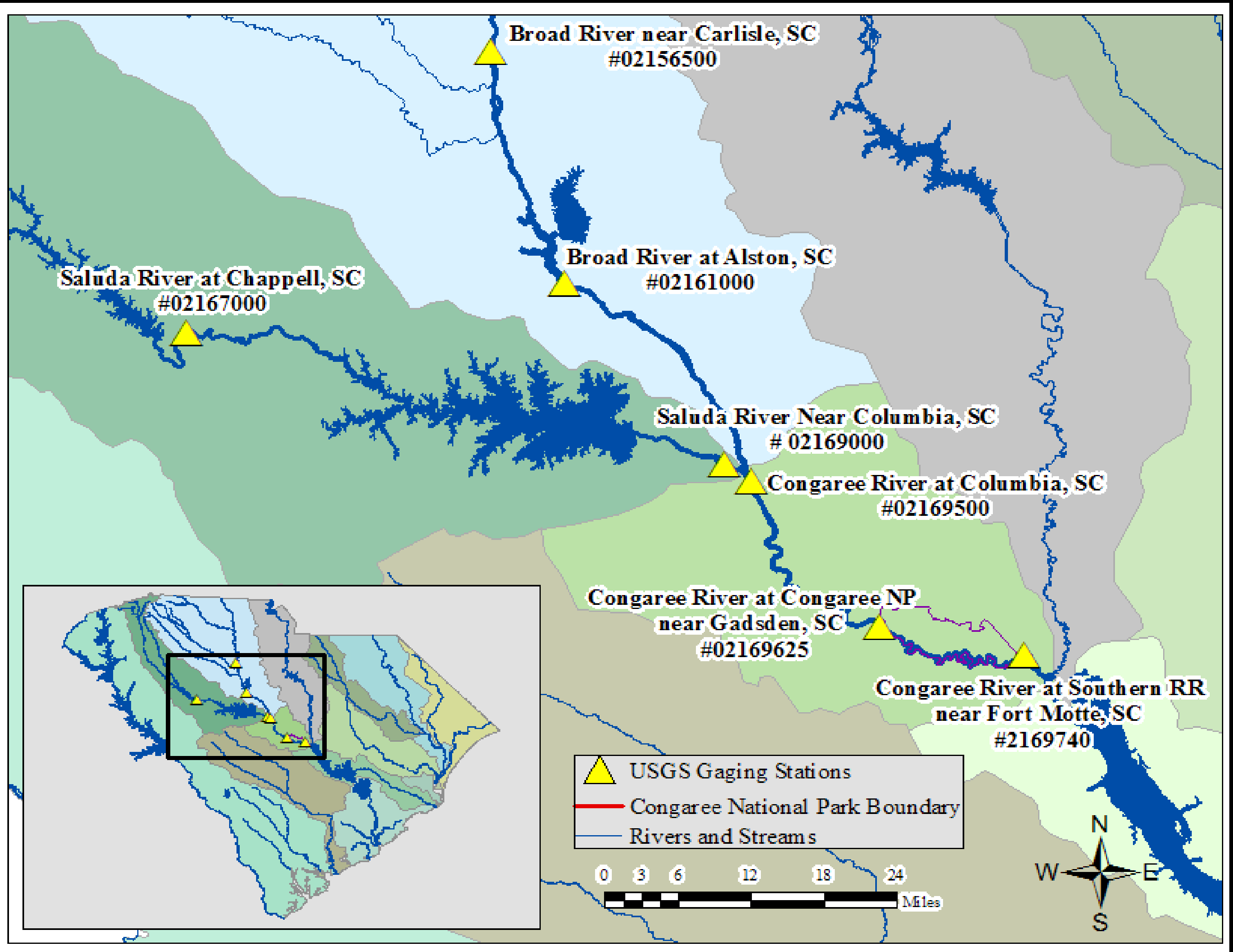
3) They spread to people who swim in the lake. NO



SCDNR Research


The End

Integrating Ecologically Sustainable Water Management into the Saluda Relicensing



Congaree River Basin with the location of USGS gaging stations used in the hydrologic analysis. Relative contributions from the Broad and Saluda River provide valuable information about the influence of dam altered flows on Congaree River hydrology. Parr Shoals Dam is located on the Broad River and Saluda Dam is located on the Saluda River.

Congaree National Park

- Located at confluence of Congaree and Wateree rivers
- 35 miles downstream of Saluda Dam/Lake Murray
- South Carolina's only National Park
- Protects more than 25,000 acres of forest, including the largest contiguous tract of old growth bottomland hardwood forest in the United States
- The floodplain ecosystem, the park regularly floods several times each year

Congaree River

What is ESWM?

- A Five Step Process
- Developed by The Nature Conservancy
- Science-based, stakeholder inclusive, balances human and ecological needs
- Steps Include:
- 1) Orientation workshop involving multiple stakeholders
- 2) Comprehensive literature review, study report
- 3) Technical workshop
- 4) Implementation of flow prescription
- 5) Adaptive management
- Monitoring, research, feedback.

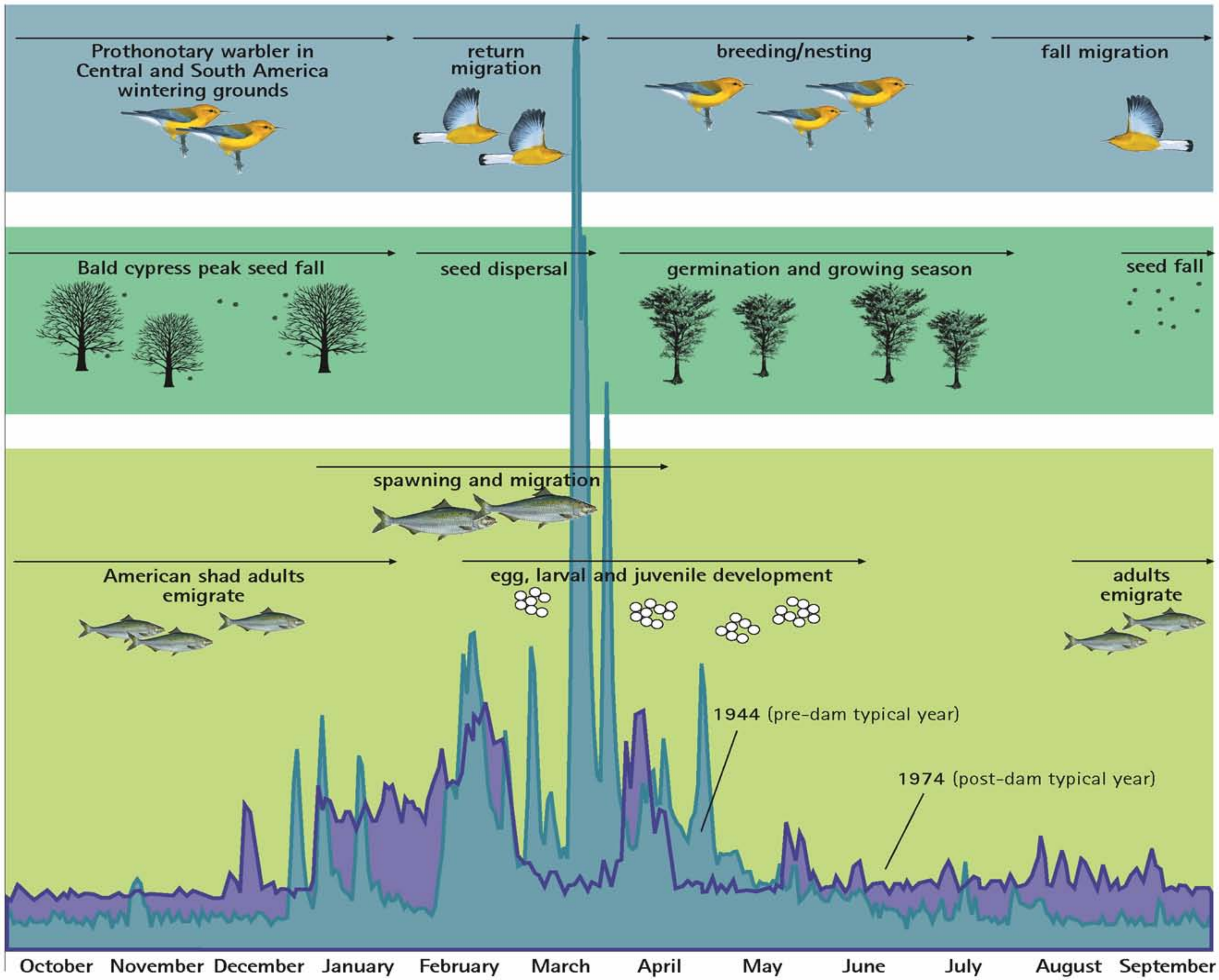
What is ESWM?

- Emphasis on collaboration; adaptive management; good science; balanced approach; natural interannual variability; species based

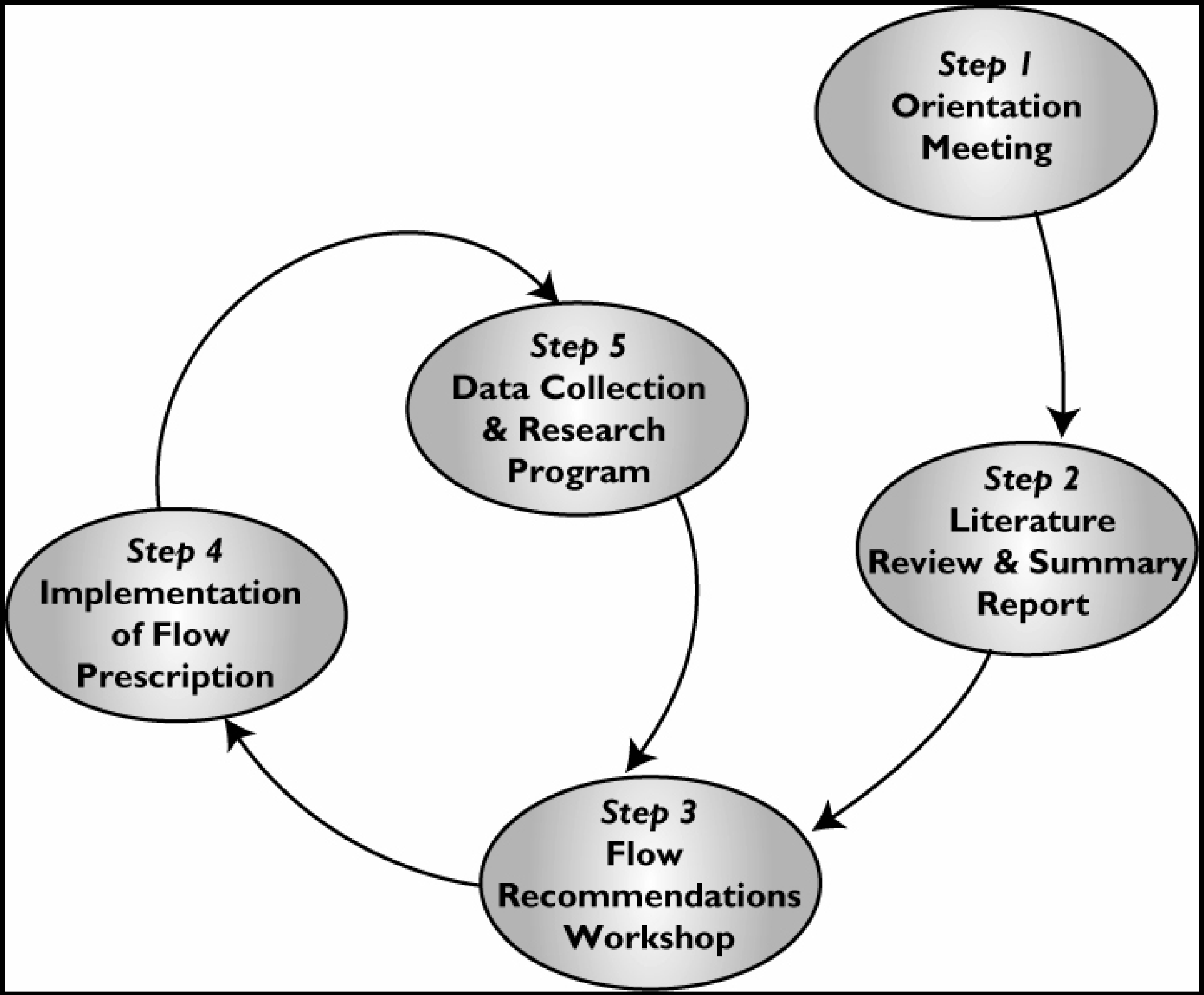
- Integrate w lake levels, hydro operations and other interests

- Successfully used at Savannah River and across country

Ecological Model of the Savannah River



The ESWM Process…



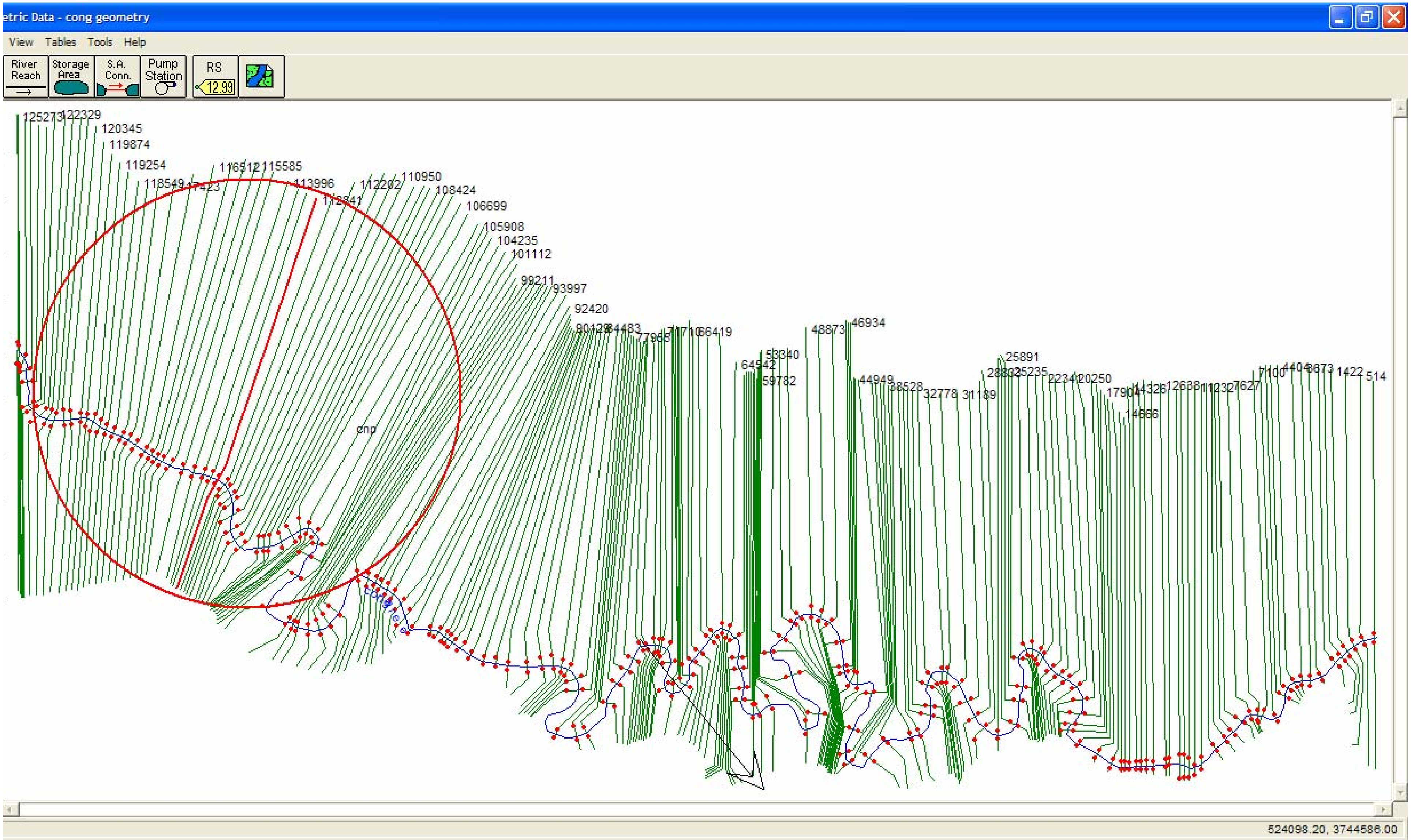
Courtesy TNC Freshwater Initiative

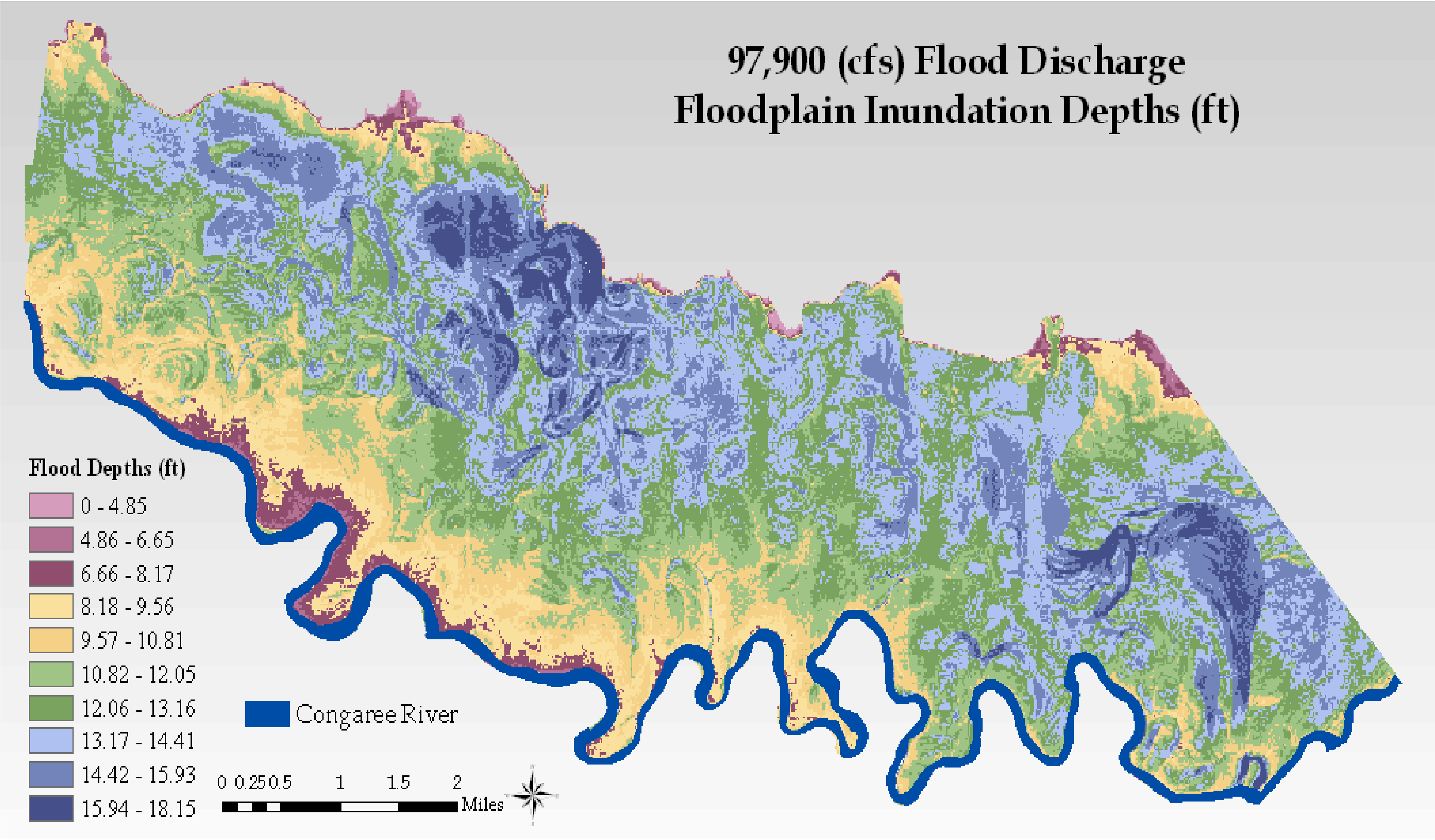
Congaree ESWM

First…

- Assemble partners (NPS, FWS, American Rivers, TNC, Coastal Conservation League, SCE&G, and others)
- Contracted with USC to conduct a comprehensive literature review, produce a study report
- Contracted with USC to develop a floodplain inundation model using LIDAR and vegetation data
- Contracted with a professional facilitator.

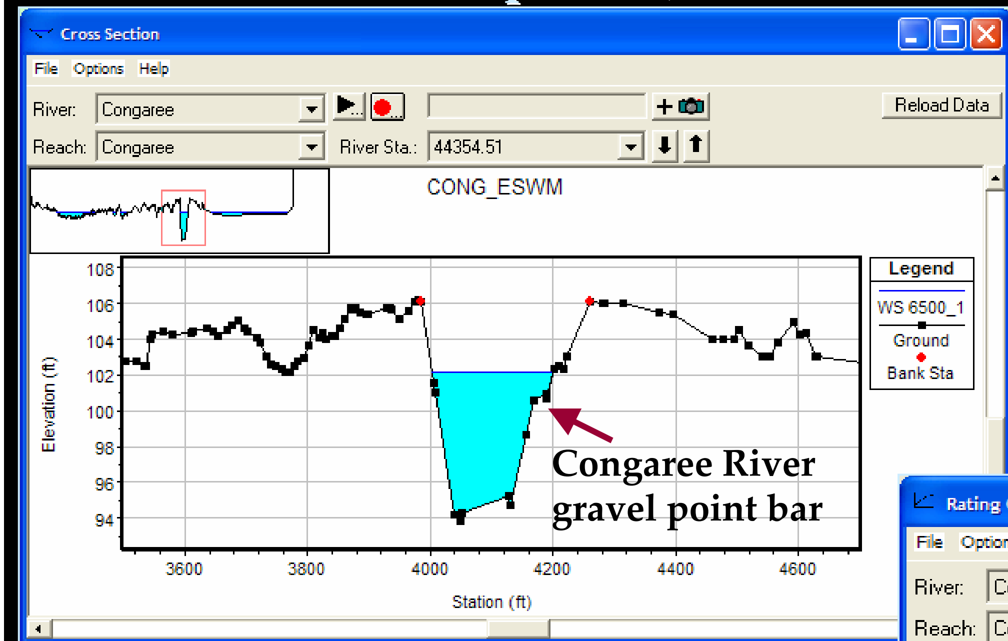
Floodplain inundation model




97,900 (cfs) Flood Discharge
Floodplain Inundation Depths (ft)
Flood Depths (ft)
0 - 4.85
4.86 - 6.65
6.66 - 8.17
8.18 - 9.56
9.57 - 10.81
10.82 - 12.05
12.06 - 13.16
13.17 - 14.41
14.42 - 15.93
15.94 - 18.15
Congaree River
0 0.25 0.5 1 1.5 2
Miles

Modeling Congaree River Flows for ESWM: Fish Spawning Habitat Criteria

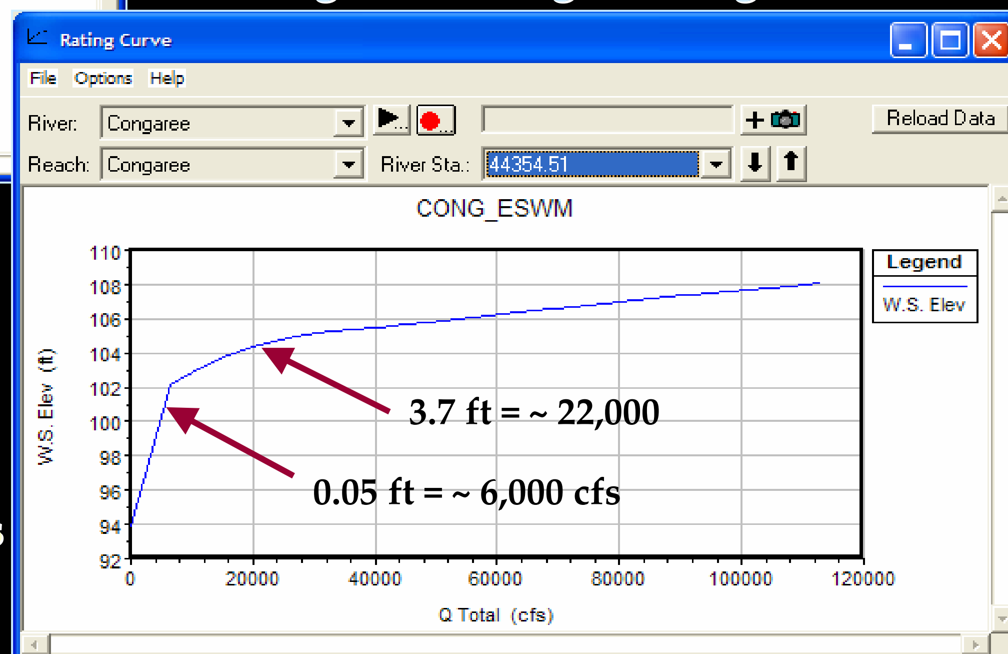
Channel Depth at 6,500 cfs



Robust Redhorse

http://www.sas.usace.army.mil/red.htm

Stage-Discharge Rating Curve



- Robust Redhorse fish require 0.5 – 3.7 feet of water flowing over gravel point bars for spawning.
- The model indicates that this flow depth occurs between 6,000 – 22,000 cfs

What we know

- Flood frequency, timing, and duration decreased since 1930 when the dam was completed
  - A 2-year event is now a 4.5 year event, etc.
- On average 1/3 of Congaree flow is from Saluda (2/3 from the relatively unregulated Broad)
- Flood plain community undergoing change in composition, particularly decreased recruitment on bald cypress

- Indicator species info
- Dependence on flows/flooding
- Available life history literature
- 17 species

Wood Duck	J	F	M	A	M	J	J	A	S	O	N	D
Reproduction (spawning or nesting)	--Timing and success of reproduction/nesting depends on timing of flooding for nest establishment and to reduce predation.[1,3] --Laying females depend upon feeding on invertebrates in shallow water for egg formation.[3]											
Growth (for juvenile stages)		Fledging of offspring.[1]										
Maintenance (foraging, prey avoidance, competition with other sp.)		Peak flooding aides in reduced floodplain nest predation.[2,3]										

1. Hepp, G.R., R.A. Kennamer, and W.F. Harvey. 1989. Recruitment and Natal Philopatry of Wood Ducks. *Ecology* 70:897-903.

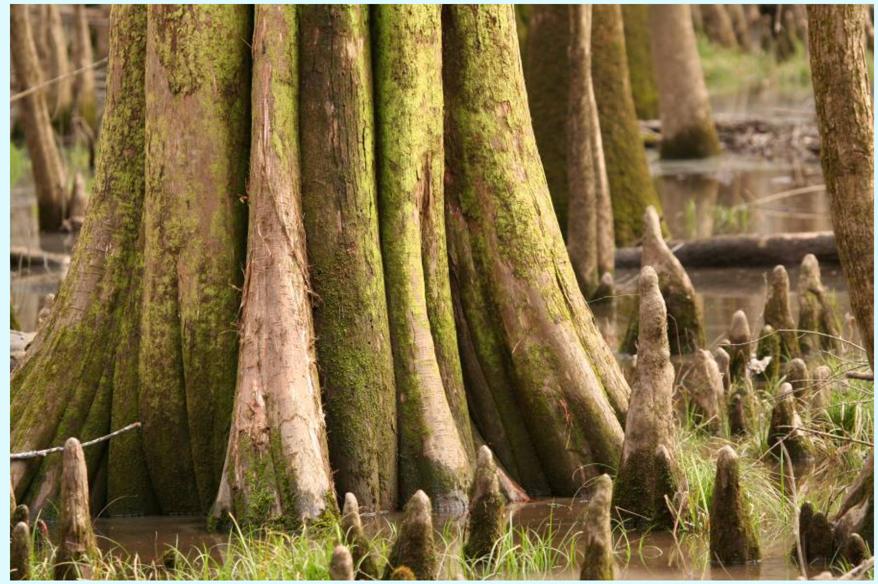
2. Nielsen, C.L.R. and R.J. Gates. 2007. Reduced Nest Predation of Cavity-Nesting Wood Ducks During Flooding in a Bottomland Hardwood Forest. *The Condor* 109:210-215.

3. Ryan, D.C., R.J. Kawula, and R.J. Gates. 1998. Breeding Biology of Wood Ducks using Natural Cavities in Southern Illinois. *Journal of Wildlife Management* 62(1):112-123.

Koman, T. M. 2003. The hydrologic effects of dams on the Saluda River, South Carolina. Masters Thesis in

Bald Cypress

- *Taxodium distichum*
- Deciduous conifer
- Long lived (+700 yrs)
- 50 to 70 feet in height with 30 foot spread
- Forms “knees”
- Dependent on floods for seed dispersal and droughts for germination, recruitment



Redfin Pickerel

- *Esox americanus*
- Carnivorous
- Have “sticky” eggs that attach to submerged vegetation
- Found in streams, lakes, ponds and backwaters
- Live 7-8 years
- Length = 12 inches

Prothonotary Warbler

- *Protonotaria citrea*
- Winters in Central and South America
- Males and females have similar appearance
- Breeds in flooded bottomland hardwood forests in holes
- Vulnerable to habitat destruction

Marbled Salamander

- *Ambystoma opacum*
- 3-5 inches long (adults)
- Breeds in fall on land
- Females guard eggs
- Carnivorous
- Important species in floodplain habitats
- Sensitive to altered hydrology, quality

Striped Bass

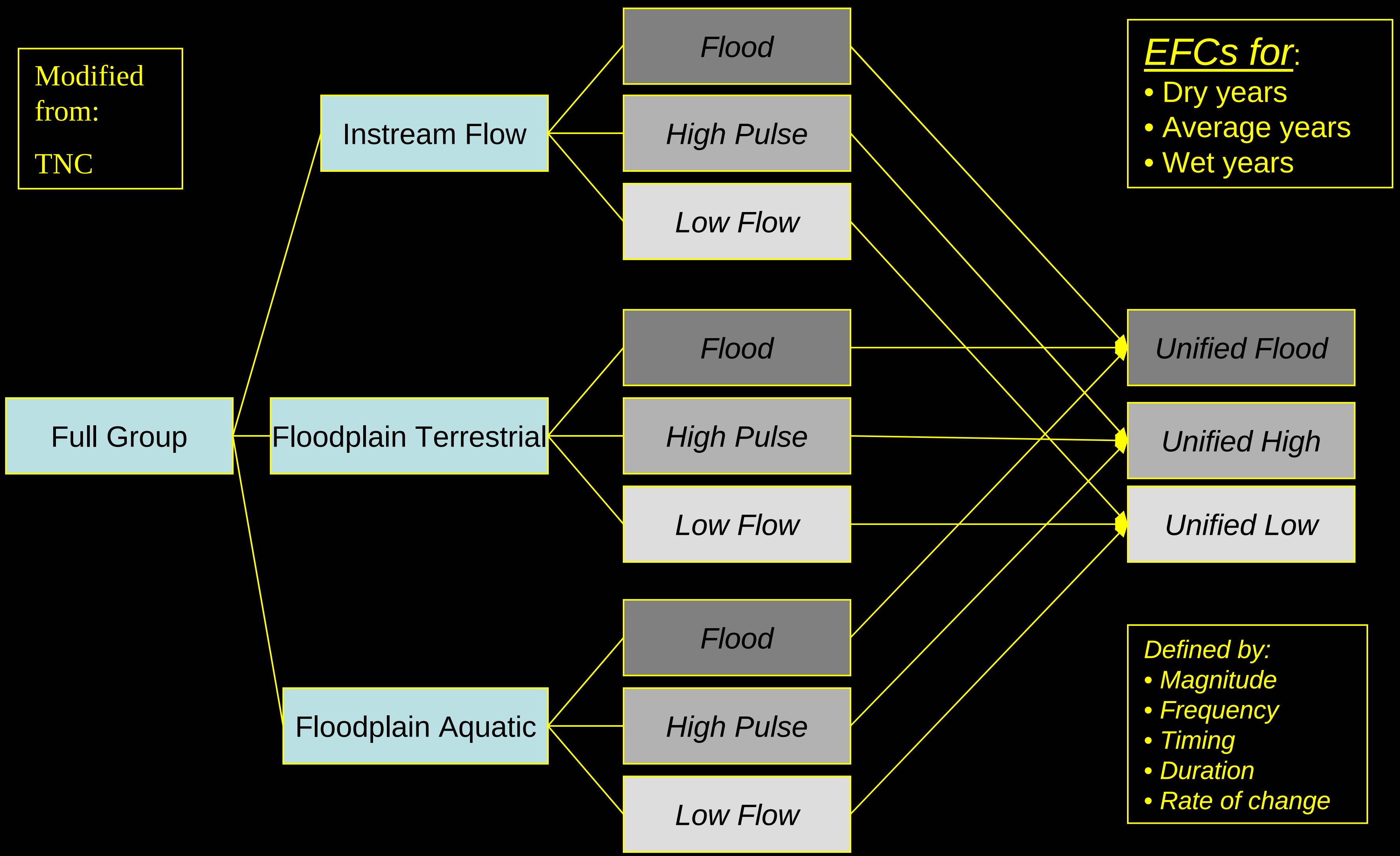
- *Morone saxatilis*
- Anadromous
- SC State Fish
  SC State Sport Fish
- Predator (carnivorous)
- 20-36 inches long
- 3-10 lbs. average weight
  (max = 60 lbs. - freshwater)
  (max = 120 lbs. - saltwater)

- Low rate of hatchling survival – reduced egg production

The Technical Workshop

- Invited "ologists"
- Encouraged other stakeholders to attend
- Goal was to develop a flow recommendations for river and floodplain, including inter-annual variability as a starting point to an adaptive management plan.

Technical Workshop process



What we've learned

- Mean annual flow in Congaree ~ 9,000 cfs
- Filling of swamp creeks and guts begins at ~8,000cfs
- Filling of back swamp areas and connecting oxbows at ~11,000-12,000 cfs
- Levees topped at ~30,000 cfs
- 2-year event ~70,000 cfs
- At high flows, flows are driven in greater proportion by Broad River.
- Saluda Dam operations netter for *enhancing* flooding

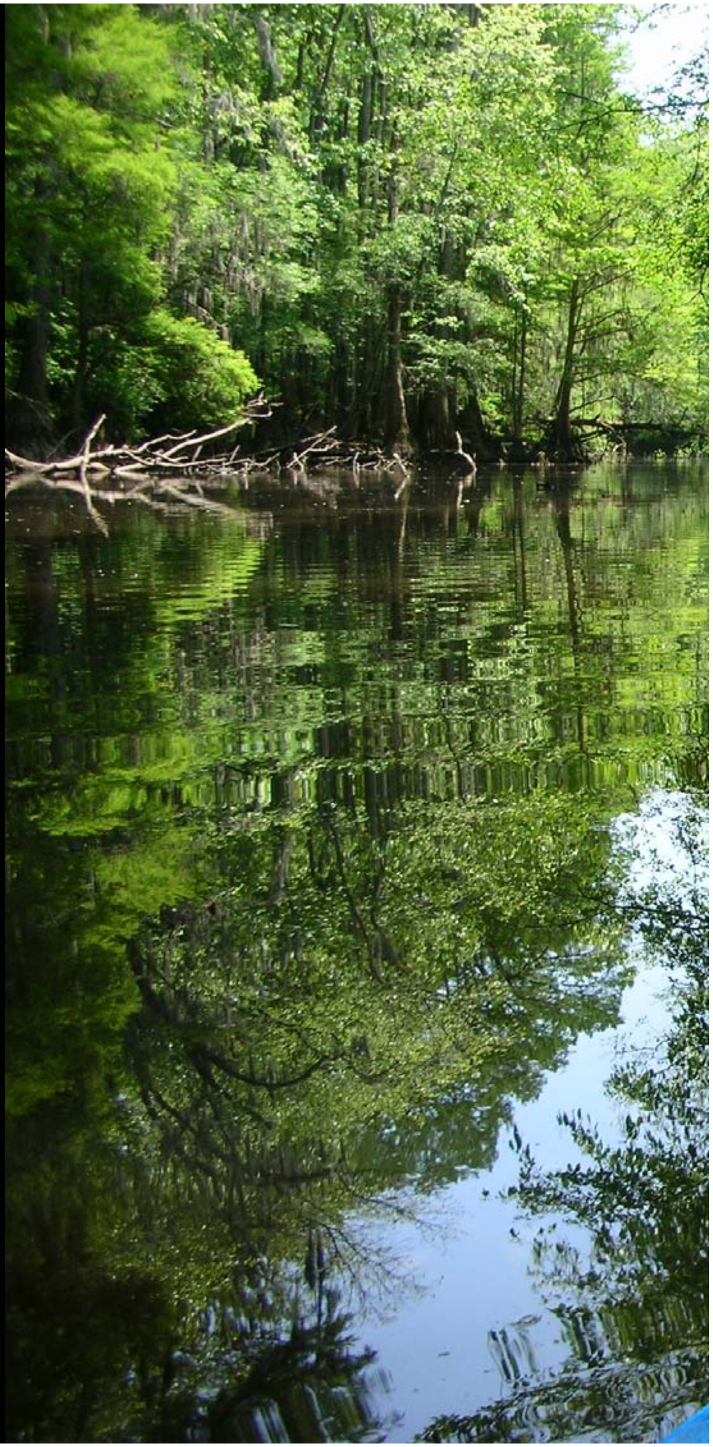
What we've learned

- Minimum flow needed (mussels)

- Periods of stable flows/inundation needed (redbreast sunfish)

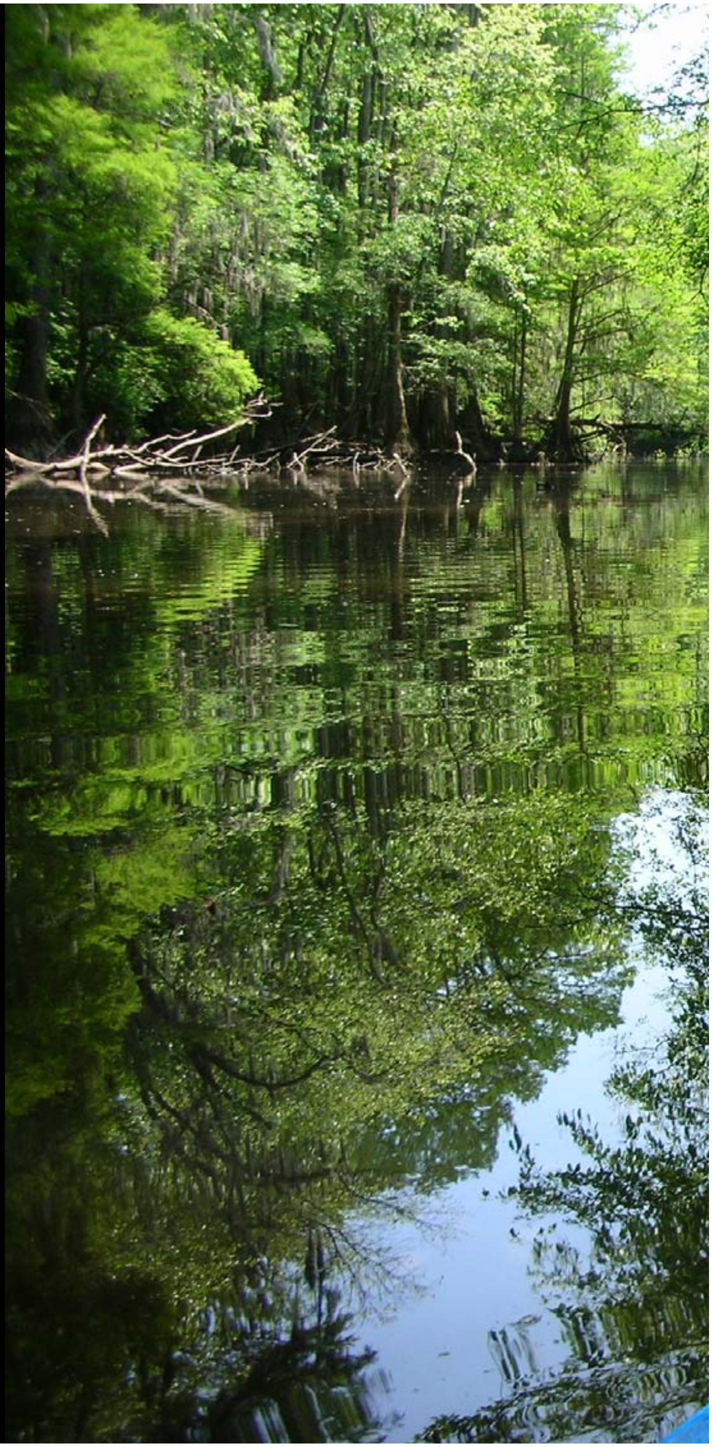
- Periods of stable temperatures needed (e.g. striped bass)

- Periods of desiccation are likely to be part of the mix (e.g., bald cypress)



What we've learned

- Large floods needed (bald cypress)
- Medium floods needed (prothonotary warbler)
- Minor floods needed (marbled salamander)
- Backwater connectivity needed (redfin pickerel)

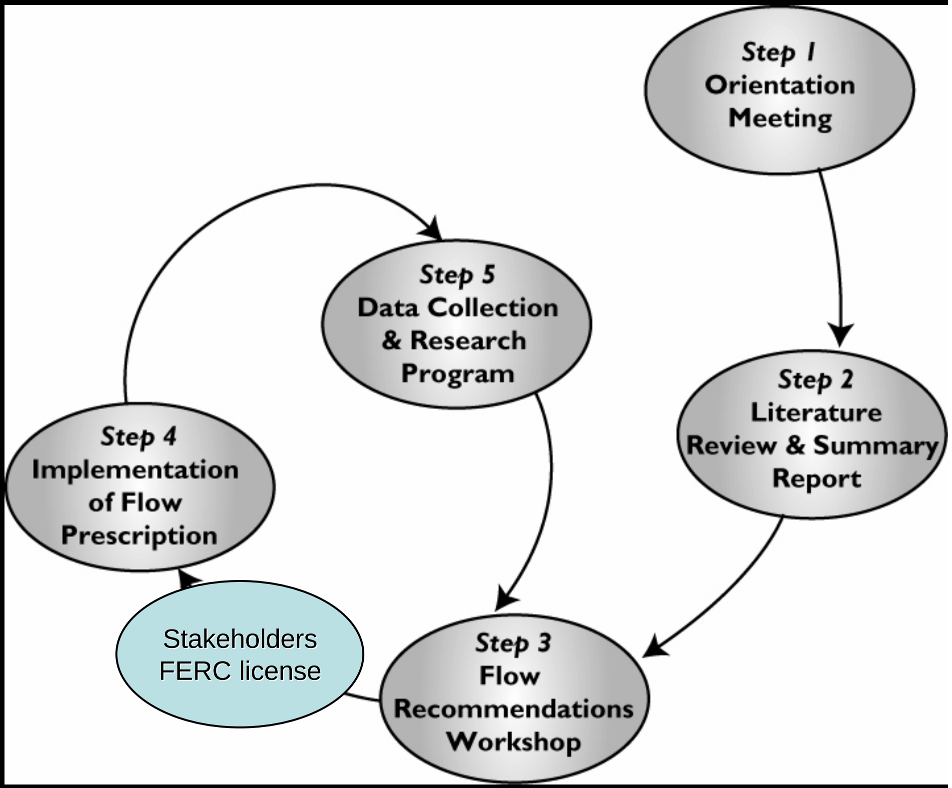


What's next

- Currently drafting an integrated flow recommendation based on technical workshop

- Reconvening stakeholders April 21 to build consensus for flow prescription

- Balancing downstream flow needs with other interests



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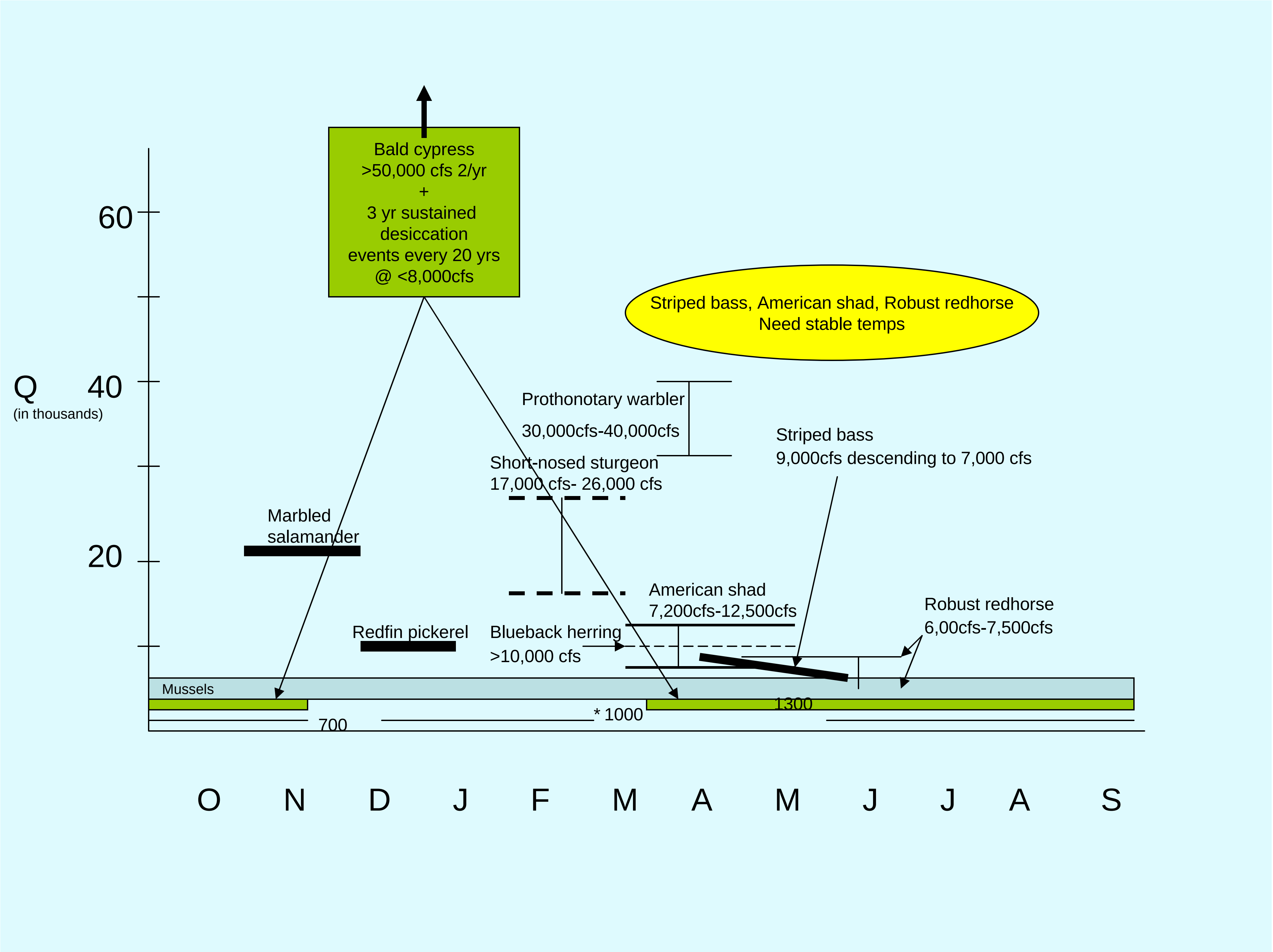
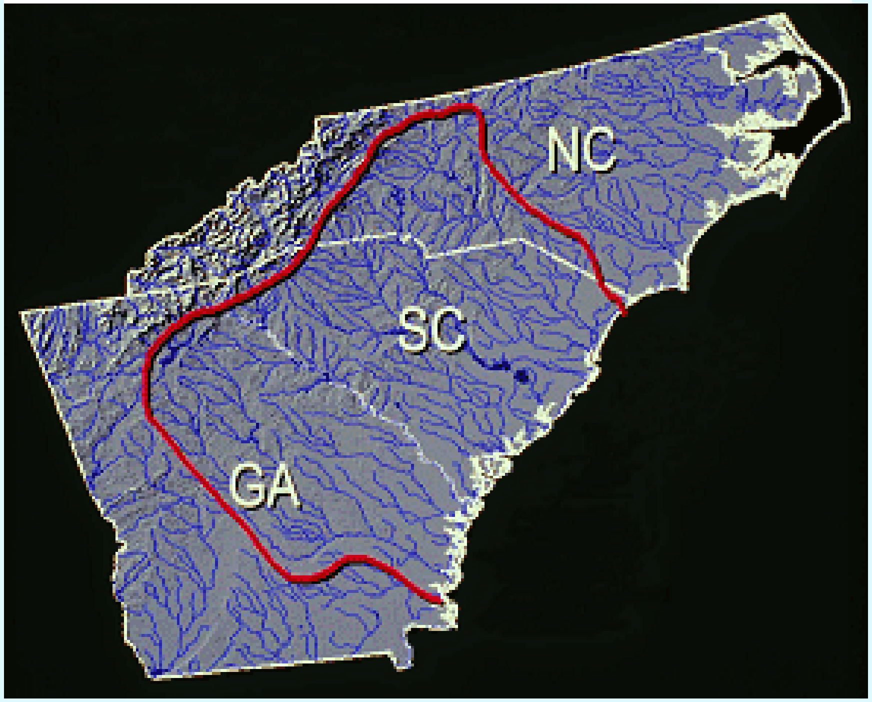


Bald cypress
>50,000 cfs 2/yr
+
3 yr sustained
desiccation
events every 20 yrs
@ <8,000cfs
Striped bass, American shad, Robust redhorse
Need stable temps
60
Q
40
(in thousands)
20
Prothonotary warbler
30,000cfs-40,000cfs
Striped bass
9,000cfs descending to 7,000 cfs
Short-nosed sturgeon
17,000 cfs- 26,000 cfs
Marbled
salamander
American shad
7,200cfs-12,500cfs
Robust redhorse
6,00cfs-7,500cfs
Redfin pickerel
Blueback herring
>10,000 cfs
Mussels
1300
* 1000
700
O
N
D
J
F
M
A
M
J
J
A
S

Robust Redhorse

- *Moxostoma robustum*
- Long-lived (+ 30 years)
- Eats freshwater mussels which it grinds with its molar like teeth
- Grows up to 30 inches and can weigh 17 lbs.
- Restricted range
- Reintroductions underway in SC
- Federally listed as a species of concern



Historic range of the Robust Redhorse

Assessment of Lake Murray Water Quality and Reservoir Releases

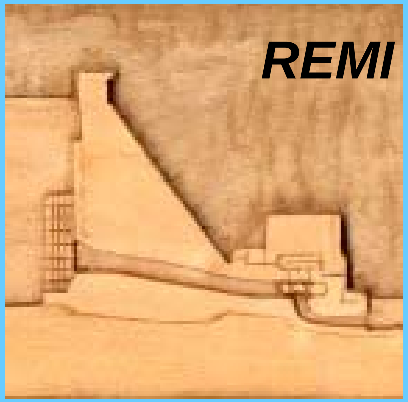
January 17, 2008

Jim Ruane

Chattanooga, TN

jimruane@comcast.net 423-265-5820

REMI Reservoir Environmental Management, Inc



Reservoir Environmental Management, Inc

- **Focus on large reservoirs and rivers**
- **Water quality modeling and assessments, including in-lake aeration systems**
- **Assessments of alternative aeration systems**
- **Assessments of alternative temperature control systems**
- **Evaluations, testing, and modeling of turbine aeration systems**
- **Predictions of operational effects on water quality**
- **Site-specific water quality standards**
- **Assessment of watershed effects on water quality**
- **Assessment and management of anoxic products (e.g., sulfides, ammonia, iron, manganese, methane)**
- **Assessment of sediment/water interactions**
- **Over 115 projects nationwide, over 65 involving enhancements to water quality**

Selected Projects

TVA RRI/LIP Principal Technical Advisor (26 projects)

Bureau of Reclamation

- Grand Canyon water quality program review
- Upper Klamath Lake—assess DO demands and proposed aeration system
- Salton Sea—estimate DO demands and develop conceptual oxygenation system

Corps of Engineers

- Savannah District—RBR/JST oxygen diffuser modeling
- Mobile District—Buford, Walter F George, Allatoona, West Point
- Nashville District—Wolff Creek, Center Hill, Dale Hollow, Percy Priest

Duke Catawba-Wateree System (11 projects)—nine CE-QUAL-W2 models (five used to evaluate nutrient reductions), 15 turbine venting models, 4 RMS models

Consumers Energy Projects (MI)—Hodenpyl (CE-QUAL-W2 model with upwelling diffuser system...installed/tested 2007), Hardy (CE-QUAL-W2), Croton (CE-QUAL-W2), Mio (CE-QUAL-W2), Alcona, Tippy

Osage Hydro (MO)—CE-QUAL-W2 and the turbine aeration model was used to evaluate various alternatives to increase DO in the releases. Recently developed the first operational turbine aeration model to operate turbine venting systems on eight large hydropower units

Wallenpaupack (PA)—turbine venting, lake aeration for sulfides, operations for tailwater temperature enhancement

Shepaug (CT)—CE-QUAL-W2 was used to design an oxygen diffuser system

Brownlee (ID)—assessed sediment effects on water quality and developed recommendations for aeration systems for turbine releases

Lake Murray/Saluda Hydro (SC)—site-specific DO standard, turbine venting systems, CE-QUAL-W2 model for Striped Bass habitat and revised operations (also for nutrient reductions), develop minimum flow operations for temperature enhancement for the tailwater, assessment of sediment and water interactions

Current and Previous Clients

Corps of Engineers—Mobile, Nashville, Little Rock, Savannah, Tulsa

Connecticut L&P

SCE&G

Duke Energy, Nantahala Power and Light

Consumers Energy

PP&L

Georgia Power

Alabama Power

AmerenUE

Entergy—Arkansas

Idaho Power Company

Appalachian Power

Mirant—New York

University of Nebraska—Lincoln

US Bureau of Reclamation

TVA

Brazos River Authority

Kleinschmidt Associates

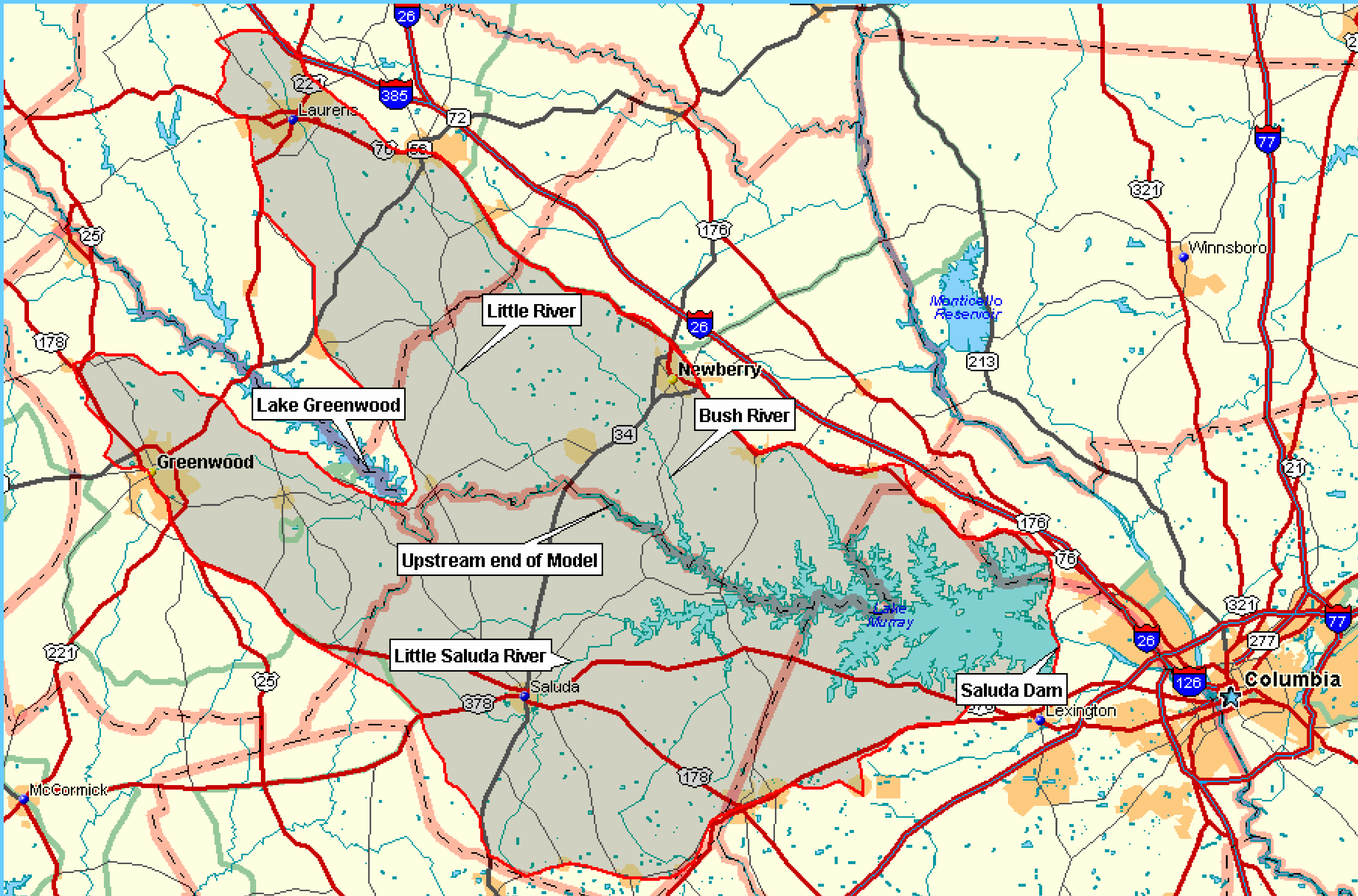
Devine Tarbell and Associates

USGS—Grand Canyon Monitoring and Research Center

MEC Water Resources

Water Supply Utilities—three in CA, one in GA

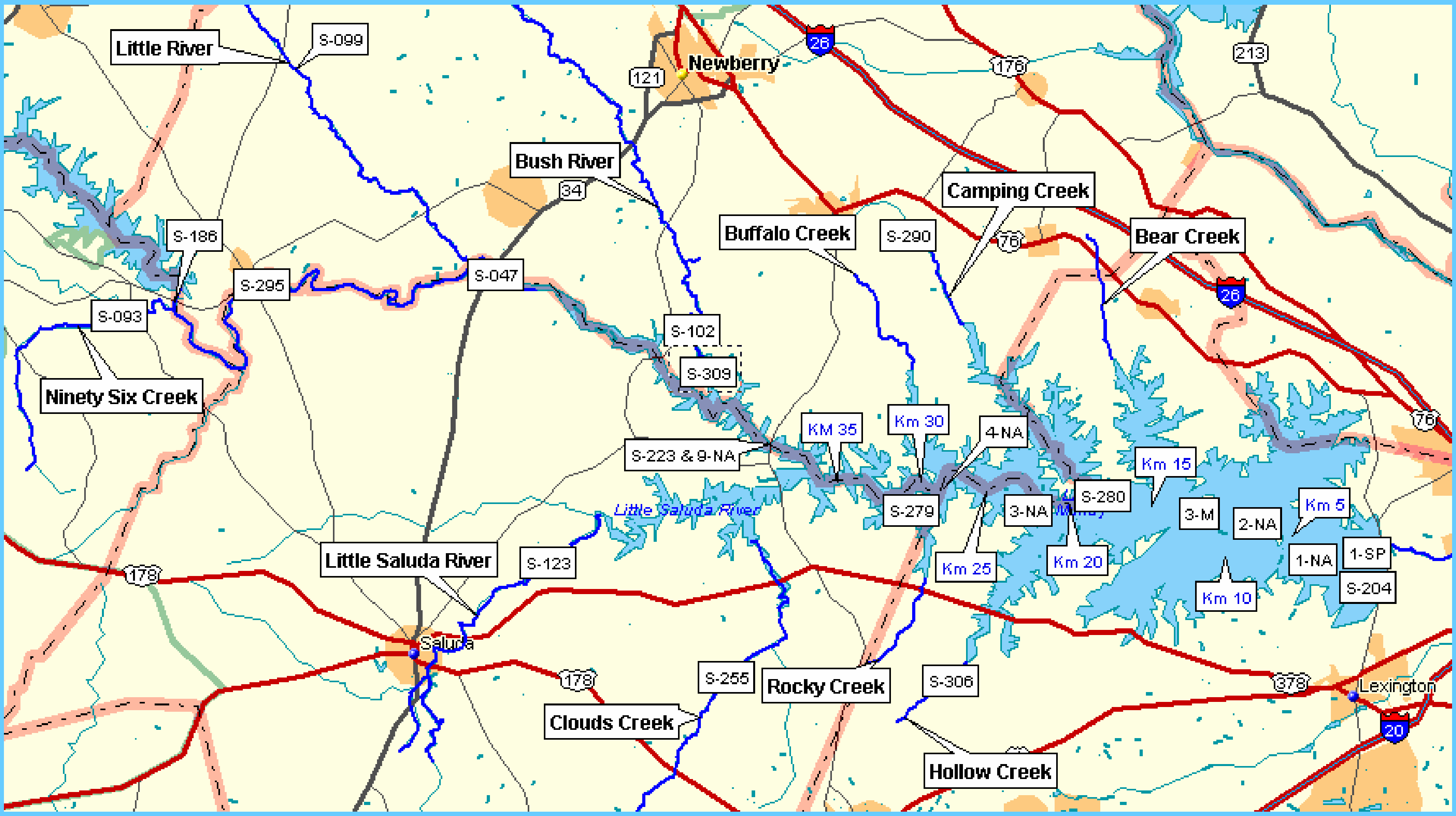
Lake Murray Watershed



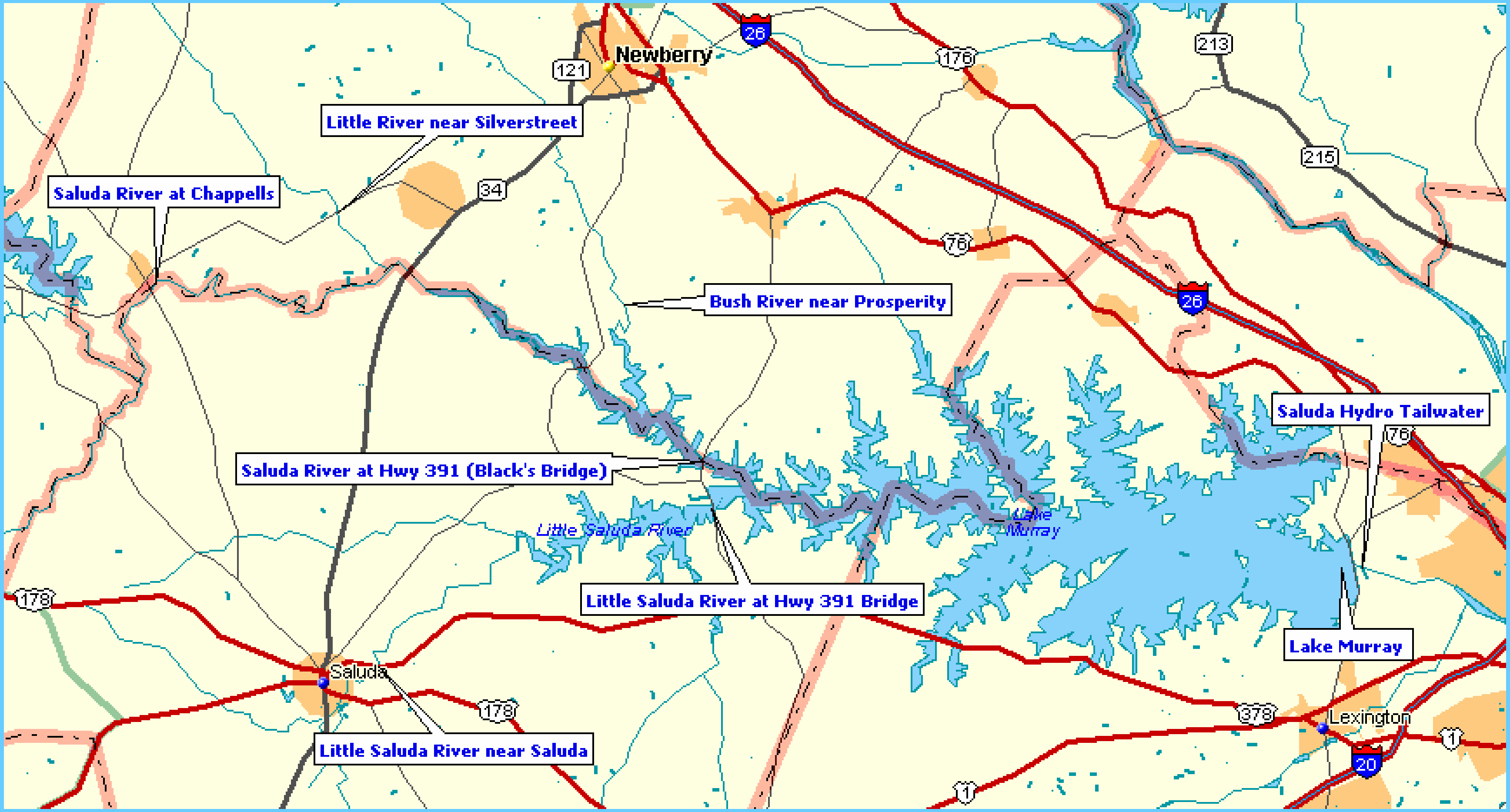
Physical Characteristics of Lake Murray

	U.S. Customary System	Metric System
Maximum depth	175 feet	53.3 m
Total lake volume	2,317,000 ac-ft	2,636 hm^3
Average Annual Flow	2778 cfs	78.7 cms
Nominal Residence Time	417 days	417 days
Depth of outlets, Units 1-4	175 feet	53 m
Depth of outlets, Unit 5	78 feet	23.5 m
Flow Capacity - Units 1-4	3000 cfs (each)	85 cms
Flow Capacity, Unit 5	6000 cfs	170 cms

Primary SCDHEC and SCE&G Monitoring Stations used for Lake Murray Water Quality Analyses



Lake Murray Watershed Showing Location of USGS Monitors



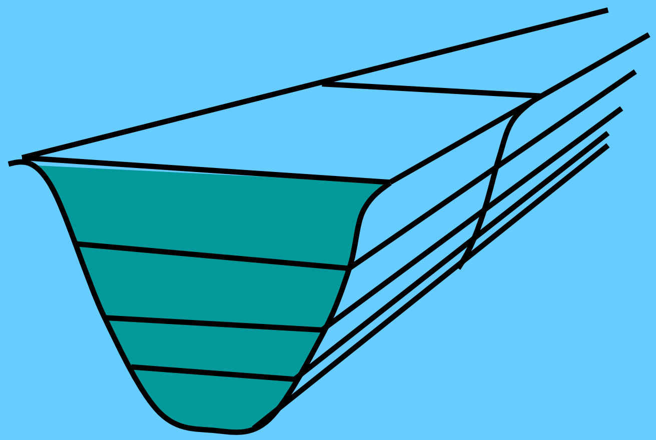
Relicensing Issues Identified by the Water Quality Technical Working Committee

- The causes of striped bass fish kills reported in previous years, especially factors related to Saluda Hydro operations
- The effects of Unit 5 operations on striped bass habitat and entrainment of blue-back herring
- Determination of operational changes that might increase habitat for striped bass and blue-back herring
- Assessment of pool level management alternatives
- Track any impacts that could occur to the tailwater cold-water fishery due to potential operational changes

Plan for Using CE-QUAL-W2 to Address the Water Quality TWC Relicensing Issues

1. Analyze water quality, meteorological, flow, and operations data for the period of study
2. Calibrate CE-QUAL-W2 model for 1996, 1992, 1997
3. Set up CE-QUAL-W2 for the years when major striped bass fish kills occurred and selected years when they did not occur
4. Use the models to develop temperature and DO criteria for tolerable striped bass habitat
5. Run models to identify the causes that apparently contributed to the fish kills
6. Use the models to explore ways to minimize such fish kills in the future, evaluate effects of proposed pool operations, and develop unit operations protocol to improve water quality

CE-QUAL-W2 is a mechanistic model based on physics of fluid flow and heat/mass transport

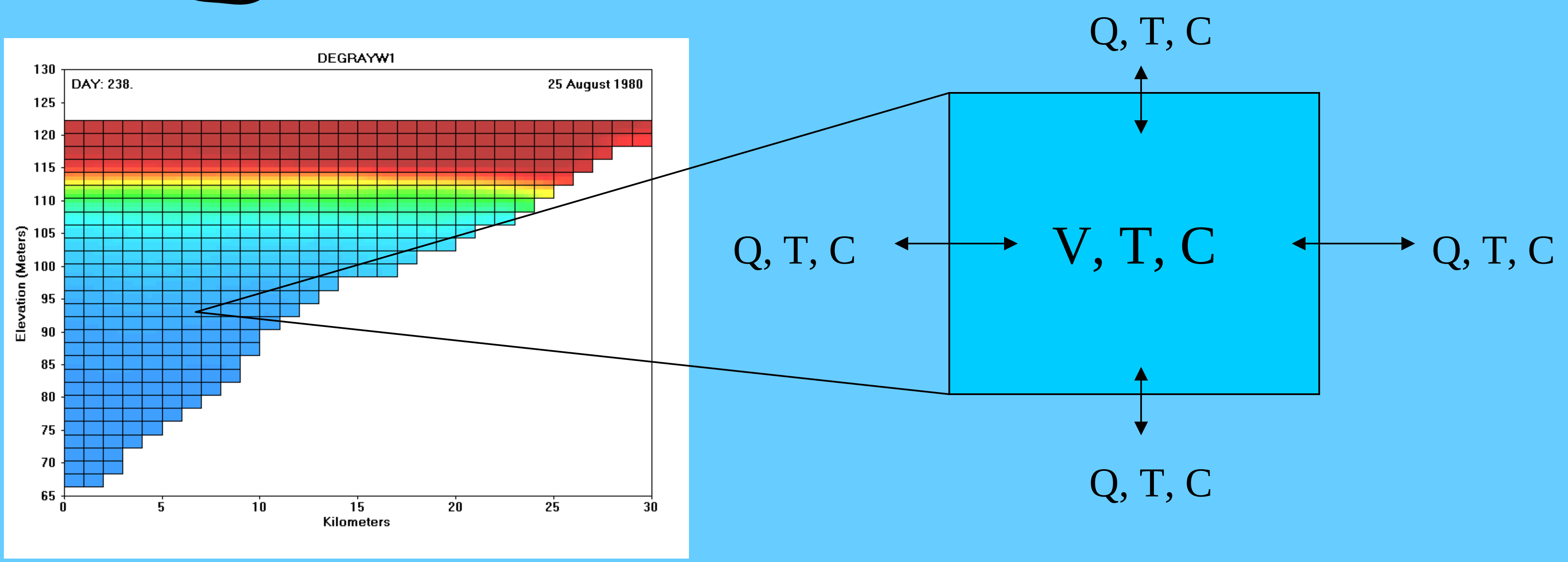


Two-dimensional (vertical, longitudinal) reservoir hydrodynamics and water quality

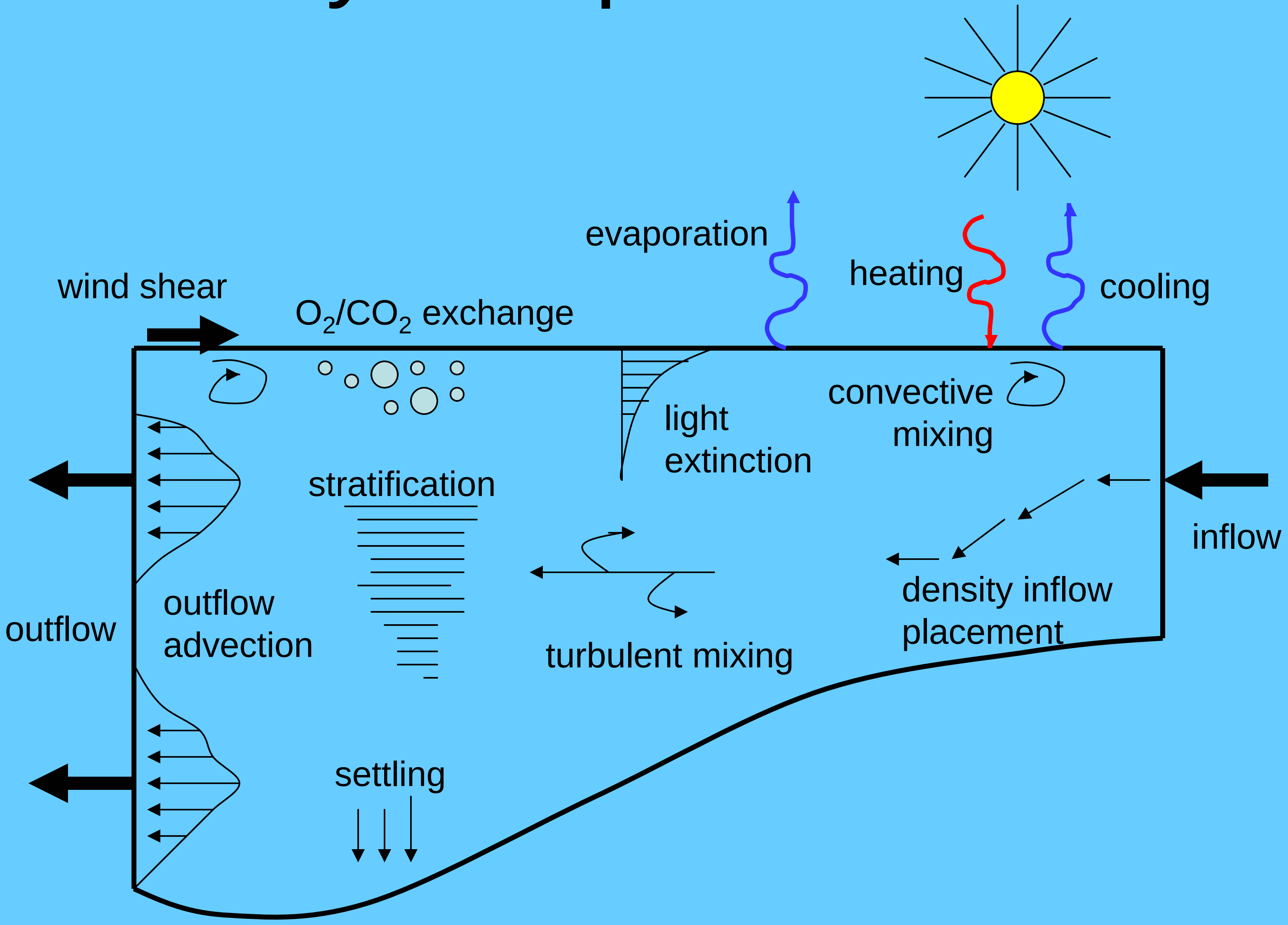
Laterally-averaged conservation of water mass, water momentum, and transported constituents (heat, WQ)

Kinetic fluxes of heat and WQ within cells, between cells, and across boundaries

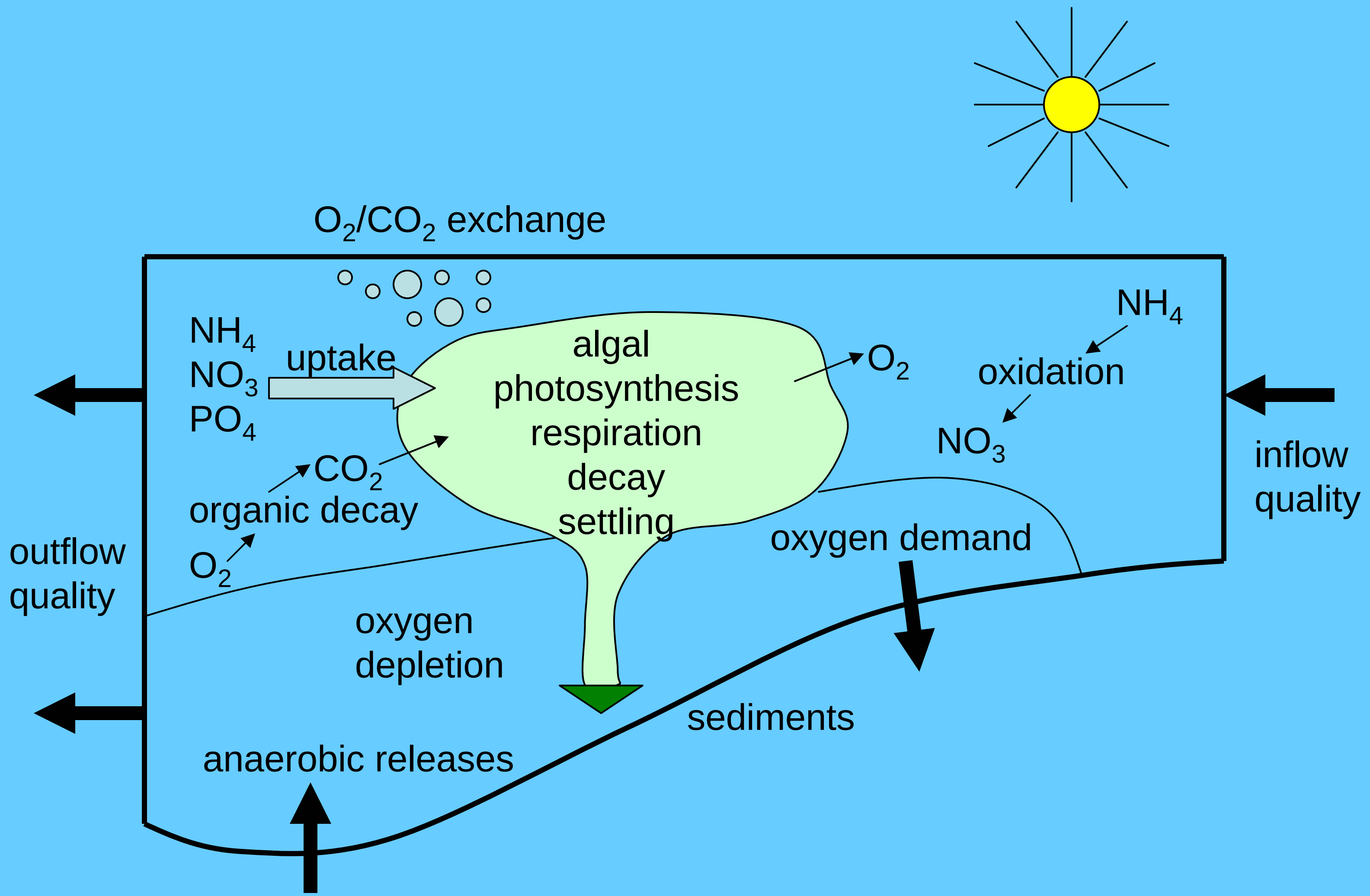
Forcing functions: meteorology, inflow/outflow, inflow temperature/WQ



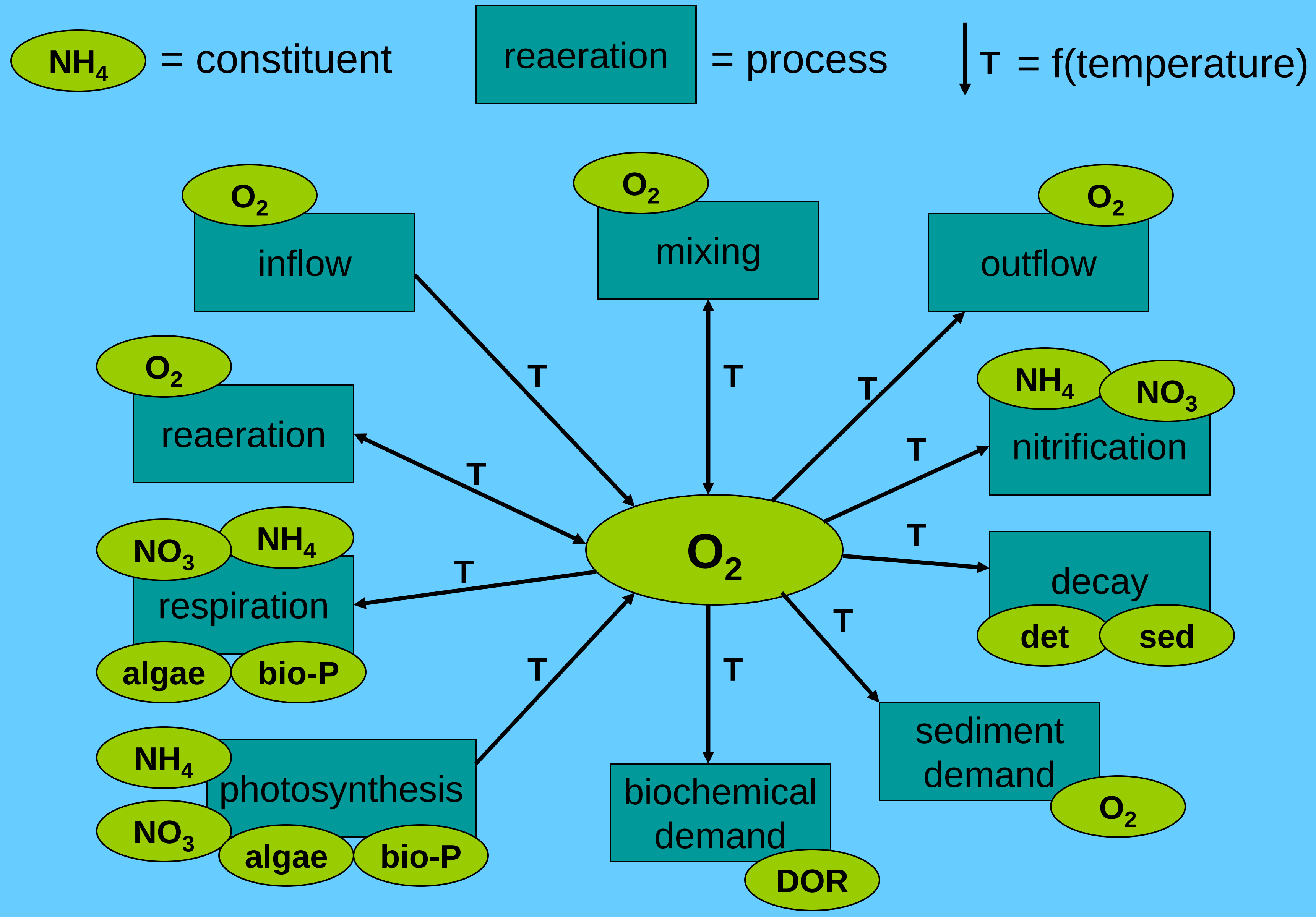
Physical processes



Biochemical processes



Highly coupled constituents



Overview of Findings for Fishery Issues

- Nutrient loads are the primary cause for impacts to striped bass habitat, blue-back herring entrainment, and low DO in the turbine releases.

- High flow, especially during March-June, is the primary cause for fish kills considering current nutrient loads (higher flows introduce greater mass of nutrients and organic matter to the lake, cause the bottom of the lake to warm, reducing habitat and increasing the rate of DO depletion)

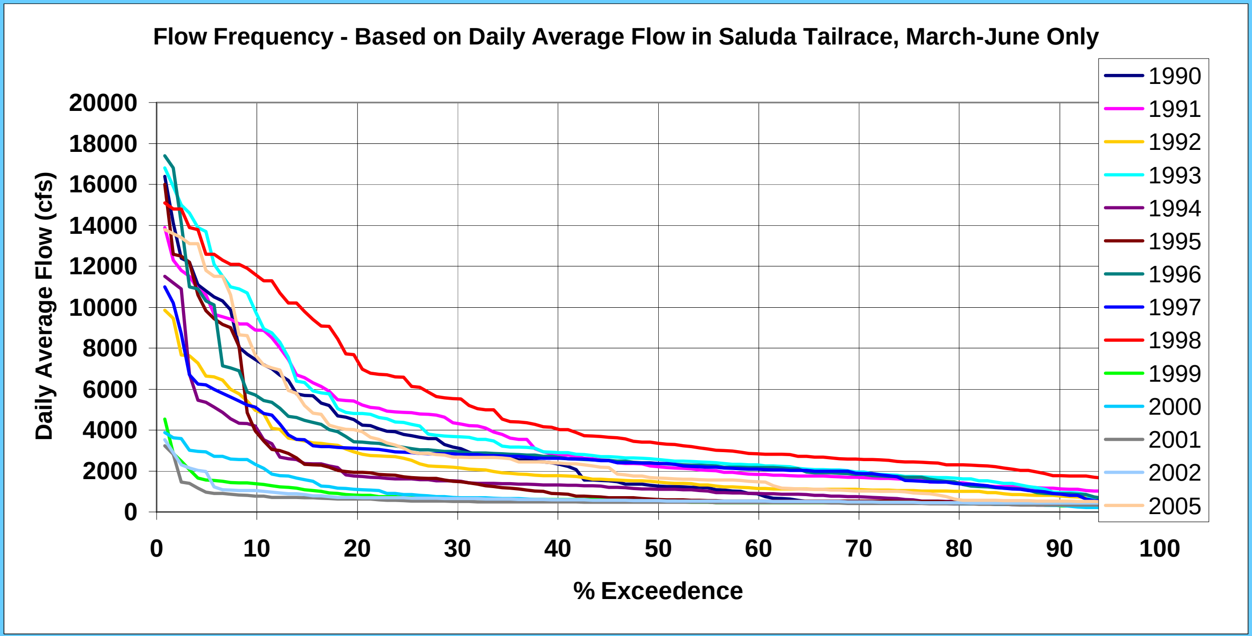
- Meteorological conditions can affect striper habitat

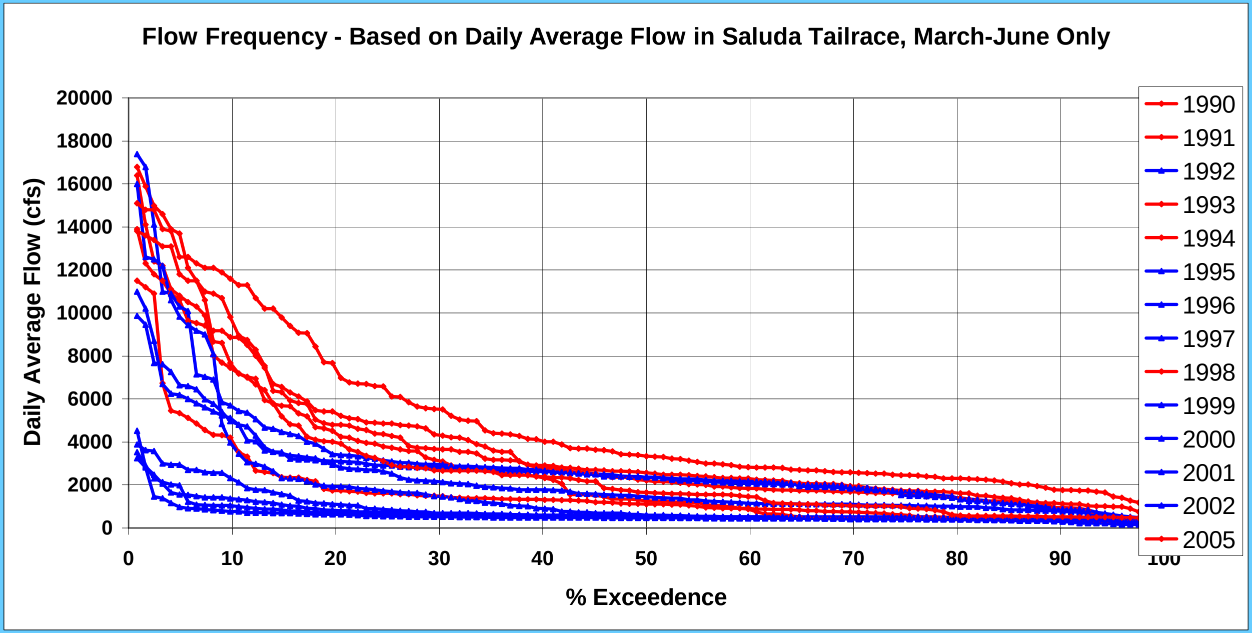
- Model results indicate that the temperature and DO range of tolerable striper habitat in Lake Murray is approximately:

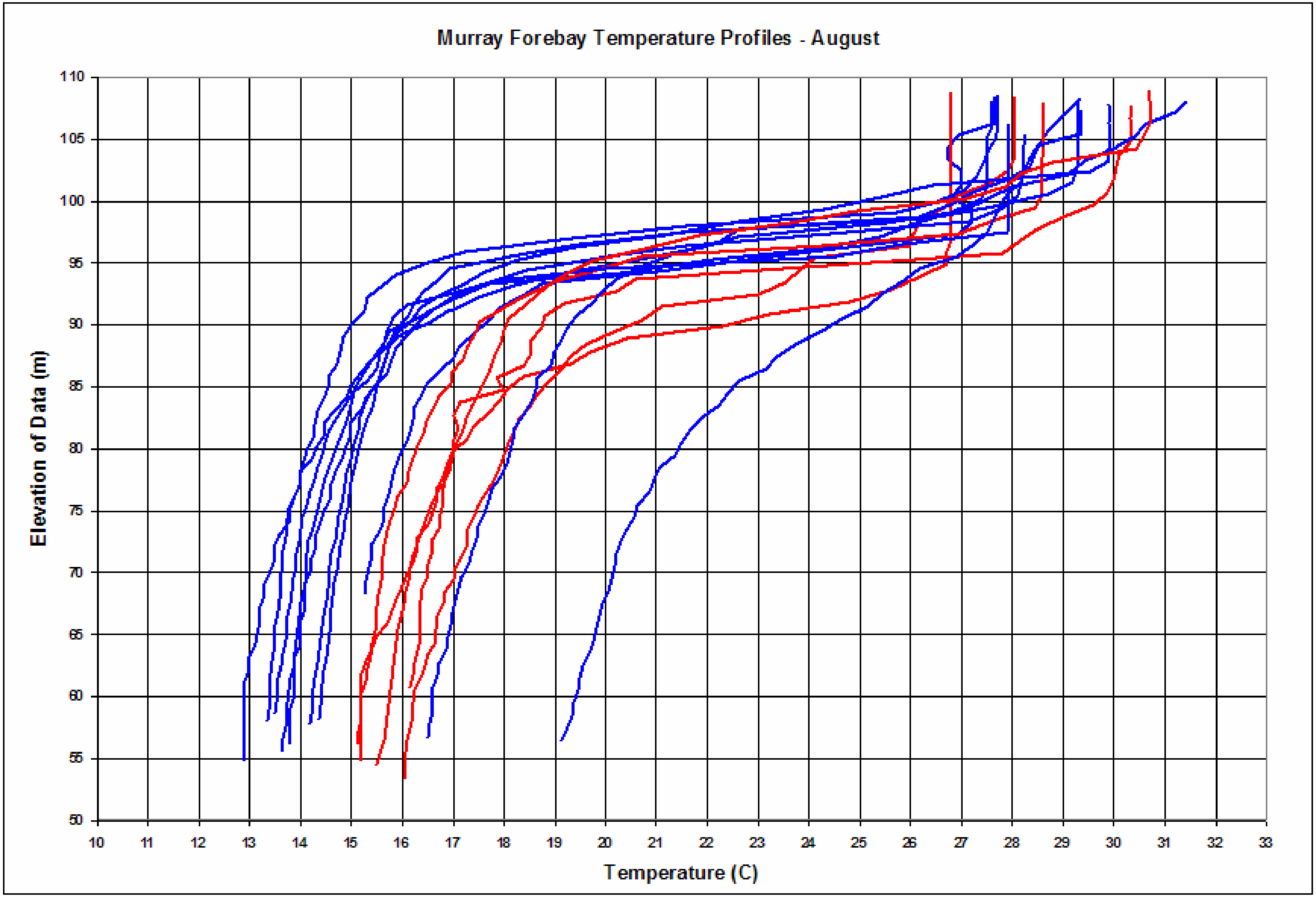
$$T < 27^{o}C \text{ and } DO > 2.5 \text{ mg/l}$$

- Higher summer pool levels and preferential use of Unit 5 helps preserve colder bottom water and was predicted to improve DO, increase striper habitat, and enhance temperature in the tailwater

Flow Frequency – Saluda River Below Lake Murray






Murray Forebay Temperature Profiles - August
Elevation of Data (m)
110
105
100
95
90
85
80
75
70
65
60
55
50
10
11
12
13
14
15
16
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28
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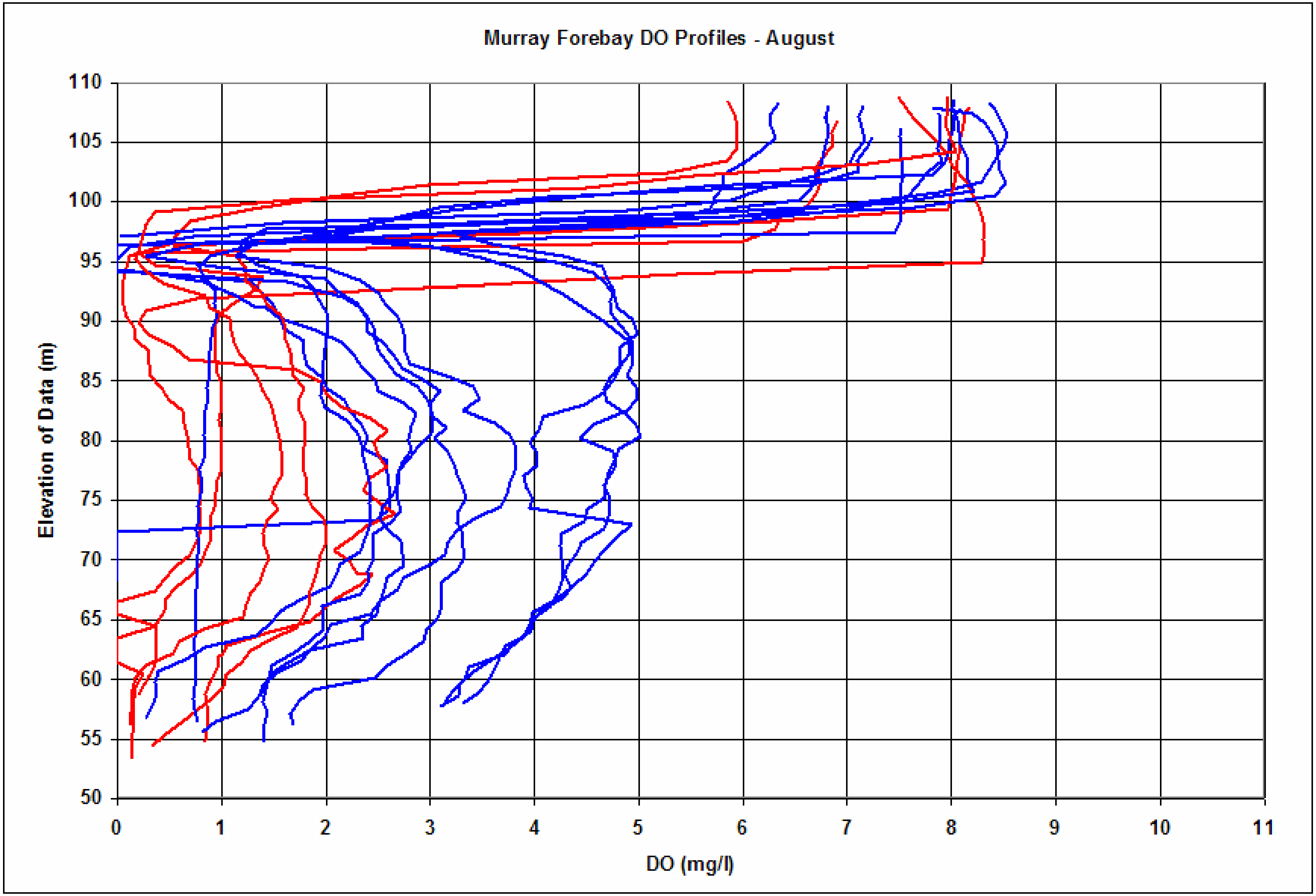
31
32
33
Temperature (C)



Murray Forebay DO Profiles - August
Elevation of Data (m)
DO (mg/l)
110
105
100
95
90
85
80
75
70
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60
55
50
0
1
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4
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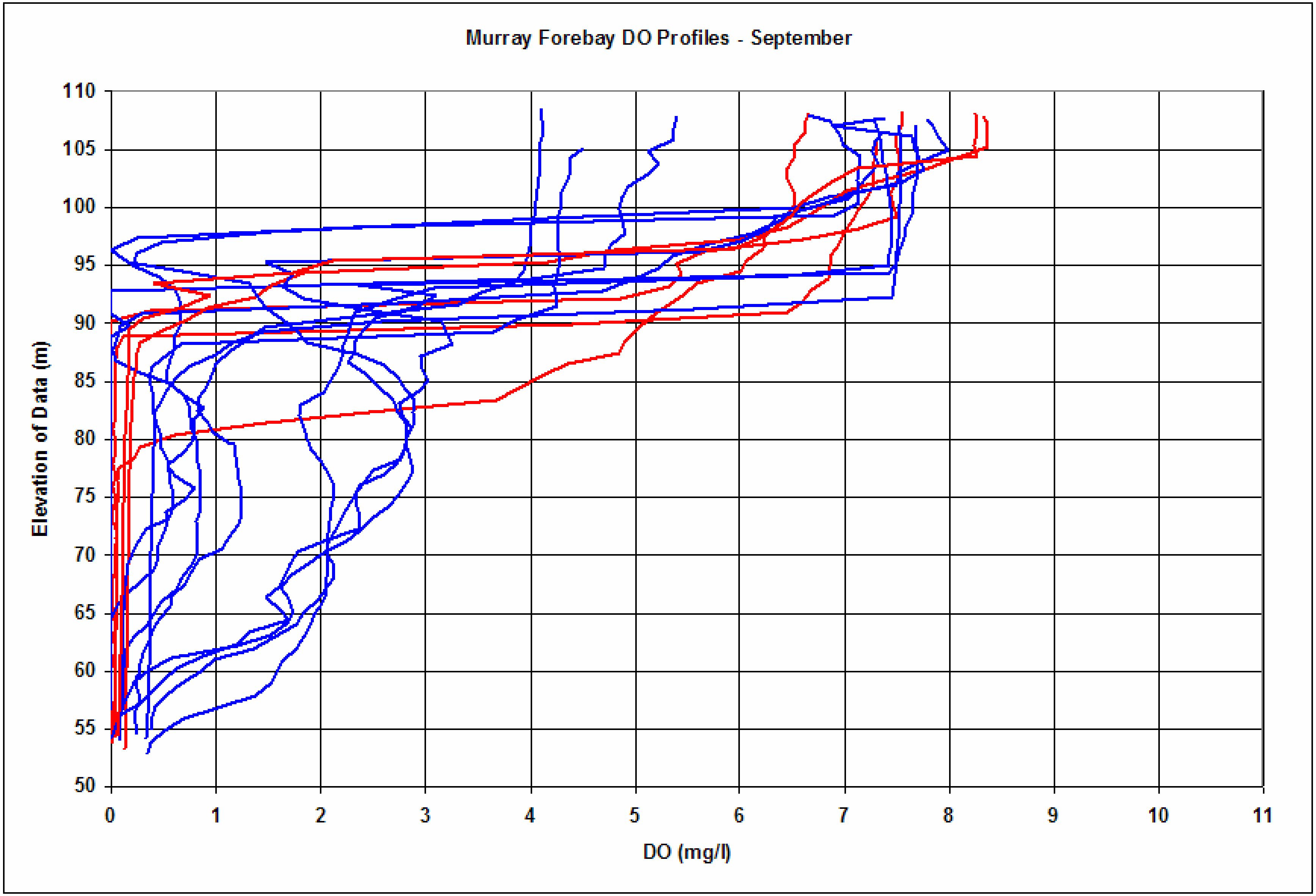
Murray Forebay DO Profiles - September
Elevation of Data (m)
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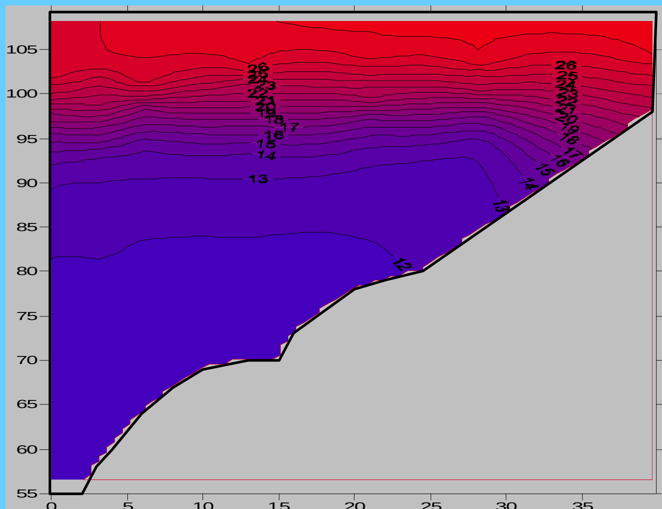
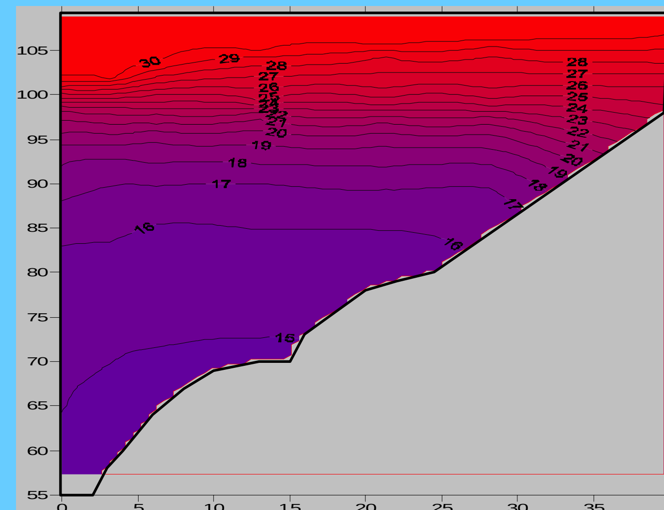
7
8
9
10
11
DO (mg/l)

Lake Murray Contour Plots

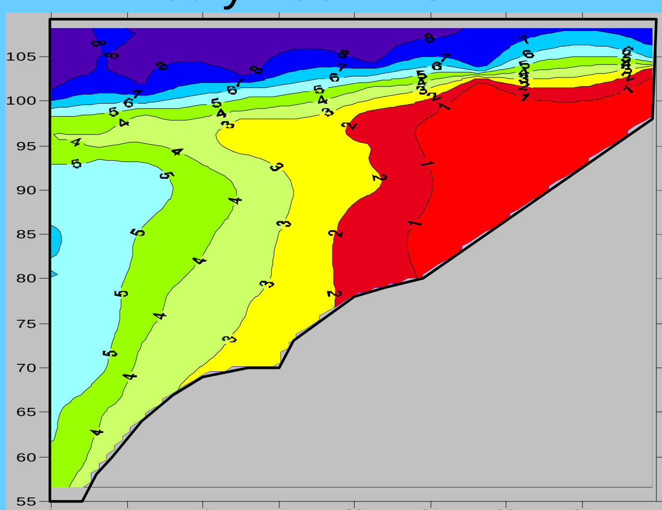
July 2002 Temperature



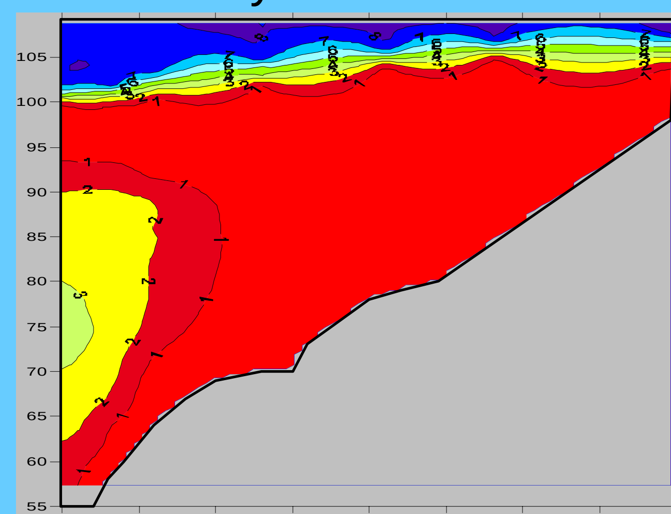
July 2005 Temperature



July 2002 DO

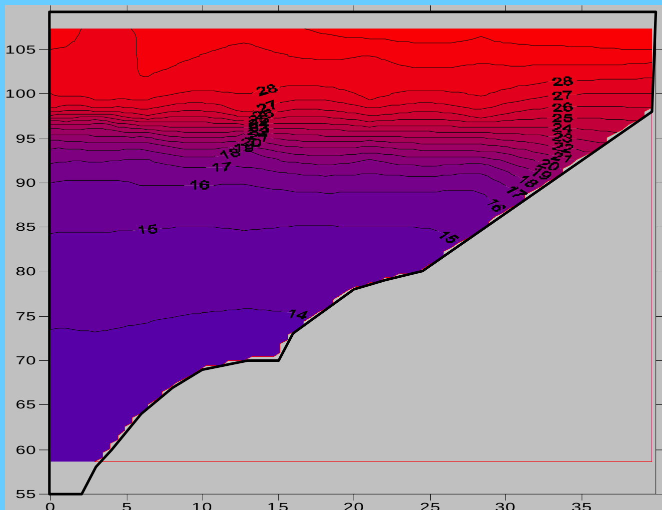


July 2005 DO

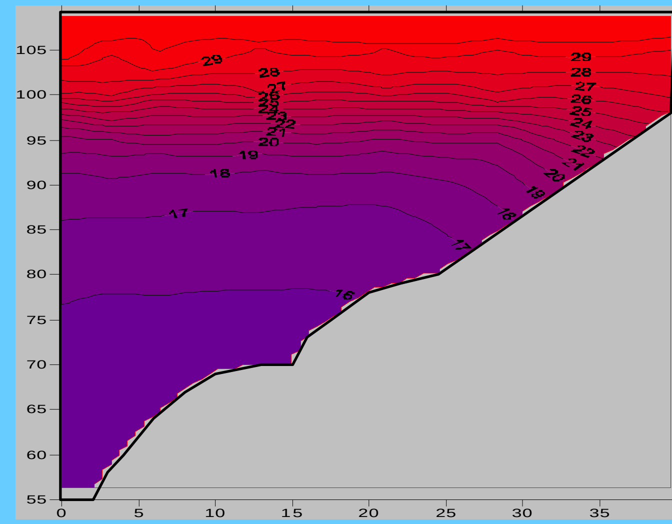


Lake Murray Contour Plots

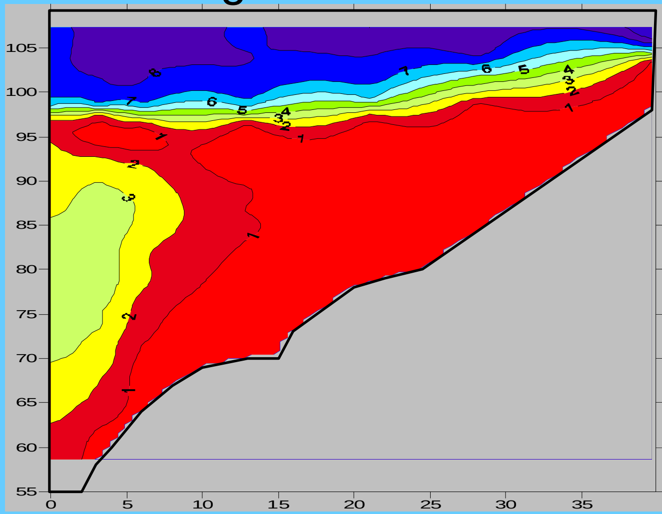
August 2002 Temperature



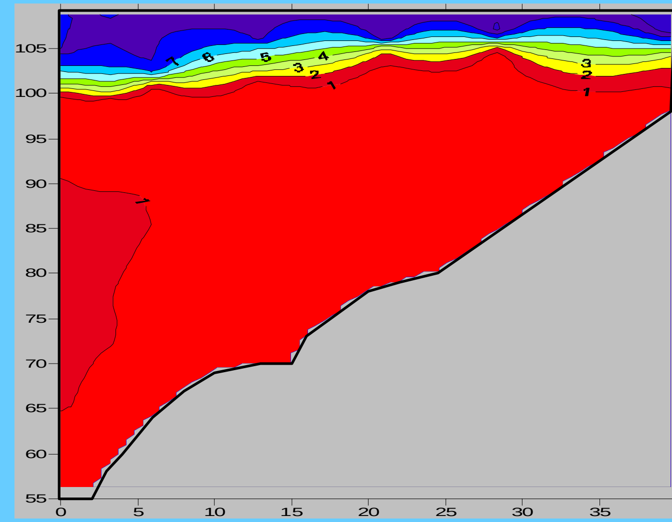
August 2005 Temperature



August 2002 DO

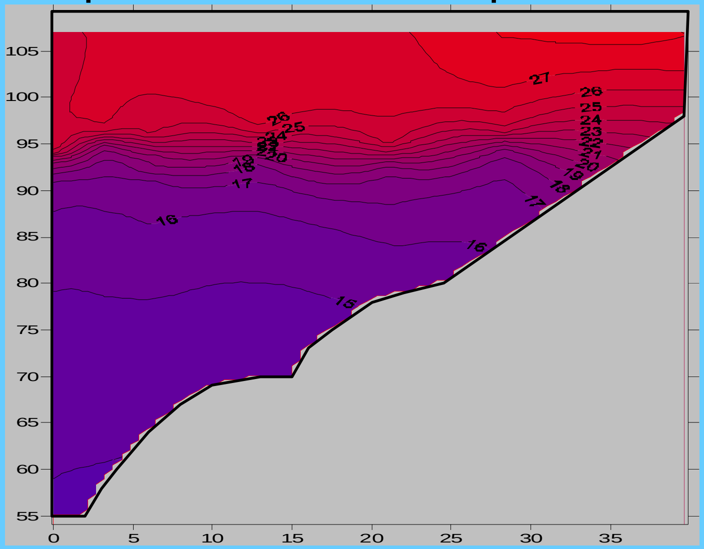


August 2005 DO

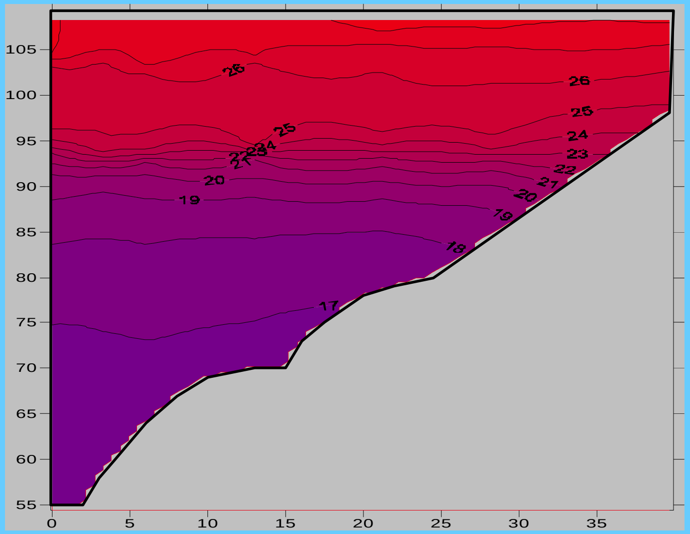


Lake Murray Contour Plots

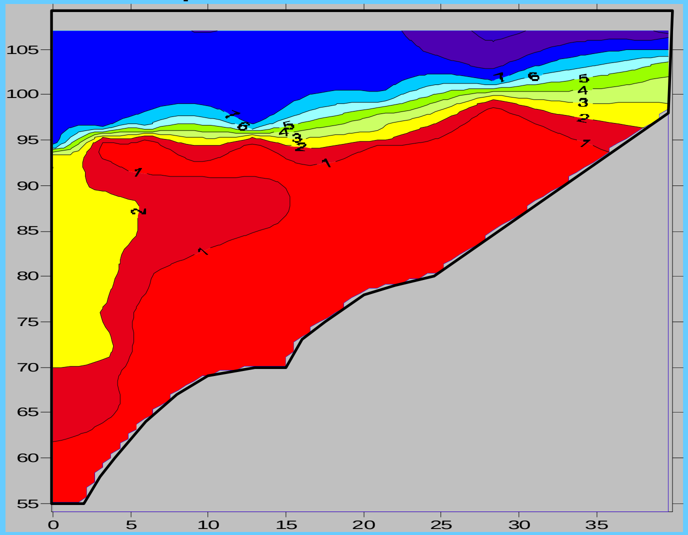
September 2002 Temperature



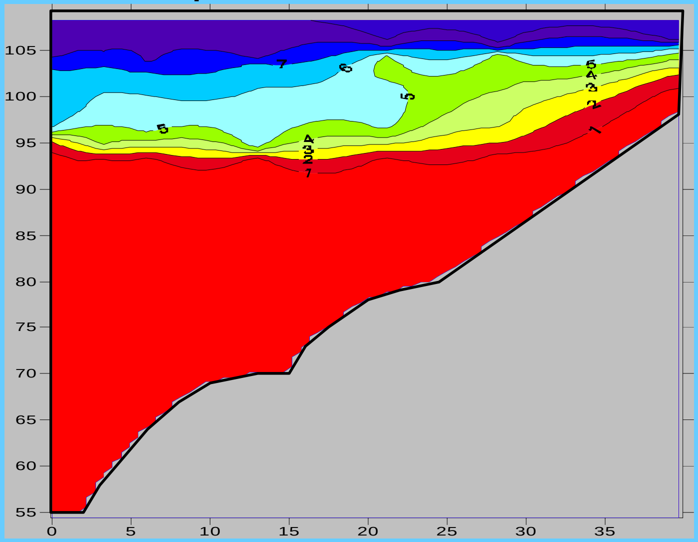
September 2005 Temperature



September 2002 DO



September 2005 DO

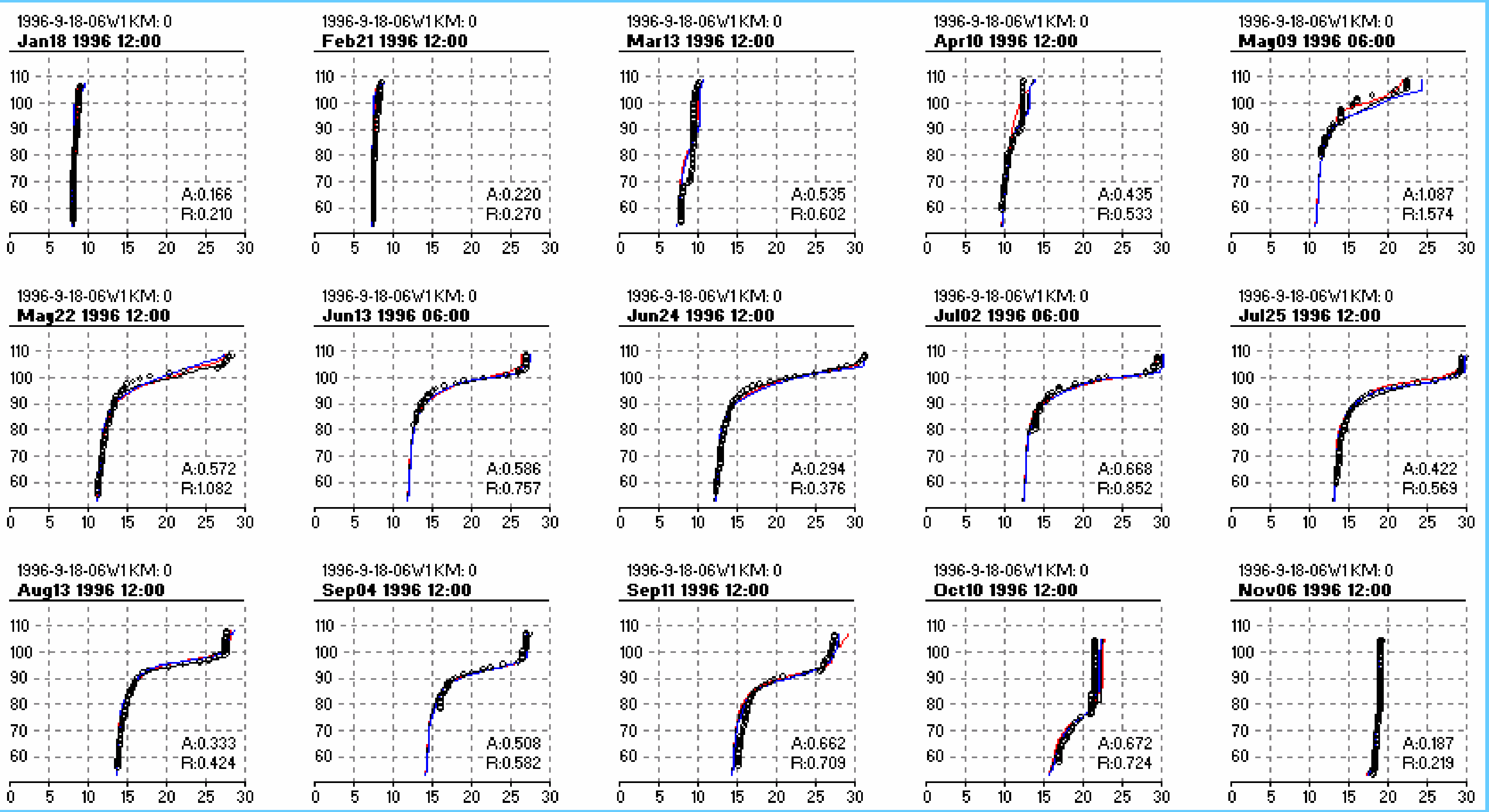


CE-QUAL-W2 Model Calibration

- Model was originally calibrated to 3 years: 1992, 1996 and 1997; then confirmed for 1991, 1998, 2000, 2001, and 2005

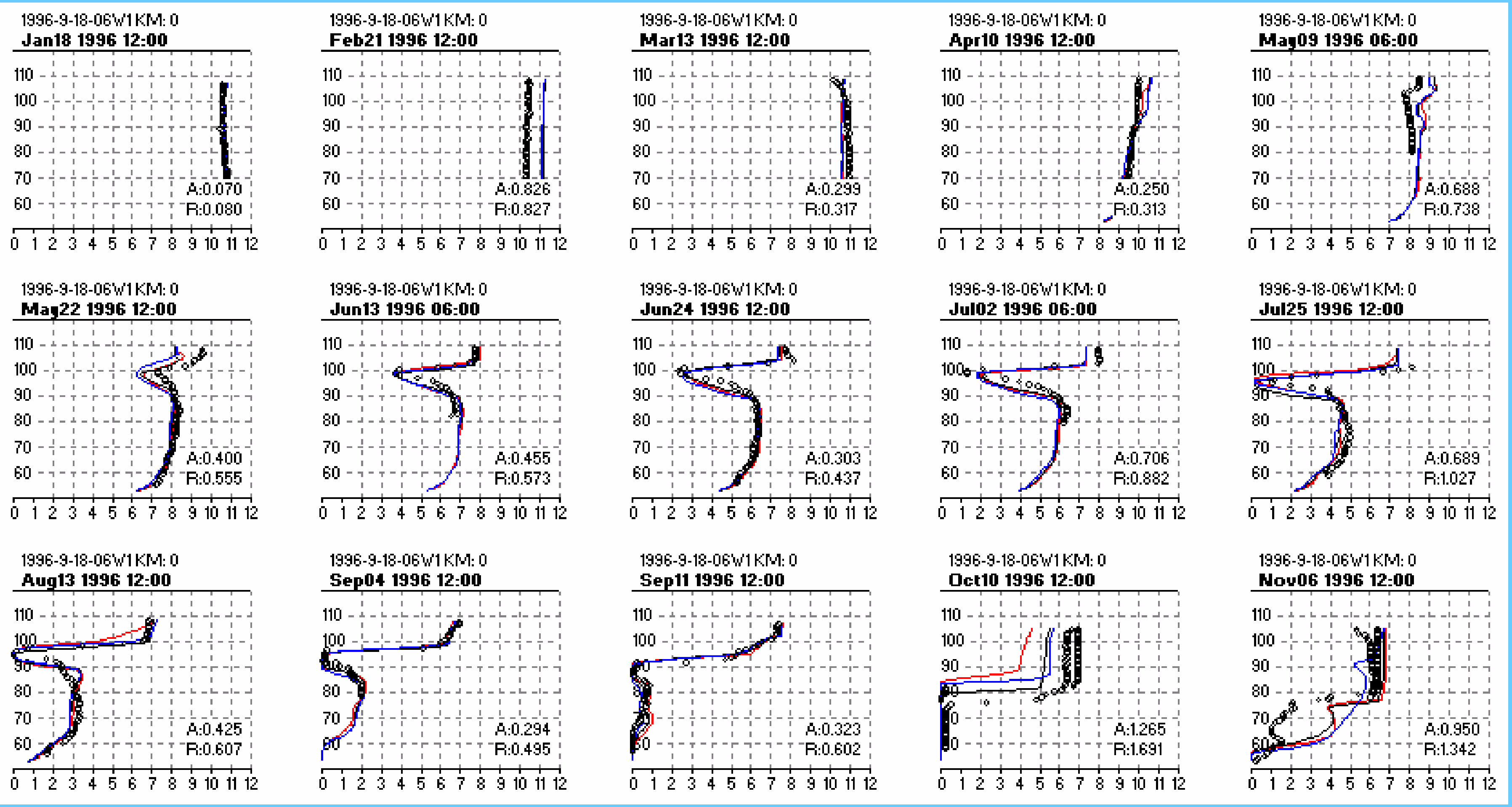
1996 Lake Murray Forebay Temperature Profiles

Model vs. Data [Overall Statistics: ABS = 0.46, RMS = 0.66]



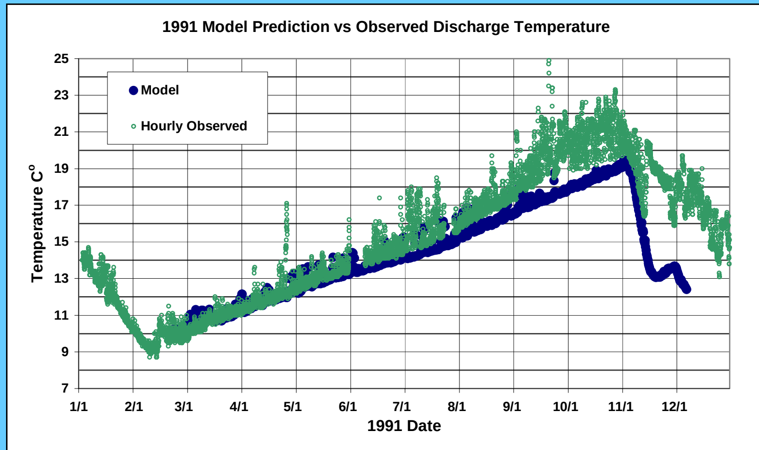
1996 Lake Murray Forebay DO Profiles

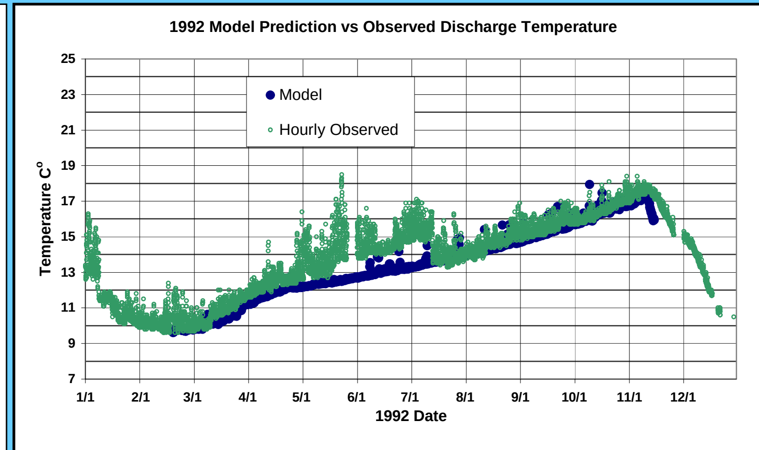
Model vs. Data [Overall Statistics: ABS = 0.57, RMS = 0.89]

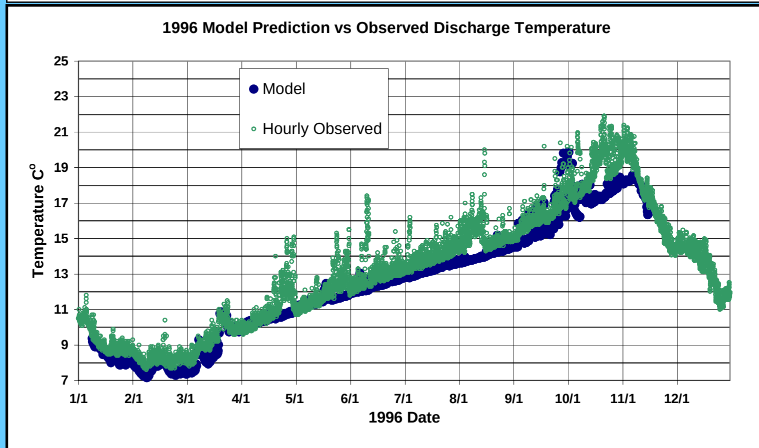


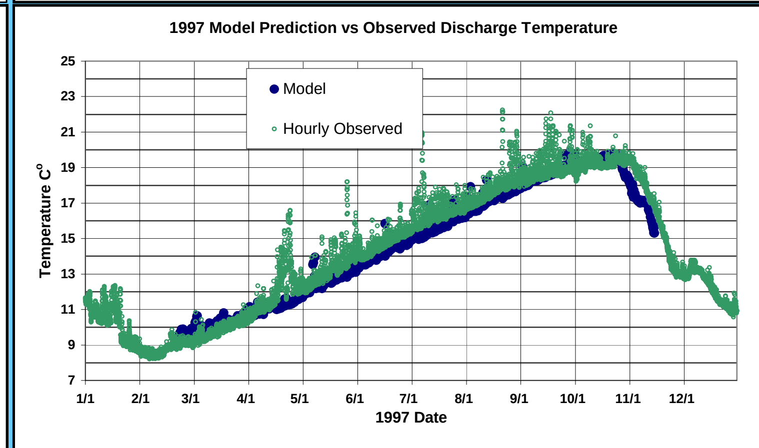
Release Temperature

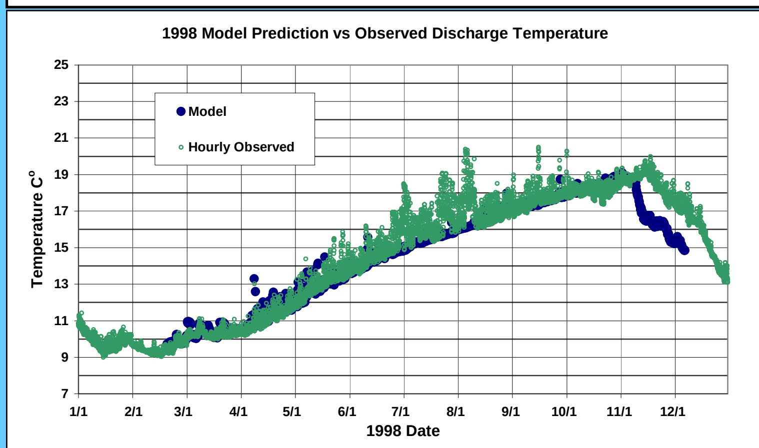
Model vs. Data

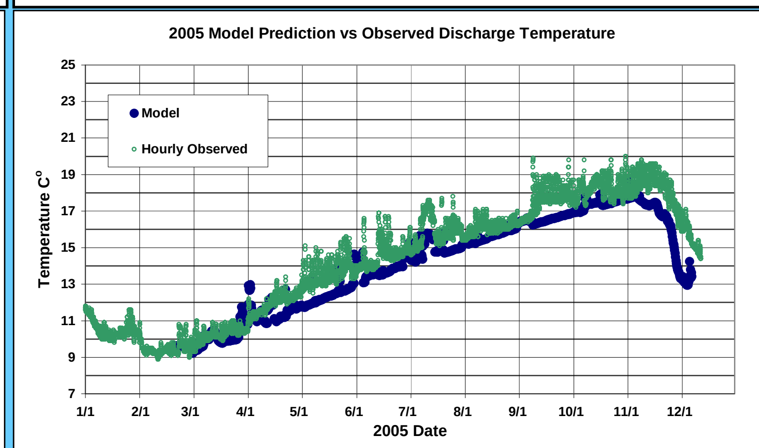






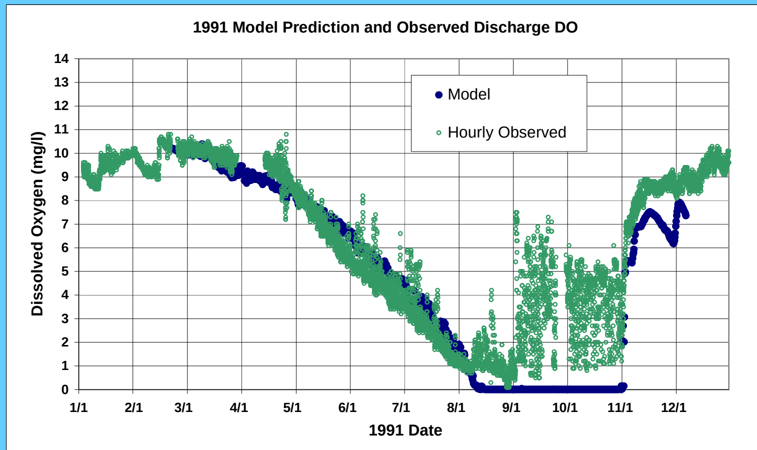


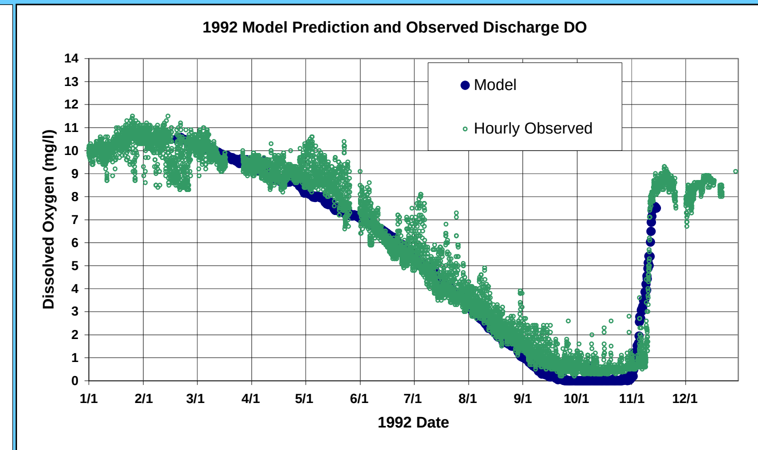


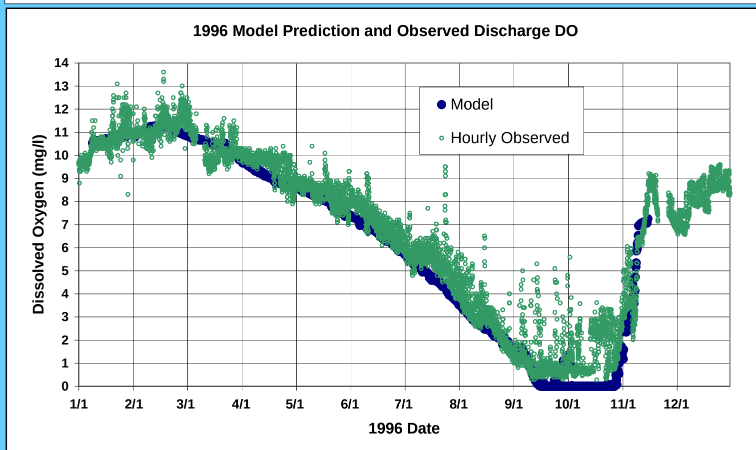


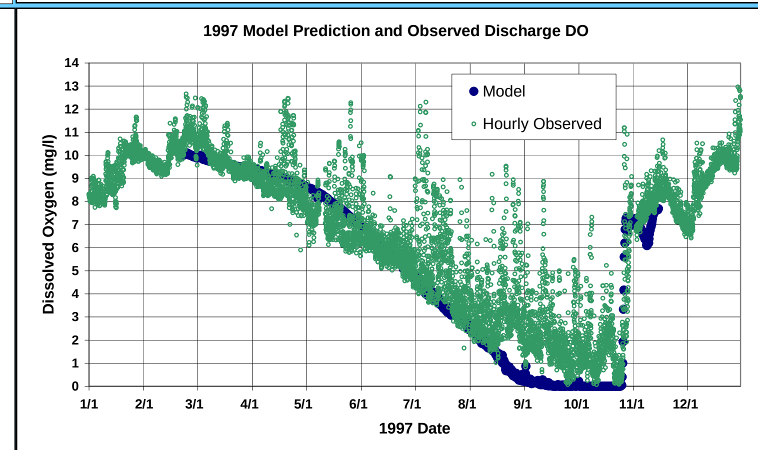
Release DO

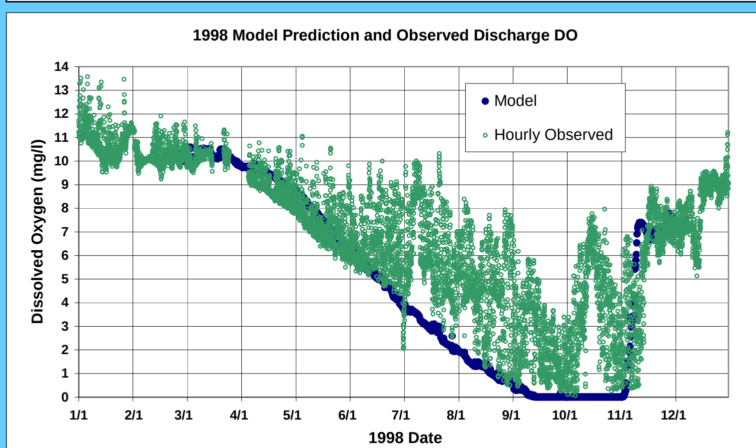
Model vs. Data

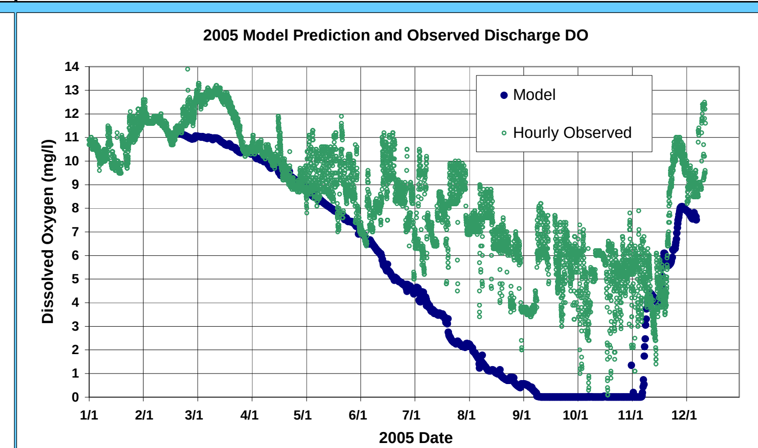




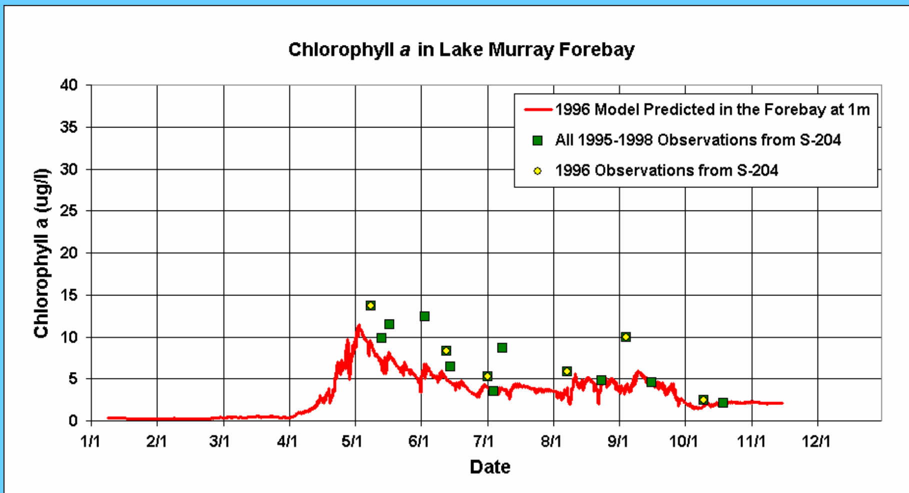


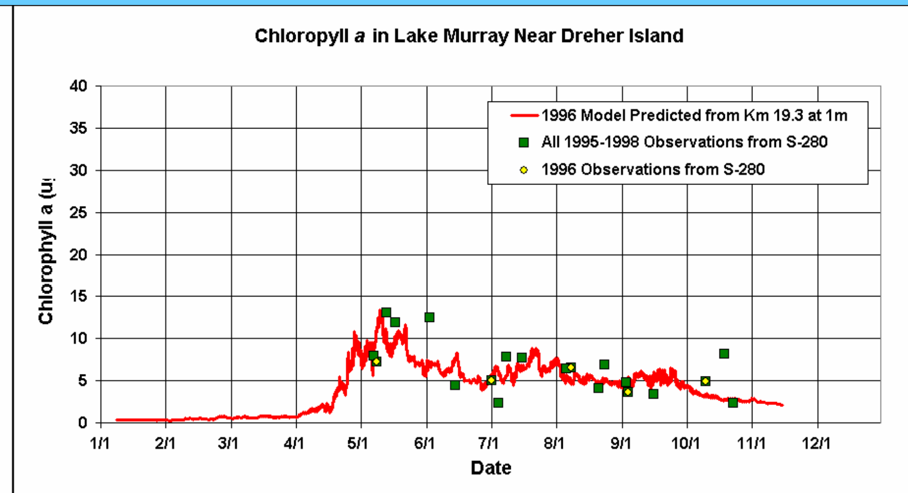


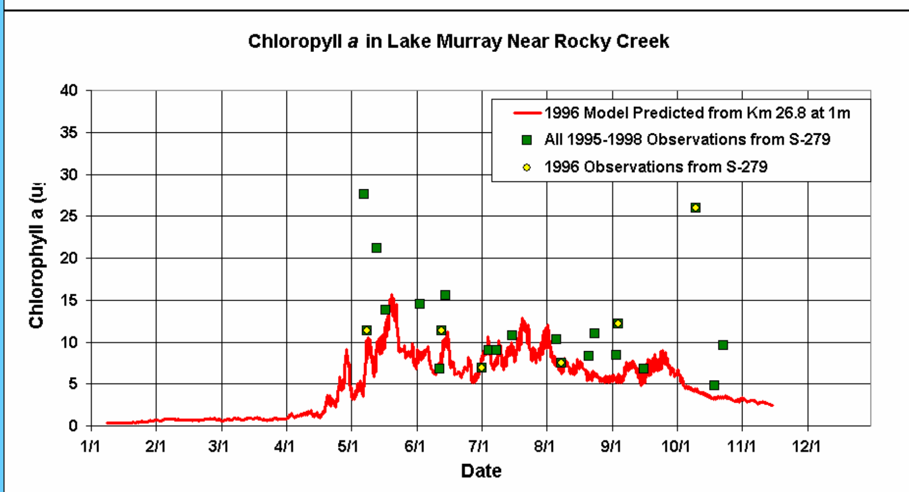


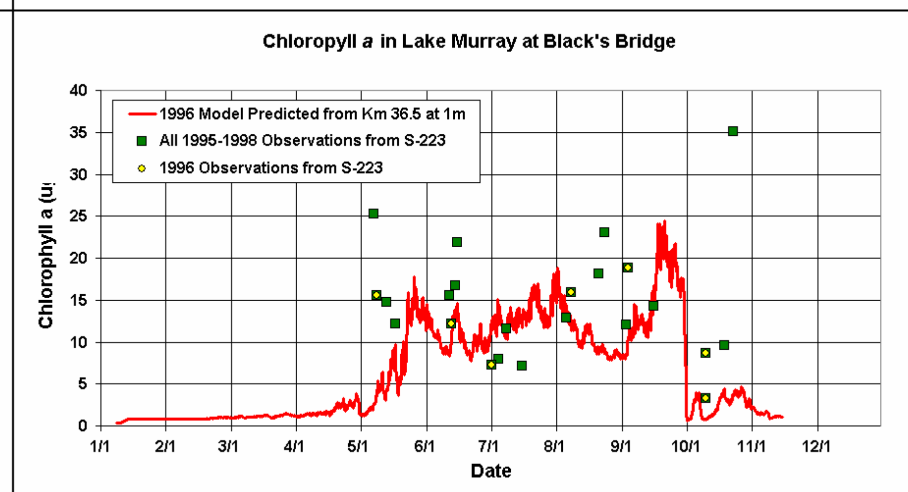


1996 Chlorophyll *a* at Four Locations in Lake Murray
Model vs. Data

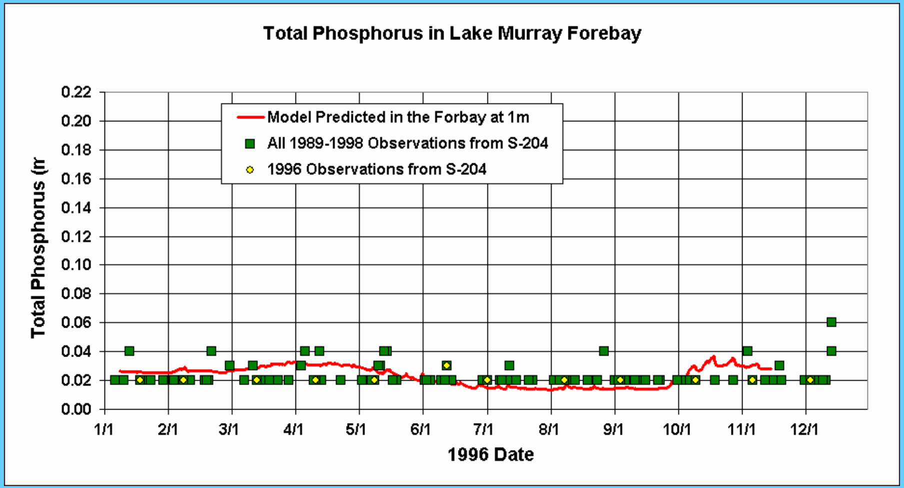


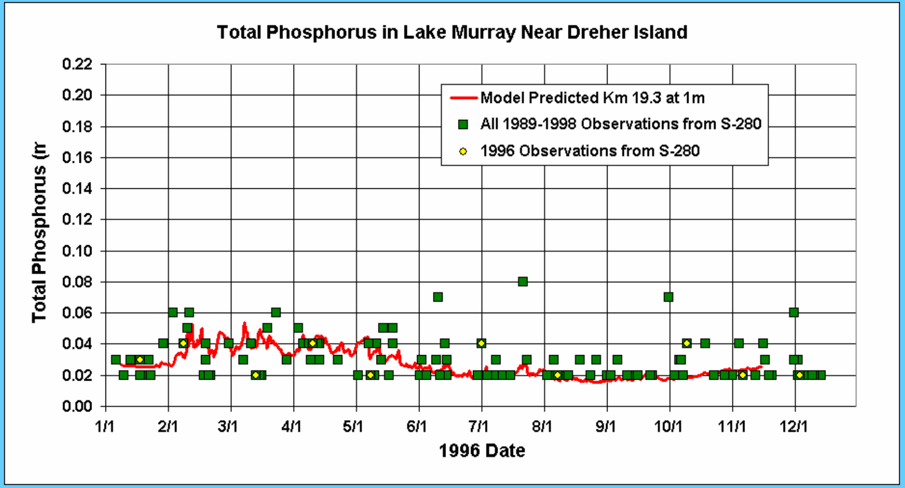


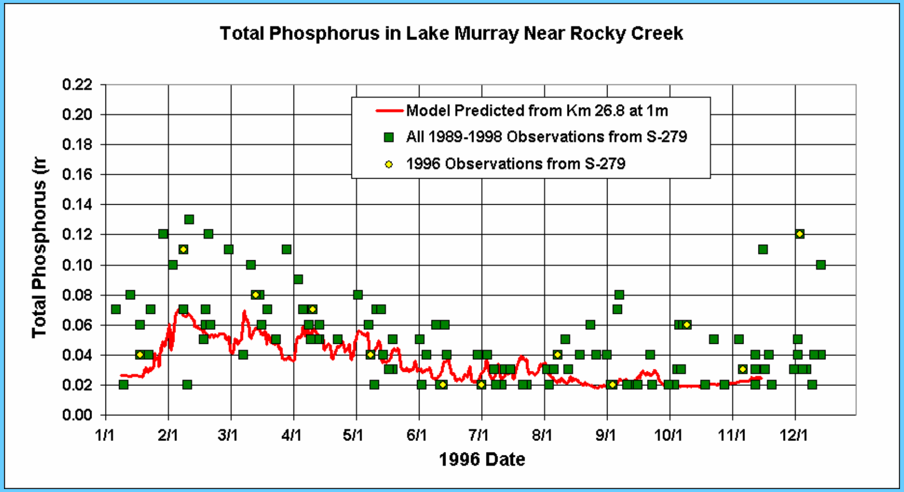


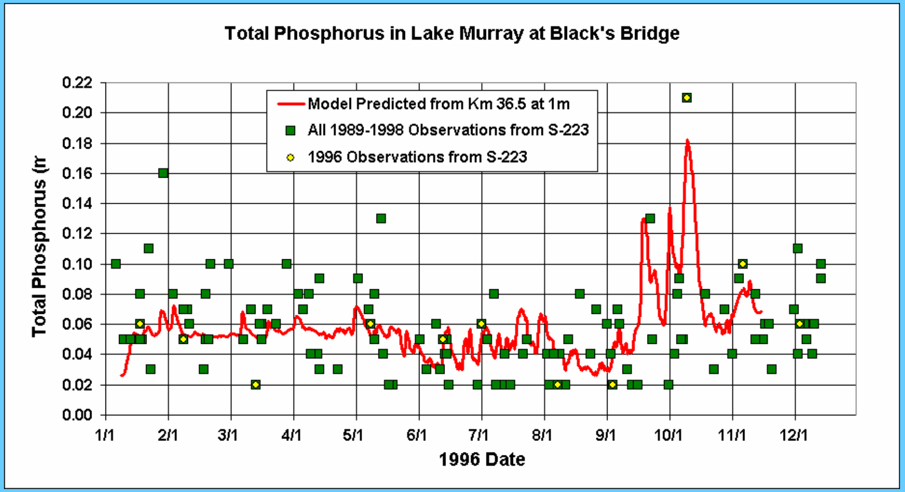


Comparison of Modeled Derived versus Measured Total Phosphorus for 1996 at Four Locations in Lake Murray



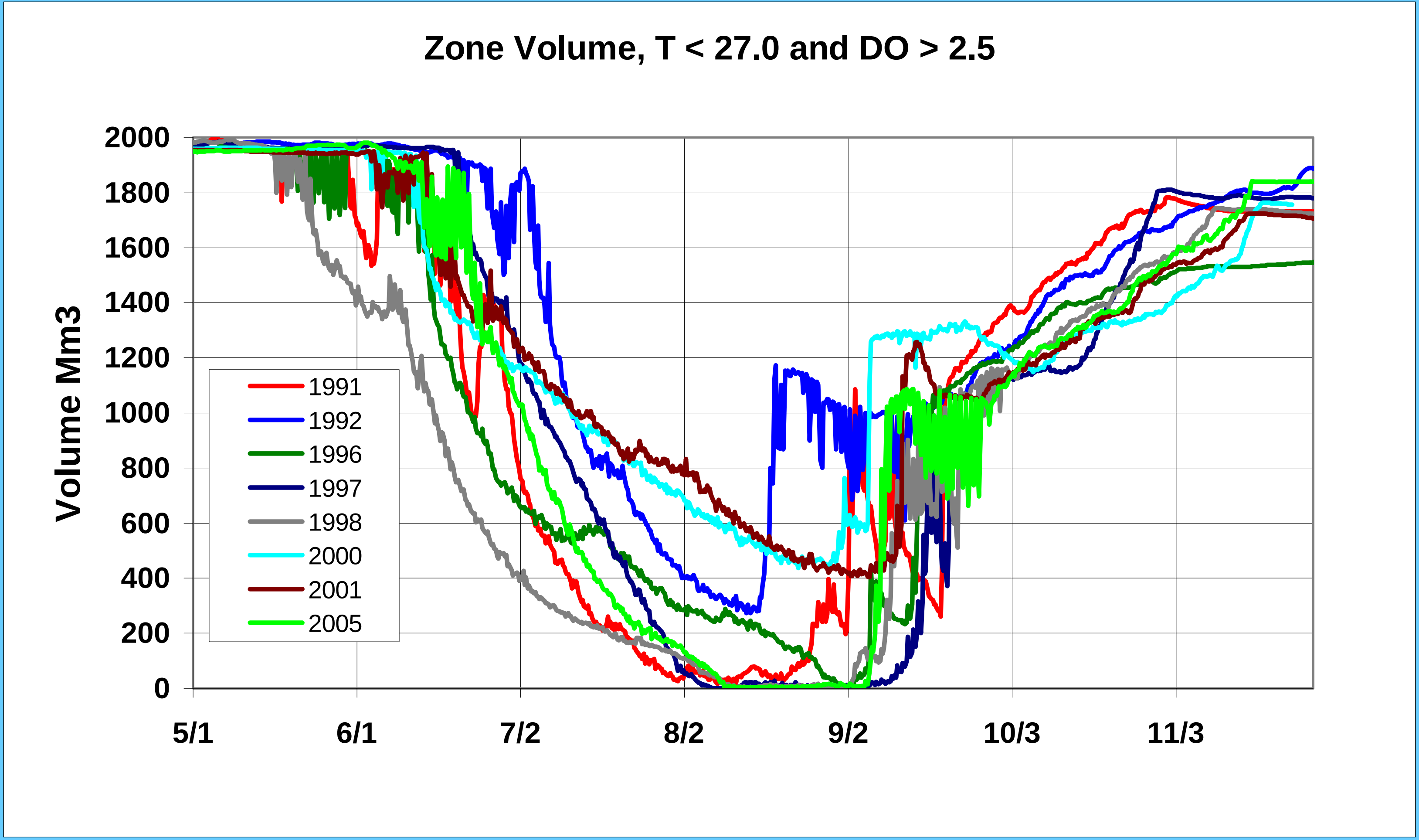






Zone Volume Plot - “Sub-optimal” Habitat

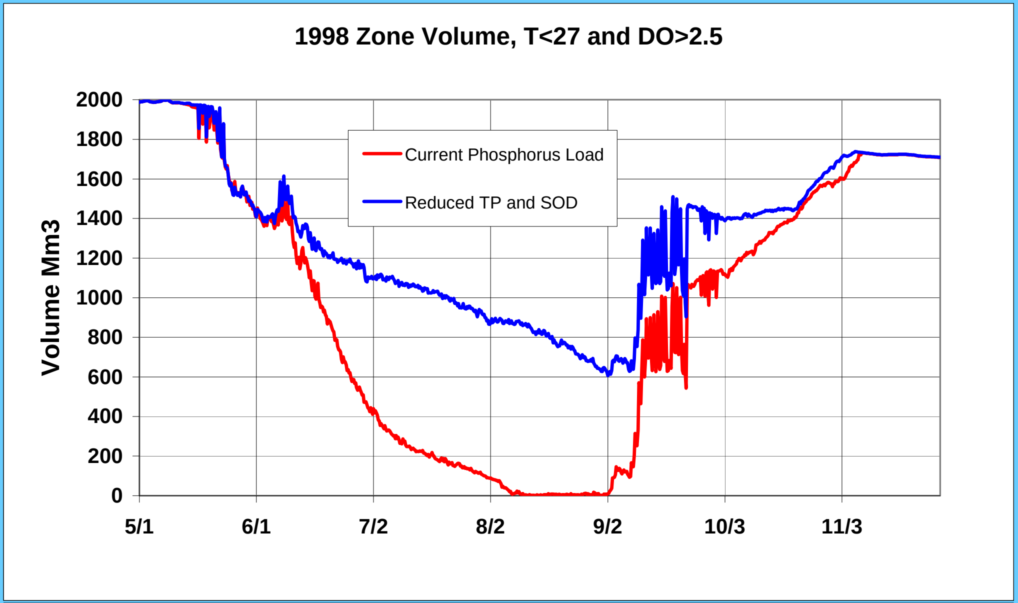
Year	Documented Dates of Fish Kills	Fish Kill Count
1991	7/19 - 8/16	3139
1998	7/30 - 8/10	456
2005	August	742

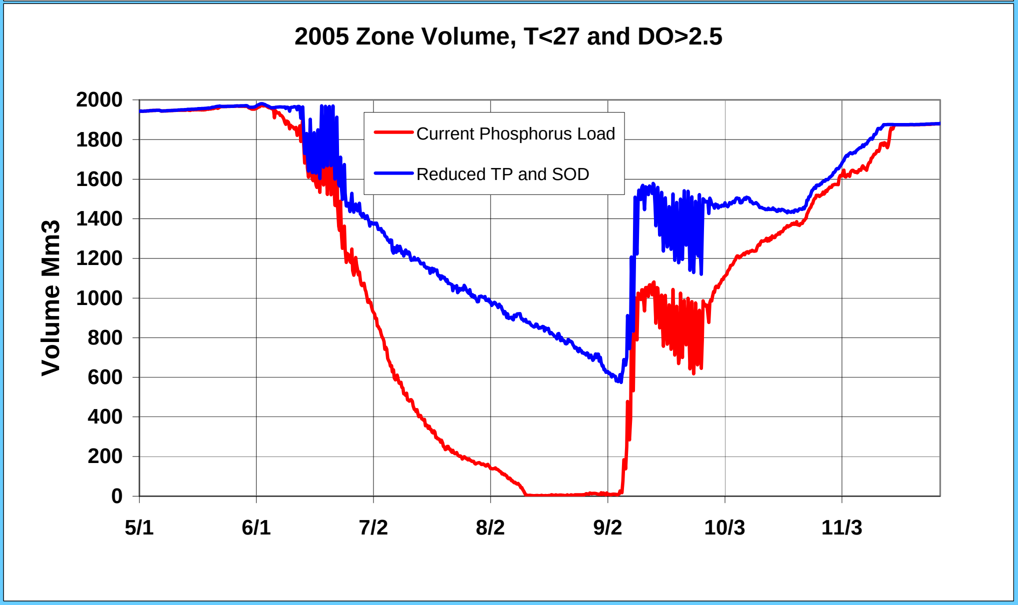


Issues Addressed by Predicting the effects of Reduced Phosphorus Using the W2 Water Quality Model

- low DO in the releases from Saluda Hydro,
- restrictions for operating Unit 5 due to entrainment of blue-back herring,
- eutrophication in the upper regions of Lake Murray,
- DO less than the State standard in the inflow regions of the lake,
- reduced striped bass habitat in the lake due to low DO in the regions of the lake where their temperature preferences occur, and
- low pH in Lower Saluda River (LSR)

Comparison of Current Phosphorus Load and Reduced Phosphorus Scenario

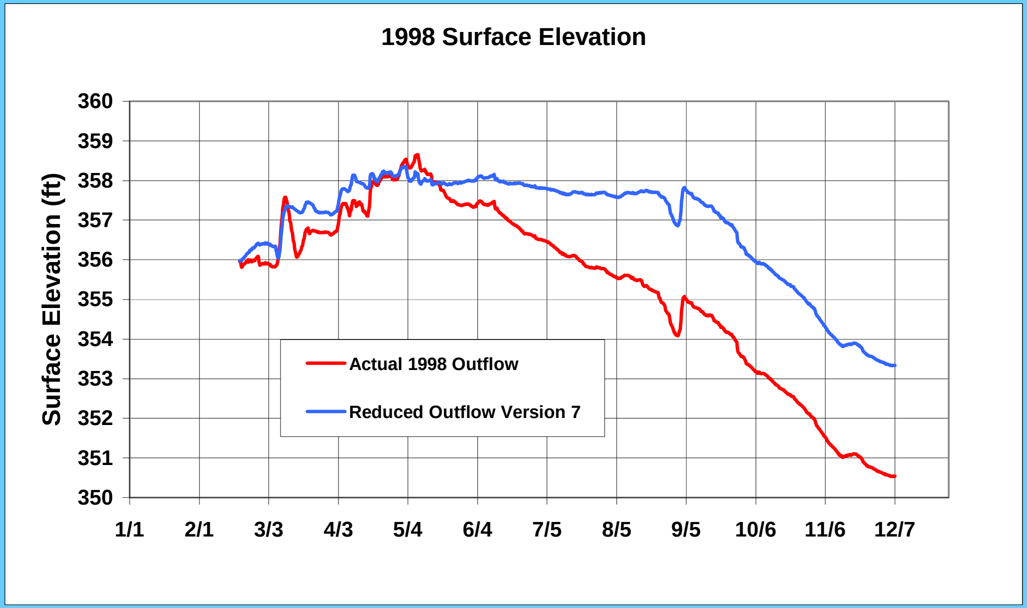


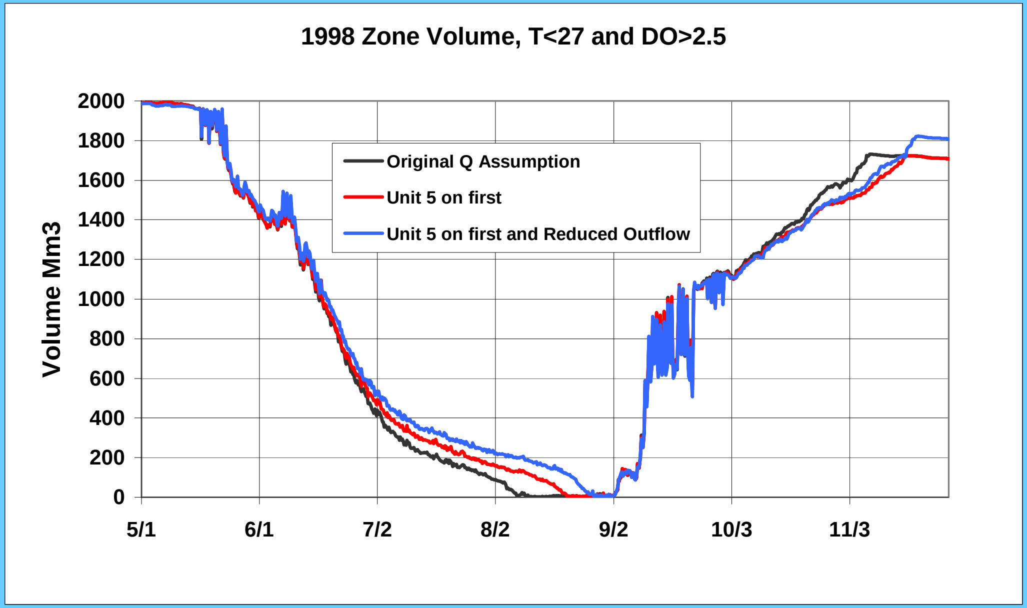


Relicensing Issues Identified by the Water Quality Technical Working Committee

- The causes of striped bass fish kills reported in previous years, especially factors related to Saluda Hydro operations
- The effects of Unit 5 operations on striped bass habitat and entrainment of blue-back herring
- Determination of operational changes that might increase habitat for striped bass and blue-back herring
- Assessment of pool level management alternatives
- Track any impacts that could occur to the tailwater cold-water fishery due to potential operational changes

Pool Level Management with 1998 Model

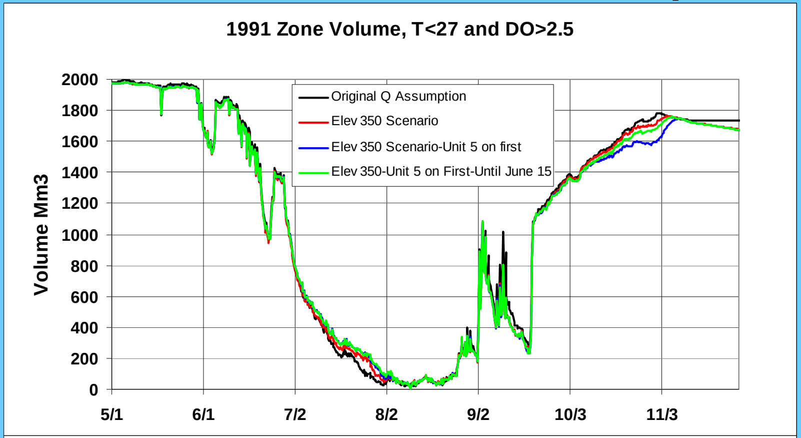


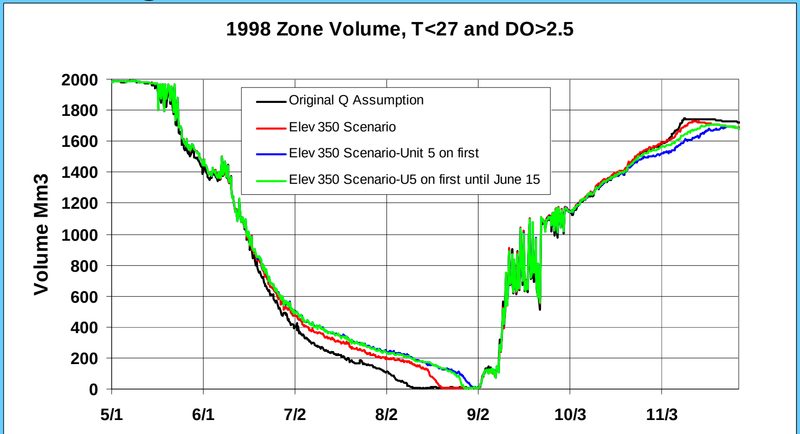


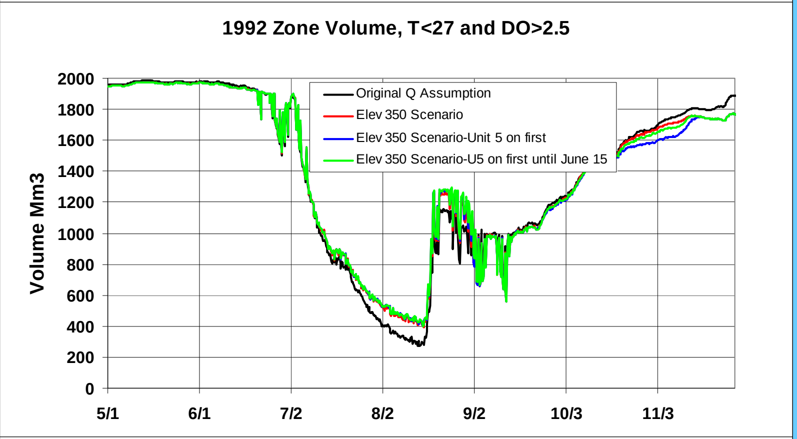
Animations

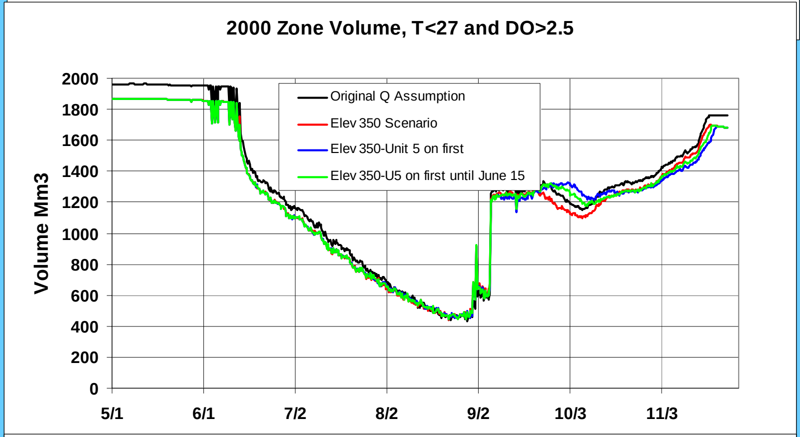
1998 with and without operational enhancements—to be shown at the end as time allows

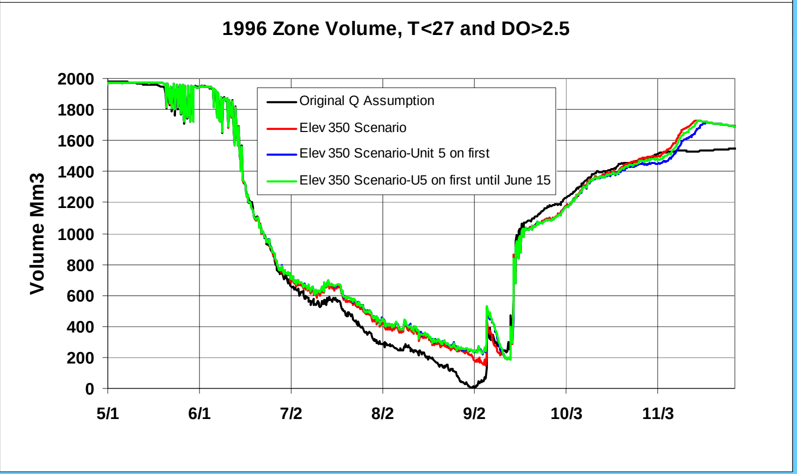
Striped Bass Habitat—Comparison of Current Operations and Promising Operational Changes











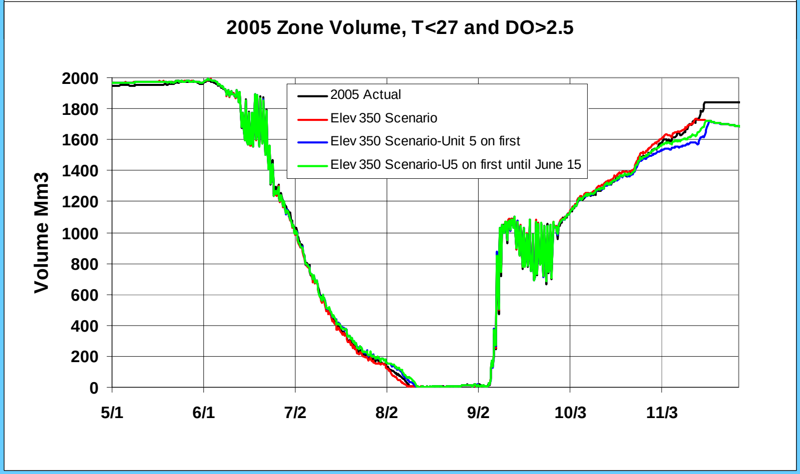
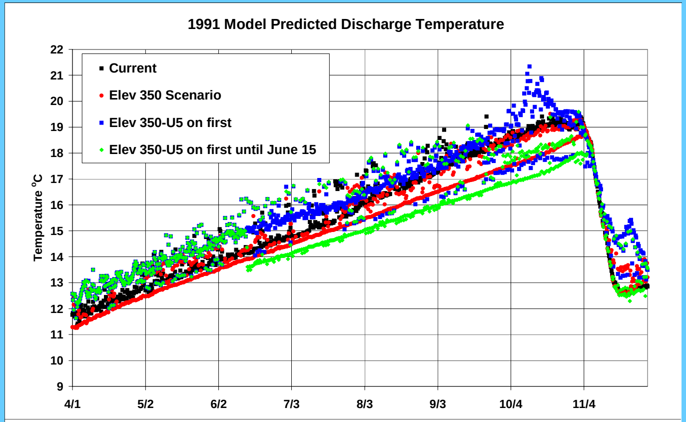
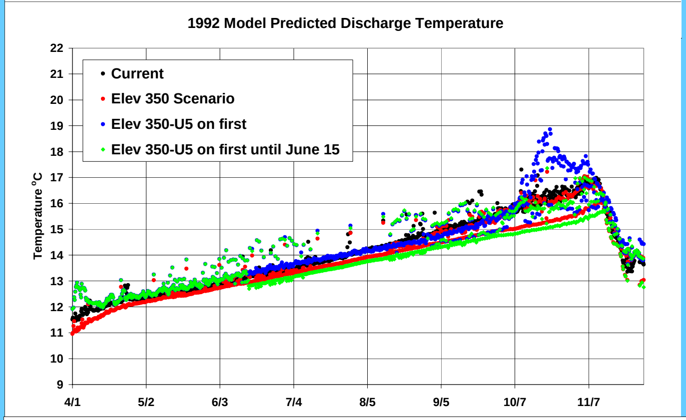


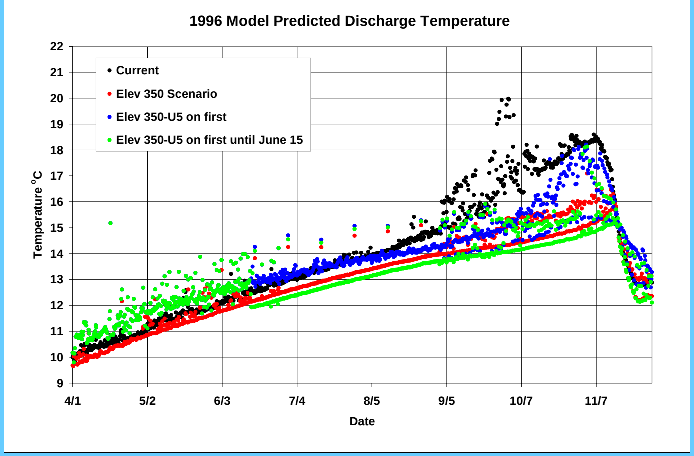
Table 4-1. Temperature increases in the tailwater between Saluda Hydro and the USGS monitor at Columbia.

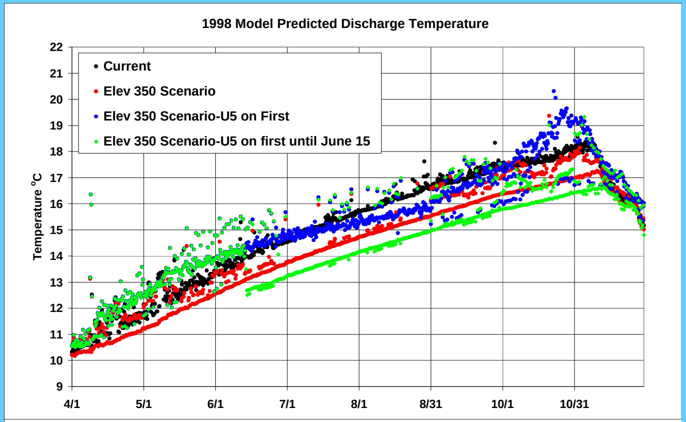
Generation levels and months of operation	Mean temperature increase, ºC	Mean temperature increase + 2*Std Deviation, ºC
Less than 1000 cfs, May-Sept	3.2	6.4
2500-3000 cfs, May-Sept	1.3	2.9
5000-6000 cfs, May-Sept	1.0	2.0
2500-6000 cfs, Oct	0.7	1.5

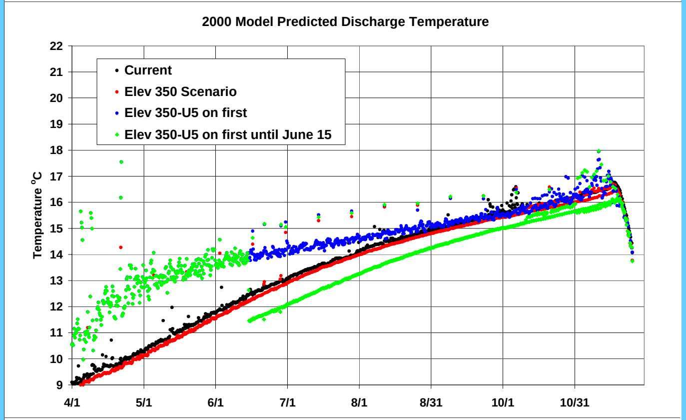
Tailwater Temperature—Comparison of Current Operations and Promising Operational Changes

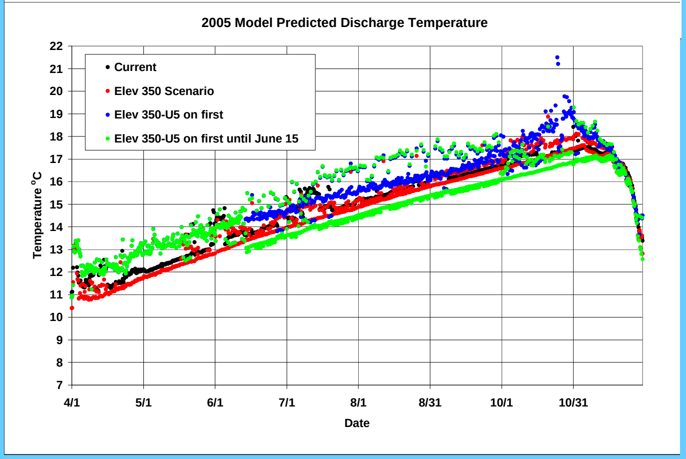












Conclusions for In-lake Water Quality and Fish Habitat

- Nutrients loads to Lake Murray are the single dominant factor that can enhance striped bass habitat
- High flow, especially during March-June, is the primary cause for fish kills, but cannot be controlled to avoid fish kills
- Model results indicate that the temperature and DO range of tolerable striper habitat in Lake Murray is approximately: $T < 27\ ^{o}C$ and $DO > 2.5$ mg/l
- Model results show that preferential use of Unit 5 helps preserve cooler bottom water resulting in improved DO and increased striper habitat in some years
- Maintaining the summer pool level at 358 either increases or has no effect on striped bass habitat.
- The combination of Unit 5 preferential operations and maintaining the summer pool level at 358 can further increase striped bass habitat.
- The combination of Unit 5 preferential operations and maintaining the summer pool level at 358 can improve water quality in the releases.

Recommendations for Saluda Unit Operations for Fishery Issues

The following protocol for unit operations was developed:

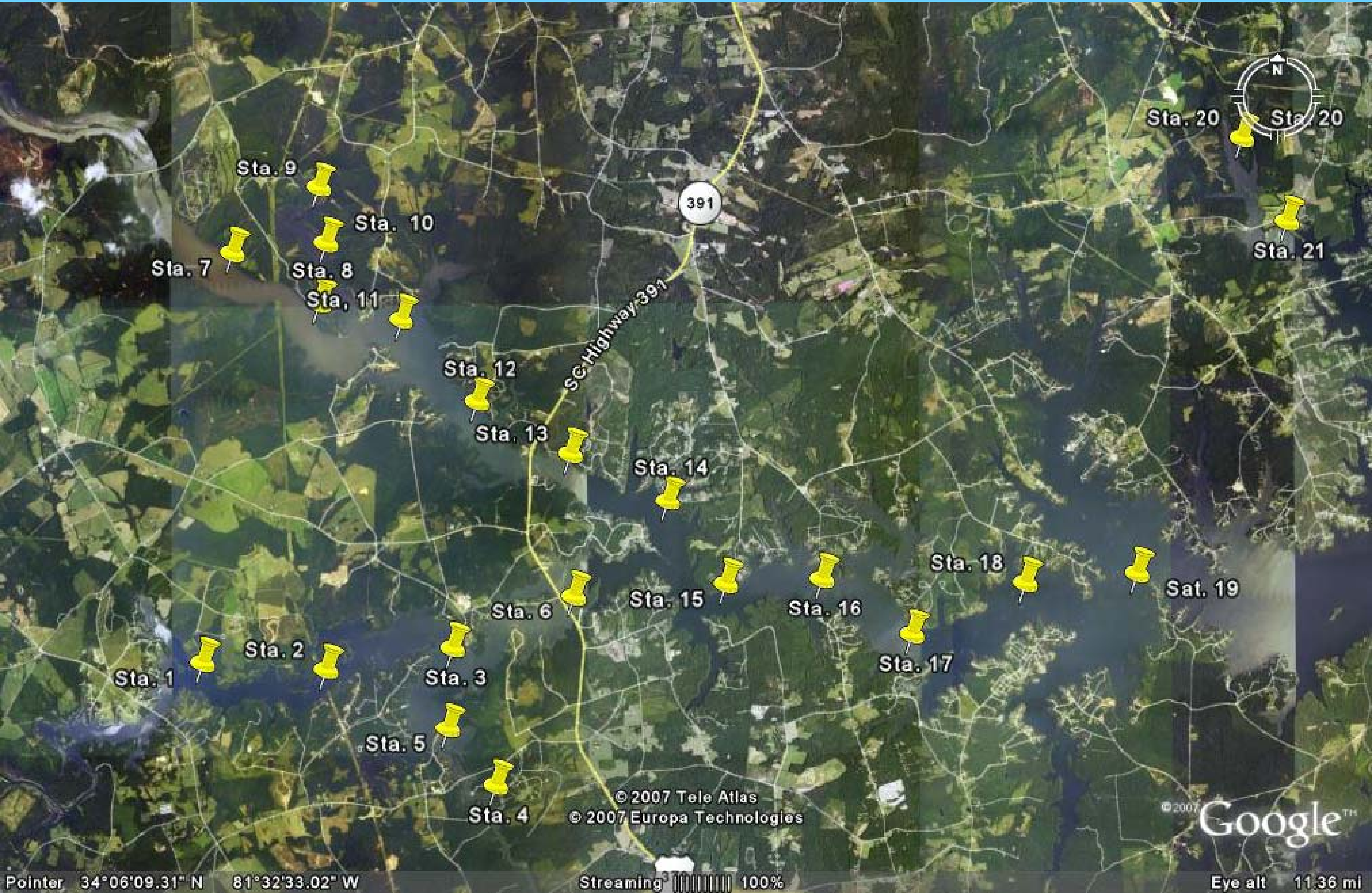
1. for minimum flows, use units 1,3,or4 June 15 thru Dec 1 and U5 for Dec 1 to June 15.
2. For generation flows (i.e., flows > minimum flow)**,** use Unit 5 preferentially for 11 months of the year: November 1 until October 1 of the following year, and use Units 1-4 preferentially in October.

Considerations About Raising the Winter Minimum Pool

- **Sediment sampling and analyses conducted in November 2007**
- **Areas of the lake that are inundated by increasing the pool level from 350’ to 354’**
- **Aquatic macrophytes**
- **Little Saluda River Embayment**
- **The likelihood to fill pool each year**

Sediment sampling and analyses on Lake Murray, November 2007

Locations of Sediment Samples



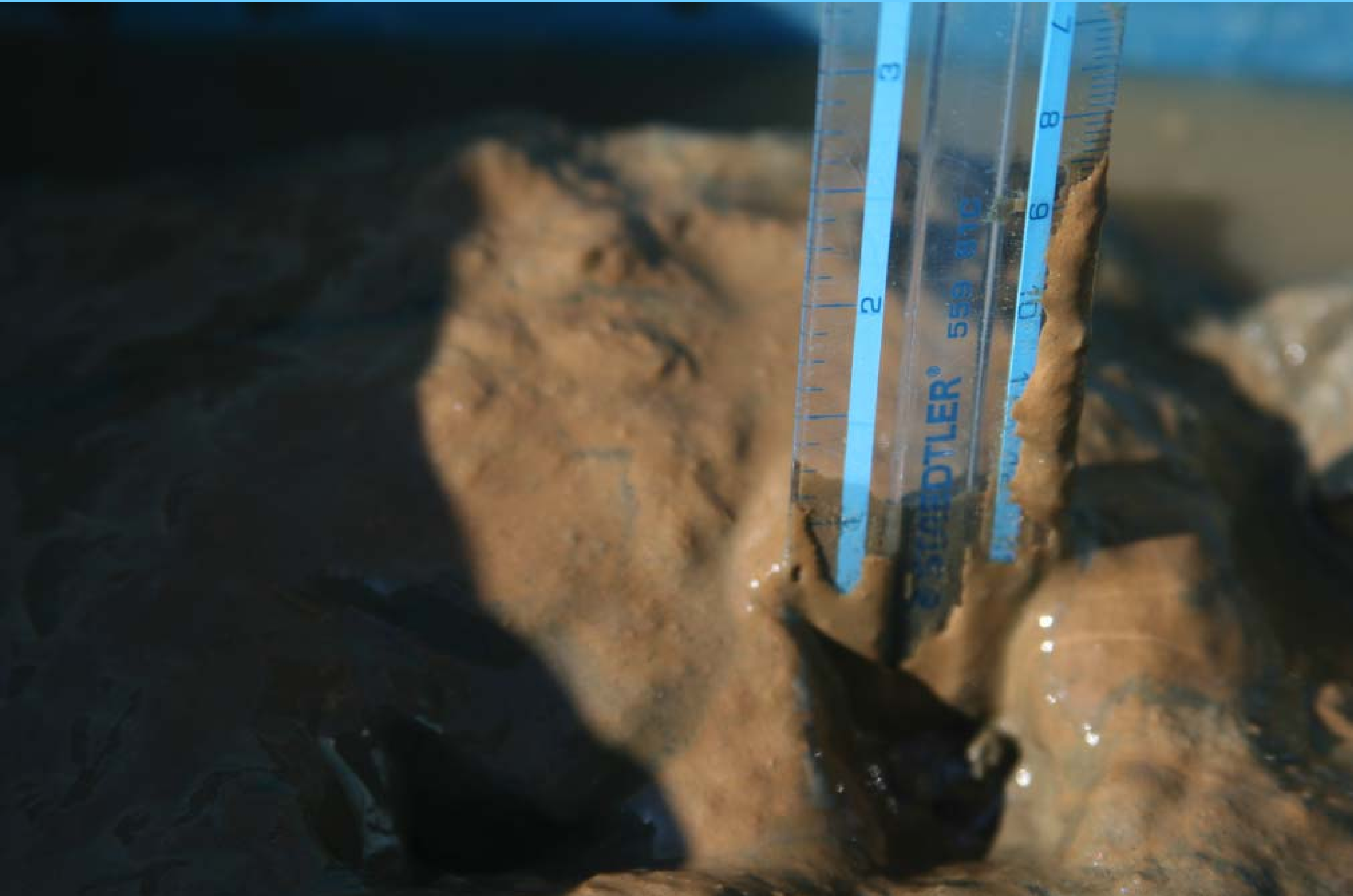
Sta. 3, LSR at Cloud Cr—ooze on top of cohesive sediment

Sta. 4, Cloud Cr inflow—ooze on top of cohesive sediment

sta 11, 2 miles below Sta 7 showing ooze on top of sample

sta 11, 2 miles below Sta 7 showing ooze scraped from top of sample

Sta. 15, 6 miles below Sta. 7



Camping Cr inflow station

Camping Creek Inflow

Results of Sampling

SampleID	CollectDate	Depth, m	Depth, ft	Ooze layer thickness, in	% Solids	% Volatile Solids	TOC	TKN	Phosphorus	Ammonia
Sta. 1Upstrm Little Saluda River	**11/15/2007**	**0.8**	**2.6**	**0.25**	**32.4**	**5.2**	**13,000**	**1,600**	**450**	**230**
Sta.2 Little Saluda River 1 Mile fr.Sta.1	11/15/2007	2.8	9.2	0.25	21.2	5.4	19,000	2,200	710	490
Sta. 3 Little Saluda R @ Mouth Clouds Cr	11/15/2007	4	13.1	0.25	20.7	7	19,000	2,300	720	380
Sta.4 Upstrm.Clouds Crk	**11/15/2007**	**0.9**	**3.0**	**0.25**	**28.8**	**6**	**13,000**	**2,100**	**450**	**260**
Sta.5 Midpt.Clouds Crk.	11/15/2007	4.3	14.1	0.25	23.8	6.6	12,000	2,200	660	550
Sta.6 200 ft above 391 Bridge	11/15/2007	8.7	28.5	0.38	16.6	7.6	25,000	2,500	1200	590
Sta.7 Upstrm.Saluda River Furtherest Pt	**11/19/2007**	**0.5**	**1.6**	**0**	**44.9**	**3.8**	**11,000**	**950**	**230**	**130**
Sta.8 Saluda River 1 mile Below Sta.7	11/19/2007	3.3	10.8	0.25	23.6	7.8	16,000	1,700	770	370
Sta.9 Bush River Furtherest Upstream	**11/19/2007**	**0.9**	**3.0**	**0.25**	**37.7**	**4.8**	**15,000**	**1,500**	**670**	**200**
Sta.10 Midpoint Bush River	11/19/2007	1.6	5.2	0.31	30.7	6.9	19,000	2,400	840	300
Sta.11 Saluda River 2 miles below Sta.7	11/19/2007	5	16.4	0.38	21.9	9.7	19,000	3,000	900	360
Sta.12 Saluda River 3 miles below Sta.7	11/19/2007	5.5	18.0	0.38	22.4	8.9	13,000	2,000	770	340
Sta.13 Saluda Rvr.4 miles downstrm Sta.7	11/19/2007	7.6	24.9	0.38	18.3	10	*6,600*	2,700	1100	440
Sta.14 Saluda Rvr.5 miles downstrm Sta.7	11/20/2007	6.4	21.0	0.62	48.8	*2.7*	29,000	*580*	260	100
Sta.15 Saluda Rvr.6 miles downstrm Sta.7	11/20/2007	8	26.2	0.88	21.3	8.6	35,000	1,600	970	350
Sta.16 Saluda Rvr.7 miles downstrm Sta.7	11/20/2007	9.9	32.5	0.88	30.3	6.6	22,000	1,600	770	330
Sta.17 Saluda Rvr.8 miles downstrm Sta.7	11/20/2007	15	49.2	1	21.3	9.7	22,000	2,300	1100	440
Sta.18 Saluda Rvr.9 miles downstrm Sta.7	11/20/2007	17	55.8	1.5	27.4	12	34,000	2,000	940	330
Sta.18 Saluda Rvr.9 miles downstrm Sta.7	11/20/2007				27.4	12	34,000	2,000	940	330
Sta.19 Saluda Rvr.10 miles below Sta.7	11/20/2007	18.8	61.7	2.75	23.3	9.7	25,000	2,700	980	510
Sta.20 Camping Cr Furtherest Upsteam	**11/20/2007**	**0.5**	**1.6**	**0**	**41.3**	**8**	***31,000***	**1,400**	**210**	**220**
Sta.21 Camping Crk 1 mi below Loc.20	11/20/2007	5	16.4	0.38	31.4	6.1	26,000	2,100	240	290
Mean values for inflow sites					**37.0**	**5.6**	***13,000***	**1,510**	**402**	**208**
Mean values for in-lake sites					25.3	*8.4*	*23,063*	*2,206*	816	382
Percent Increase between inflow sites and in-lake sites					**-32**	**51**	**77**	**46**	**103**	**84**

Observations about sediment survey on Lake Murray

NOTE: two inflow stations had zero ooze, and no ooze was observed on the exposed shoreline sediments

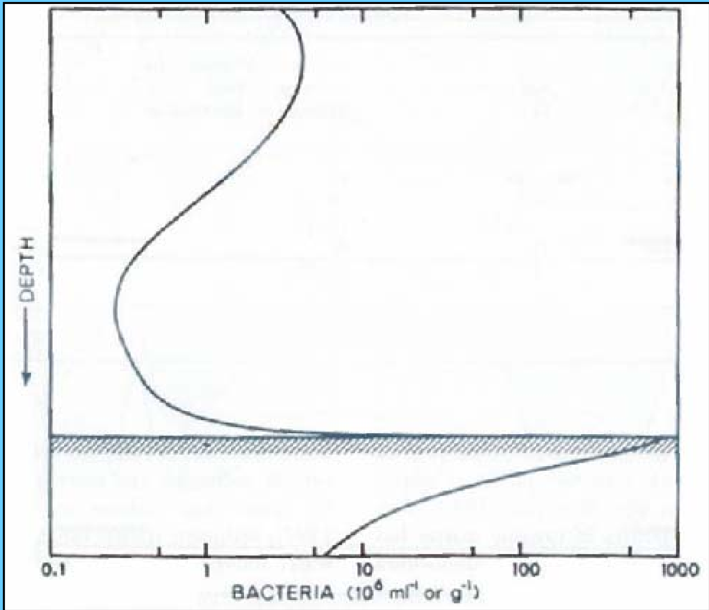
NOTE: the first location downstream from the inflow points increased in TOC, P, TKN showing that there would be more accumulation of org matter nearer the surface of the lake unless the pool drops more and allows this matter to redeposit deeper into the lake

		Carbon 45 40	Nitrogen 7 7	Phosphorus 1 1	
labile stoichiometry	C = 45	**C/N**	**6.4**	**45**	**C/P**
labile stoichiometry	C = 40	**C/N**	**5.7**	**40**	**C/P**
data for inflows		**C/N**	**8.6**	**32.3**	**C/P**
data for in-lake sites		**C/N**	**10.5**	**28.3**	**C/P**
			still labile, but less than in typical water column		

Effects of Sediment Processes on Water Quality

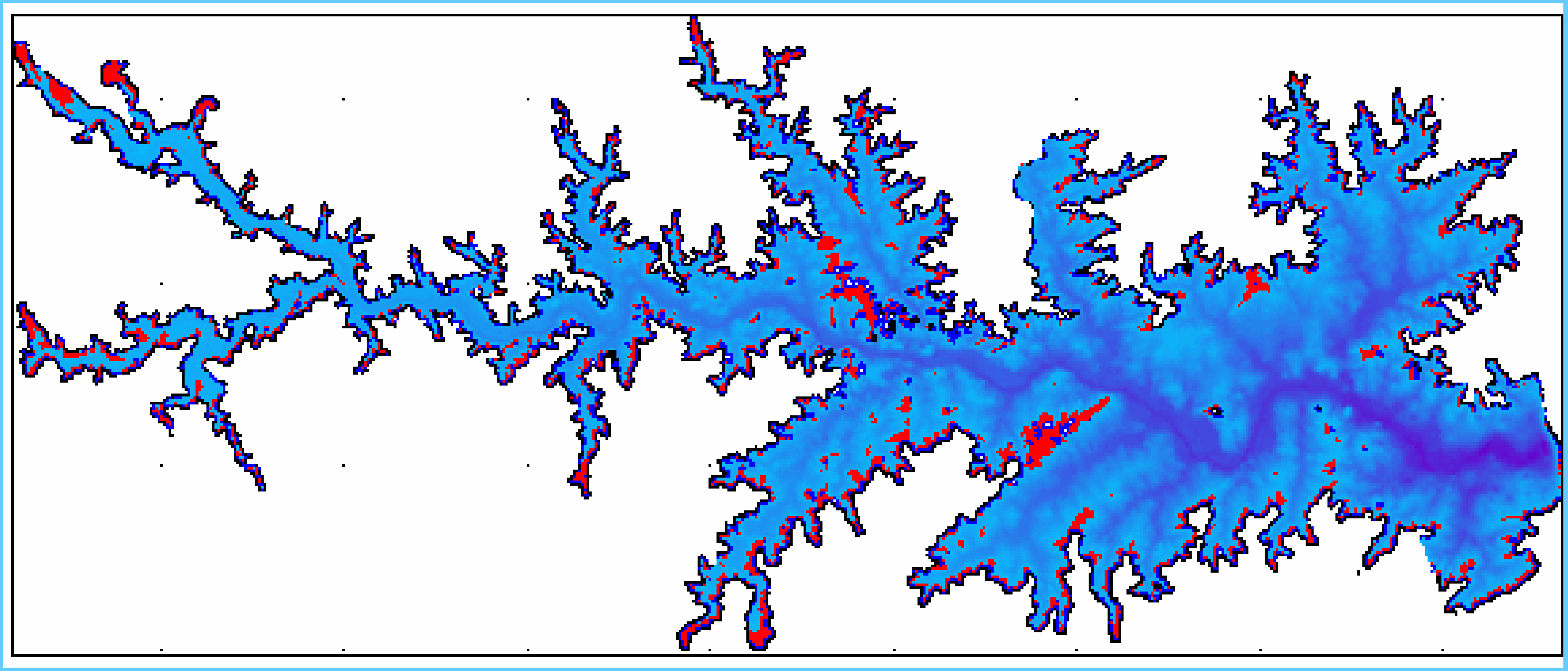
- **The sediment/water interface usually is the area of highest rates for biochemical processes**
- **Shallow water areas are impacted more than deep water areas due to less volume of water over the sediments**
- **Organic matter created by algal growths and aquatic weeds settles to the sediments where it decomposes and releases phosphorus and nitrogen back into the water column**
- **The ooze layer in the upper part of Lake Murray is labile, so the biochemical process rates are high**
- **Commonly used water quality models do not account for shoreline ecosystem processes**

- **Bacterial activity is proportional to organic matter concentrations**
- **Organic matter levels are proportional to the amount of algae and plant growth in areas of lakes, especially littoral areas**
- **Numbers of bacteria are lower in organic-poor, wave swept areas of the lake**
- **The rates of nutrient cycling from sediments to overlying water is proportional to organic matter and the number of bacteria**

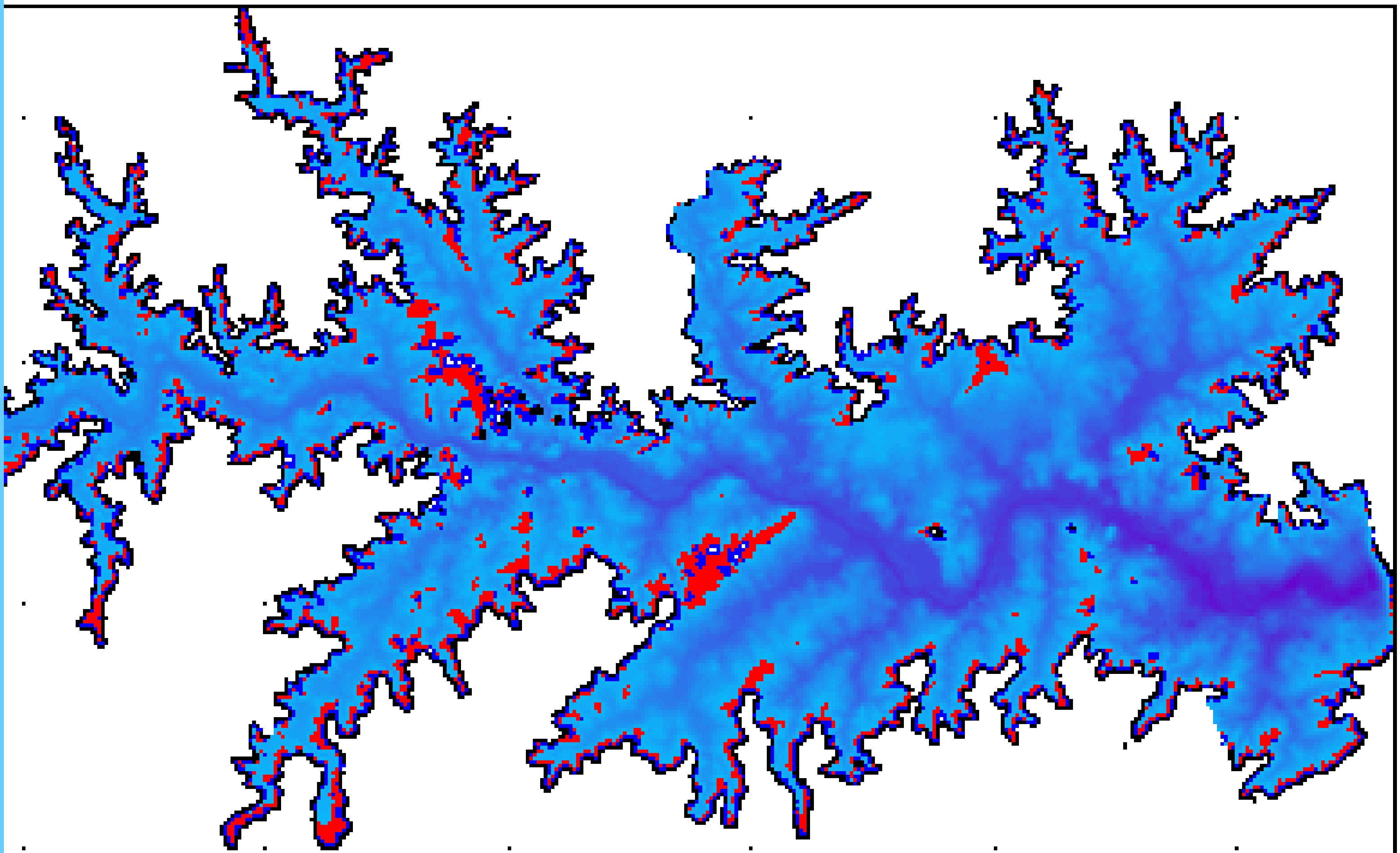


Map of Lake Murray showing the area of the lake between elevations 350 ft and 354 ft. When the minimum pool elevation in the winter is at 350 ft, the red regions of the lake are exposed. If the minimum pool elevation in the winter was raised to 354 ft, the red areas would no longer be exposed. The red regions are a concern if the minimum pool is raised to 354 ft: 1. aquatic weeds are likely to take root in some of these areas and not be controlled by winter freeze conditions; 2. sediment would accumulate in these areas since deposition would be increased and erosion would be reduced, especially those areas where tributaries enter the lake; 3. algal growths would increase in embayments because more phosphorus would be released from the lake sediments, especially in the Spring.

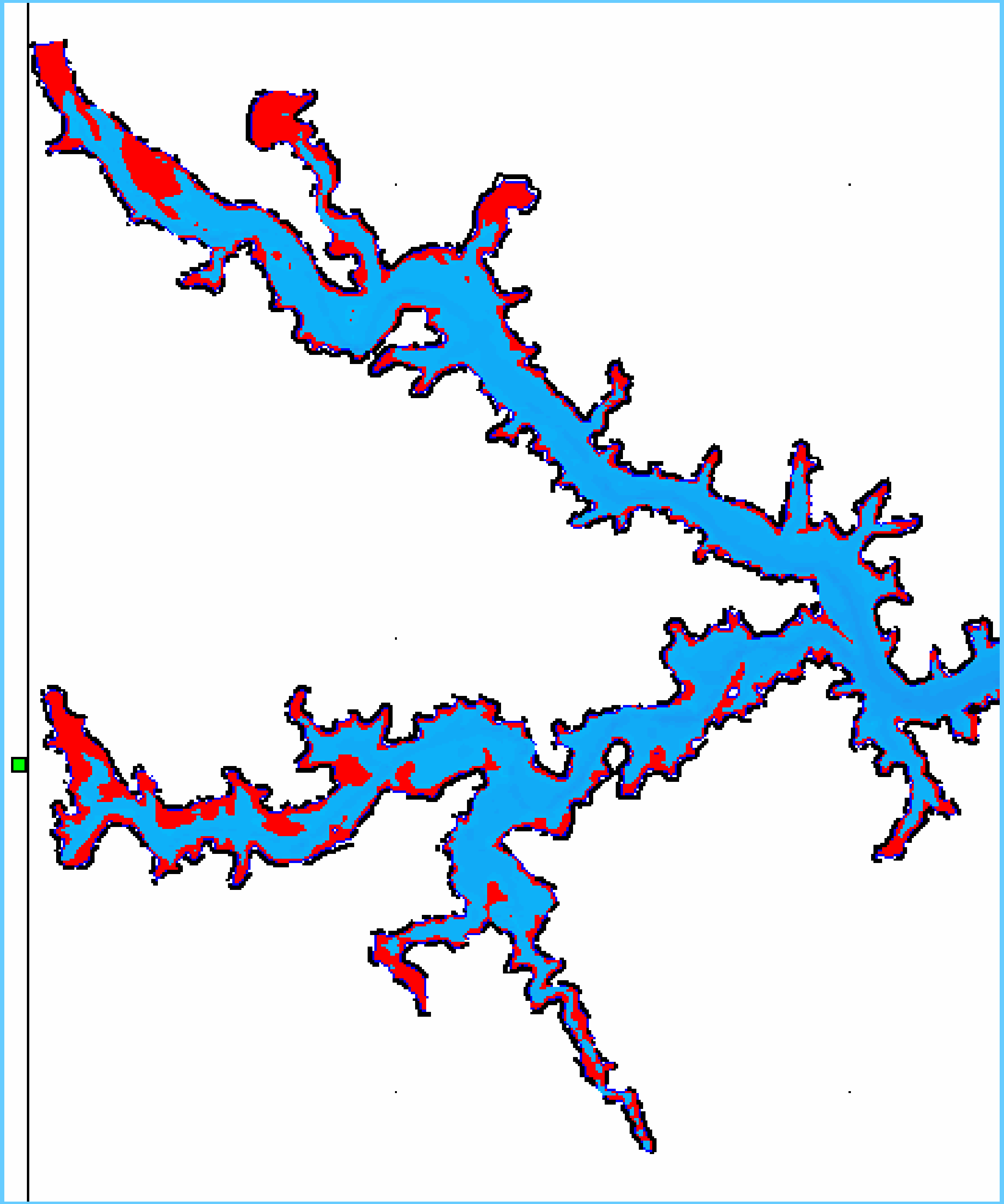
The following 2 slides show zoomed-in images of the upper region of the lake and the main body of the lake.



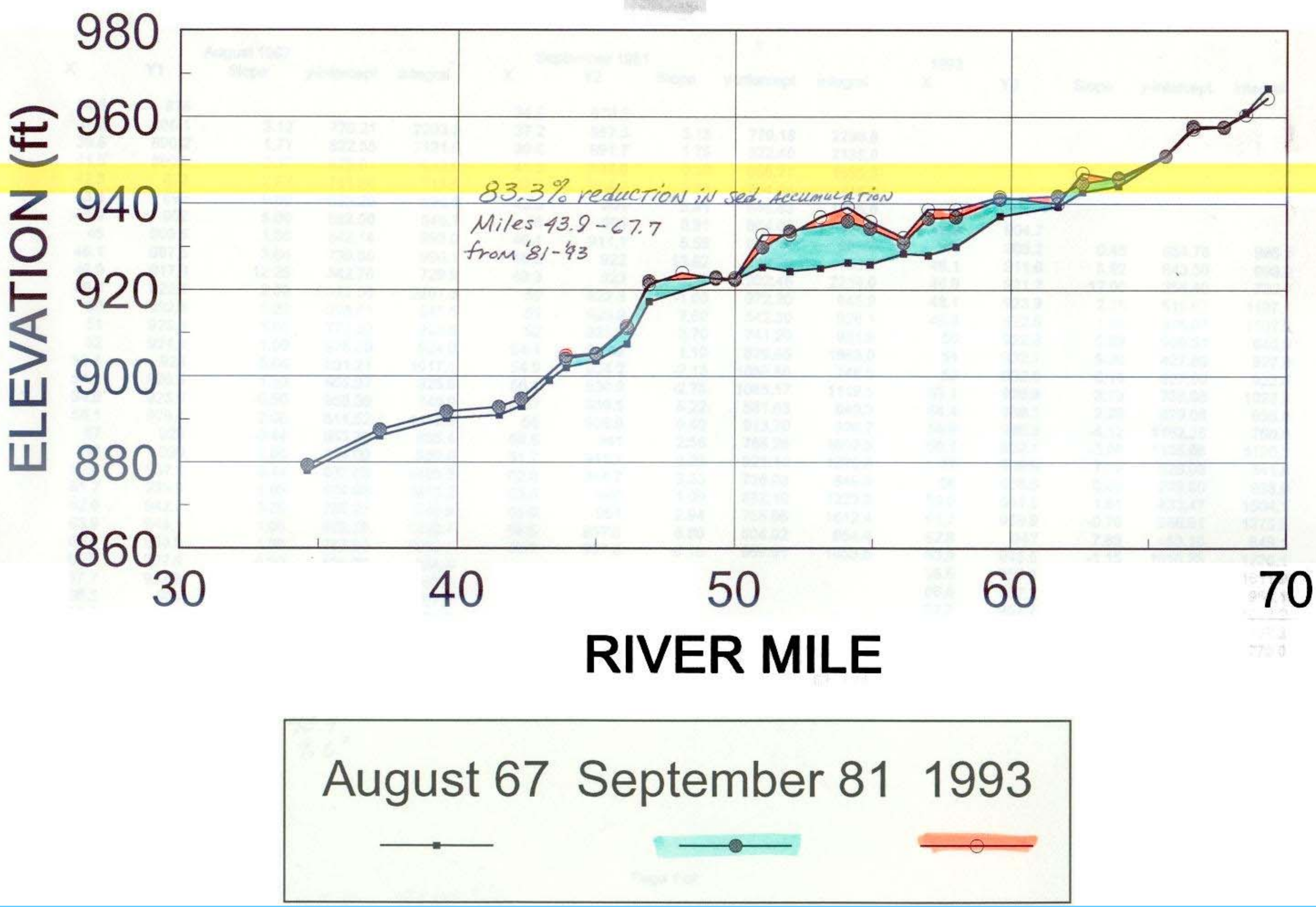
The main body of the lake



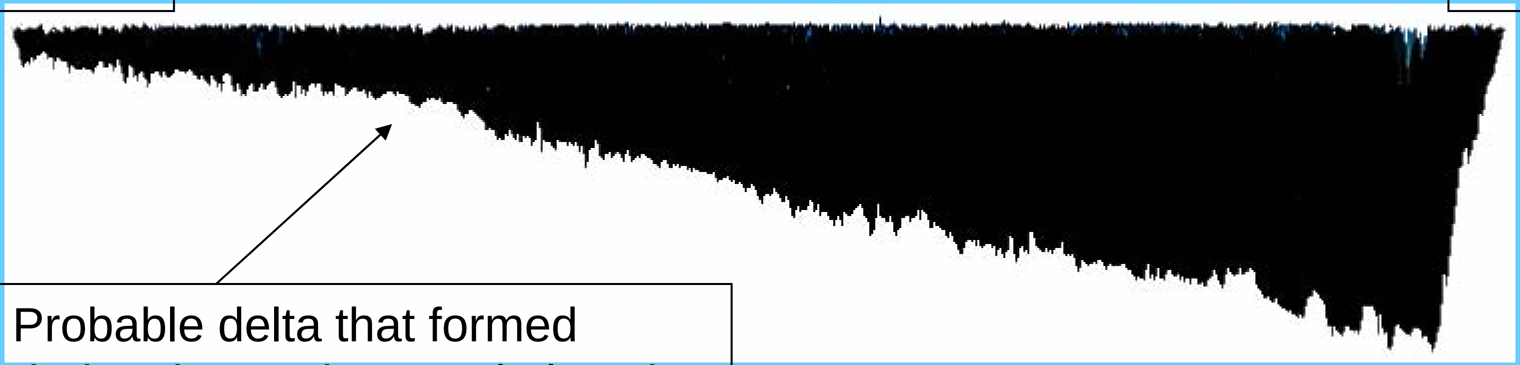
Upper end of Lake Murray showing Little Saluda R and Saluda R inflow regions. Data were not available for further upstream on the Little Saluda R, so the area between Elevation 350 and 354 is not shown; however, most all the area of the Little Saluda R embayment that is not shown is between elevation 350 and 354.



DOUGLAS RESERVOIR STREAMBED PROFILE



Display of hydrographic data used to develop bathymetry of Lake Murray showing possible sediment accumulation upstream from Rocky Creek



Increase in Sediment Deposition vs. Elevation at Claytor Lake (VA)

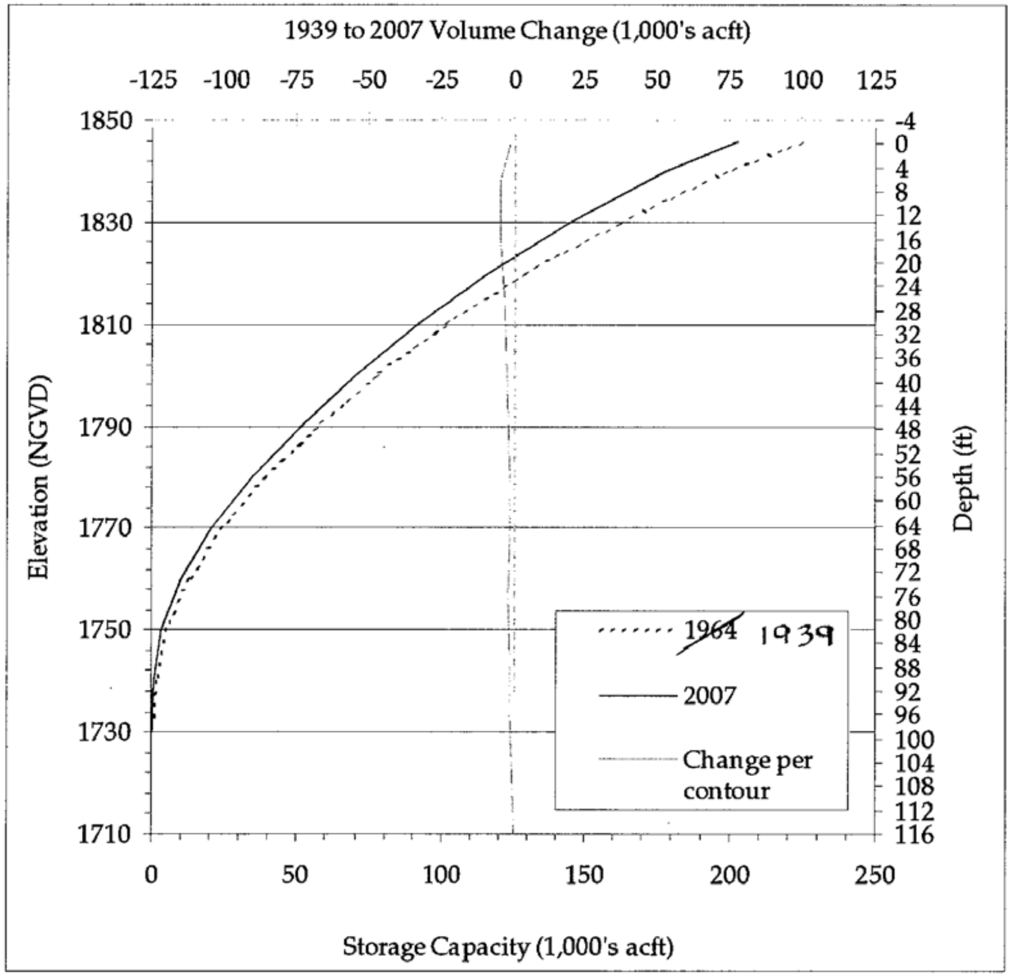


Figure 3: Updated storage volume curve for Claytor

Increase in Sediment Deposition vs. Elevation at Claytor Lake (VA)

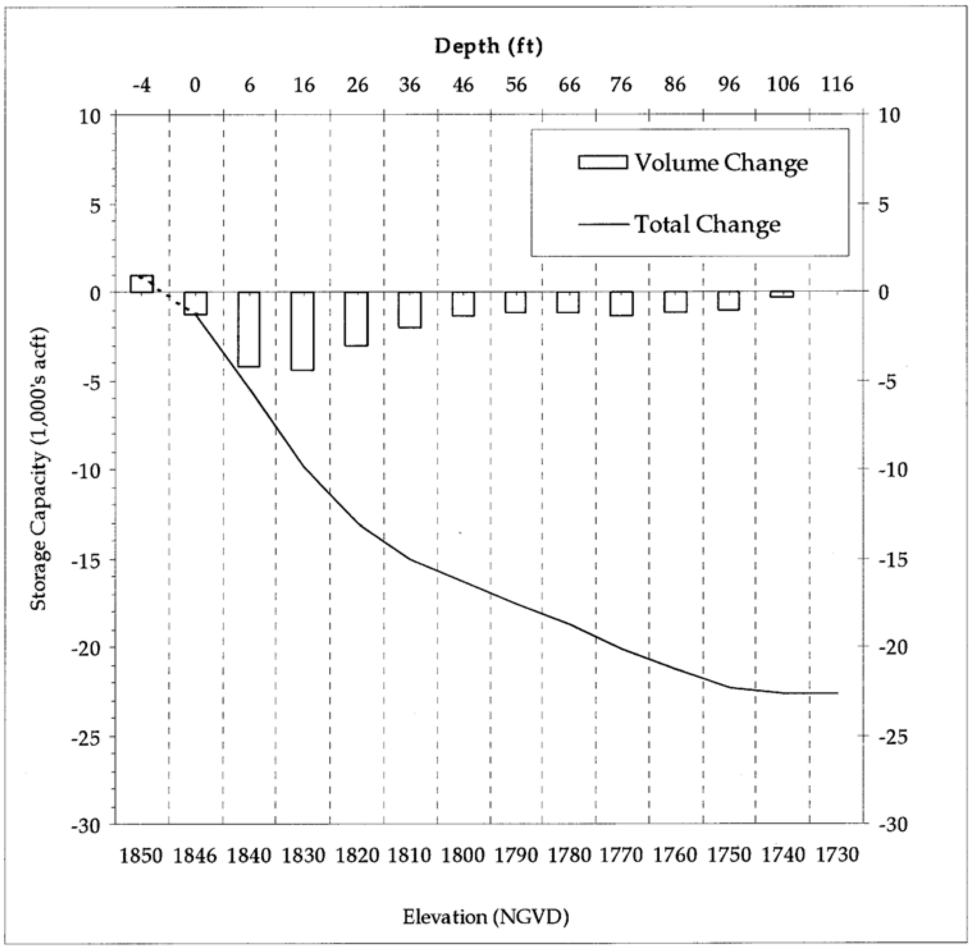
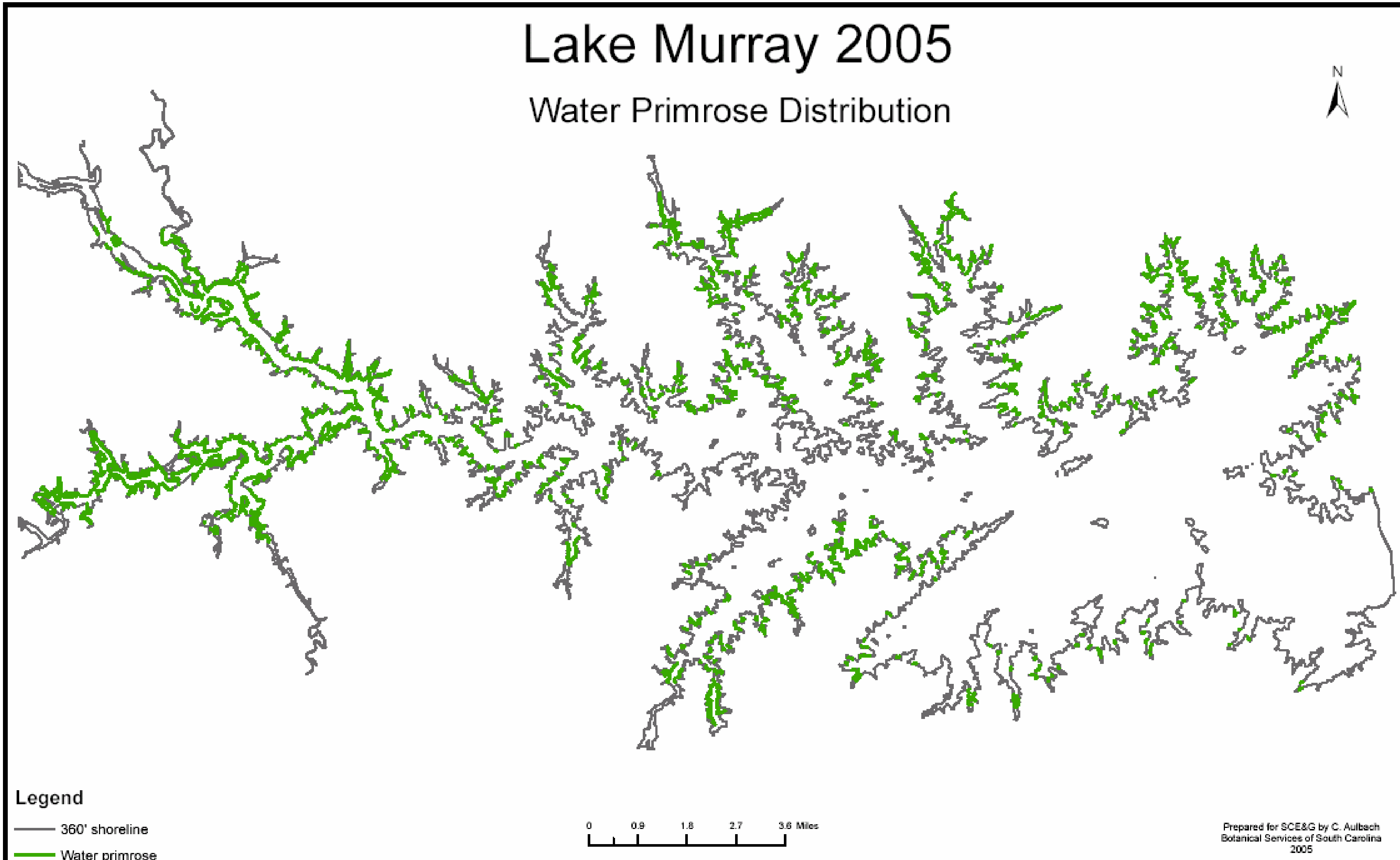


Figure 4: Change in storage volume capacity by elevation. Data above 1,846 feet are for illustrative purposes only. These data are preliminary and will be revised when final terrain data become available.

Aquatic Plants

- Affected by depth of water
- Affected by clarity of water
- Preferred by some fishermen (mainly large mouth bass?), disliked by other lake users
- Surface area exposed by dropping minimum pool to 350’ instead of 354’
- Exposure of plants to dry and freezing conditions causes plants to be reduced


Lake Murray 2005
Water Primrose Distribution
N
Legend
360' shoreline
Water primrose
0 0.9 1.8 2.7 3.6 Miles
Prepared for SCE&G by C. Aulbach
Botanical Services of South Carolina
2005

Primrose growing at elev 346 due to 2003-4 low summer pool levels

North of LSR on west side

LSR embayment

Considerations for Minimum Pool Elevation for Controlling Aquatic Plants

Considering that summer pool elevation can drop to < 358 ft even when May-June elevation starts at 358 ft due to low inflows, evaporation, and minimum flow provision, aquatic plants could take root at elevation ~ 350-352 when summer pools are low. Therefore, the minimum winter pool should be dropped to about elevation 350 periodically to freeze these plants.

Little Saluda Embayment

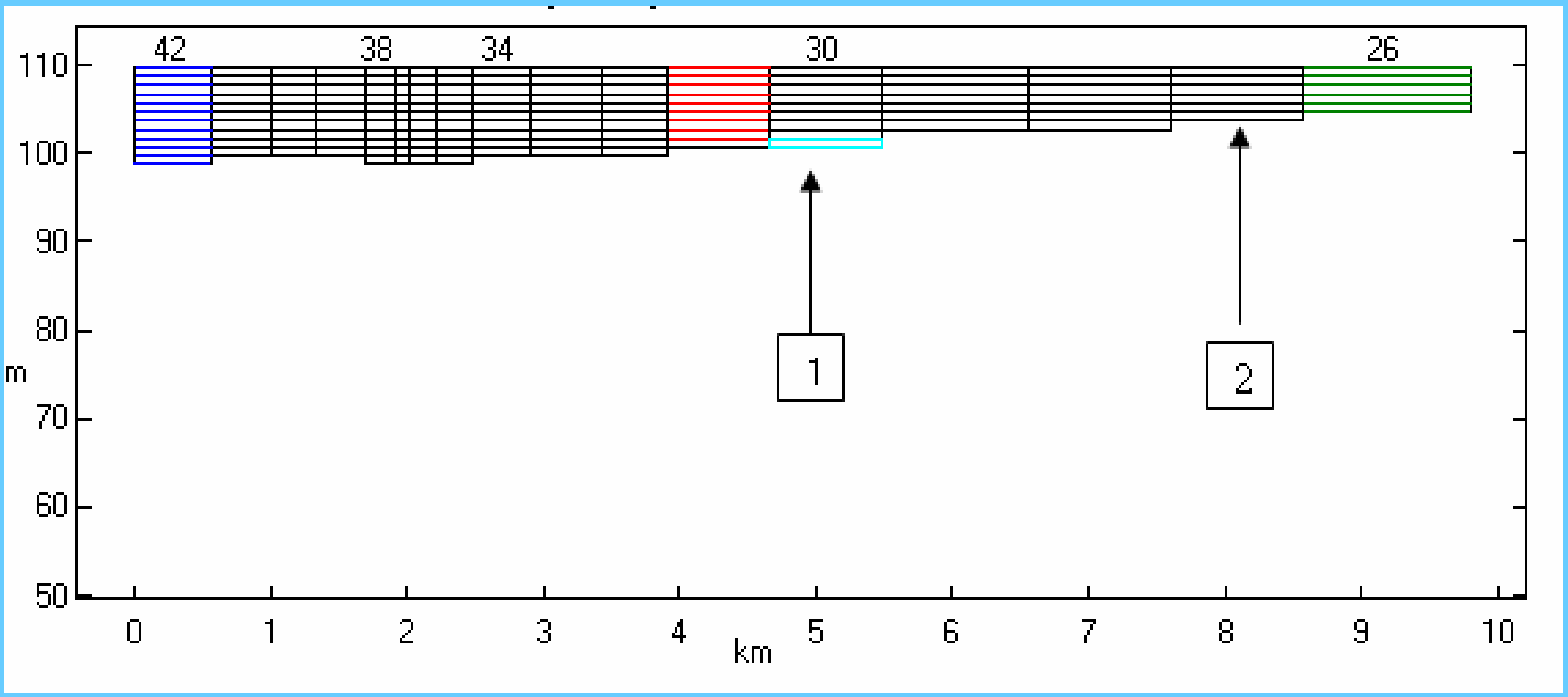
- Greater impact on water quality is expected to occur in the Little Saluda River embayment, especially upstream from the bridge on SC Hwy 391.
- This is a relatively large embayment with a small watershed; therefore, the residence time of water in this embayment can be longer than the comparable region of the upper part of the main stem of Lake Murray.
- If minimum pool elevation is raised, there would be less scouring of organic and inorganic sediments during the winter months.
- This would lead to increased “internal cycling” of nutrients in this embayment to the point that it may become insensitive to nutrient loads from the watershed because the release of nutrients in the sediments of the embayment could be sufficient to support eutrophic conditions in the embayment.
- In some cases this condition can lead to the formation of algal mats on the water, and these mats of algae are known to significantly affect water quality and water uses.

Model Application to Little Saluda Embayment

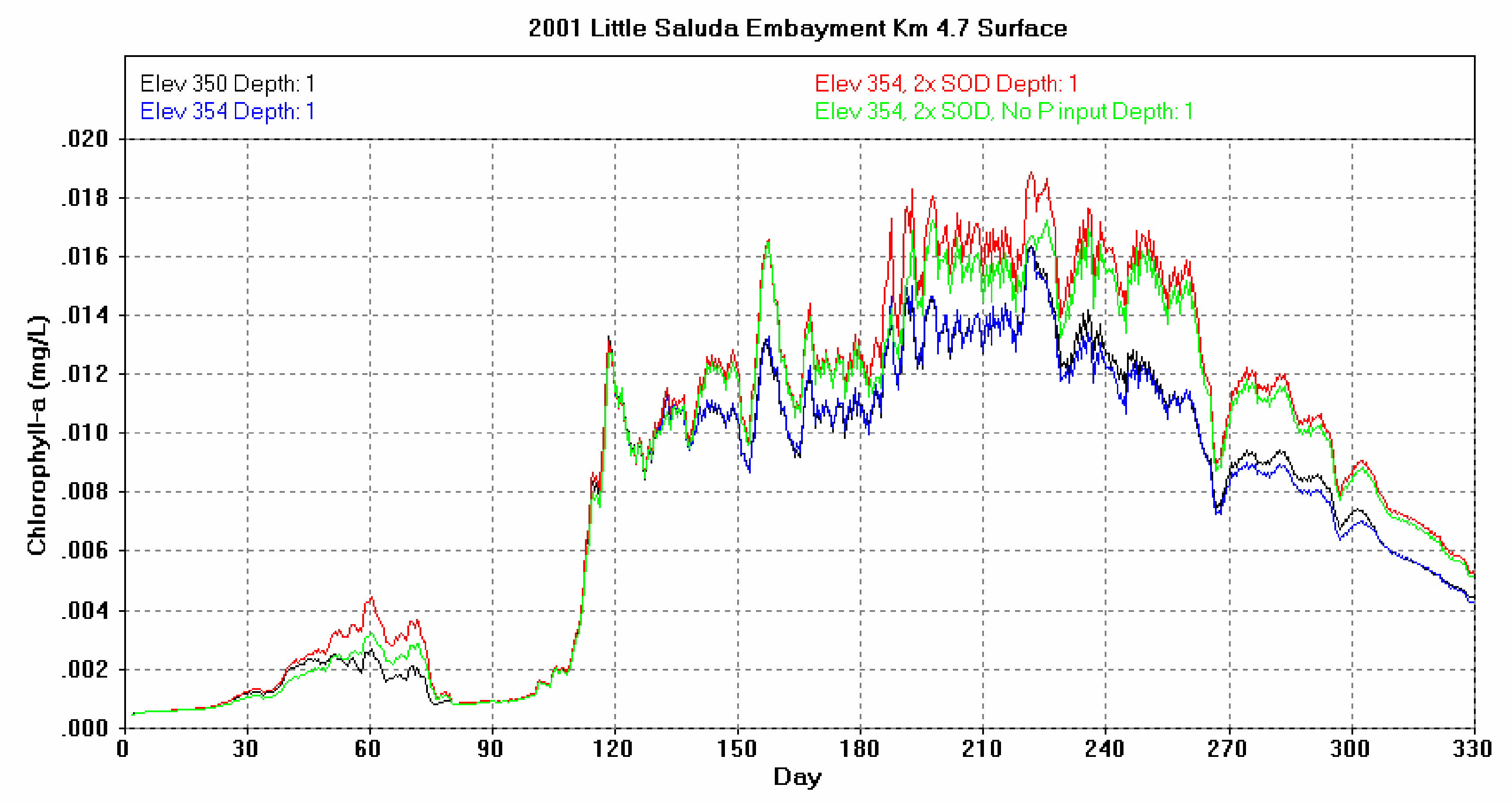
2001 Comparison of:

- Calibration case,
- Case with SOD doubled in the Little Saluda Embayment and upper Lake Murray , and
- The last case with SOD doubled with no phosphorus inputs from inflows.

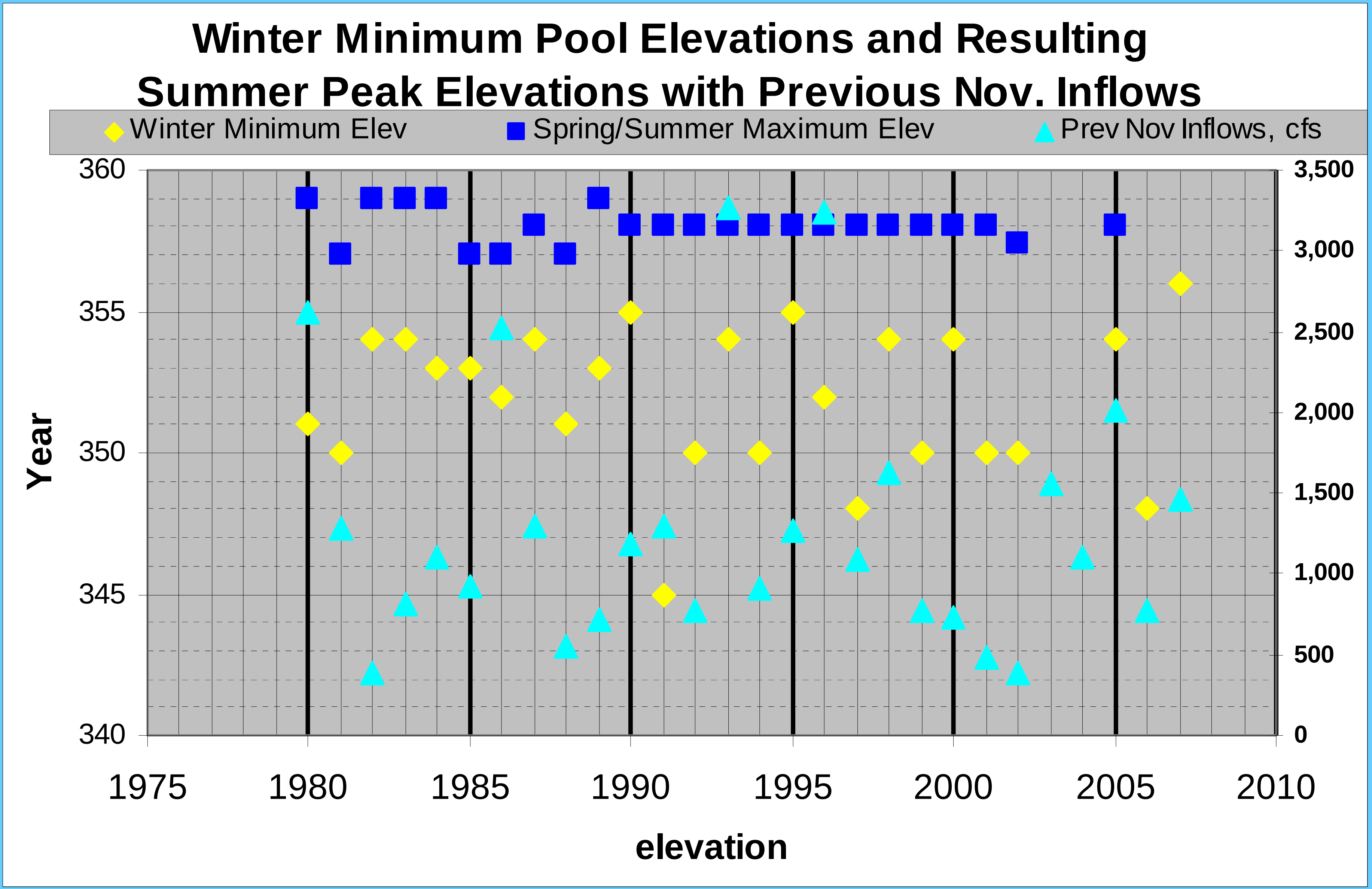
Side View of Little Saluda Bathymetry



Chlorophyll *a* near the surface at location 1



The likelihood to fill pool each year



Winter Minimum Pool Elevations and Resulting
Summer Peak Elevations with Previous Nov. Inflows
Winter Minimum Elev
Spring/Summer Maximum Elev
Prev Nov Inflows, cfs
360
355
350
345
340
Year
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1975
1980
1985
1990
1995
2000
2005
2010
elevation

Considerations for the frequency of dropping the winter minimum pool elevation to 350 feet above msl

Year	Nov. Flow		Jan-Apr flow the next year	
1950	1175	1495	1590	
1928	1189	2716	4572	
1989	1190	1555	3357	half of nov flows are greater; 79/39 = 2.0 yr frequency
1963	1203	1838	4458	
1936	1223	3481	4095	
1945	1234	1541	3796	
1965	1262	2177	2624	
1994	1267	1901	3003	
1980	1282	2113	1358	
1986	1293	893	2647	
1990	1293	1937	2662	40% of nov flow are greater; 79/(79-47) = 2.5 yr frequency
1930	1356	1405	1708	
1969	1424	2232	1706	
1959	1443	1624	4050	
1962	1459	2052	2753	
1935	1486	1681	6878	
1937	1492	2647	1846	33% of nov flows are greater; 79/(79-53) = 3.0 yr frequency
1946	1519	2333	2345	
1940	1534	1263	1313	
2002	1555	1029	3182	
1973	1570	2721	3162	28% of nov flows are greater; 79/(79-57) = 3.6 yr frequency
1997	1621	1865	4623	
1972	1727	2251	3917	
1970	1739	1269	2917	

This is best since this frequency is what has happened historically and especially considering freezing effects are needed for weed control

Also, the frequency of dropping the pool level to 350 is not that important to the pool level reaching ~ 358 each year.

Concerns for Increasing the Winter Minimum Pool Level from 350' to 354' Every Year

- **Sediment accumulation in coves, especially Little Saluda River**
- **Aquatic plants increasing around the lake, especially the Little Saluda River embayment, and especially following years with low summer pools**
- **Organic and nutrient accumulation in sediments of embayments, especially the Little Saluda River embayment and the shallow shoreline around the lake**
- **Water quality and algae in the Little Saluda River embayment could already be controlled by internal-cycling (i.e., insensitive to nutrients in inflows creeks), and increasing the minimum winter pool to 354' could cause worse conditions**
- **Probable impact on the TMDL process on the Little Saluda River embayment**
- **Modeling at this point can involve only sensitivity analyses since data are inadequate to calibrate the model**

Water Quality Issues that are Related to Effects of the Winter Minimum Pool Elevation that can affect Lake Users

- Increased eutrophication around shoreline that would result in increased algae levels, aquatic plants, turbidity, and sediment deposition
- Internal nutrient cycling in the Little Saluda River embayment so that external sources cannot control algae
- Increased sediment deposition at inflow sites that would impact boating and enhance aquatic plant growths, especially when summer pool elevations were less than full pool

Conclusions Regarding the Minimum Winter Pool Level

- Regarding considerations for developing a policy for winter minimum pool levels, based on data for 1980 through 2007, the winter pool level was down to about 350 ± 2’ about half the time. It would be best to maintain this frequency of drawing the lake down to this level each year or risk poorer water quality compared to current conditions.
- Maintaining the frequency of drawing the lake down to ~ 350’ for an average of every two years should not be difficult based on historical inflows and pool level data as well as taking advantage of using November flows to predict the years when Jan-Apr flows would likely be sufficient.
- The minimum winter pool level has little to do with attaining and maintaining a summer pool level at elevation 358 ± 1’. It is the lack of sufficient inflows, evaporation, and minimum flows during the summer period that cause the pool elevation to drop like it did in 2007 to elevation 352’.
- A reservoir operations model would be best for developing alternative operating policies with associated pros and cons for each policy. Quantifiable as well as intangible pros and cons would be included.

The End

Saluda Hydro Relicensing Quarterly Public Meeting

Saluda Shoals Park

October 25, 2007

Upcoming Milestones

Issuance of the Draft Application	November 2007
Draft Shoreline Management Plan	January 2008
Operational Modeling with Resource Group Constraints	January 2008
Begin Development of Issue Resolution Agreements	April 2008

So you think we have it bad here…..

The effects of the 2007 drought on Southeastern Reservoirs

Alan Stuart and Alison Guth

Kleinschmidt Associates

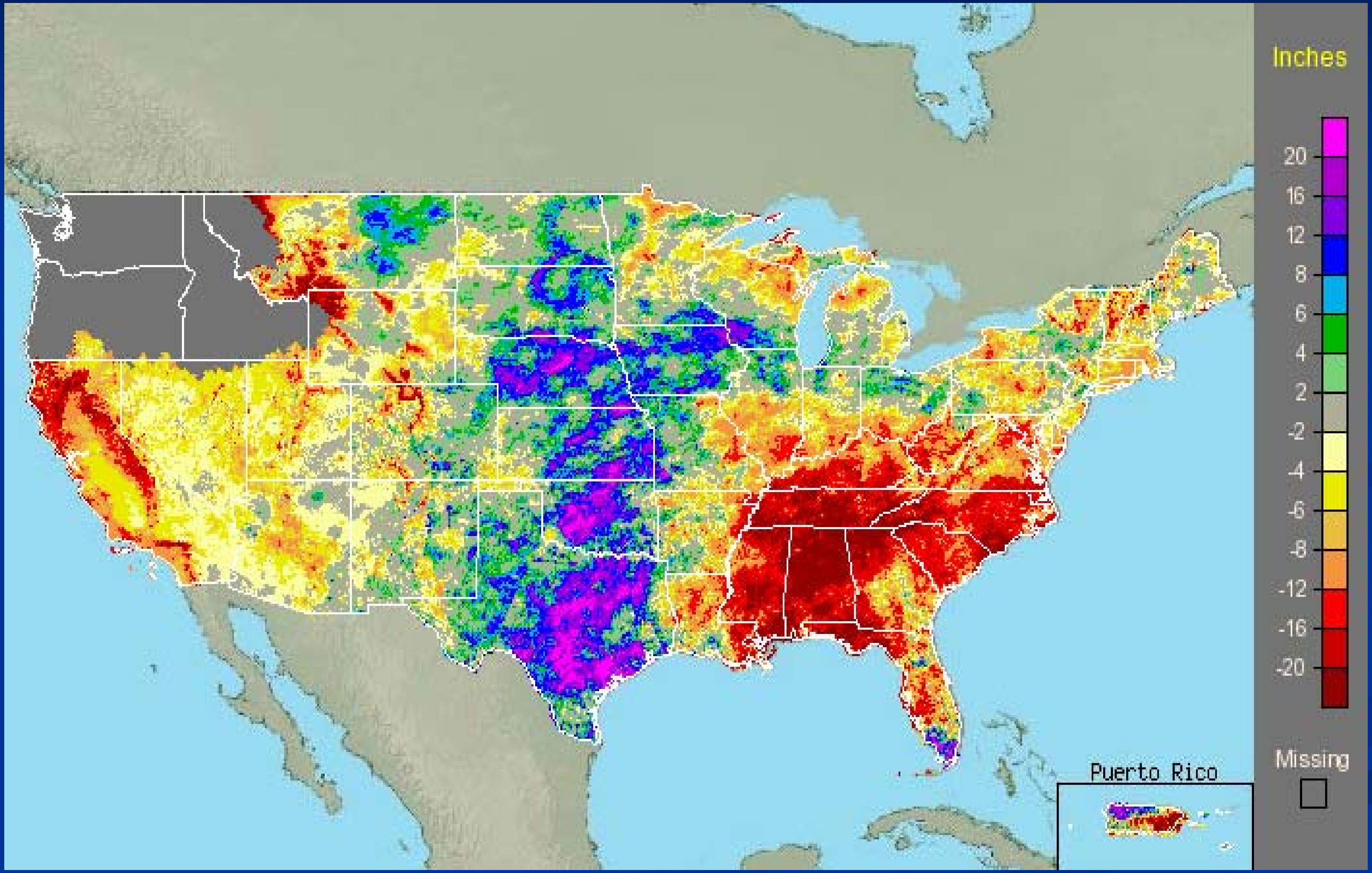
Drought

- **Drought Intensity Categories**
  D1 ... Moderate Drought
  D2 ... Severe Drought
  D3 ... Extreme Drought
  D4 ... Exceptional Drought

- 26 % of the SE is under Exceptional Drought

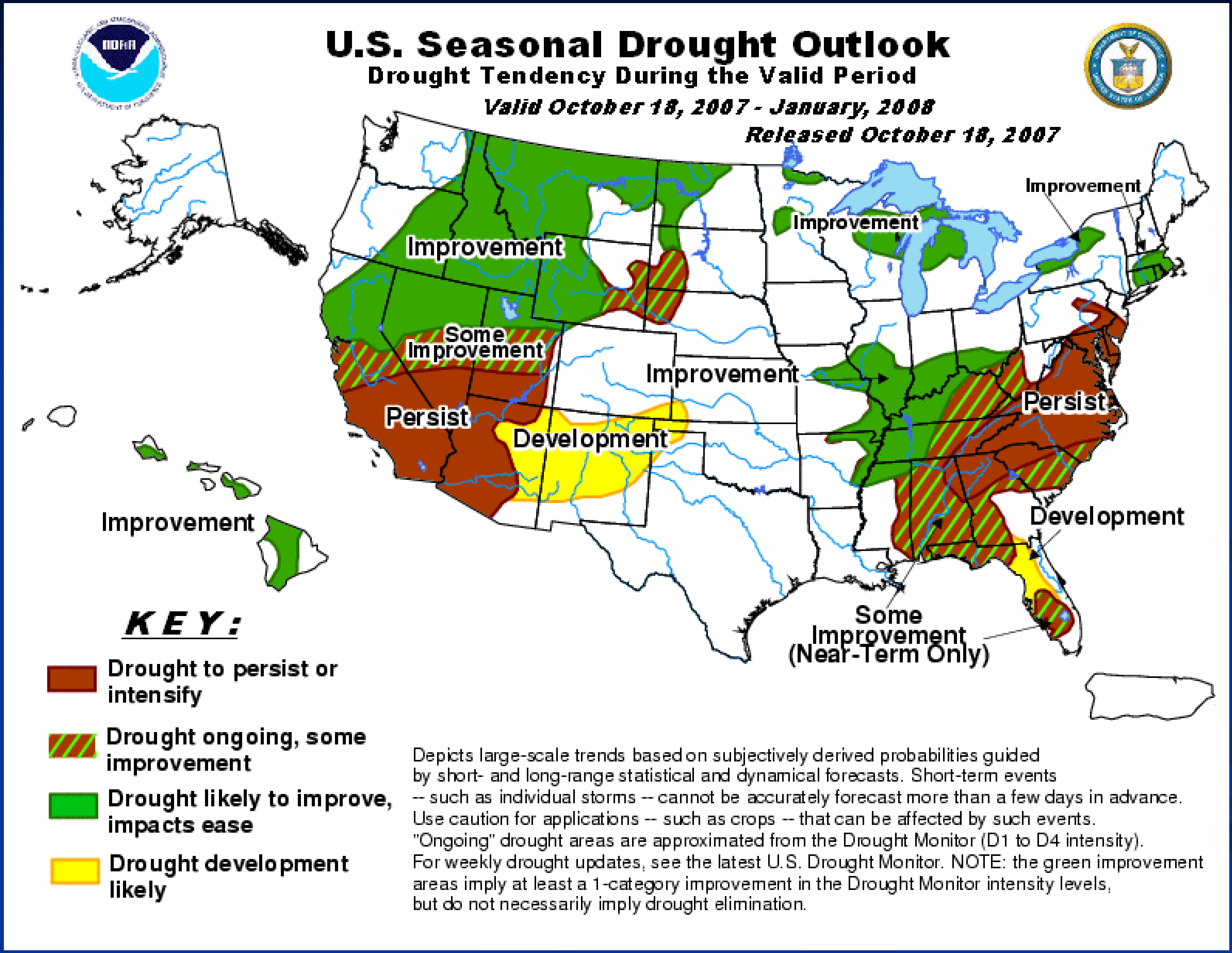
- Mandatory Water Conservation at some level in all Southeastern States

Nationwide Departure of Normal Rainfall
October 22, 2007



Rainfall deficits (in) for Select Southeastern Cities

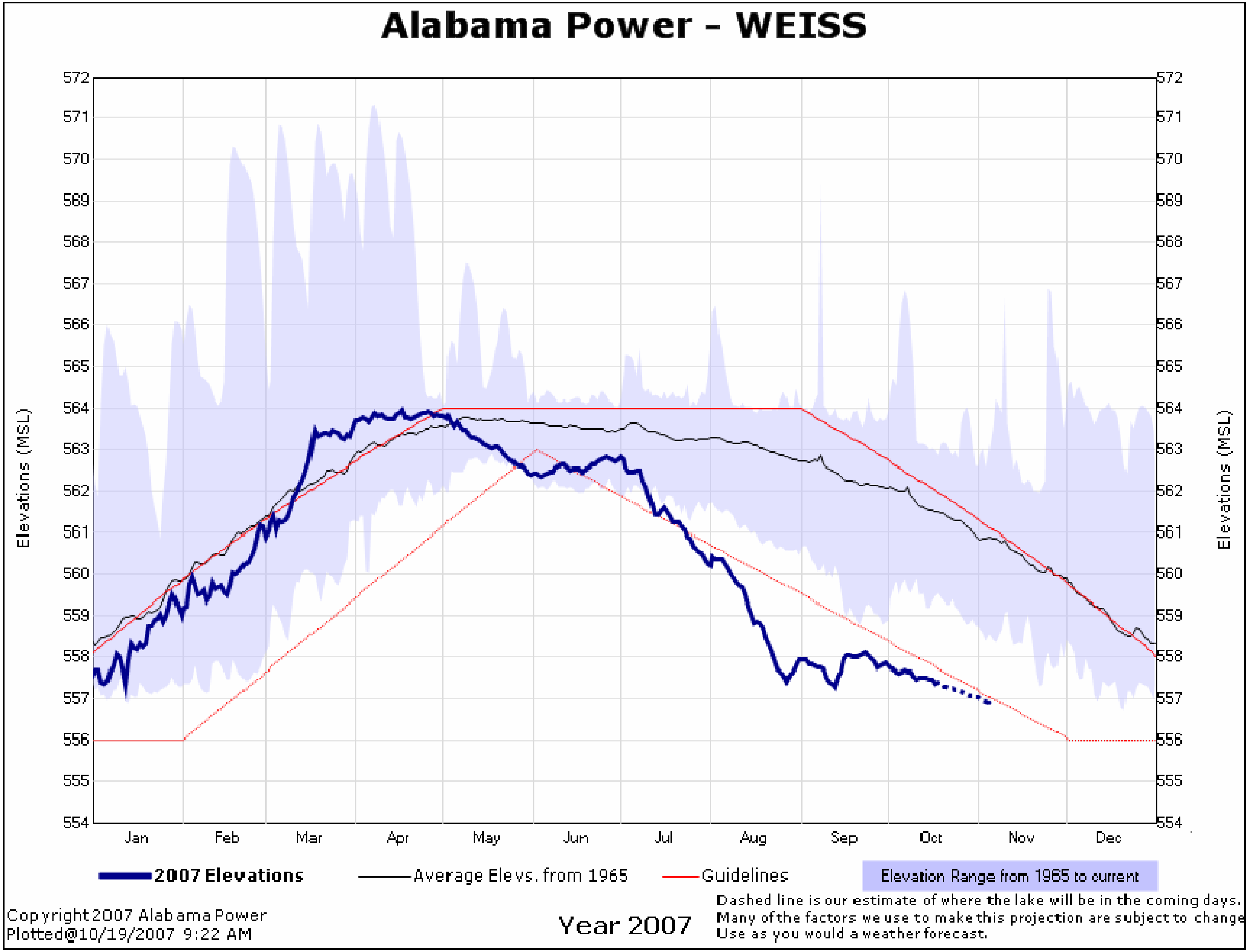
Birmingham, AL	- 19.68
Columbia, SC	- 17.10
Atlanta, GA	- 16.62
Nashville, TN	- 16.65
Tallahassee, FL	- 15.69
Jackson, MS	- 15.67
Augusta, GA	- 12.32
Raleigh, NC	- 9.39


U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid October 18, 2007 - January, 2008
Released October 18, 2007
Improvement
Improvement
Improvement
Some Improvement
Persist
Development
Improvement
Persist
Development
Some Improvement (Near-Term Only)
Improvement
KEY:
Drought to persist or intensify
Drought ongoing, some improvement
Drought likely to improve, impacts ease
Drought development likely
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

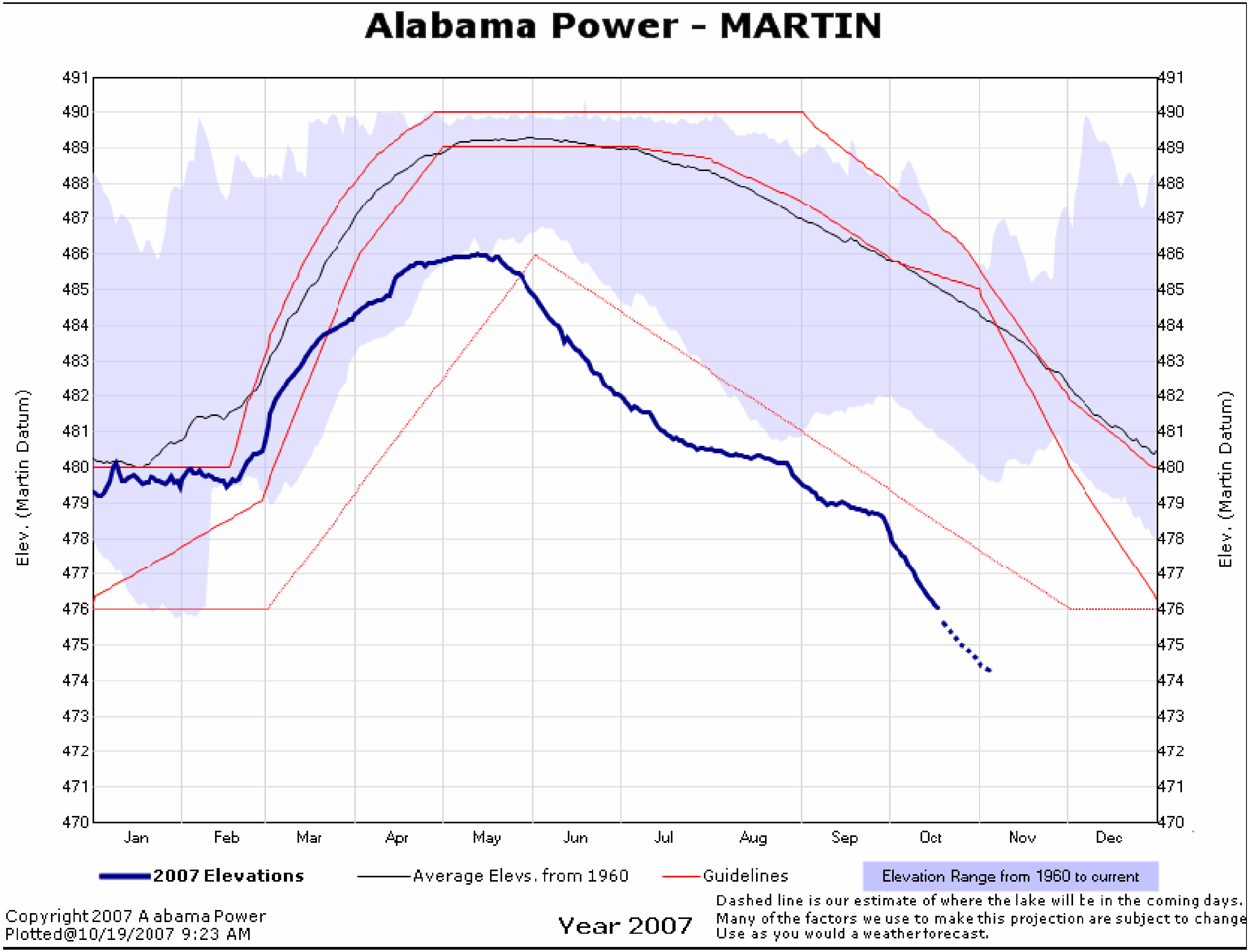
Tennessee
South Carolina
Alabama
Georgia
Tim's Ford
Elk
Chattanooga
Wateree
Hartwell
26
Columbia
TTWW Divide Section
Huntsville
Wheeler
Guntersville
75
Carters
85
Etowah
985
575
Sidney Lanier
Richard B. Russell
95
65
59
Weiss
Allatoona
Lewis Smith
Mulberry Fork
Locust Fork
Oconulgee
J. Strom Thurmond
Charleston
TTWW Aberdeen
Sipsey
20
Atlanta
Augusta
New Savannah Bluff L&D
Birmingham
Little Tallapoosa
Ogeechee
Savannah
TTWW Columbus
Black Warrior
Coosa
Tallapoosa
Flint
BW&T Holt
Tuscaloosa
Lay
West Point
Macon
Mitchell
Martin
Auburn
185
16
Gainesville
BW&T Warrior
Columbus
Savannah
BW&T Demopolis
Alabama
Chattahoochee
Montgomery
ARL Woodruff
BW&T Coffeeville
ARL Dannelly
Tombigbee
Big Satilla
Walter F. George
Satilla
ARL Clairborne
George W. Andrews

Lake Sizes

Lake Weiss	30,200 acres
Lake Martin	40,000 acres
Lake Allatoona	12,010 acres
Lake Lanier	38,000 acres
Lake Hartwell	56,000 acres
Lake Thurmond	70,000 acres
Lake Murray	48,000 acres



Source www.alabamapower.com



Source www.alabamapower.com

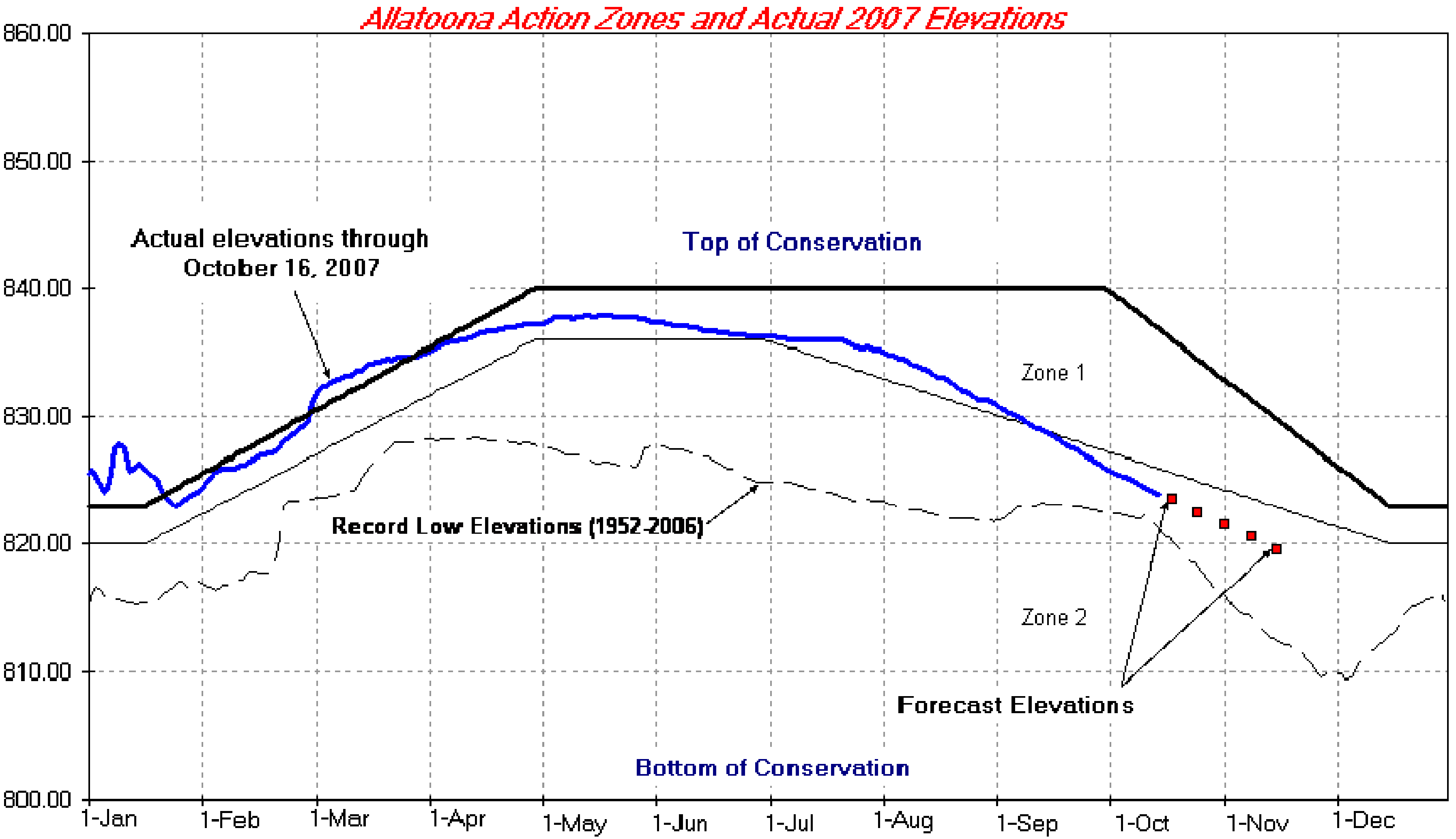
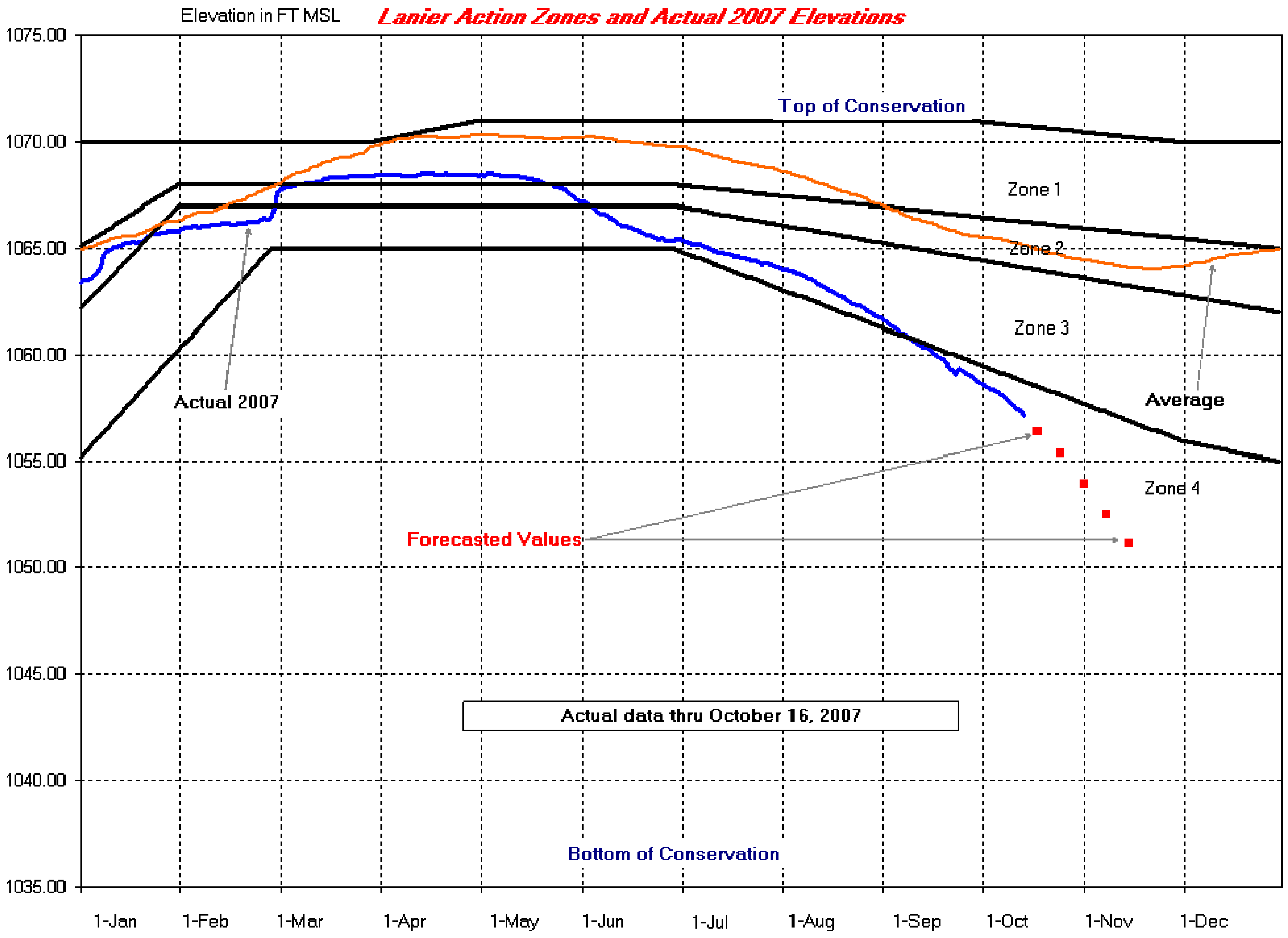


Photo Source
http://www.sas.usace.army.mil/



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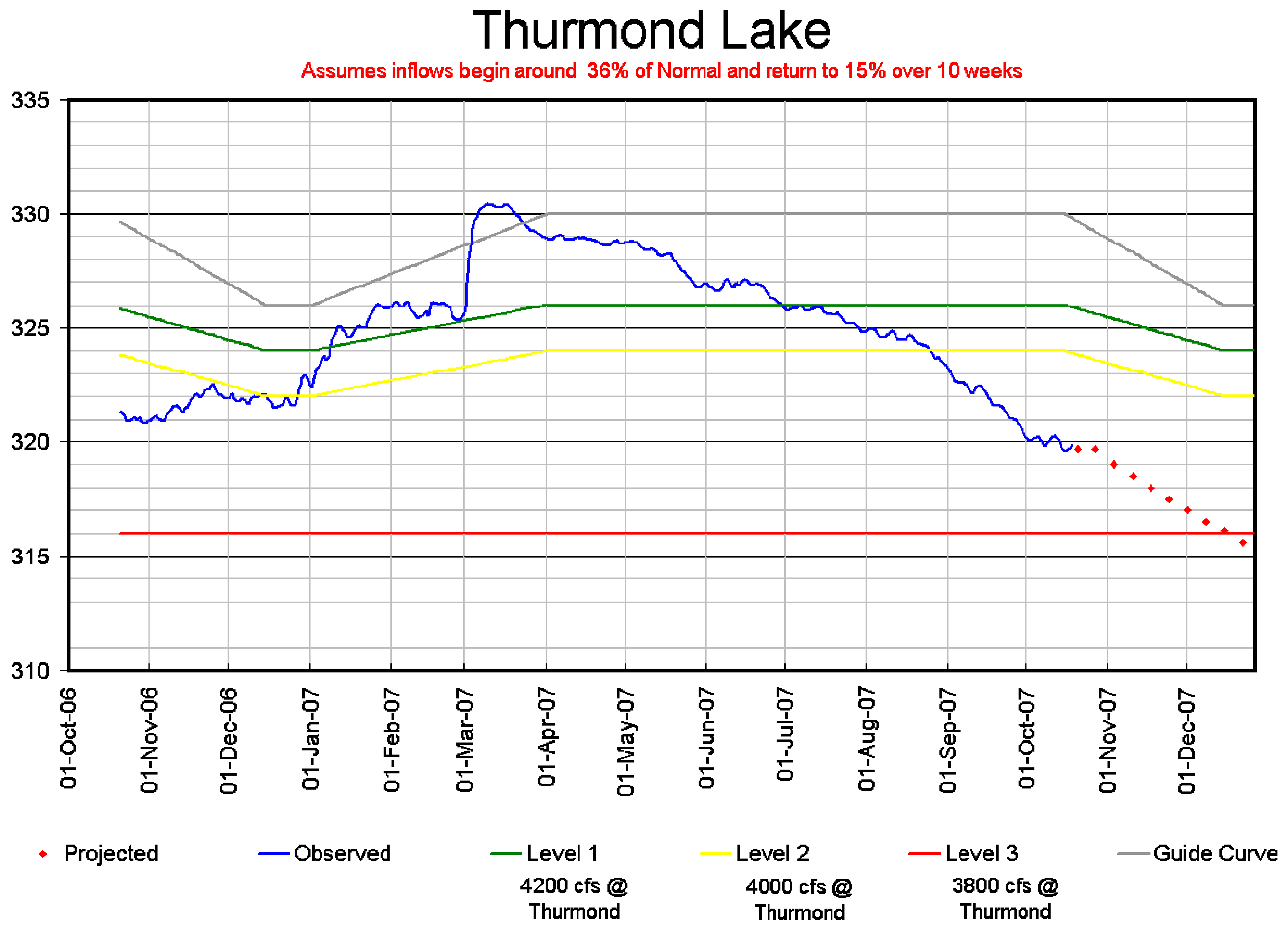

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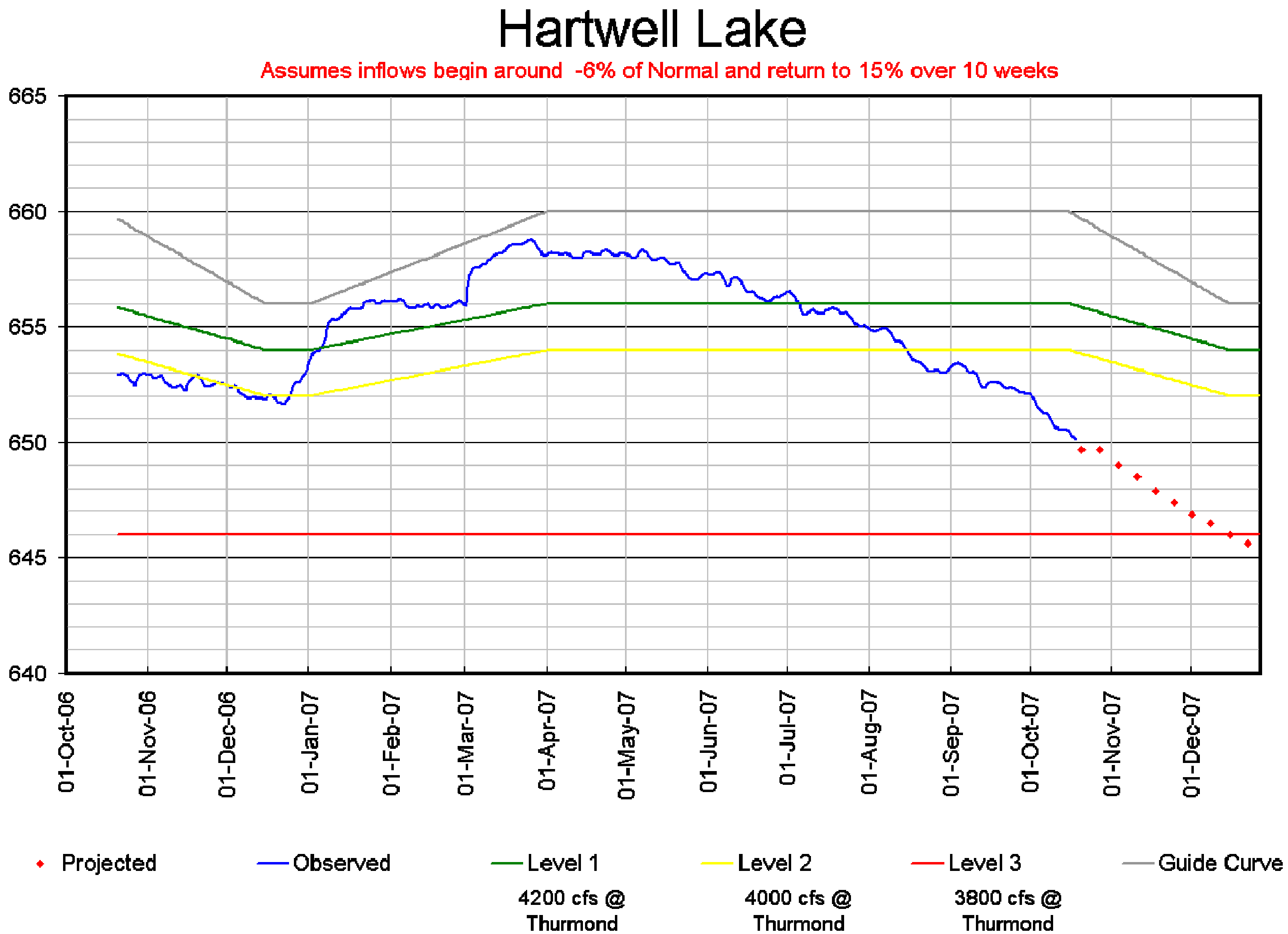
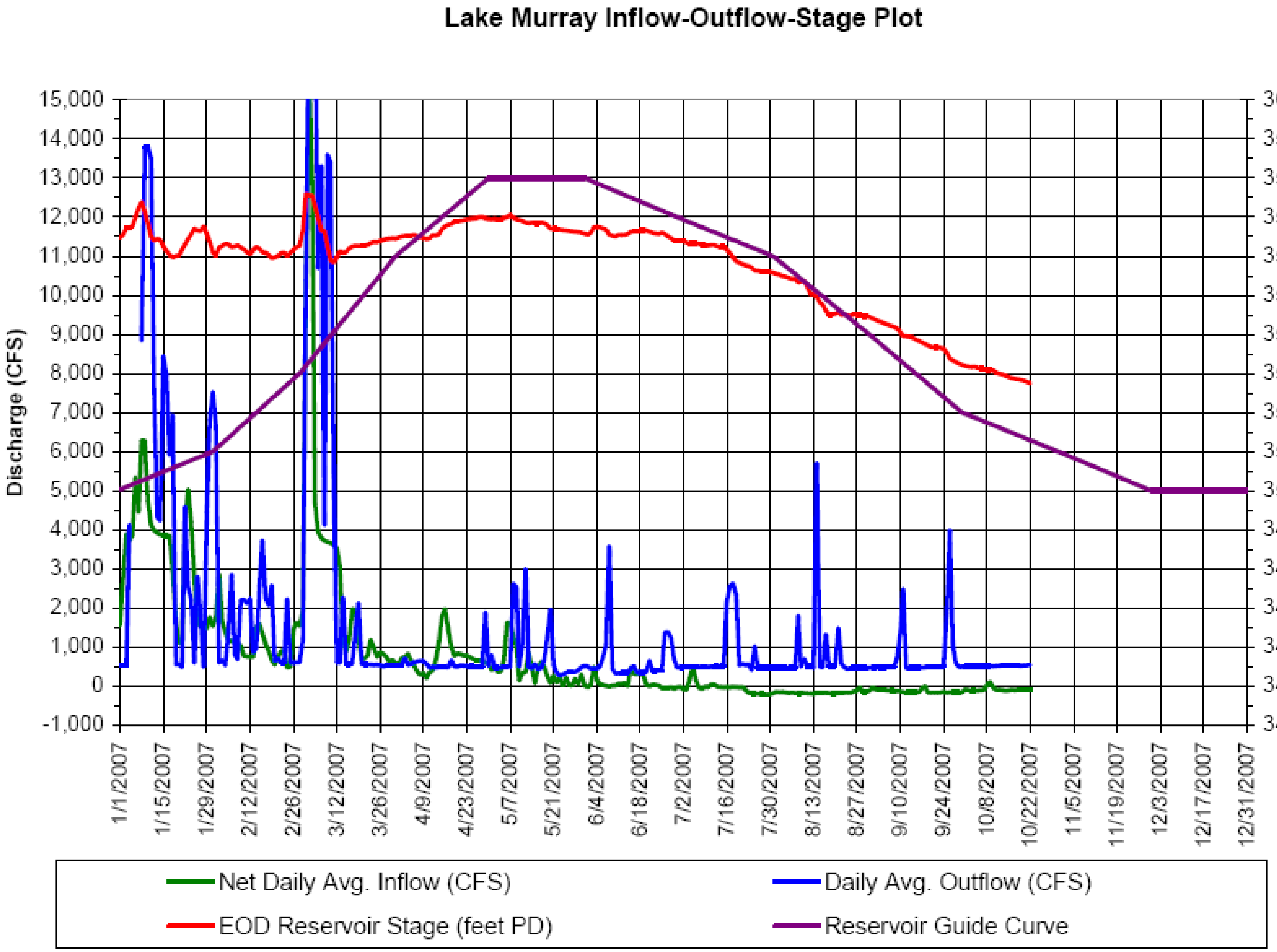
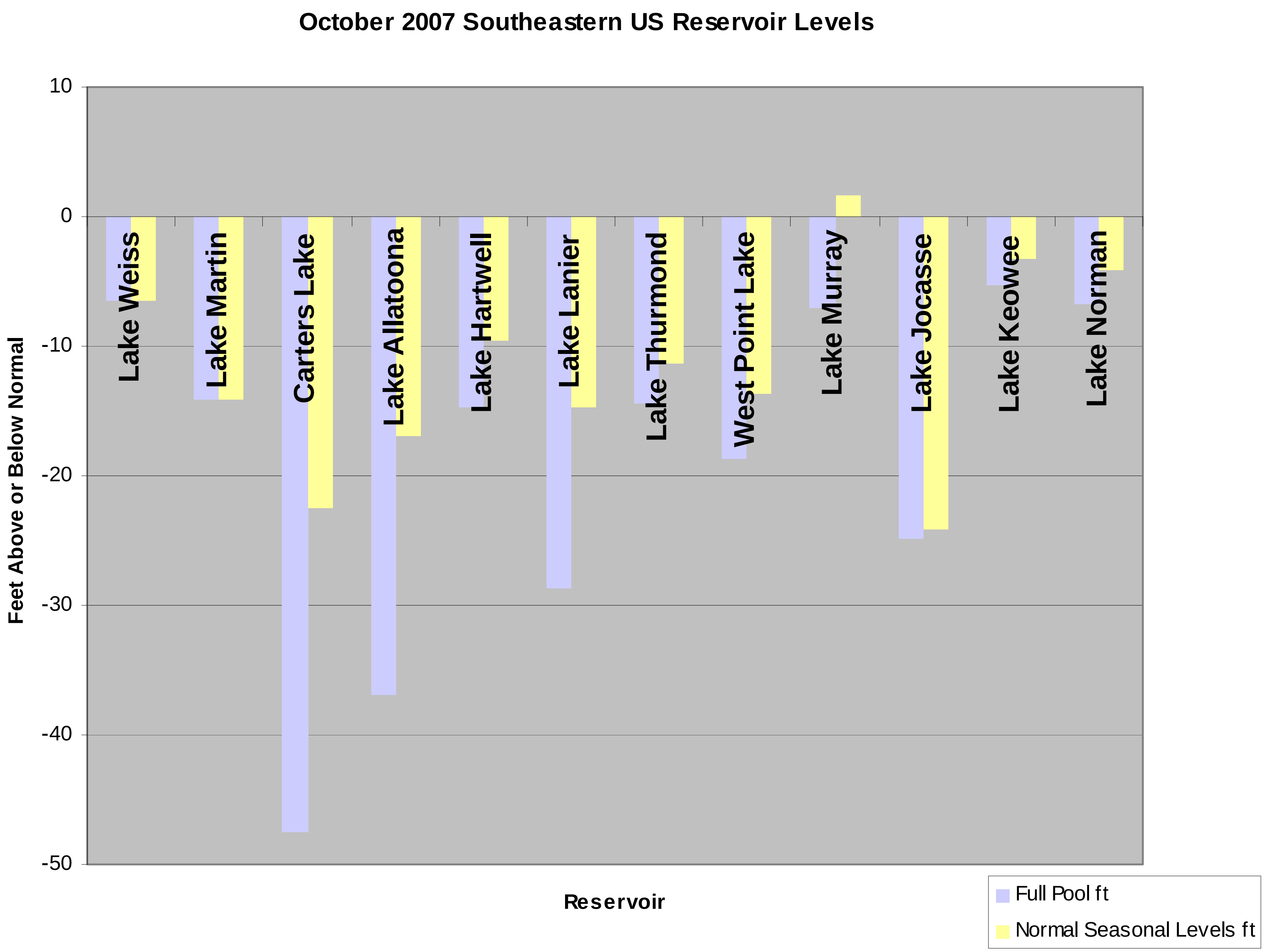


Photo Source
http://www.sas.usace.army.mil/



Source : Ray Ammarell, SCE&G



October 2007 Southeastern US Reservoir Levels
10
0
-10
-20
-30
-40
-50
Feet Above or Below Normal
Lake Weiss
Lake Martin
Carters Lake
Lake Allatoona
Lake Hartwell
Lake Lanier
Lake Thurmond
West Point Lake
Lake Murray
Lake Jocasse
Lake Keowee
Lake Norman
Reservoir
Full Pool ft
Normal Seasonal Levels ft

Summary of Impacts

- All marinas at Lake Martin are closed
- Governors from Alabama and Georgia are preparing to file laws suits against the Corps of Engineers and United States Fish and Wildlife Service to halt flow releases
- Lake Lanier provides drinking water for 1 in 3 Atlanta residents and estimated to run out of drinking water within 120 days.
- Approximately 50 % of boat ramps are closed at Lakes Hartwell and Thurmond (currently only 1 SCE&G public ramp at Lake Murray unusable)

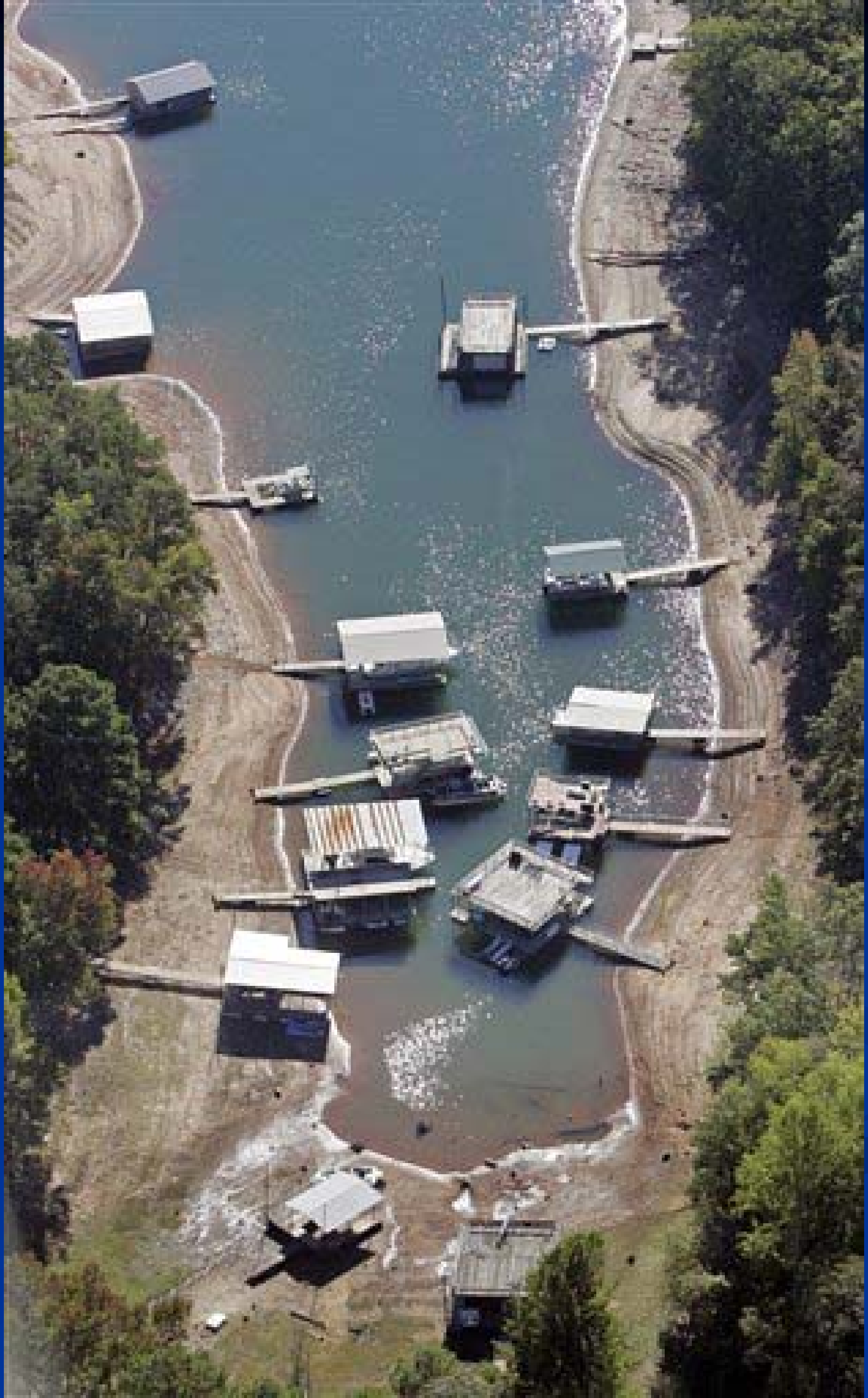
Lake Martin

Lake Marion

Lake Allatoona, GA

Source Photo: www.georgia-outdoors.com

Lake Lanier



Lake Hartwell

Photo Source
http://www.sas.usace.army.mil/

Lake Thurmond

Photo Source http://www.sas.usace.army.mil/

Lake Norman

Photo Source: www.catawbariverkeeper.org

Lake James, NC

Photo Source: www.catawbariverkeeper.org

Lake Wylie

Photo Source: www.catawbariverkeeper.org

Falls Lake, NC

Photo Source www.wral.com

Desperate Times, Call for Desperate Measures

Source Photo: www.georgia-outdoors.com

Questions ??

"State Hydrologist Bud Badr reported all lake levels are below normal (except Lake Murray, which is slightly above normal)."

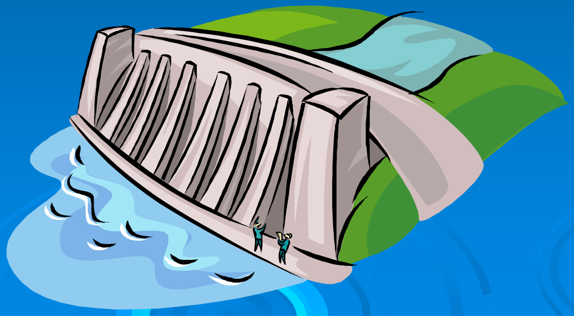
September 5, 2007

http://www.dnr.sc.gov/climate/sco/Drought/drought_current_info.php

Saluda Hydro Relicensing Quarterly Public Meeting

"What Is the Draft Application?"

October 25, 2007



Discussion Points

- Brief Overview of Past Milestones
- Purpose of Draft Application
- Contents of Draft Application
- Future Milestones
- Public Comments

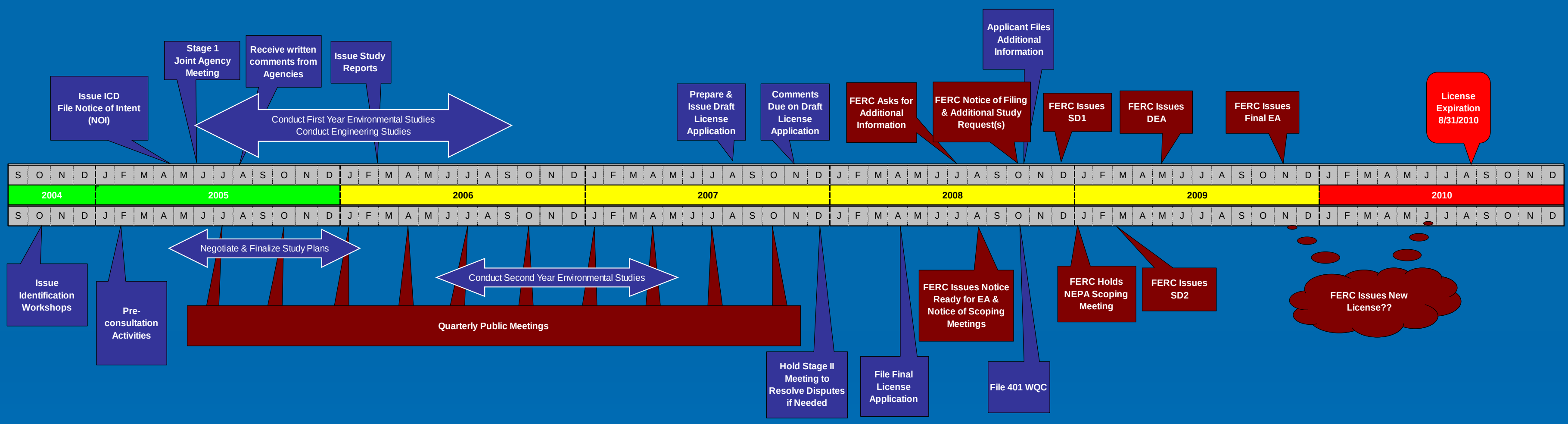
Brief Overview of Past Milestones and Process

- Notice of Intent (NOI) was filed April 29, 2005
  - The NOI must be filed at “least five years, but not more than five and one-half years, before the existing license expires” – 18 CFR 5.5(d)
- Initial Consultation Document (ICD) was also filed simultaneously with the NOI (April 29, 2005)
- Joint Agency Public Meeting – held on June 16, 2005
  - Quarterly Public Meetings have been held since that time.
- Resource Conservation Group and Technical Working Committee Meetings

Saluda Hydroelectric Project Traditional Relicensing Timeline

Saluda Hydroelectric Project Relicensing
FERC No. 516

Enhanced Traditional Licensing Process



NOTES:

DEA - Draft Environmental Assessment
FERC - Federal Energy Regulatory Commission
ILP - Integrated Licensing Process
NEPA - National Environmental Policy Act
NOI - Notice of Intent
PAD - Pre-Application Document
REA - Ready for Environmental Analysis
SD1 - Scoping Document 1
SD2 - Scoping Document 2
TLP - Traditional Licensing Process
WQC - Water Quality Certification

Brief Review: Mission Statement

While SCE&G will manage the process, state and federal resource agencies, home owners groups, environmental and recreational special interest groups, etc., must/will play a significant role in the relicensing of the Project. SCE&G will consult with agencies, groups, and individuals to gather as well as provide information. This is performed in order to identify and learn from, as well as to educate, stakeholders on the issues, and to address and resolve those issues.

Brief Review: Traditional Three Stage Licensing Procedure

- The Traditional Process is a tried and proven method for relicensing.
- Was the original Process developed for relicensing procedures.
- 3 Stage Process

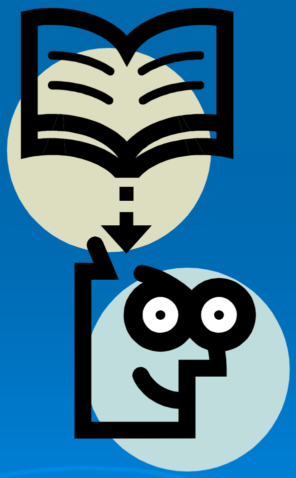
  Stage 1 - Issuance of ICD, Applicant conducts JAM and site visit, resource agencies, stakeholders and tribes provide written comments, dispute resolution on studies is held with the commission

  Stage 2 - Applicant completes necessary studies, Applicant provides Draft Application and study results to resource agencies, stakeholders and tribes, Resource agencies, stakeholders and tribes comment on draft application, Applicant conducts additional meetings if necessary

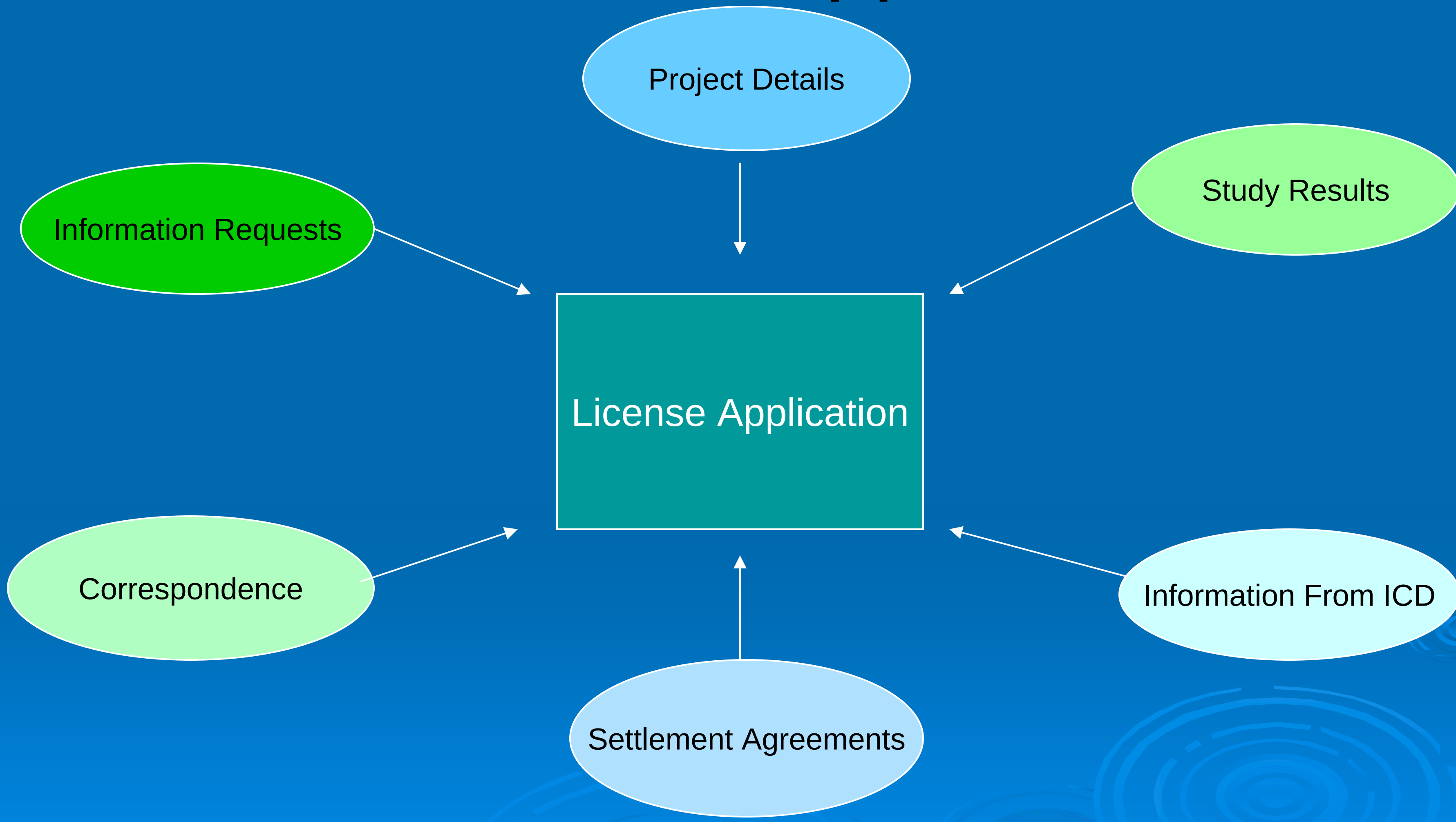
  Stage 3 – Applicant files Final Application with the Commission and copies are sent to resource agencies, stakeholders, and tribes.
- Variations of the Traditional Process have developed over the years (**Enhanced**, Hybrid)

Purpose of Draft Application

- Allows a period of time for additional comments to be considered as the final license application is being prepared.



What Assists in the Preparation of the License Application?



A Walk Through the Contents of the Application

- The Draft Application of an existing major project consists of the following pieces:
  - General Information – 18 CFR 4.32(a)
  - Initial Statement – 18 CFR 4.51(a)
  - Exhibit A - Project Description
  - Exhibit B – Project Operation and Resource Utilization
  - Exhibit C – Construction History
  - Exhibit E – Environmental Report
  - Exhibit F – Design Drawings and Supporting Design Report (CEII)
  - Exhibit G – Project Location Maps (NIP)
  - Exhibit H – Description of Project Management and Need for Project Power

Exhibit E: Results of Much Labor

- Exhibit E includes descriptions of existing environmental, cultural, historic, land use and recreational resources
- Included one will find the study results of recommended relicensing studies, discussed during the many Resource Group meetings
- Study reports are included in as appendices
- The set up of the Exhibit E is similar to that of the ICD…

Contents of Exhibit E: Results of Much Labor

- Section 2.0 – Water Use and Quality
- Section 3.0 – Aquatic Resources
- Section 4.0 – Wildlife Resources
- Section 5.0 – Botanical Resources
- Section 6.0 – Historical and Cultural Resources
- Section 7.0 – Recreational Resources
- Section 8.0 – Land Management and Aesthetics

Future Milestones

- Draft License Application to be issued in November
- SCE&G is required by the FERC to file an Application for New License at *least 24 months before the expiration of their existing license*. (18 CFR 5.17)
- Therefore, Final License Application to be filed in or before August 2008

How Will I Know When the Draft Application has been submitted for Public Comment?

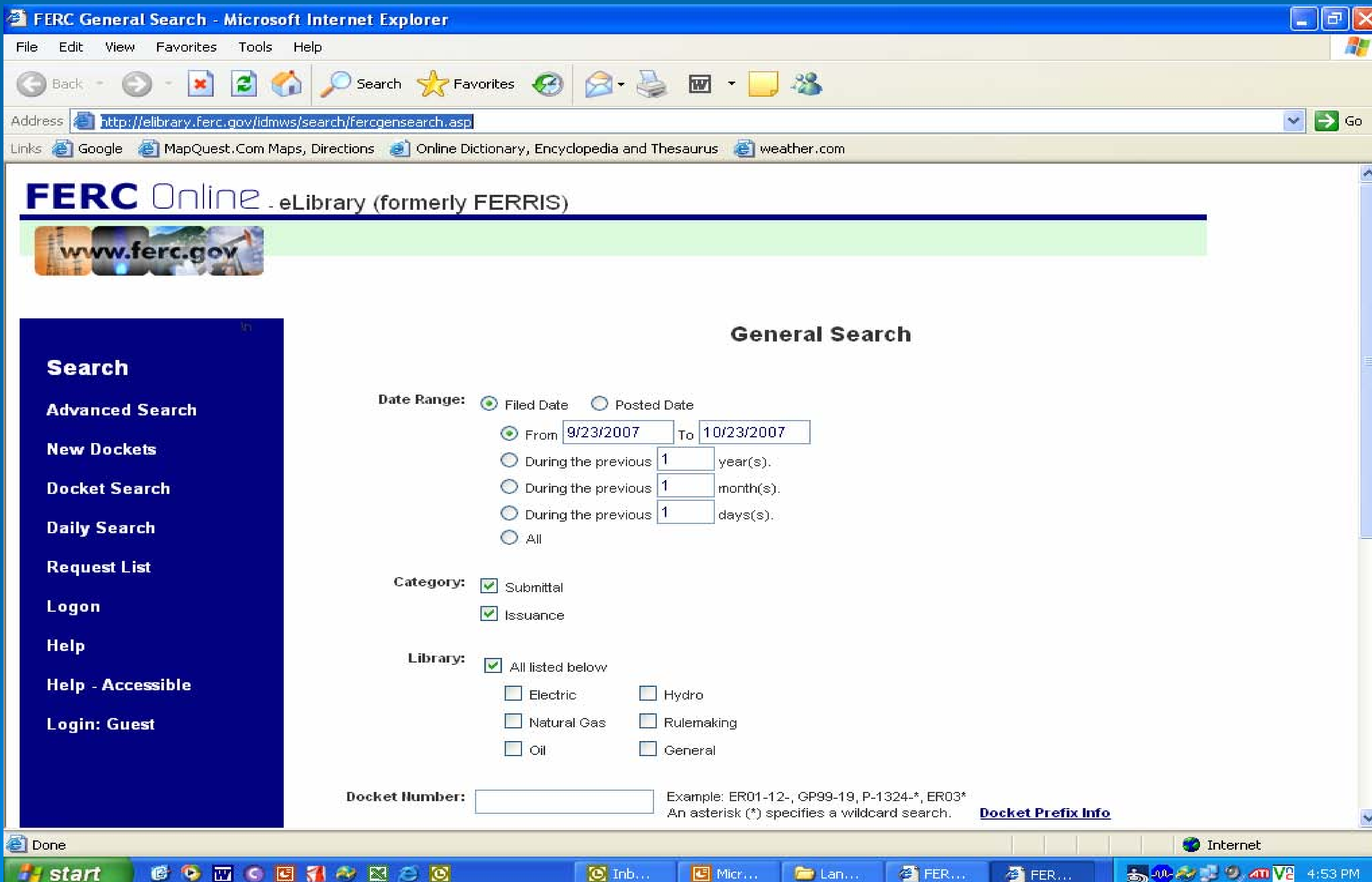
- The Draft Application will be posted to the Relicensing Website (www.saludahydrorelicense.com)
- An email will be distributed to those individuals who have elected to be on the relicensing mailing list
- The Draft Application will be mailed in CD format to those individuals on the Service List
- The Draft Application will be submitted to FERC pursuant to 18 CFR 5.16 and will be available via the FERC e-library

How will I know that the Final License Application has been submitted for comment?

- In accordance with 18 CFR 5.17(d), SCE&G must twice publish a notice of the filing of the Final Application in the local newspapers of the counties that Saluda Hydro is located
- The Final License Application will be posted to the relicensing website
- Copies of the Final Application will be distributed to those on the Service List

FERC E-Library

http://elibrary.ferc.gov/idmws/search/fercgensearch.asp



What About Issue Resolution Agreements?

- Licensing processes that are collaborative in nature, such as the enhanced traditional process employed by SCE&G, often result in agreements among the parties involved.
- The Resource Groups are still in the process of finalizing studies and reviewing information provided by those studies
- Therefore, any issue resolution agreements that arise likely will be filed with or before the filing of the Final License Application (18 CFR 385.602)

Public Comments

- Written comments on the Draft License Application are due within 90 days of the draft’s issuance

Guidelines for Requests for Additional Information and Studies

Code of Federal Regulations 18 CFR…

All requests for information or studies must:

- Identify the purpose the information will serve.
- Demonstrate how the information is related to operation and maintenance of the Project, and therefore necessary.
- Discuss your understanding of resource issues and your goals and objectives for these resources.
- Explain why each recommended study methodology is more appropriate than alternatives, including any that SCE&G has proposed.
- Document that each proposed study methodology is a generally accepted practice.
- Explain how the study will be used to further resource goals and objectives that may be affected by proposed operation of the Saluda Hydroelectric Project.

Questions?

Saluda

HYDRO

RELICENSING

Boat Density Study Report

Quarterly Public Meeting

July 19, 2007

Purpose of Study

- Identify area available for recreational boating on Lake Murray by lake segment.
- Assess boat densities occurring under normal (weekend) and peak (holiday) use conditions on Lake Murray by lake segment.
- Examine whether recreational boat use of Lake Murray is currently above, below, or at a desirable, or optimal, level.

SCE&G A SCANA COMPANY

Saluda HYDRO RELICENSING

Kleinschmidt Energy & Water Resource Consultants

Methods

- Usable Boating Acreage
- Boat Count Estimates
- Recreational Boating Capacity

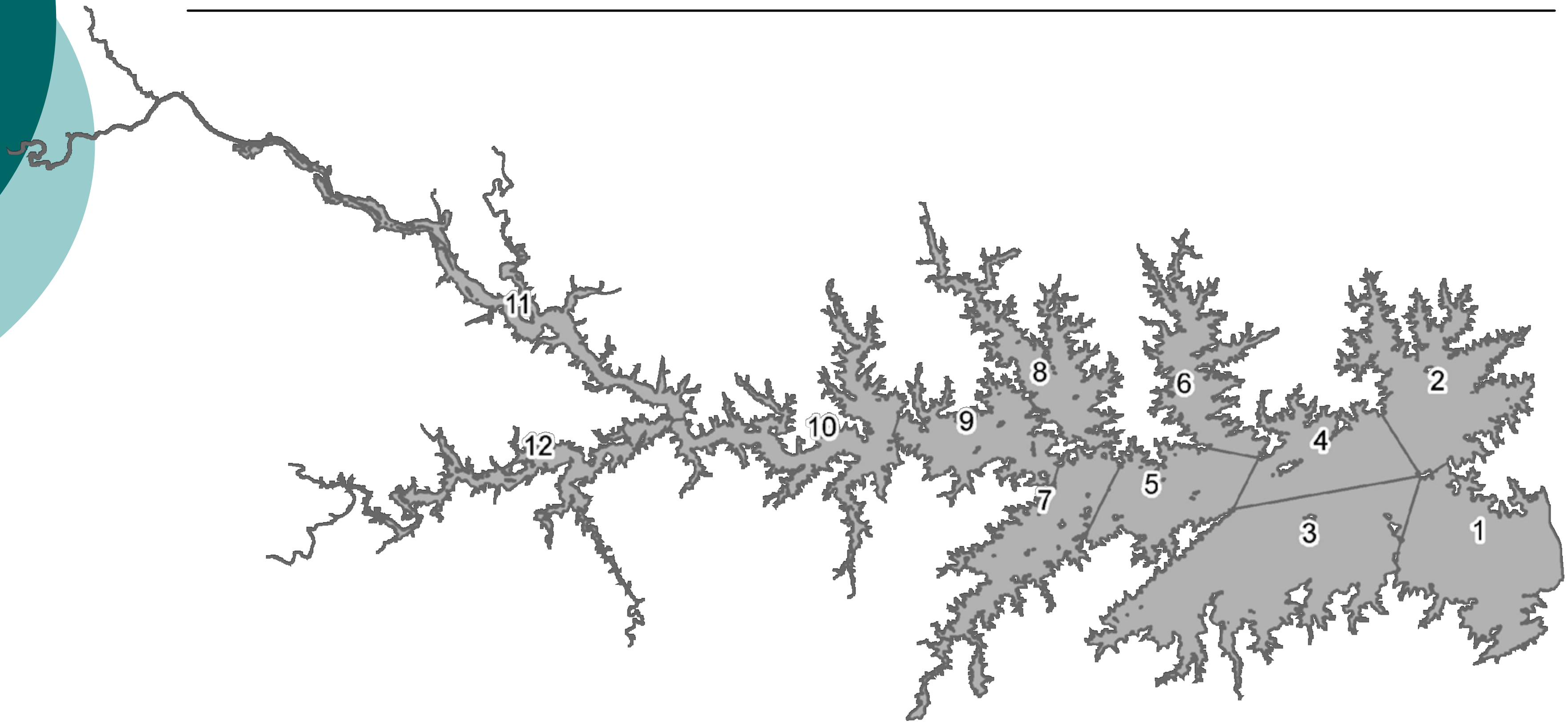
Boat Count Estimates

WEEKEND DATES	HOLIDAY DATES
May 5	May 26
May 19	June 30
June 17	July 4
June 24	
July 15	
August 11	
September 22	

Optimal Boating Acreage

- Multiple use of water area
- Shoreline configuration
- Amount of open water
- Amount of facility and shoreline development
- Crowding

Segments of Lake Murray Used in Analysis



Segment #1 – Usable Acreage

Estimated Acreage

5,740

minus islands & 75 foot "buffer"

Estimated Usable Acreage

5,440

Segment #1 – Boat Counts

Weekend Days

Total = 784

Average = 112

Holiday Days

Total = 727

Average = 242

Base Acreages

	LOW -5	BASE 0	HIGH 5
Power Boating	18	9	3
Canoeing and Kayaking	2.5	1.3	0.5
Angling	1.0	.5	.06
Jet Skiing	20	12	7
Sailing	10	4.3	2
Water Skiing	20	12	7

Segment #1 – Factor Assessment

Multiple Use	=	-1
Shoreline Configuration	=	-1
Amount of Open Water	=	1
Available Recreation Access	=	1
Weekend Crowding Rating	=	0
Total	=	0

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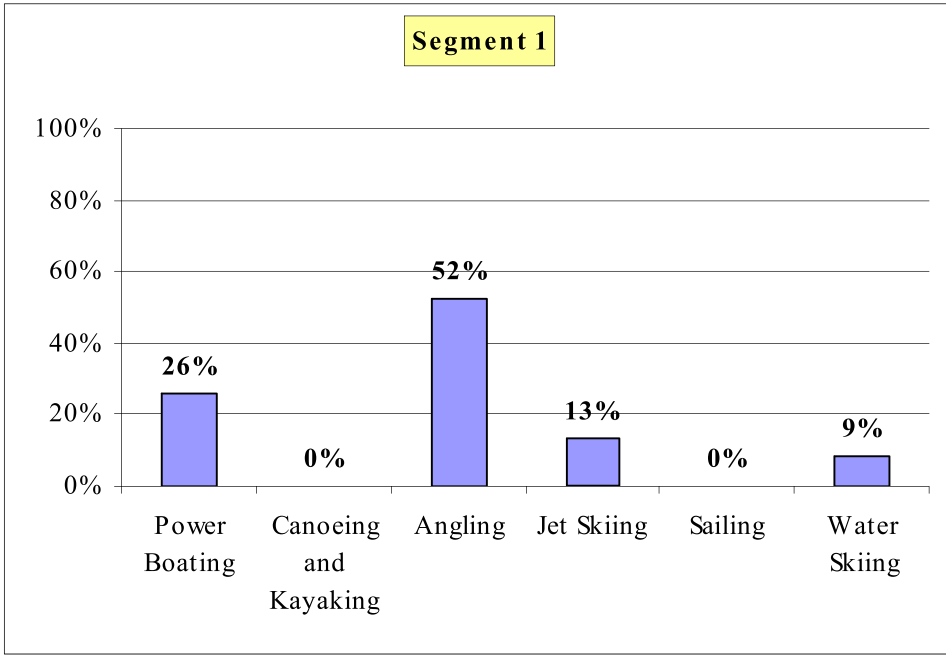
Saluda HYDRO RELICENSING

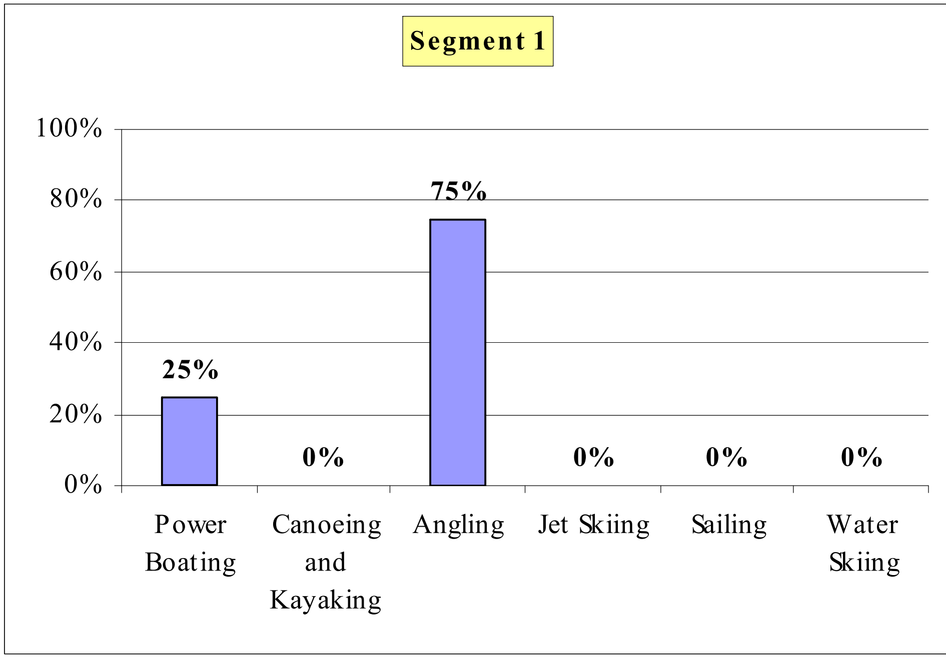
Kleinschmidt Energy & Water Resource Consultants

Segment #1 – Weekend Boating Use Distribution



Power Boating	29
Canoeing and Kayaking	0
Angling	58
Jet Skiing	15
Sailing	0
Water Skiing	10
Total	112

Segment #1 – Holiday Boating Use Distribution



Power Boating	61
Canoeing and Kayaking	0
Angling	182
Jet Skiing	0
Sailing	0
Water Skiing	0
Total	242

Segment #1 – Optimum Boating Use

Usable Acreage (5,440) ÷ Use Factor (Base 9) → Max No. of Boats (604)

Activity Distribution (26%)

Boat Activity Mix (158)

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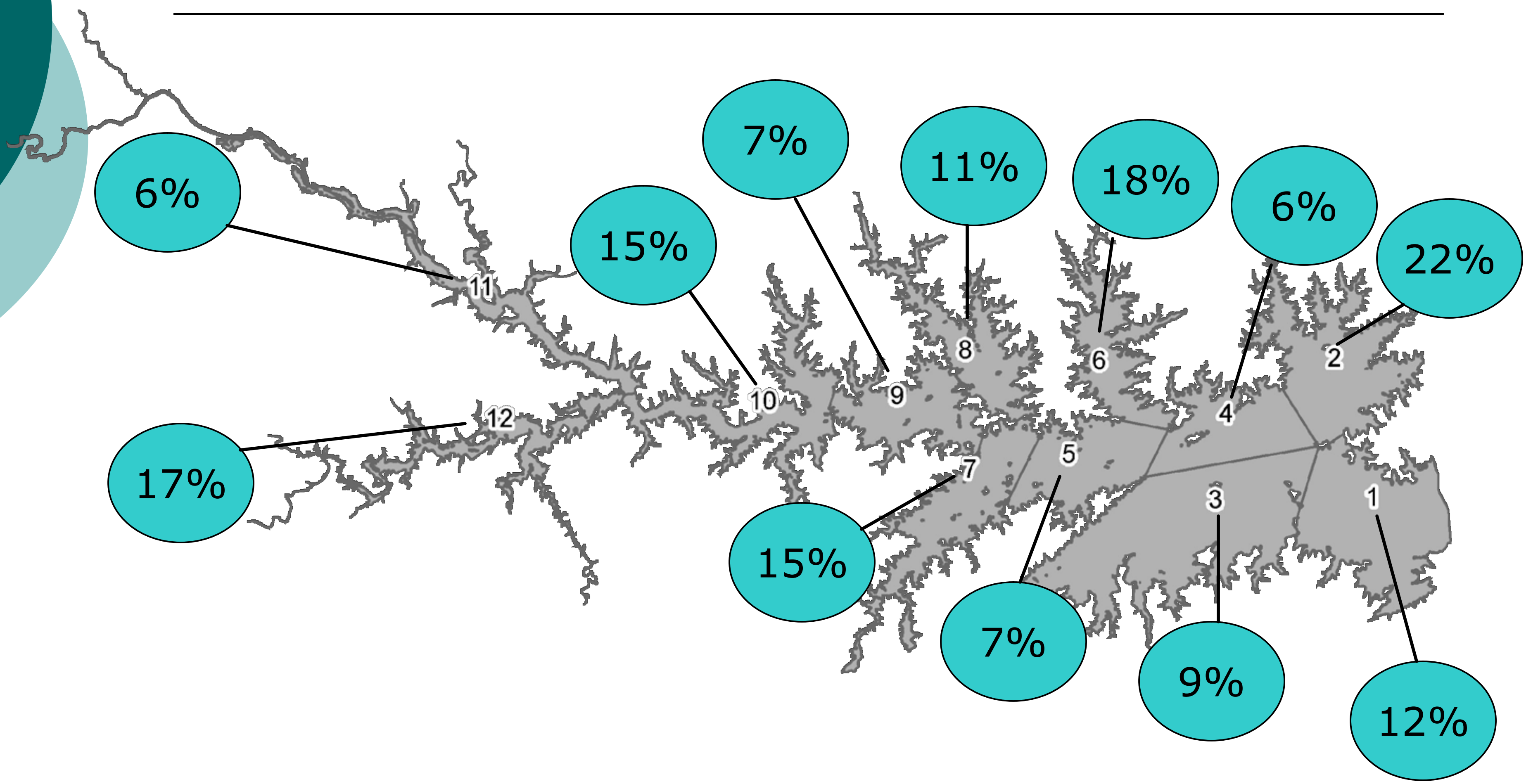
Segment #1 – Optimum Boating Use

Power Boating	158
Canoeing and Kayaking	0
Angling	660
Jet Skiing	59
Sailing	0
Water Skiing	39
Optimum Boating Use	916 boats

Segment #1 – Recreational Boating Carrying Capacity

Optimum Boating Capacity	916 boats
Average Peak Weekend Use	112 boats
Percent Capacity on Weekends	12%
Average Peak Use Holiday Use	242 boats
Percent Capacity on Holidays	26%

Recreational Boating Weekend Carrying Capacity



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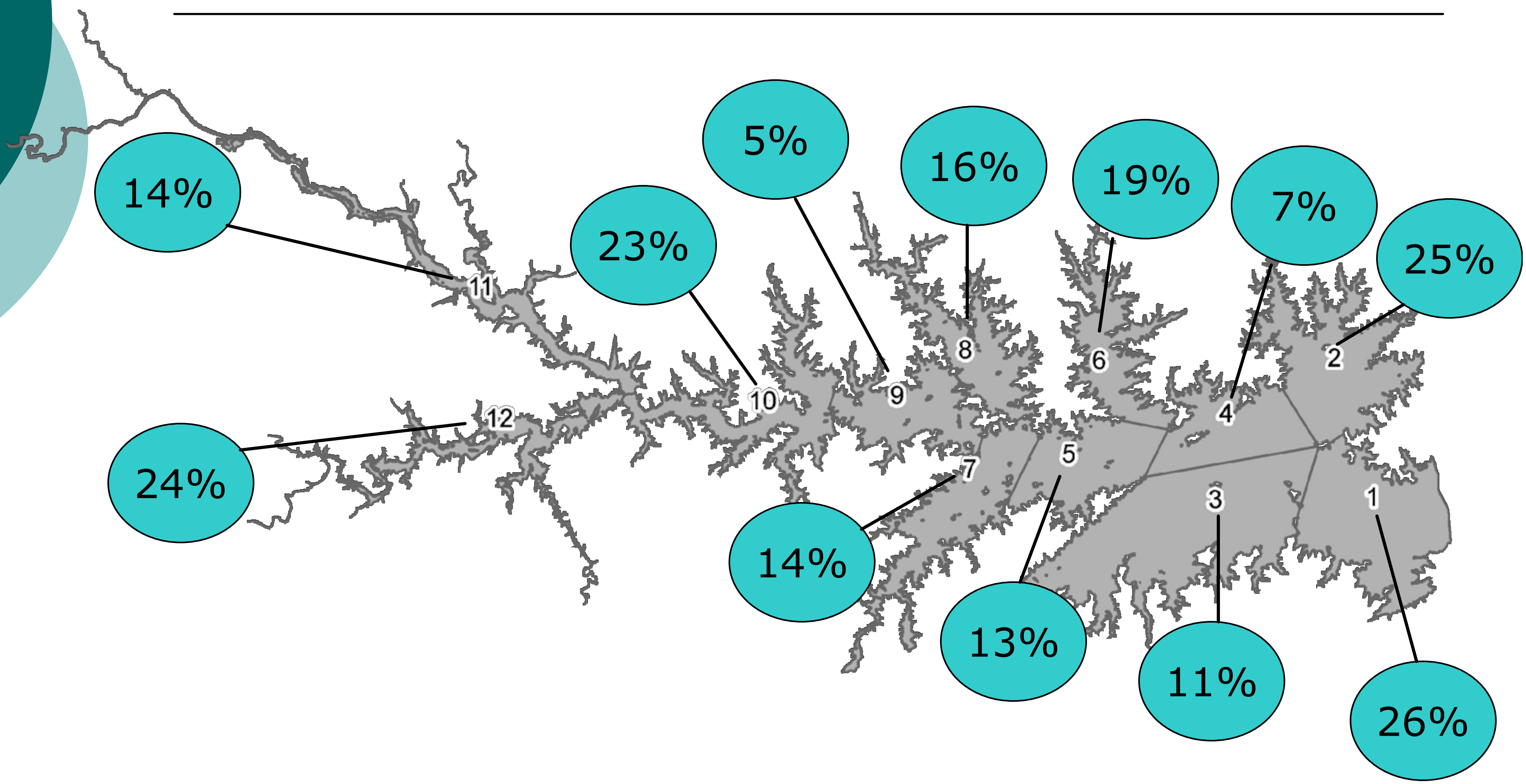
Recreational Boating Holiday Carrying Capacity



Conclusions

- Lake Murray is currently used at levels well below its estimated boating capacity.
- Based on projections to 2030, future use can be accommodated.
- Results could be used in future recreation facility planning activities

Questions?

Flo Release Study

Obtaining Dynamic Flow Routing Information on the Lower Saluda River

Purpose

- Provide Information for Downstream Recreation Flow Assessment Study
  - Determine Approximate Rates of Stage Change, Arrival (Travel) Times, Total Stage Changes
- Study Different Flows Along arious Reaches of River
- Use to Calibrate HEC-RAS Model
- If Possible, Enhance Safety Systems

erminology

- Stage Depth of Water (in Feet)
- Rise Change in Stage (in Feet)
- Rate of Rise Time it Takes for Stage to Rise (Ex 0.10 Feet Per Min)
- Arrival Time, or Travel Time Time it Takes for Releases to Reach a Downstream Location
- Parameters are Specific to a Location and Flow

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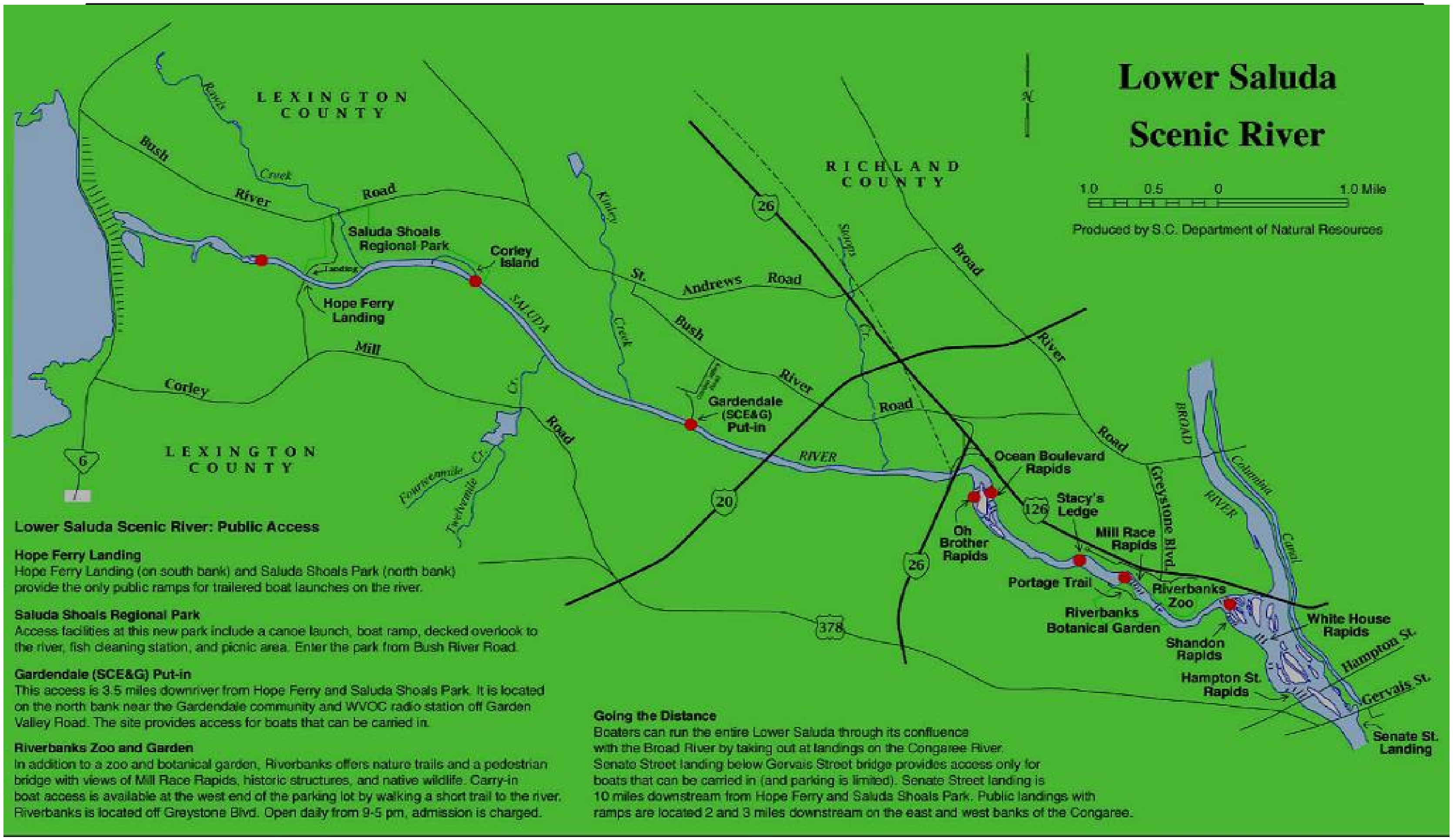
Primary Purposes for Releases

- Lake Level Management
  - Usually a Scheduled Event
  - Long Duration (Several Hours or Even Days)
- Reserve Generation (Reserve Call)
  - Immediate Need for Replacement Power
  - Short Duration (Less Than Two Hours)
- Recreational Releases
  - Planned Events
  - Duration of Several Hours

Data Collection Locations

- Eight Locations Determined by Members of Resource Conservation Groups
  - Primary Areas of Recreational Use
- Representative of   arious Reaches of River
  - Narrow Channels with Steep Banks
  - Wide Rapids Areas
  - Dual Channels at Oh Brother Rapids

Map of Locations



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Field nstallation

- Challenging Environment
  - Fast-Moving Water, arying Depths, Rapids
  - Substrate ariations
  - Debris Loading
- Accessibility
- Minimi e E uipment
  - Carrying to Location
  - Avoid Drawing Attention (andalism)

Data Collection   Le elloggers

- Self-Contained, Programmable Pressure Transducer and Data Recorder
- Collects Pressure in Feet at Set Intervals
  - One Minute Intervals Selected
  - Also Collects Temperature
- Use Barologger to Eliminate Atmospheric Pressure   ariations

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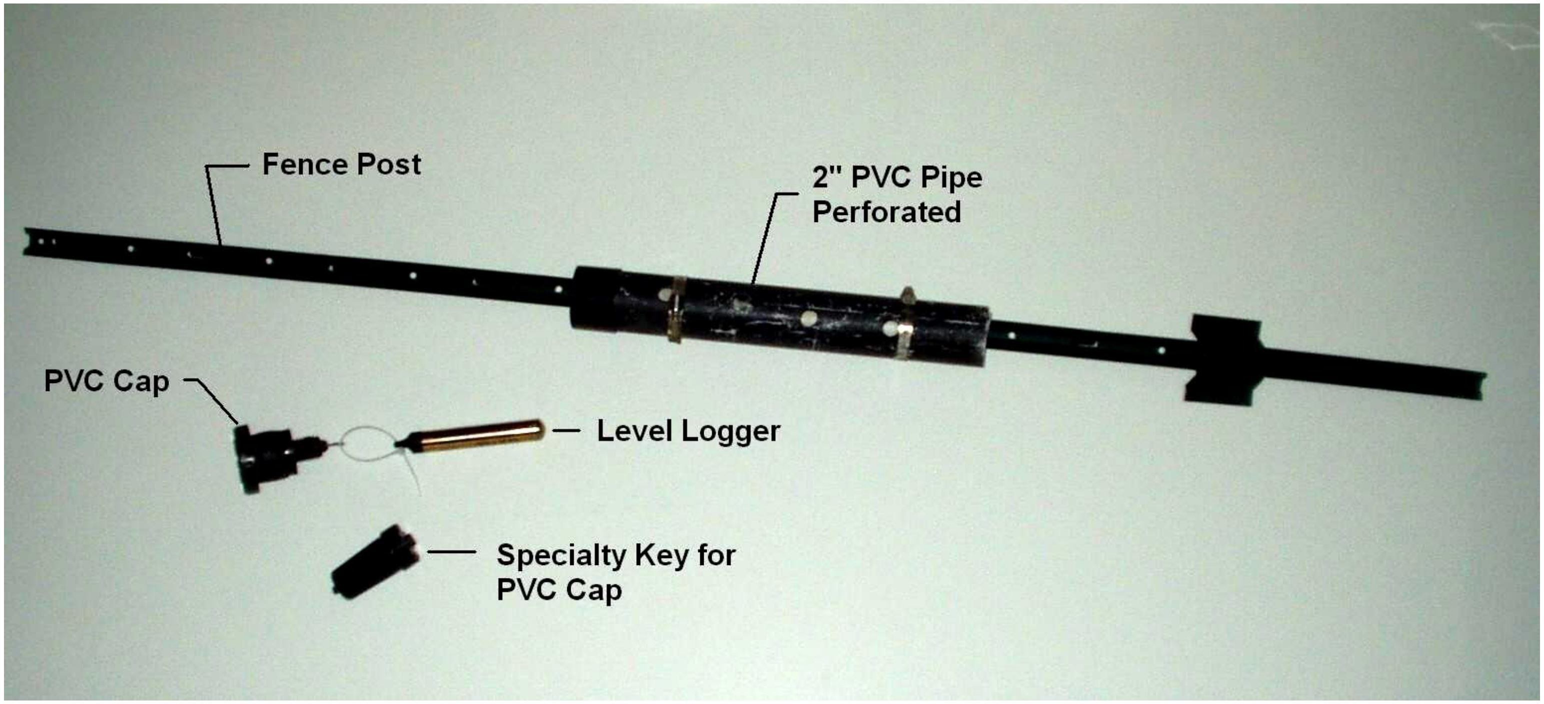
Le elLogger E uipment



ypical Site nstallations

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Data Collection During Study

- Checked Sites Weekly
- Re-Install Any Failed E uipment Installations
  - Two Site Failures During Study
  - Did Not Lose Data, but Flow Events During Failures were Affected
- Collected Data During Site isits To Prevent Losing

Flo Release E ents

- Twelve Different Flows Released From January 22 - February 15, 2007
- 1,000 cfs Increments up to 6,000 cfs, then 2,000 cfs Increments to 18,000 cfs
- Release Durations aried During Study
  - Shortest Release 1 hr 20 min, Mimics Reserve Call
  - Longest Duration 6 hr, Mimics Recreation Release or Lake Level Management

Data E aluation

- Evaluate All Flow Events at Each Location
  - All Flows at Corley Island, All Flows at Mill Race, etc.
- Evaluate Individual Flow Events at All Locations
  - 5,000 cfs at All Locations, 12,000 cfs at All Locations, etc.
- Graphed Data for Examination

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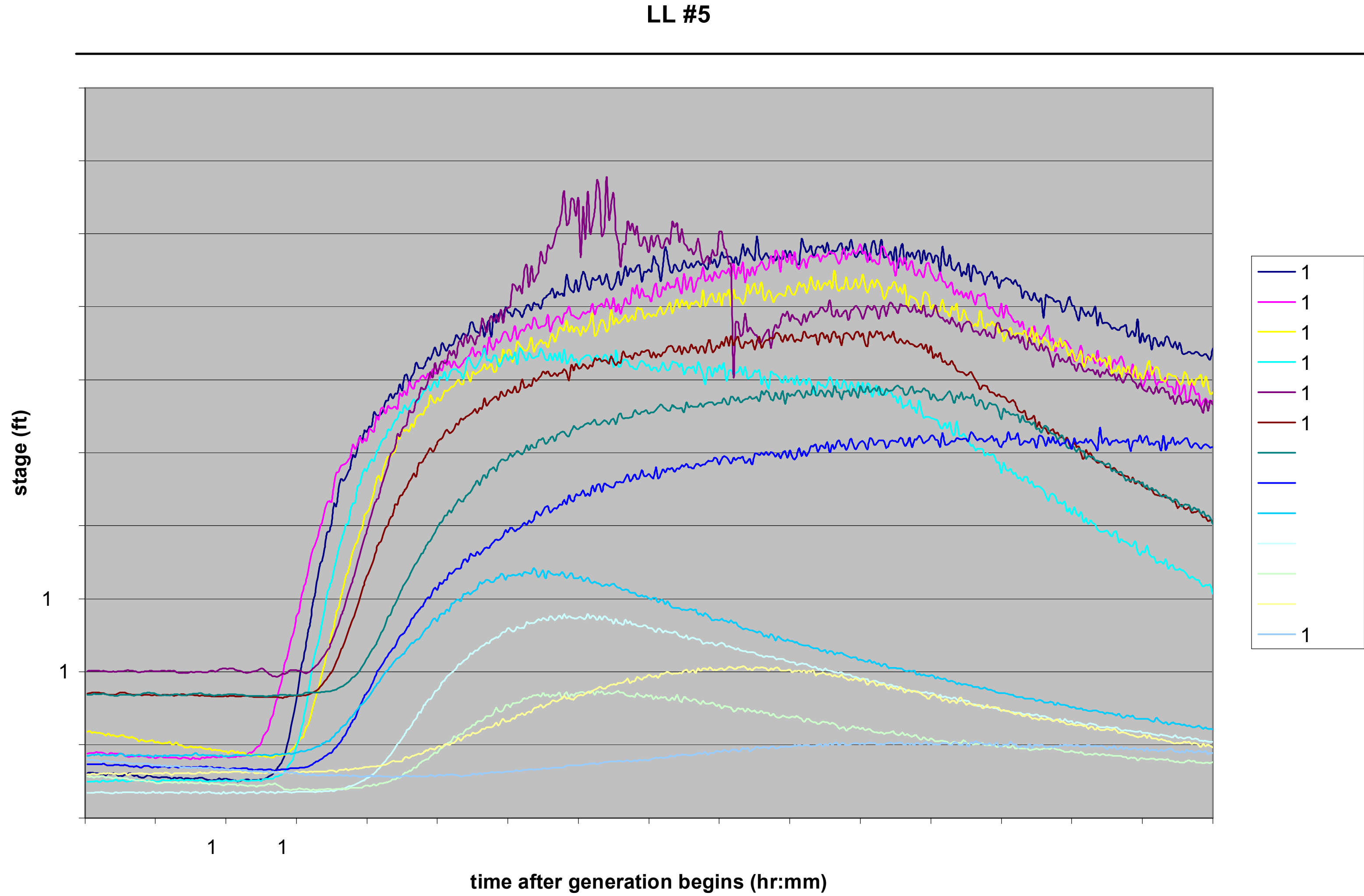
E ample of One Location All Flo s

Preliminary Study Data



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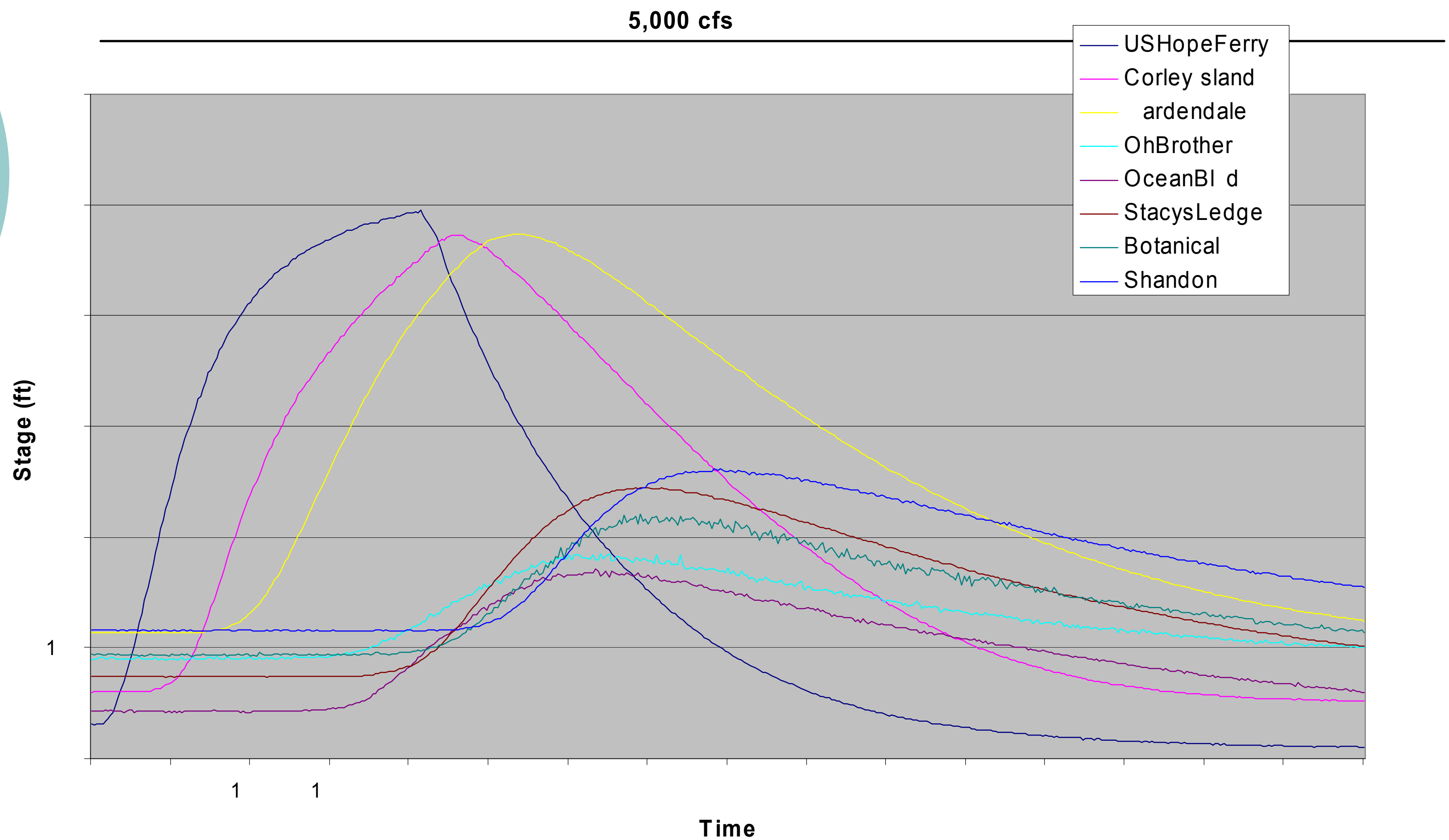
E ample of One Flo   All Locations

Preliminary Study Data



Data E aluation QA QC

- Calculate Approximate Rates of Rise at Each Location for Each Flow
- Compare Arrival Times for Different Flow Events, Downstream Locations
- Consider Differences Between Sites What Affects Rates of Rise, Travel Times, Total Stage
- Does It Make Sense

Preliminary Results QA QC

- Some Results Not as Expected
  - Preliminary Arrival Time Problems
  - Discrepancy of Initiating Flows vs. Reaching Full Flows Corrected with Revised Start Times
- Check Site Failures for Errant Data
  - Use Graphs to Determine Quality of Data
  - Noticeable Failure Points, Eliminate Flow Events as Necessary

Complicated Study E aluation

- Stabili ation How Long Does Each Site Take to Reach Maximum Stage
  - No Such Thing as Complete Stabili ation
  - Duration of Release Greatly Impacts Stages Reached for Each Flow Event
  - Release Duration Also Affects Time to Recede
- Selecting Arrival Times can ary Due to Subtle, Continuous Stage Fluctuations

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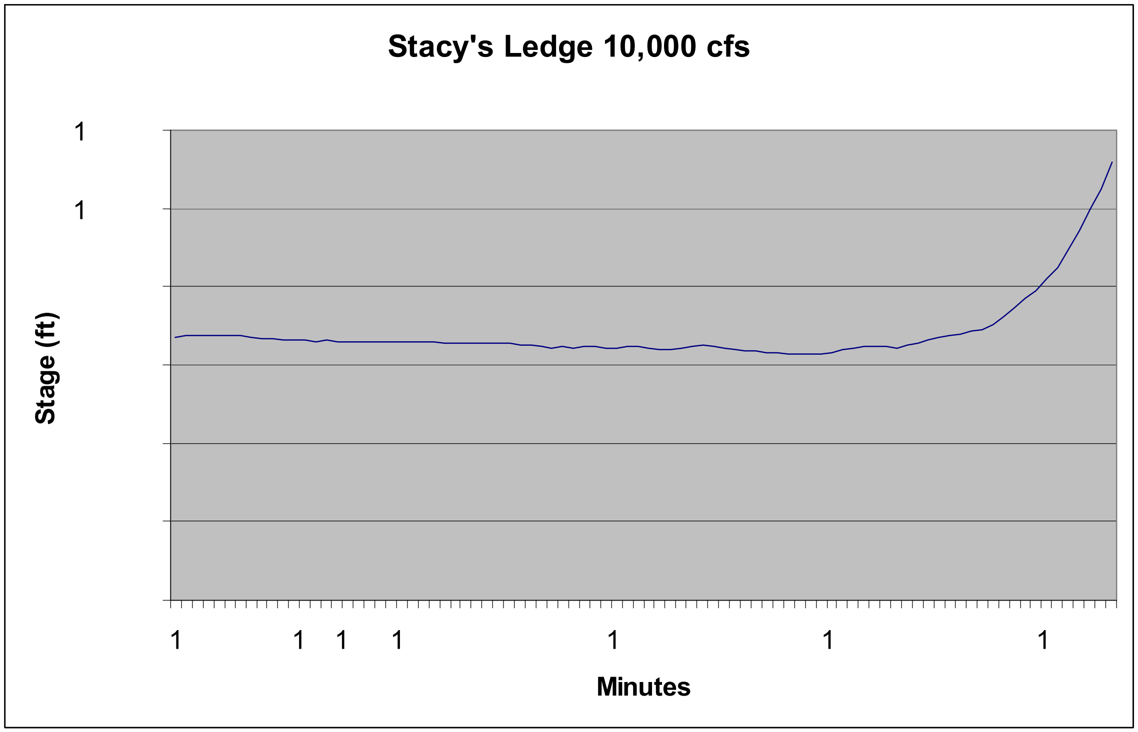
nterpretation Find Arri al ime



Subtle Stage ariations can Lead to Discrepancies of 15 Minutes or More with Human Interpretation

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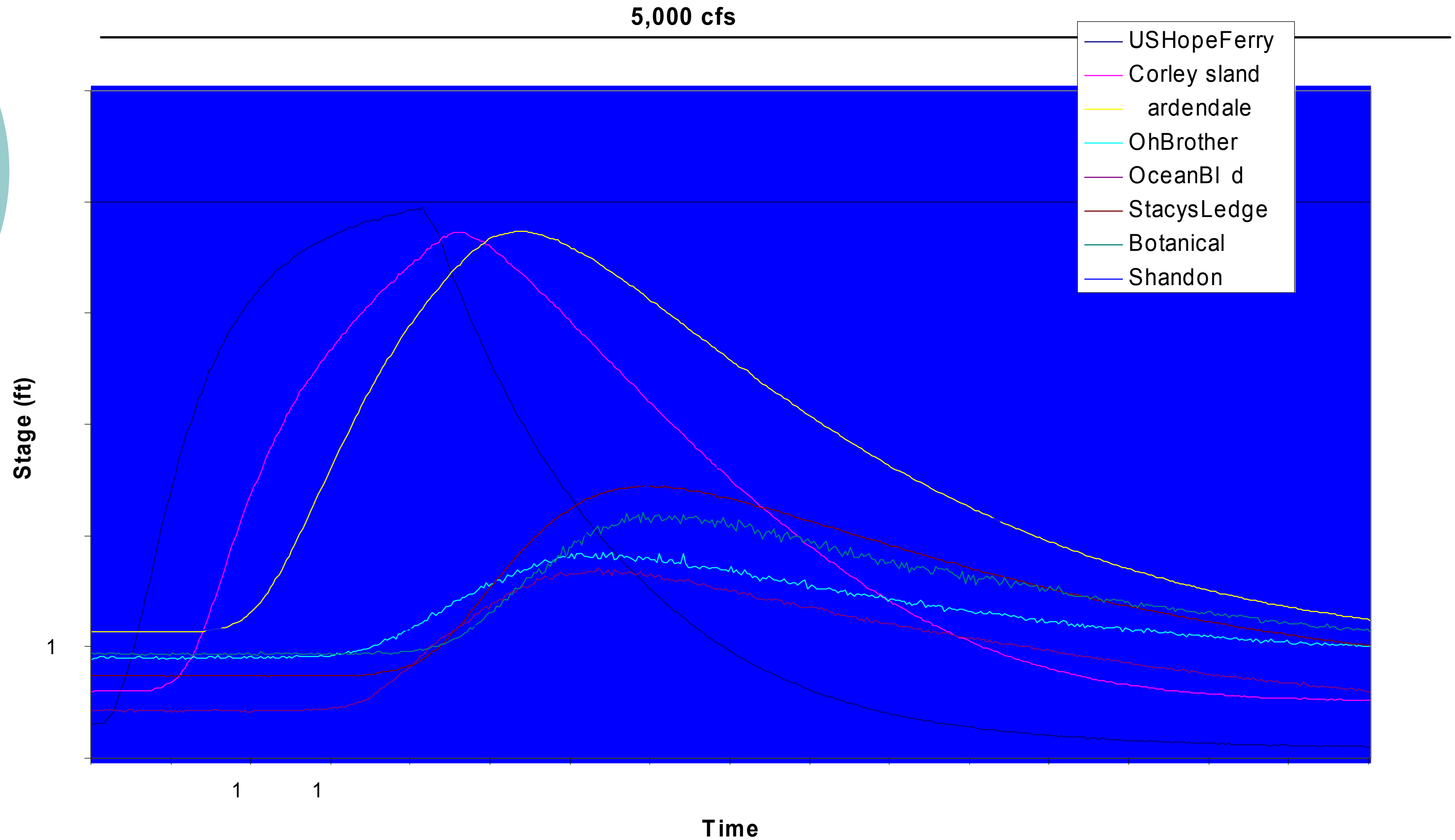
nterpretation Find Ma imum Stage

Preliminary Study Data



Accounting for Flo ariances

- Maximum Stage, Arrival Times, Time to Recede Difficult (or Impossible) to Determine from Actual Field Data
  - Flow Durations aried
  - This Represents ***Real*** Operations
  - Not Reasonable to Conduct Field Study of All Flows for Multitude of Durations
  - Account for Precipitation

Using the Ri er Model

- HEC-RAS Already Being Developed as Part of Operations RCG
  - River Analysis System, Being Developed in Conjunction with HEC-Res Model (Reservoir Operations Model)
- Calibrate River Model to Study Data
- Not Subject to Human Interpretation of Real-World Data (Proved to be Difficult and Inconsistent)

Modeling Data for arious E ents

- Can Run Multitude of Scenarios (Such as Flow Durations) at Each Location Studied
- Model can Account for Precipitation that Occurred During Study
- Yields Consistent Arrival Times and Maximum Stage
  - Based on Ideal (Constant) Starting Points, Not Fluctuating Stages

Modeling Flo s

- Run Same Flows for 1-1 2, 6, and 24 hours
- Check vs. Actual Field Study Results (Part of Calibration Procedure)
- Extract Parameters Maximum Stage, Rates of Rise, Arrival Times, Time to Recede

Questions?

Land Rebalancing Ho o Allocate Future De elopment Lands for a e License erm

Lake and Land Management TWC

What s Land Rebalancing?

- General Definition:
  - The TWC's* evaluation of SCE&G owned future development lands to develop recommendations for classification changes on certain properties
  - ex) At the recommendation of the TWC, a parcel of future development property may be placed under a protected classification such as Forest and Game Management Land if the land is deemed environmentally significant.

*Technical Working Committee

What Brought his Process About?

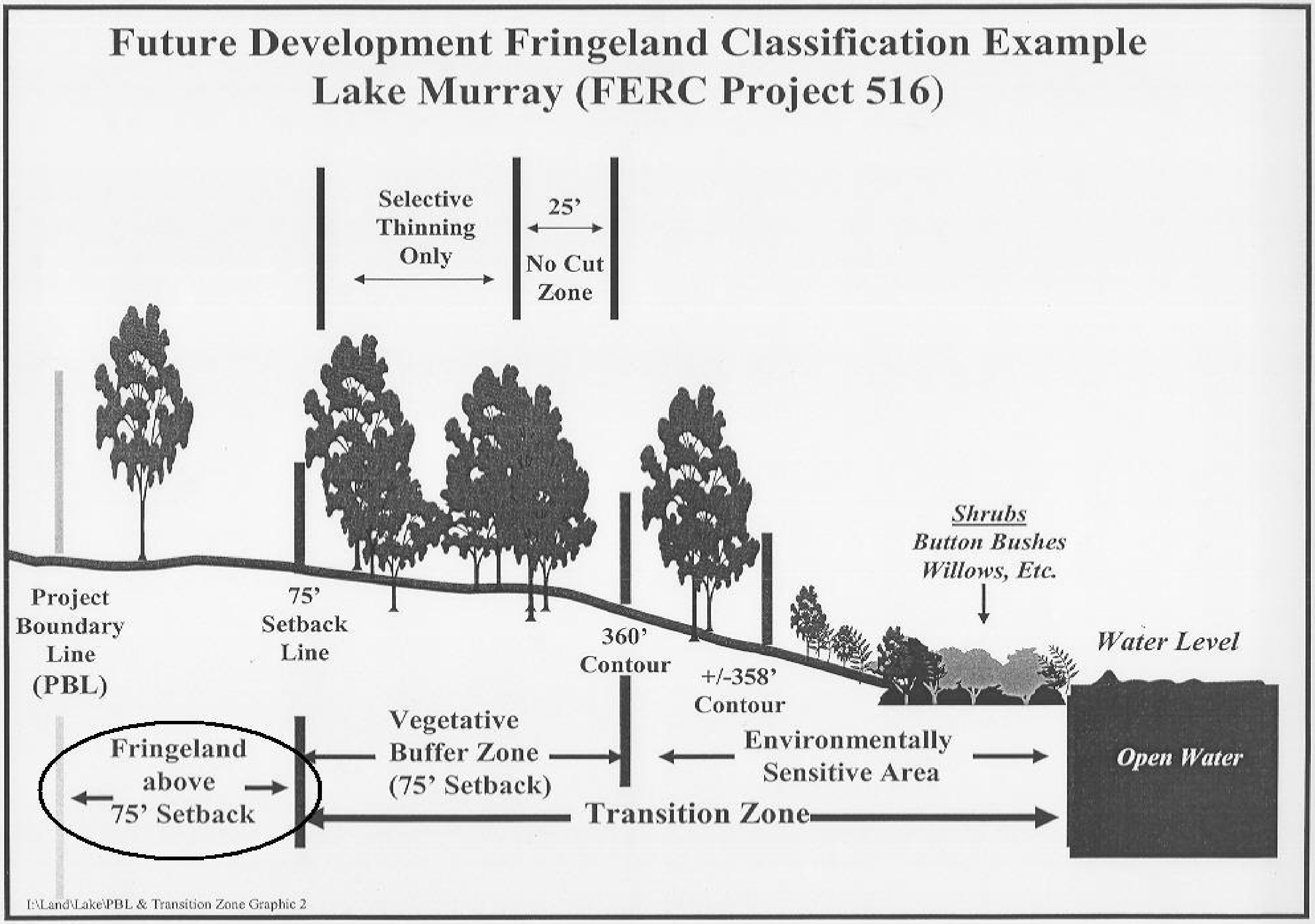
- At the request of stakeholders, such as DNR, LMA, Lake Watch, (etc.) during relicensing meetings and in ICD comments.

"*We believe that the developmental and non-developmental activities must be balanced to ensure that public access and recreational opportunities are provided now and into the future" – DNR (ICD Comments, August 11, 2005)*

What s Land Rebalancing cont oal

- Goal of Rebalancing (as defined by DNR – Rebalancing Straw-man, Nov. 21 2006)
  - “The goal is to protect public resource values of Project lands in accordance with the Federal Power Act through rebalancing and other shoreline classification modifications and restrictions.”

What Lands Are n ol ed?



Ho Does One Determine he alue of a Parcel of Land?

Two Conflicting Values…..

Economic Value of the Land <--------------->Natural Resource Value of the Land

Ho Was his Process Accomplished?

- Two subcommittees were developed in the November 21, 2006 TWC meeting in order to evaluate the Future Development lands:
  - Natural Resource Values Subcommittee
  - Economic Values Subcommittee
- The two subcommittees worked independently of one another during the evaluation process

Ho Was his Process Accomplished Process imeline

October 31, 2006
TWC

November 21
TWC

Economics Group
December 12

December 20
Natural Resource Group

TWC
January 17

January 26
TWC

Natural Resource Group
February 26, 27, March 1

April 3 & 4, 2007
Economics Group

Ho Was his Process Accomplished Process imeline

- October 31, 2006 – Introductory discussion on rebalancing
- November 21, 2006 – separation of TWC into Economics and Natural resource subcommittees
- December 12, 2006 – Meeting of Economics Subcommittee to develop rebalancing criteria
- December 20, 2006 – Meeting of Natural Resources Subcommittee to develop rebalancing criteria
- January 17, 2007 – Collective review of the criteria developed by each subcommittee
- January 26, 2007 – Continued review of Economic committees scoring criteria
- February 26,27, March 1 – Natural resource subcommittee's rebalancing exercise with Orbis
- April 3-4 – Economic subcommittee’s rebalancing exercise with Orbis

atural Resource alues Subcommittee

- Members:
  - David Hancock – SCE&G
  - Randy Mahan – SCANA
  - Bill Argentieri – SCE&G
  - Joy Downs – Lake Murray Association
  - Dick Christie – SCDNR
  - Ron Ahle – SCDNR
  - Tony Bebber – SCPRT
  - Steve Bell – Lake Watch
  - Amanda Hill – US Fish and Wildlife Service

atural Resource alues Subcommittee

- Scoring Criteria:
  - Fish spawning and nursery habitat
  - Length of shoreline
  - Mean width of fringeland
  - Waterfowl hunting opportunity
  - Regional importance
  - Land Use
  - Recreational values
  - Adjacency
  - Environmentally sensitive areas, conservation areas
  - Unique habitats
  - Terrestrial Wildlife

What Happened During the Rebalancing E ercise?

- Orbis projected the shoreline maps up on the front screen and navigated to each individual parcel of future development land.
- Group collectively rated each value a 1, 3, or 5. (1 being poor, 5 being excellent) for each parcel of land.
- During exercise, all data was entered into an Excel Spreadsheet which was set up to calculate mean width, and final score.
- Some parcels of land that were close in proximity were grouped and scored collectively.

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75%

10

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AE1 fx

A	B	C	D	E	F	G	H	I	J	K
	Group Chosen #	Parcel # (s) - FDID	Tract Name	Total Acres	After_75ft_Buffer	After_100ft_Buffer	Shoreline Feet : **Value**	Length of Shoreline: **Score**	Fish Spawning and Nursury Habitat: **Value**	Fish Spawning And Nursury Habitat:**Score**
Definition:	*As the group moves around the lake, these are the numbers that the group assigns to a parcel, or combined parcels of land.*	*Original parcel numbers as assigned by Orbis.*						*< 300ft - moderate (1) 300' to 1000' - good (3) >1000' - best (5)*		*< 10% - - - - - - poor (1) 10% to 50% - - good (3) >50% - - - - - - - best (5)*
Blue are those that have been e		1	**CoastGuard Island**	1.04	0.02	0.00	1577.75			
	Group 8	2, 8, 16, 25	Sunset	4.16	1.55	1.04	1610.62			
	Eliminated, NS	3	Marina Rd.	0.53	0.34	0.26	276.47			
		4	Salem Church Rd.	1.88	1.60	1.48	147.02	1	ire shorline is ESA	5
		5	Moore Property	32.56	17.03	12.45	9176.87	5	80 percent	5
		6	Old Ferry/Amick's Ferry	10.19	6.17	4.88	2335.1	5	80 percent	5
		7	**Check Ownership/Saluda Island**	9.68	6.68	5.87	1579.45	5	100 percent	5
	Group 8	8, 2, 16, 25	Sunset	5.22	1.96	1.34	2320.72			
		9	Old Ferry/Amick's Ferry	16.49	11.60	9.98	2841.35	5	75 percent	5
		10	Lion's Club	14.32	9.50	7.93	2838.16	5	35 percent	5
		11	Black	12.62	6.39	4.70	4060.27	5.00	60 percent	5
	Eliminated, NS	12	Black	1.50	0.84	0.62	395.4			
	Eliminated, NS	13	Lion's Club	0.88	0.44	0.40	273.46			
		14	Maple Knoll	6.15	3.34	2.61	1743.48	5	100 percent	5
	Eliminated, NS	15	Marina Rd.	0.37	0.23	0.16	57.25			
	Group 8	16, 2, 8, 25	Sunset	8.73	4.92	4.05	2704.20			
	Eliminated, NS	17	Lion's Club	0.66	0.35	0.26	185.42			
	Eliminated, NS	18	Johnson Marina Rd.	0.80	0.06	0.01	501.28			
	Group 2	19 & 23	Stone Mountain	2.00	0.47	0.22	1157.9			
	group 2	20 with 34 and 26	Koon Tract	0.00	0.00	0.00	33.69			
	Eliminated, NS	21	Ballentine Estates	1.34	1.34	1.34	350.5			
		22	Indian Cove Rd.	1.30	0.62	0.40	415.5	3		5
	Group 2	23 & 19	Stone Mountain	0.61	0.00	0.00	692.96			
	Eliminated, NS	24	Johnson Marina Rd.	1.19	0.55	0.30	288.3			
	Group 8	25, 16, 2, 8	Sunset	9.58	4.62	3.32	3179.05	5.00	40 percent	5

Natural Resources Committee / Sheet3 /

Sum=5026 NUM

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AE1

X	Y	Z	AA	AB	AC	AD	AE	AF
ESA's : **Value**	ESA's: **Score**	Unique Habitat (including RT&E Species): **Value**	Unique Habitats (including RT&E Species : **Score**	Terrestrial Wildlife: Value	Terrestrial Wildlife: Score	**Average Final Score**	**Total Final Score**	Additonal Comments
Specific amount or estimate of ESAs or CA's on the property	*< 10% - - - - - - poor (1) 10% to 30% - - good (3) >30% - - - - - - - best (5)*	*Specific amount or estimate of habitat that is considered unique on this parcel of land*	***< 5% - - - - - - - - - - - - - - - - poor (1) 5% to 20% - - - - - - - - - - - - - good (3) >20% or with RTE species - best (5)*** *ex) piedmont seepage wetlands, gum swamps, old growth hardwoods, eagle nest sites*		*< 1 acre - mod (1) 1-5 acres - good (3) >5 acres - best (5)*	*Sum of all score categories/11*		*Notes may include why parcels are combined, unique features of the parcel, or parcels that rated low but are specifically important for other reasons*
						0		
						0	0	
						0	0	two little pieces on each side of ro
	5		1		3	2.454545455	27	ESA
0 percent	5	bald eagle	5		5	3.909090909	43	
0 percent	5		1		5	3.545454545	39	
00 percent	5		1		5	3	33	
						0	0	
5 percent esa	5		1		5	3.545454545	39	will be house on prop, portion sold
5 percent	3		1		5	3	33	houses, newberry lions club
0 percent	5		1		5	3.363636364	37	
						0	0	shoreline less than shown, 200 ft.
						0	0	docks
5 percent	5		1	a lot of land infront of prop	5	3	33	
						0	0	dock
						0	0	
						0	0	Docks
						0	0	docks
						0	0	
						0	0	
						0	0	
00 percent	5		1		3	2.636363636	29	
						0	0	
						0	0	acreage change, house dock, nee
500 ft, 25 percent	3		1		5	3.909090909	43	

Natural Resources Committee / Sheet3

Sum=5026 NUM

Economic alues Subcommittee

- Members

  Tommy Boozer – SCE&G

  Bill Argentieri – SCE&G

  John Frick – landowner

  Kim Westbury – Saluda County

  Randy Mahan – SCANA

  Roy Parker – Lake Murray Association

  Theresa Powers – Newberry County

  Van Hoffman – SCE&G

Economic alues Subcommittee

- Scoring Criteria
  - Shoreline Footage
  - Acreage
  - Mean Width
  - Dock Qualifications
  - Economic Interest – to SCE&G
  - Economic Interest – to Local Government
  - Economic Interest – to Back Property Owners
  - Proximity to Utilities
  - Proximity to Road Access
  - Proximity to Amenities
  - Direct Water Usability and Topography for Boating
  - Market Value

L	M	N	O	P	Q	R
Mean Width:score	Dock Qualifications	Economic Interest (Local Government)	Economic Interest (SCE&G)	Economic Interest (Back Property Owners)	Proximity to Utilities (water/sewer/etc.)	Proximity to Road Acces
(5) - >125 ft Depth ***(3) - 75-125 ft Depth*** ***(1) - <75 ft depth*** *Area/Length represented in ft.*	***(5) - Unrestricted*** ***(3) - Limited (Deck, multi-use)*** ***(1) - Does not qualify***	***(5) High*** ***(3) Medium*** ***(1) Low*** *ex) Property Tax Revenue, Recreation, Economic Growth*	***(5) High*** ***(3) Medium*** ***(1) Low*** *ex) Land Sale (value), Recreation, Environmental (ESA)*	***(5) High*** ***(3) Medium*** ***(1) Low*** *ex) Lake Access, Dock Permit, Developmental Potential*	***(5) Existing*** ***(3) Planned*** ***(1) Not suitable***	***(5) - Existing and adequ*** ***(3) - Minor improvemen needed*** ***(1) - Major improveme needed***
3	5	1	1	1	1	
5	1	1	1	1	3	
5	3	5	3	5	3	
5	3	5	5	5	3	
5	1	1	1	1	1	
5	3	5	5	5	5	
5	5	5	5	5	3	
5	3	3	3	5	1	
5	5	5	3	5	1	
5	5	1	1	1	1	
5	3	3	1	3	1	

Economics Scoring Sheet / Sheet2 / Sheet3 o that each parcel has recei ed an Economic Score and a atural Resource Score hat happens ne t?

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100%

12

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D82   fx Average Final Score

A	B	C	D	E	F	G
	Group Chosen #	Parcel # (s) - FDID	**Average Final Score**	**Total Score**	**Natural Group Ranking**	**Economics Group Ranking**
Definition:	*As the group moves around the lake, these are the numbers that the group assigns to a parcel, or combined parcels of land.*	*Original parcel numbers as assigned by Orbis.*	*Sum of all score categories/11*			
	Group 5 (332 343 & 346, 34	348	4.818181818	53.00	1	16
		57	4.454545455	49.00	2	9
	Group 29 (51 & 53 , 58)	58	4.454545455	49.00	2	5
	Group 19 (103 & 108, 110)	110	4.272727273	47.00	3	5
	Group 27 (189 & 184)	189	4.272727273	47.00	3	16
		226	4.272727273	47.00	3	2
		223	4.272727273	47.00	3	9
check mean width lat	Group 2 (19 & 23, 20, 34, 2	34	4.090909091	45.00	4	7
		185	4.090909091	45.00	4	8
		215	4.090909091	45.00	4	9
		225	4.090909091	45.00	4	9
		277	4.090909091	45.00	4	12
	Group 15 (311, 325, 328, 32	329	4.090909091	45.00	4	10
		5	3.909090909	43.00	5	4
	Group 8 (2 , 8, 16, 25)	25	3.909090909	43.00	5	4
		38	3.909090909	43.00	5	4
		45	3.909090909	43.00	5	11
		52	3.909090909	43.00	5	14
		121	3.909090909	43.00	5	2
	Group 21 (122 & 129)	129	3.909090909	43.00	5	2
	Group 17 (136 & 140)	140	3.909090909	43.00	5	10
	Group 26 (165 & 171, 130)	171	3.909090909	43.00	5	3
	Group 20 (211 & 205)	211	3.909090909	43.00	5	3

Group Comparison Chart / Economics Group Scoring Sheet / Natural Group Scoring Shee

Sum=10075.90909   NUM

Natural Resource Group				Economics Group		
Top 5 Scored Parcels				Top 10 Scored Parcels		
Parcel Number	Average Score	Final Score		Parcel Number	Final Score	Average Score
348	4.818181818	53.00		60	60	5
57	4.454545455	49.00		10	58	4.833333333
58	4.454545455	49.00		47	58	4.833333333
110	4.272727273	47.00		121	58	4.833333333
189	4.272727273	47.00		129	58	4.833333333
226	4.272727273	47.00		169	58	4.833333333
223	4.272727273	47.00		223	58	4.833333333
34	4.090909091	45.00		298	58	4.833333333
185	4.090909091	45.00		309	58	4.833333333
215	4.090909091	45.00		9	56	4.666666667
225	4.090909091	45.00		28	56	4.666666667
277	4.090909091	45.00		94	56	4.666666667
329	4.090909091	45.00		106	56	4.666666667
5	3.909090909	43.00		138	56	4.666666667
25	3.909090909	43.00		145	56	4.666666667
38	3.909090909	43.00		164	56	4.666666667
45	3.909090909	43.00		167	56	4.666666667
52	3.909090909	43.00		168	56	4.666666667
121	3.909090909	43.00		171	56	4.666666667
129	3.909090909	43.00		177	56	4.666666667
140	3.909090909	43.00		186	56	4.666666667
171	3.909090909	43.00		193	56	4.666666667
211	3.909090909	43.00		199	56	4.666666667
220	3.909090909	43.00		211	56	4.666666667
342	3.909090909	43.00		271	56	4.666666667

Group Comparison Chart / Economics Group Scoring Sheet / Natural Group Scoring Shee

mportant tems to ote About Scoring

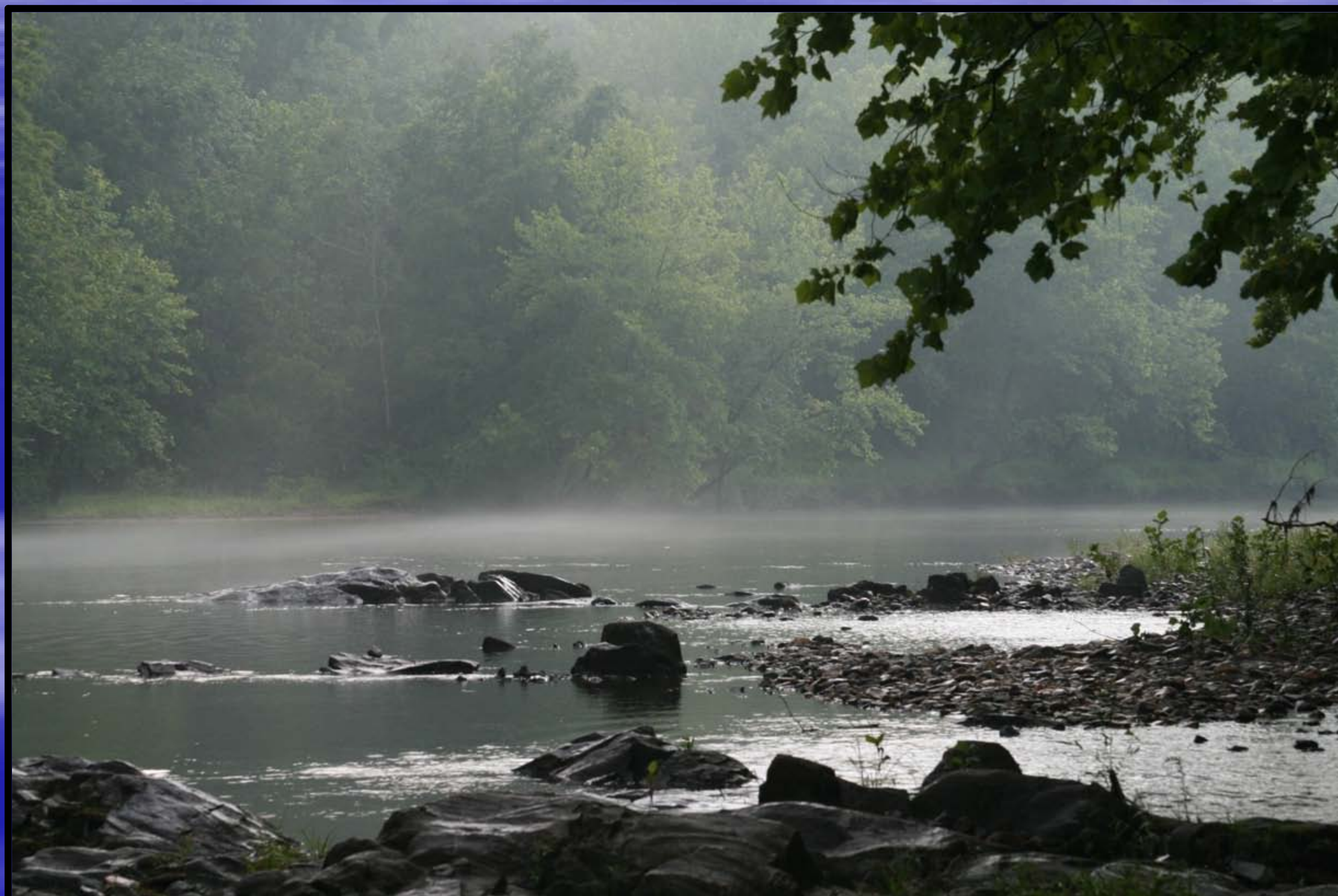
- The same parcels were rated in each group
- A parcel may have received a high score from the natural resource side, but a low score from the economics side
- However, there are some conflicts. Certain parcels rated high on both sides. This is where discussions will take place.

e t Steps

- The TWC (includes Natural Resource and Economics Groups) will convene collectively in the Fall of ’07 for discussions.
- Discussions will mainly center around top-rated parcels of land (i.e. most important to either group).
- A recommendation will be made by the TWC on possible classification changes to top-rated future development lands.

Questions?

nstream Flo Analysis for the Lo er Saluda Ri er



erminology

- F M ncremental nstream Flo Methodology
- PHABS M Physical Habitat Simulation Model
- Mesohabitat Commonly occurring habitat types
- uild A group of species ha ing similar resource re uirements and foraging strategies and therefore ha ing similar roles in the community

Purpose

- Pro ide data   uantifying the effects of flo   s on a uatic habitat suitability in the lo   er Saluda Ri er LSR for target species and lifestages

arget Species

- Redbreast Sunfish
- Spotted Sucker
- Blueback Herring
- American Shad
- Shortnose Sturgeon
- Robust Redhorse
- Saluda Darter
- Shorthead Redhorse
- orthern Hogsucker
- Spottail Shiner
- Striped Bass
- Bro n rout
- Rainbo rout
- Smallmouth Bass

uild Categories

ee S		
S e e	**e t ge**	**S e S e**
A eri an ad		Cataw a Wateree
l e a k erring	awning	
l e a k erring		
ort ern og ker	ad lt	
red rea t n i	ad lt	
ro t red or e	enile	
ro t red or e	ad lt	
otted ker	enile	
otted ker	ad lt	

ee t		
S e e	**e t ge**	**S e S e**
A eri an ad		Cataw a Wateree
A eri an ad	awning	
ort ern og ker	awning	
ort ern og ker	ry	
ort ern og ker	enile	
ort ead red or e	ad lt	
ottail iner	ad lt	

uild Categories

S t		
S e e	**e St ge**	**S e S e**
ent i a roin er	enile	Cataw a Wateree
ro t red or e	awning	
Sal da darter	ad lt	
ottail iner	awning	
otted ker	awning	

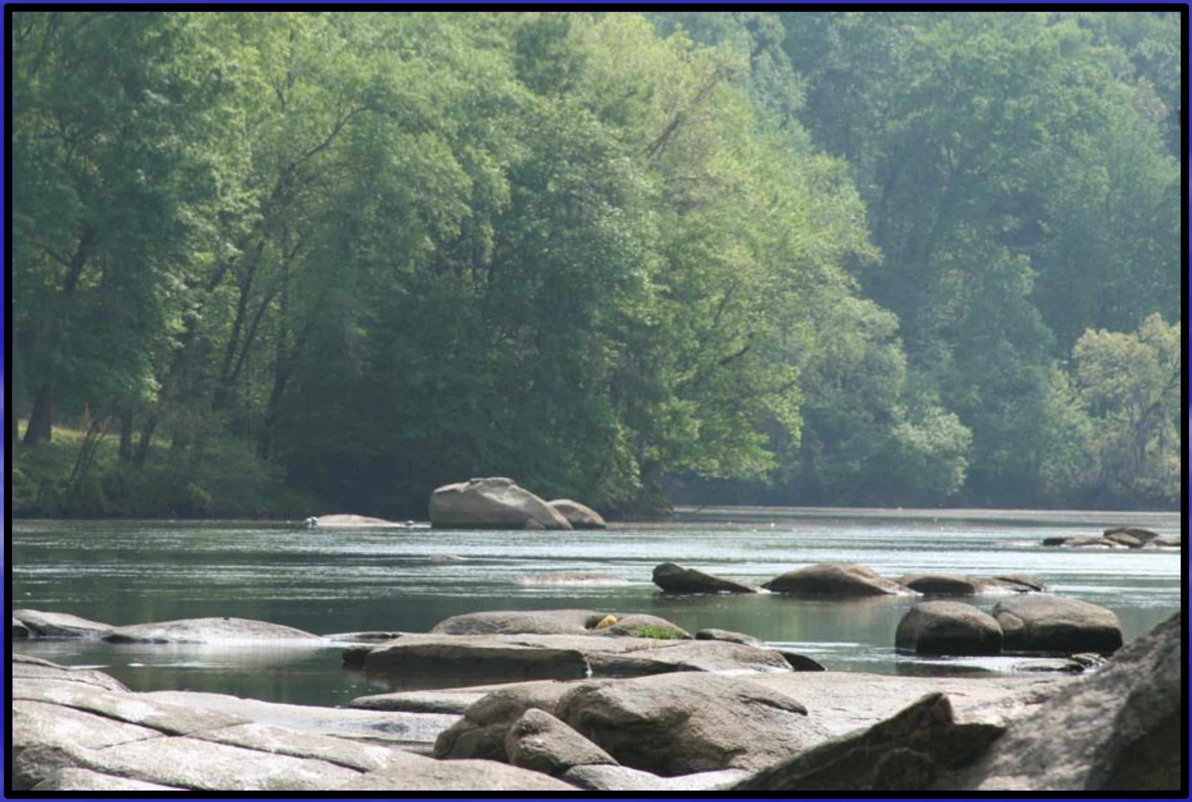
S S		
S e e	**e St ge**	**S e S e**
red rea t n i	awning	Cataw a Wateree
ro t red or e	ry	
otted ker	enile	
otted ker	ry	

Stand Alone Species

- Shortnose Sturgeon
- Bro n rout
- Rainbo rout
- Smallmouth Bass
- Striped Bass

Field Reconnaissance and Habitat Mapping

- Classification and distribution of mesohabitats in the LSR study area



Mesohabitat ypes

Mesohabitat ypes

u enile Adult Spotted Sucker

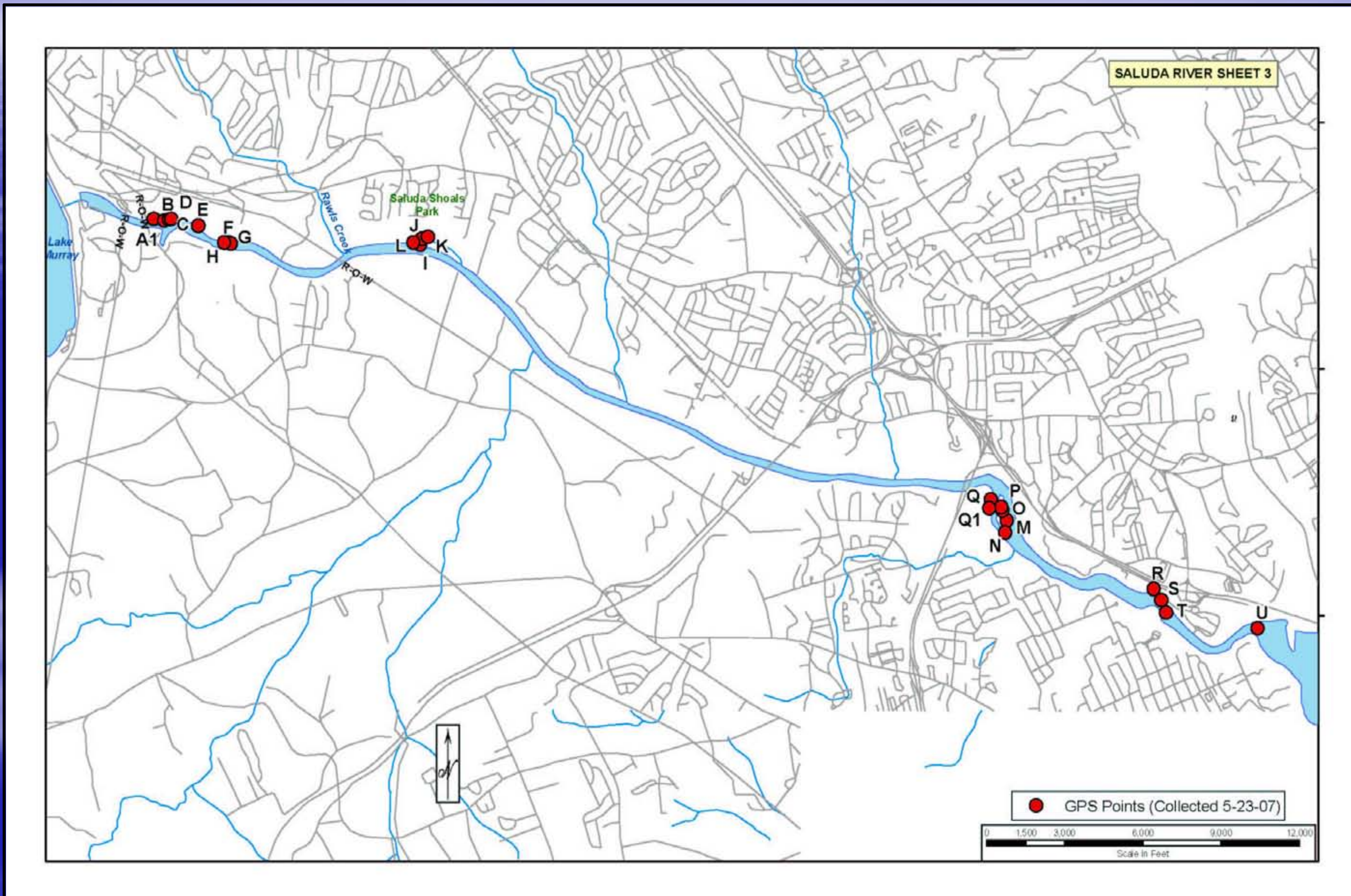
Mesohabitat ypes

Mesohabitat ypes

ransect Selection

- Appro imately transects ere selected

ransect Locations



one of Passage

- One site   as determined to ha e critical   one of passage for migratory fish species

Field Data Collection

- Data as collected at three target flo s
  - – cfs
  - – 1 cfs
  - – 1 cfs

Field Data Collection

- Cross section sur eys and ater surface ele ations ere taken at each transect

Field Data Collection

- elocities flo and slope measurements ere taken at each transect

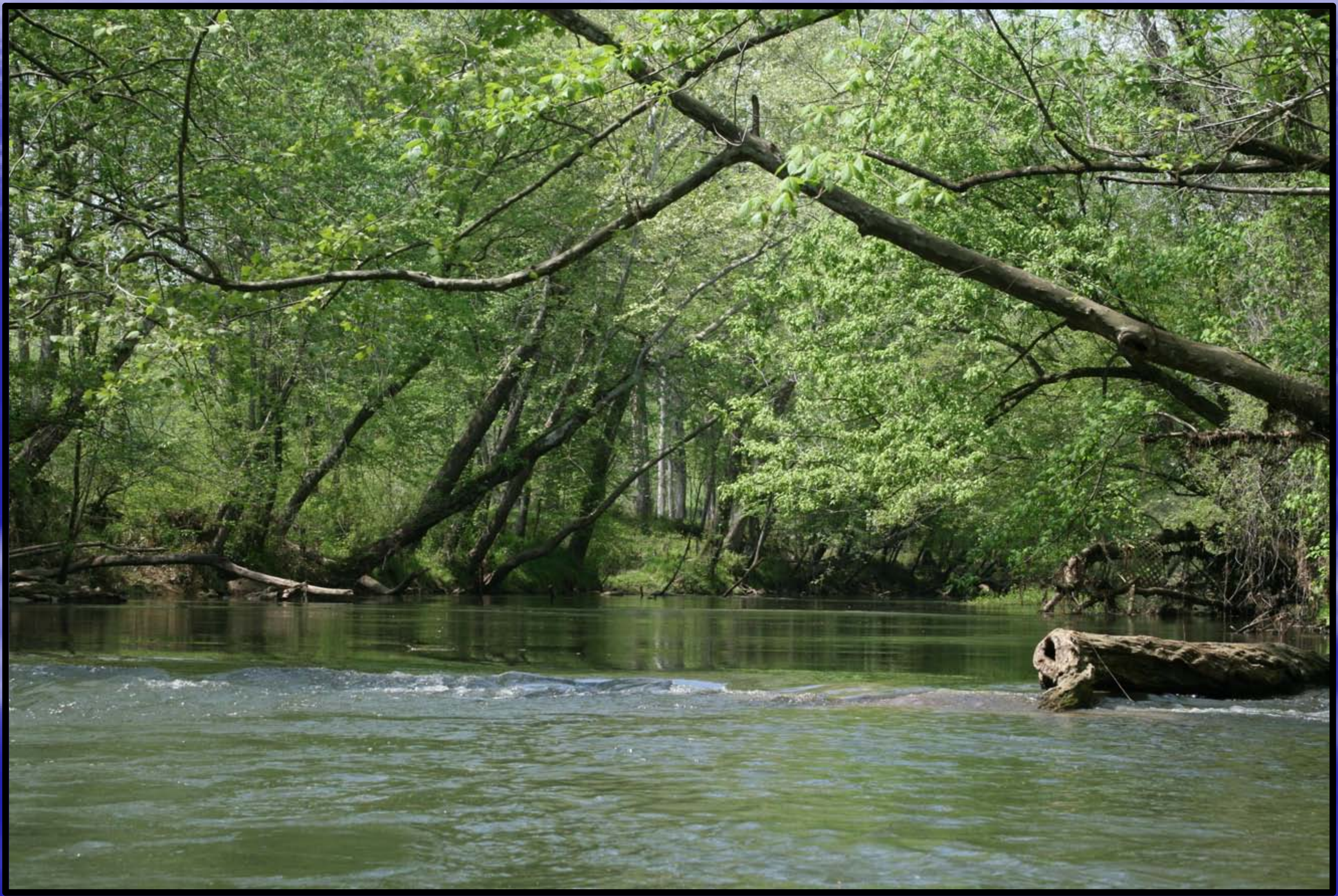
Study Results

- Field data collected at each transect ill be entered in the PHABS M model hich ill be used to e aluate habitat suitability for target fish species in the LSR at arying flo s
- Empirical flo measurements ill also be e amined in the model to e aluate the one of passage hydraulics at Millrace

Reporting

- A draft report ill be prepared for the WC for re ie and comment in the fall of
- Study results ill be used to de elop flo recommendations that best meet habitat needs of target species

Questions?



Recreation Assessment Study Report

Quarterly Public Meeting

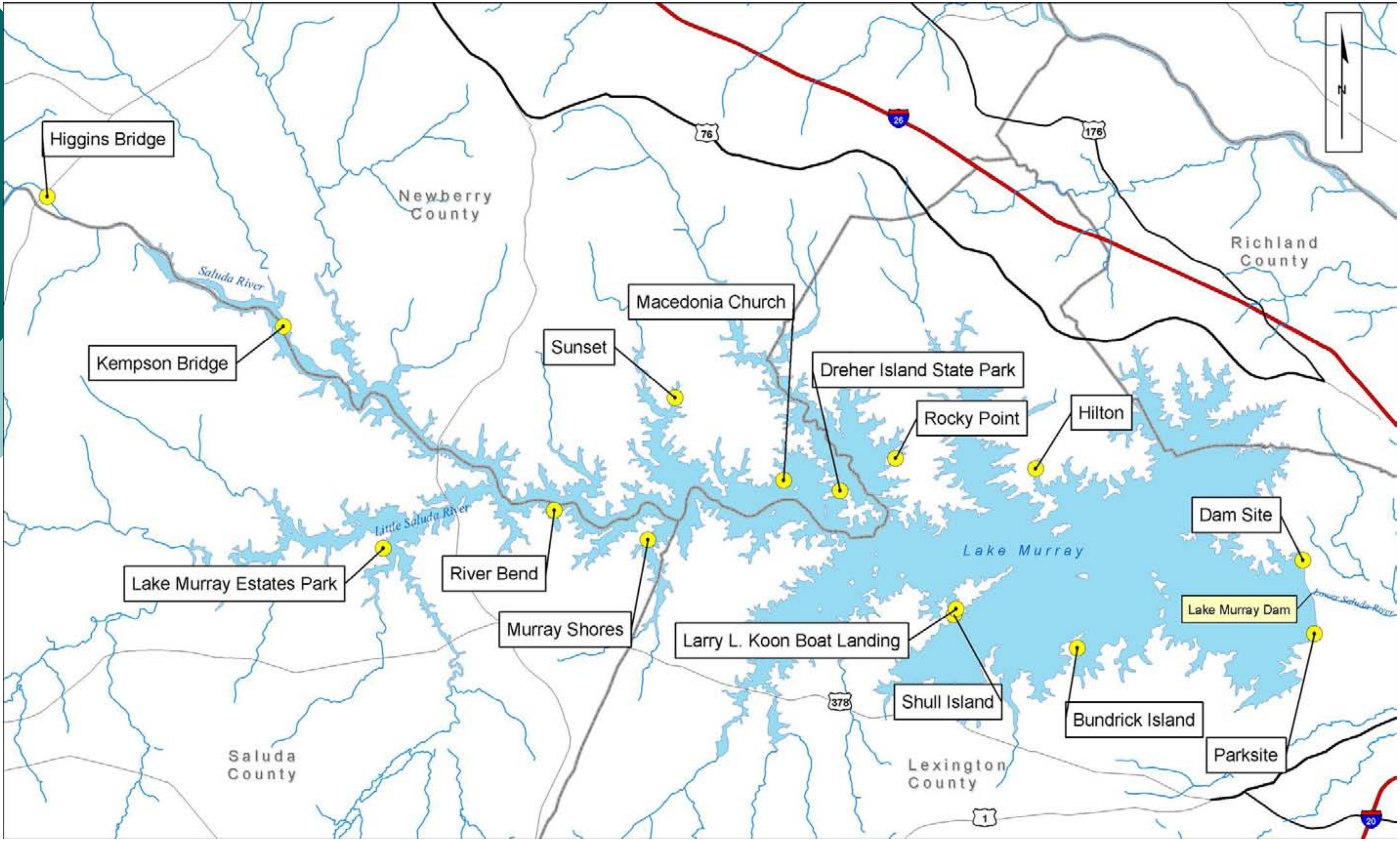
April 19, 2007

Purpose of Study

- Characterize existing recreational use of SCE&G's recreation sites on Lake Murray and the lower Saluda River.
- Identify future recreational needs relating to public recreation sites on Lake Murray and the lower Saluda River.

Lake Murray Sites Included in Study

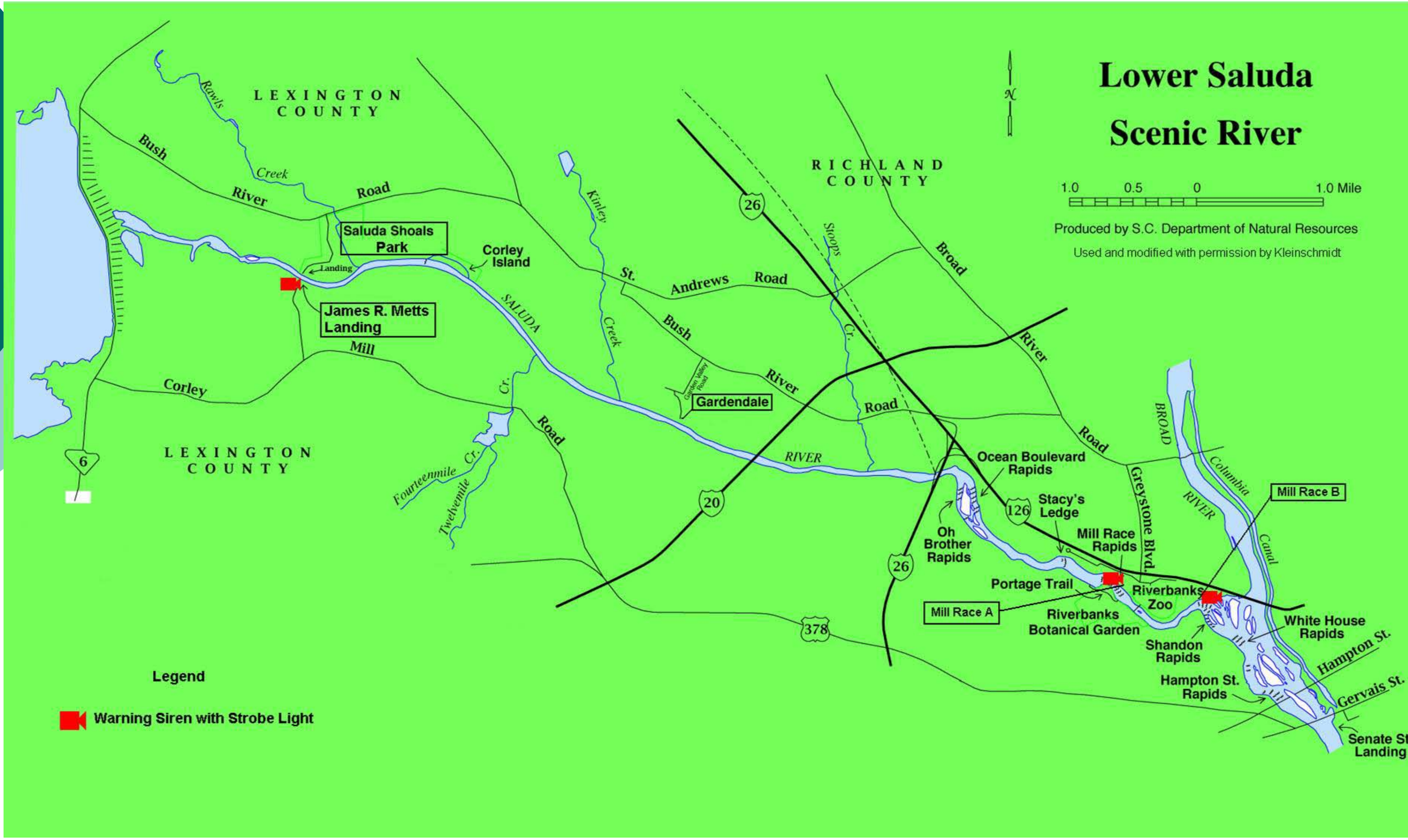
- Dam Site
- Parksite
- Larry L. Koon Boat Landing
- Shull Island
- Bundrick Island
- Murray Shores
- River Bend
- Higgins Bridge
- Kempson Bridge
- Lake Murray Estates Park
- Macedonia Church
- Sunset
- Rocky Point
- Dreher Island State Park
- Hilton



Higgins Bridge
Newberry
County
Saluda River
Kempson Bridge
Macedonia Church
Sunset
Dreher Island State Park
Rocky Point
Hilton
Richland
County
Dam Site
Lake Murray
Little Saluda River
Lake Murray Estates Park
River Bend
Murray Shores
Larry L. Koon Boat Landing
Lake Murray Dam
Lower Saluda River
Shull Island
Bundrick Island
Parksite
Saluda
County
Lexington
County
N
76
26
176
378
1
20

LSR Sites Included in Study

- Mill Race A
- Mill Race B
- Gardendale
- James R. Metts Landing
- Saluda Shoals Park



Lower Saluda
Scenic River
1.0 0.5 0 1.0 Mile
Produced by S.C. Department of Natural Resources
Used and modified with permission by Kleinschmidt
LEXINGTON COUNTY
RICHLAND COUNTY
Saluda Shoals Park
Corley Island
James R. Metts Landing
Gardendale
Ocean Boulevard Rapids
Stacy's Ledge
Oh Brother Rapids
Mill Race Rapids
Portage Trail
Mill Race A
Mill Race B
Riverbanks Zoo
Riverbanks Botanical Garden
Shandon Rapids
White House Rapids
Hampton St. Rapids
Senate St. Landing
Bush River Road
St. Andrews Road
Corley Mill Road
Broad River Road
Greystone Blvd
Hampton St.
Gervais St.
Legend
Warning Siren with Strobe Light

Methods

- Recreation Site Inventory
- Vehicle Counts
- Recreation Site Surveys
- Waterfowl Hunter Focus Group
- Secondary Data Sources

Analysis-Current Use Estimates

- # of vehicles
- # of people per vehicle
- # of day types (week day, weekend, holiday)
- For example:

  ((200 cars * 2 people per car) * 2) * 31

Site	Size	Boat Launch	Fishing Docks/Piers	Picnic Tables	Camp Sites	Restrooms	Swimming Area
Dam Site	6.8	×	×	×		×	
Parksite	17.9			×		×	×
Larry L. Koon	2.2	×		×		×	
Shull Island	0.4	×					
Murray Shores	1.6	×		×		×	
River Bend	11.6	×	×	×		×	
Higgins Bridge	1.1	×					
Kempson Bridge	1.1	×	×				

Site	Size	Boat Launch	Fishing Docks/Piers	Picnic Tables	Camp Sites	Restrooms	Swimming Area
Lake Murray Estates Park	5	✗	✗	✗			
Macedonia Church	5.3			✗			
Sunset	2.3	✗	✗	✗		✗	
Rocky Point	1.7	✗		✗			
Bundrick Island	87.9						
Dreher Island	348	✗		✗	✗	✗	✗
Hilton	4.4	✗	✗	✗		✗	

Site	Size	Boat Launch	Fishing Docks/Piers	Picnic Tables	Camp Sites	Restrooms	Swimming Area
Mill Race A	0.4						
Mill Race B	0.5						
Gardendale	4.6	×					
Saluda Shoals	240	×	×	×		×	
James R. Metts Landing	1	×					

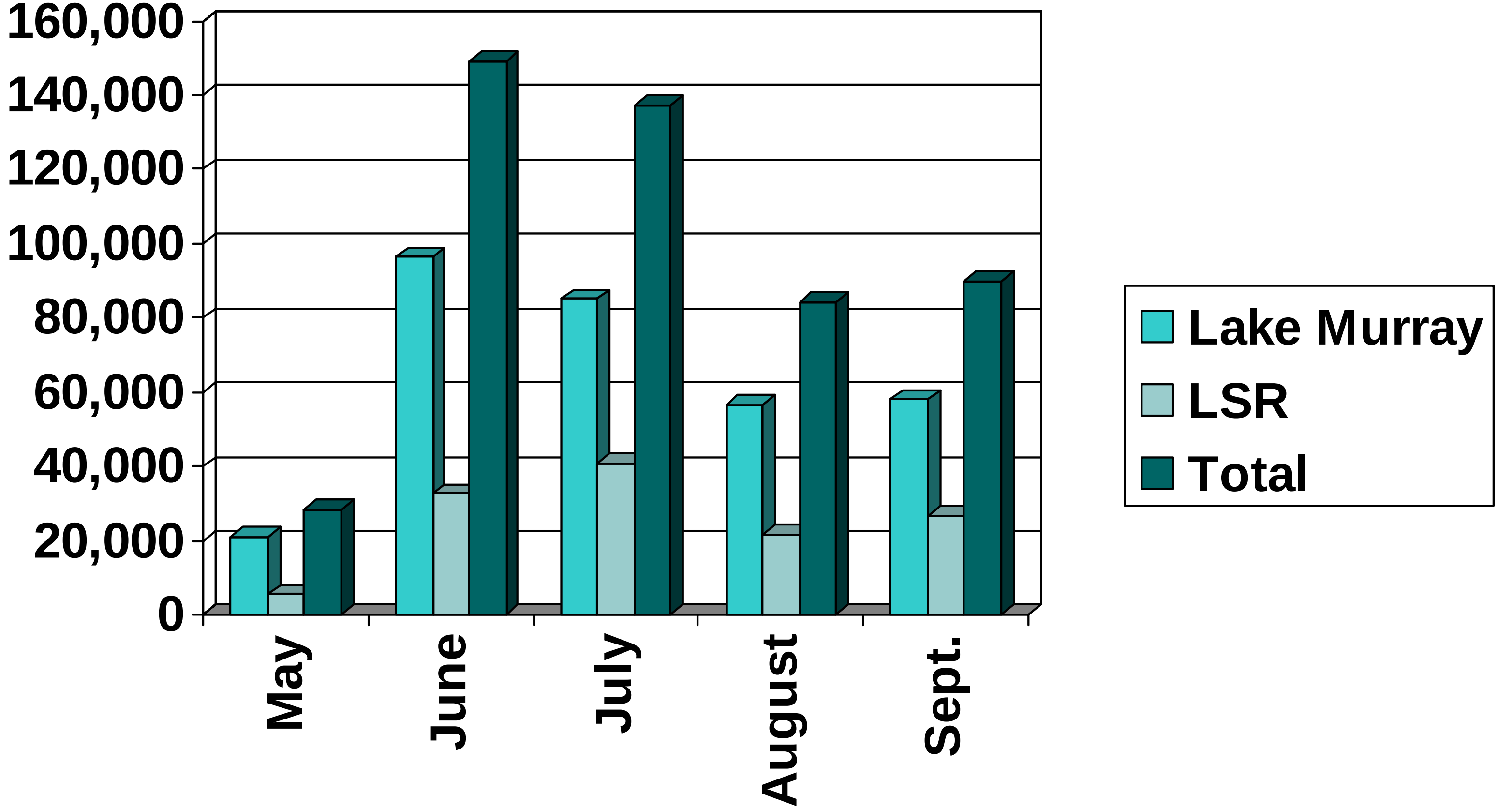
Lake Murray Users

- Mostly male
- Predominantly local residents
- Majority do not own shoreline property
- Location, Location, Location

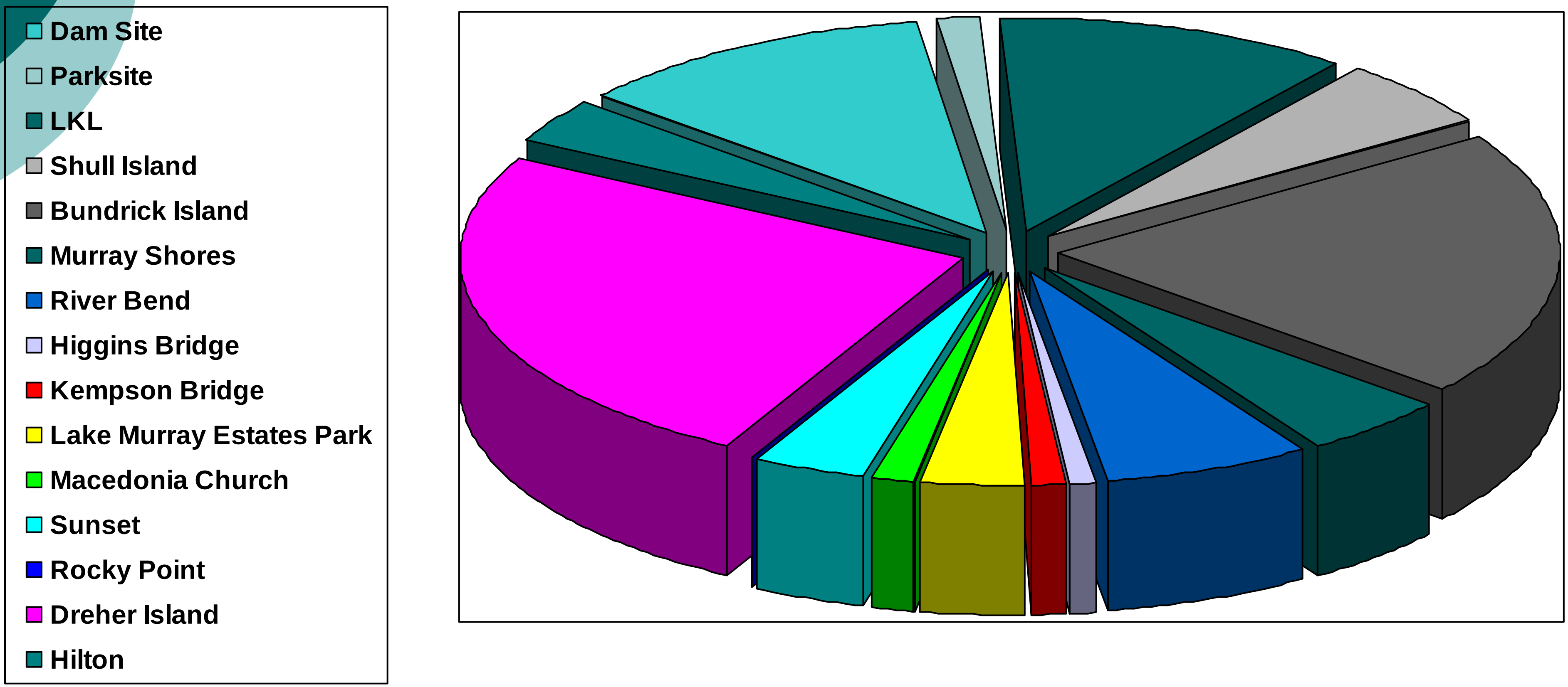
LSR Users

- Mostly male
- Predominantly local residents
- Majority do not own shoreline property
- Not location

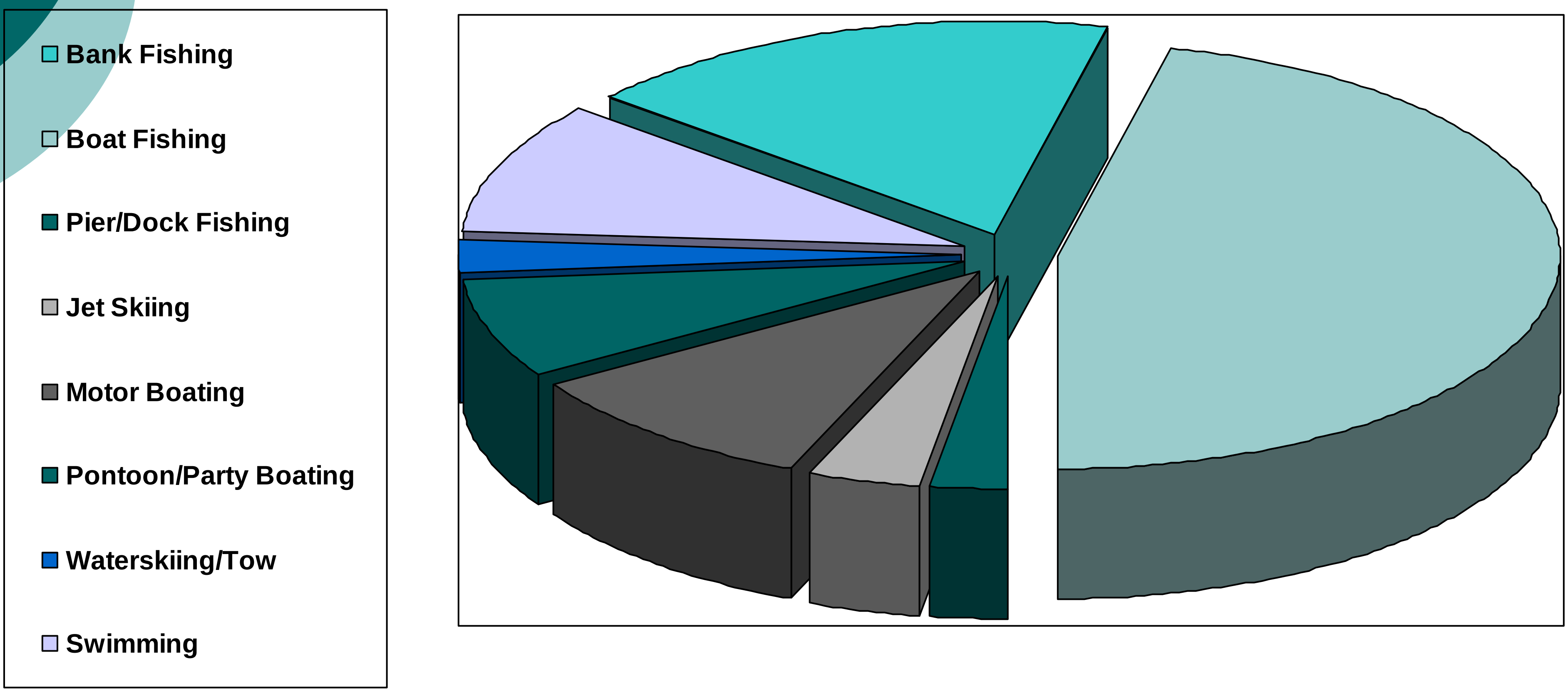
Estimated Recreation Days by Month



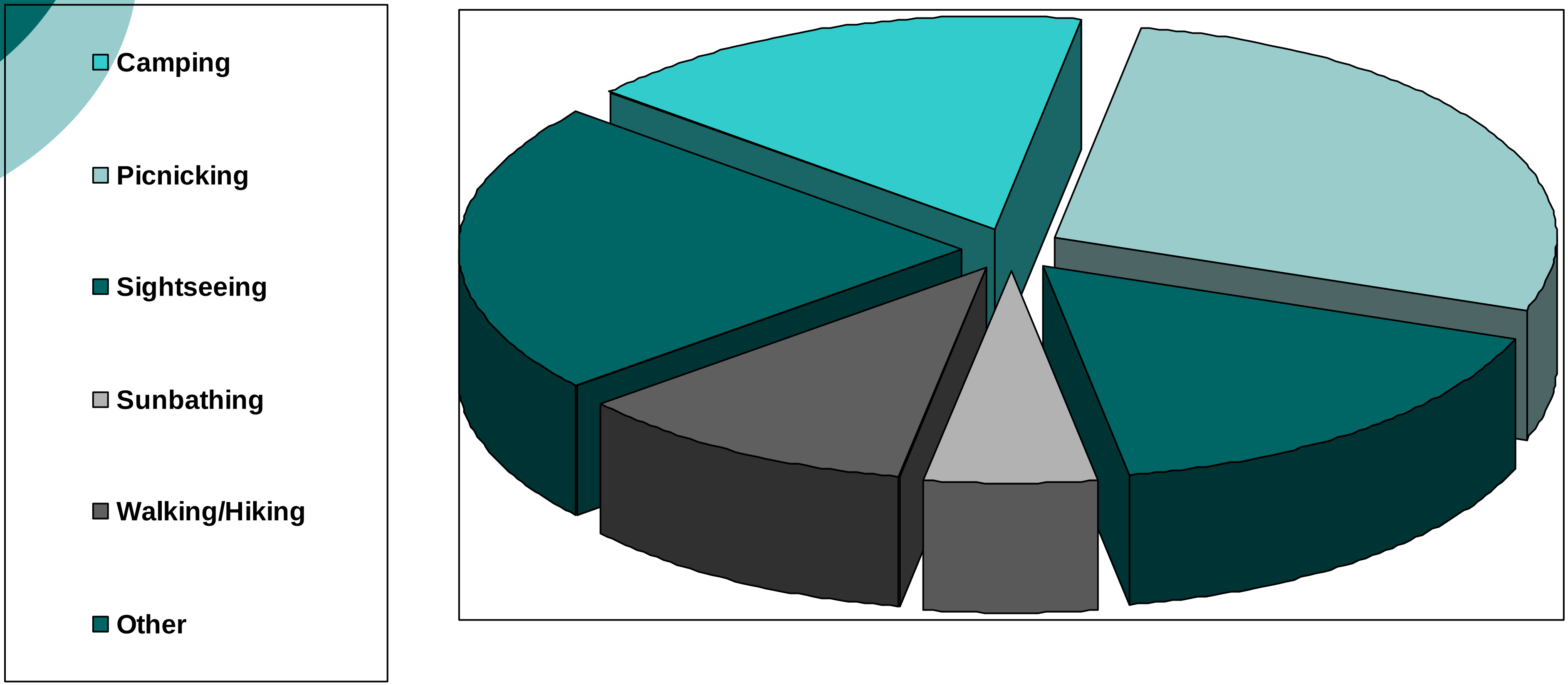
Estimated Recreation Days by Lake Murray Site



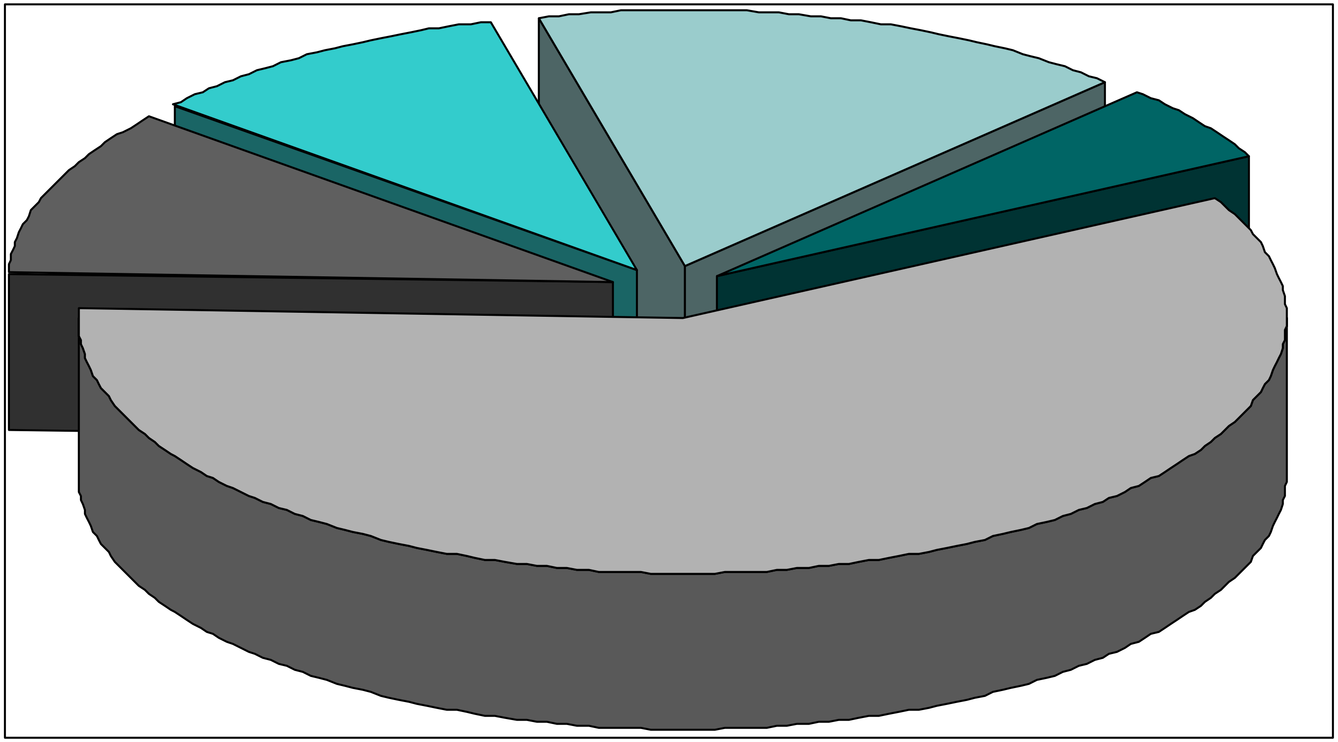
Primary Water-Based Activities on Lake Murray



Primary Land-Based Activities at Lake Murray Sites

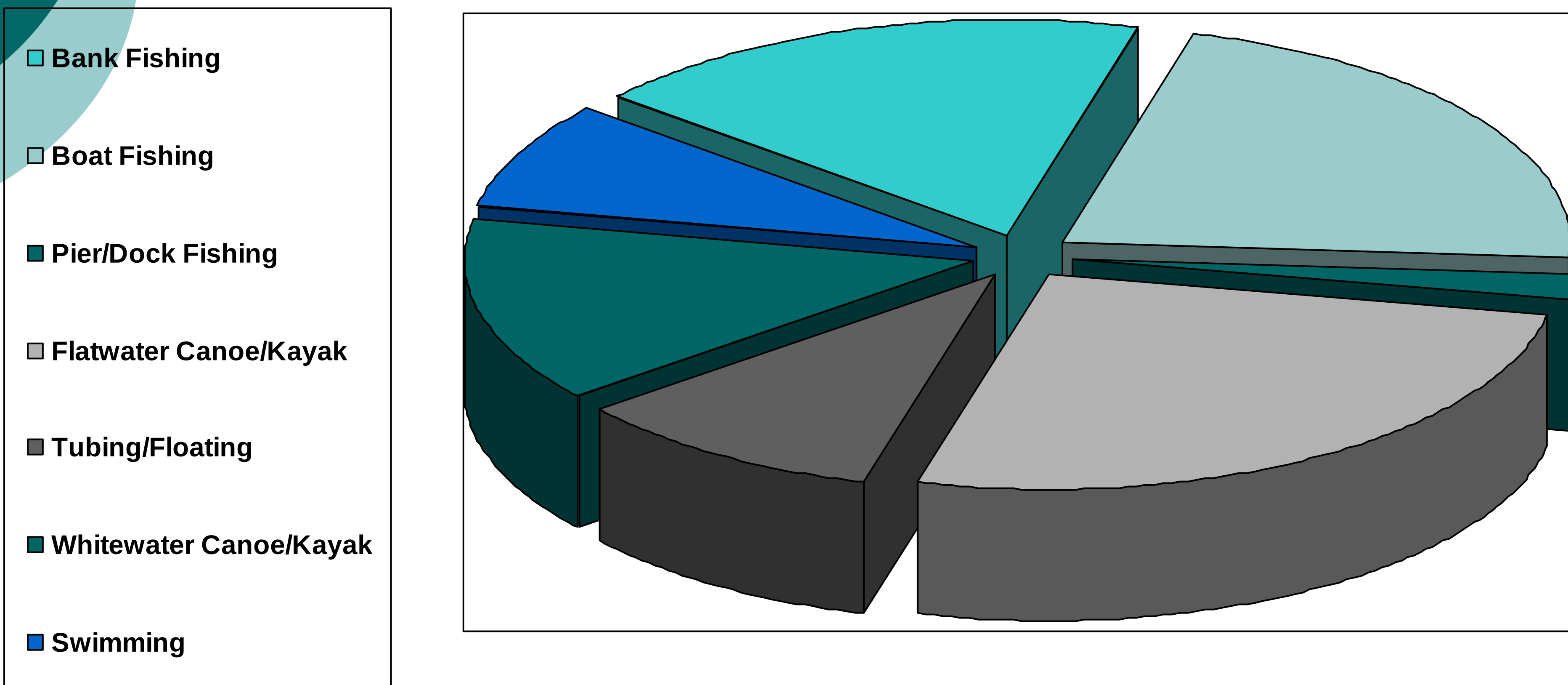


Estimated Recreation Days by Lower Saluda River Site

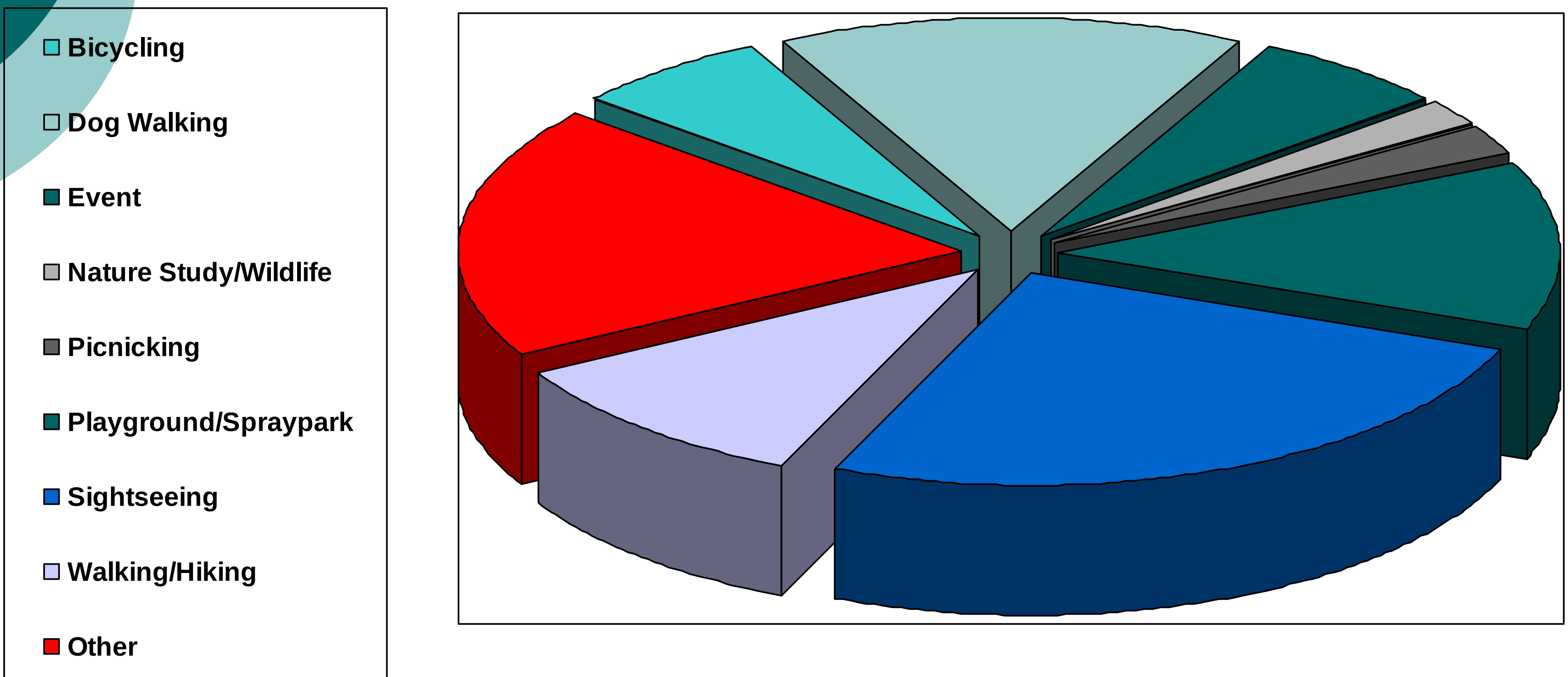


- Mill Race A
- Mill Race B
- Gardendale
- Saluda Shoals Park
- Metts Landing

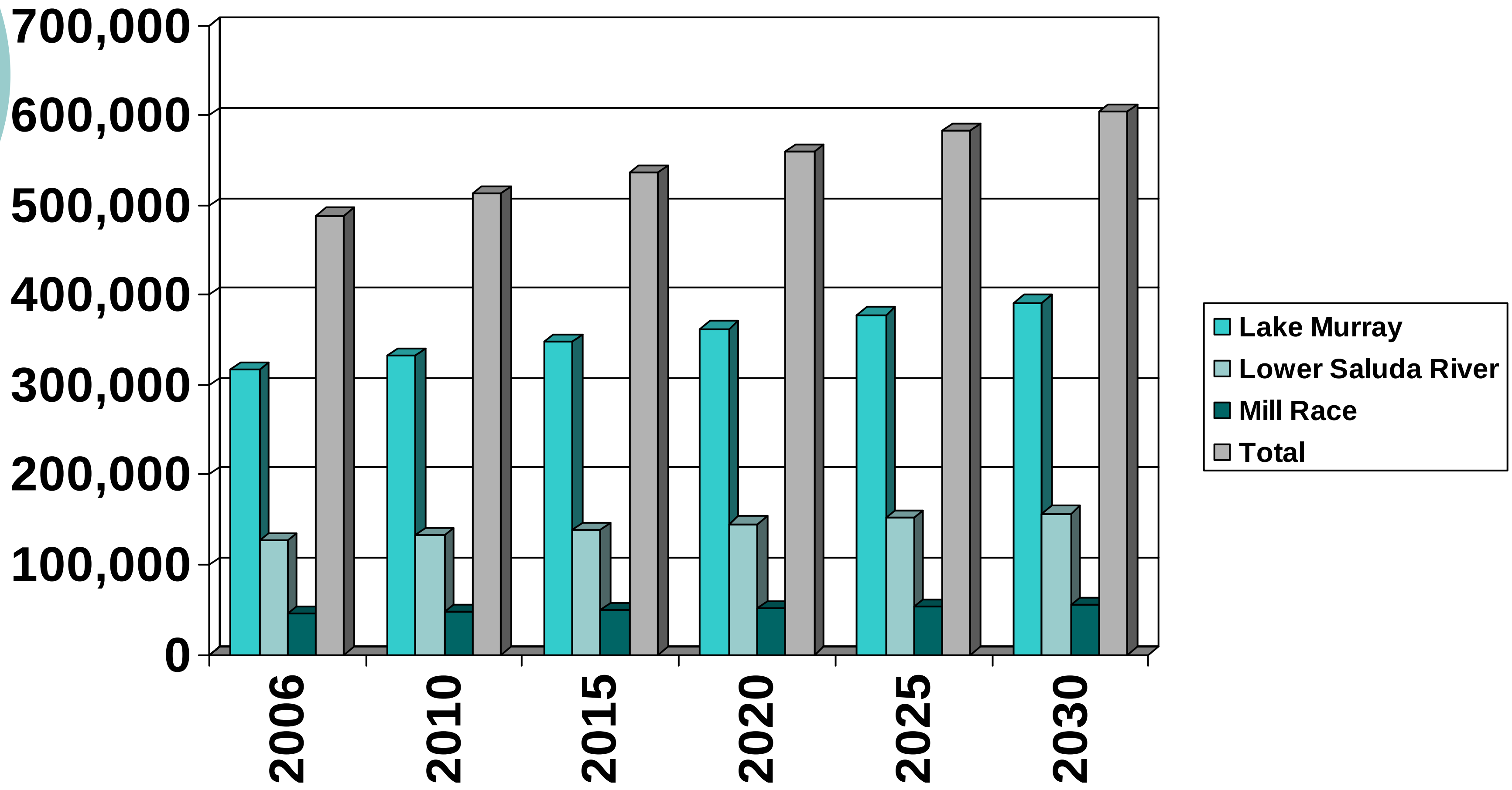
Primary Water-Based Activities on the Lower Saluda River



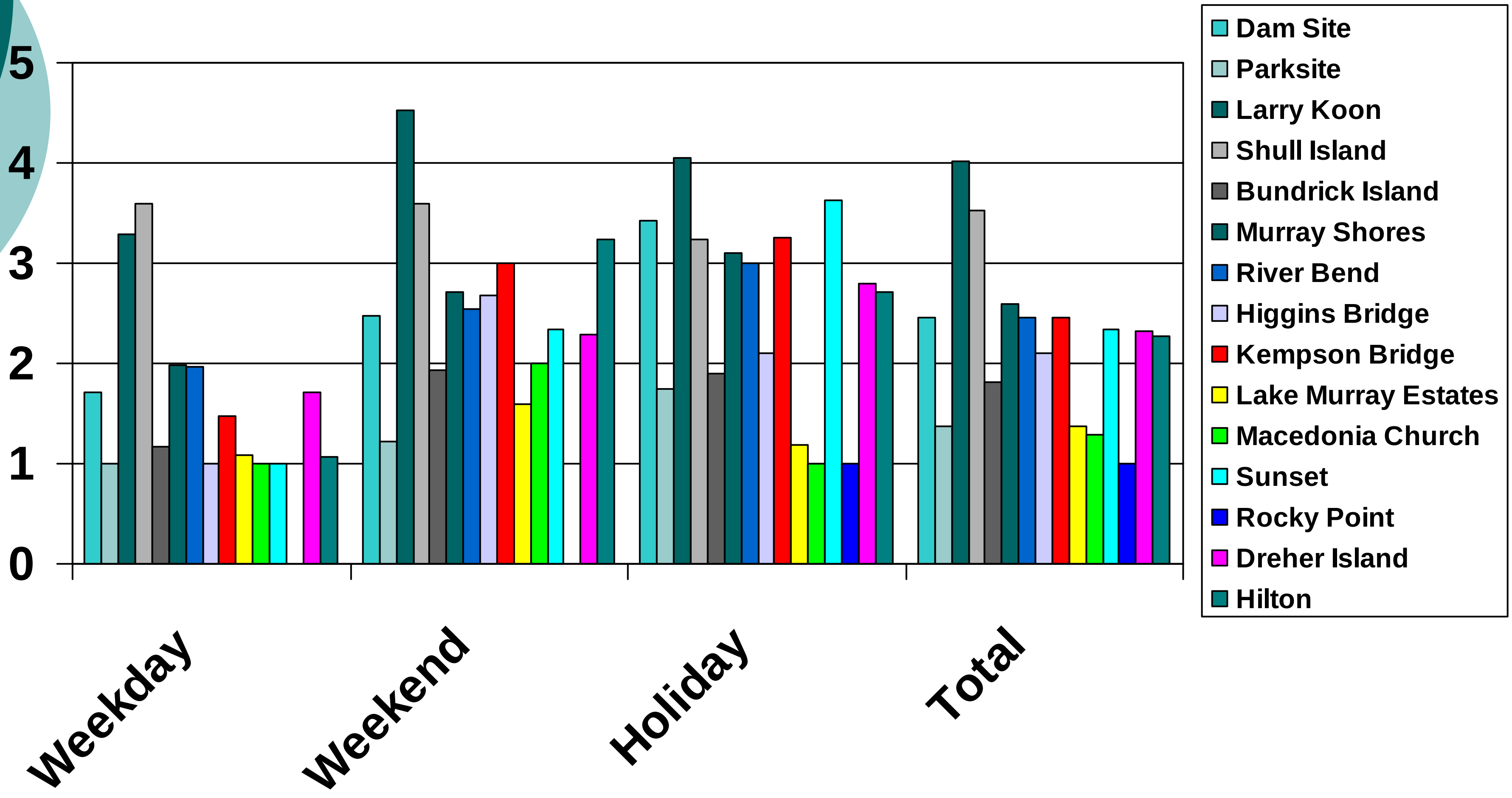
Primary Land-Based Activities at Lower Saluda River Sites



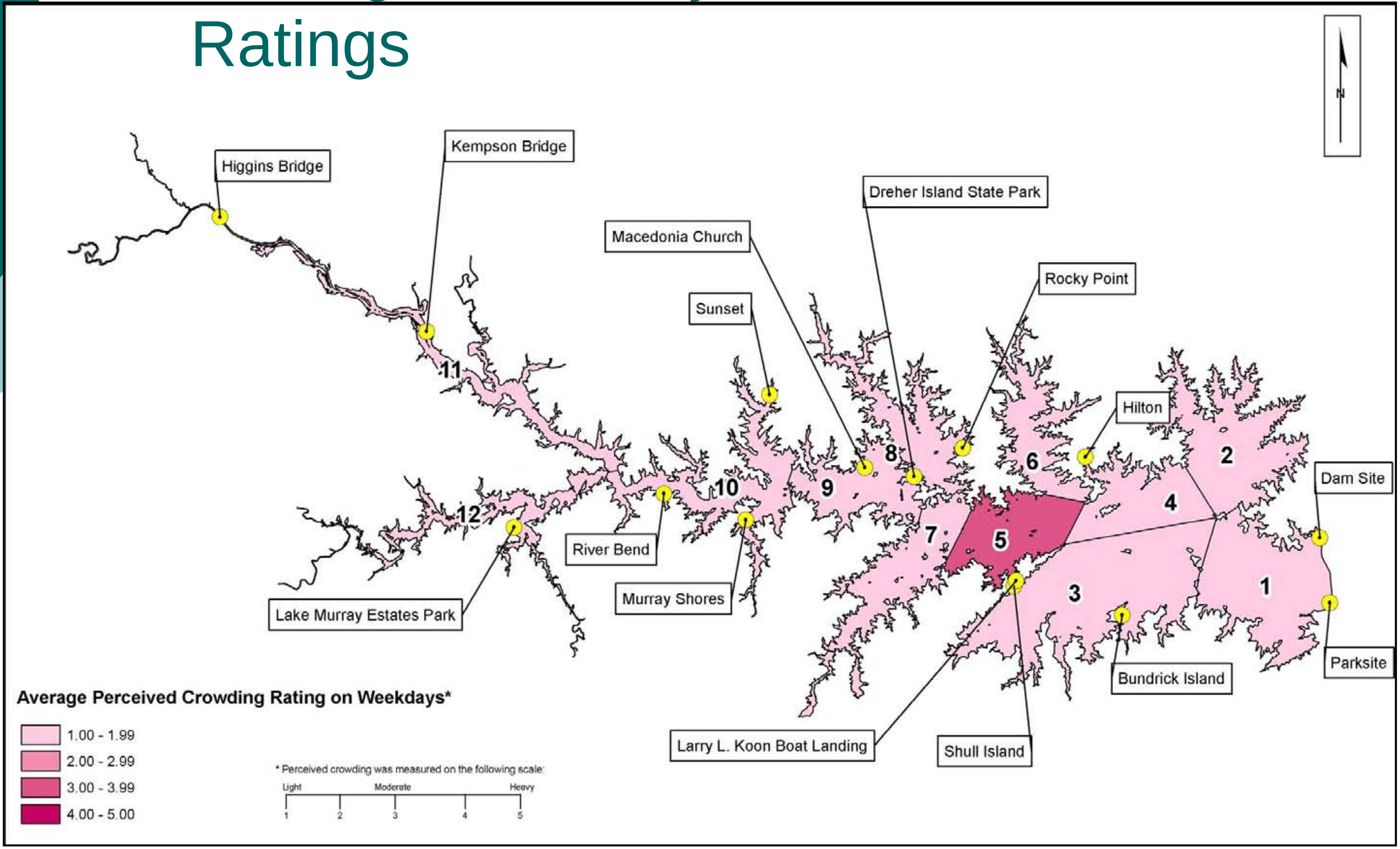
Estimated Future Recreation Days for the Saluda Project



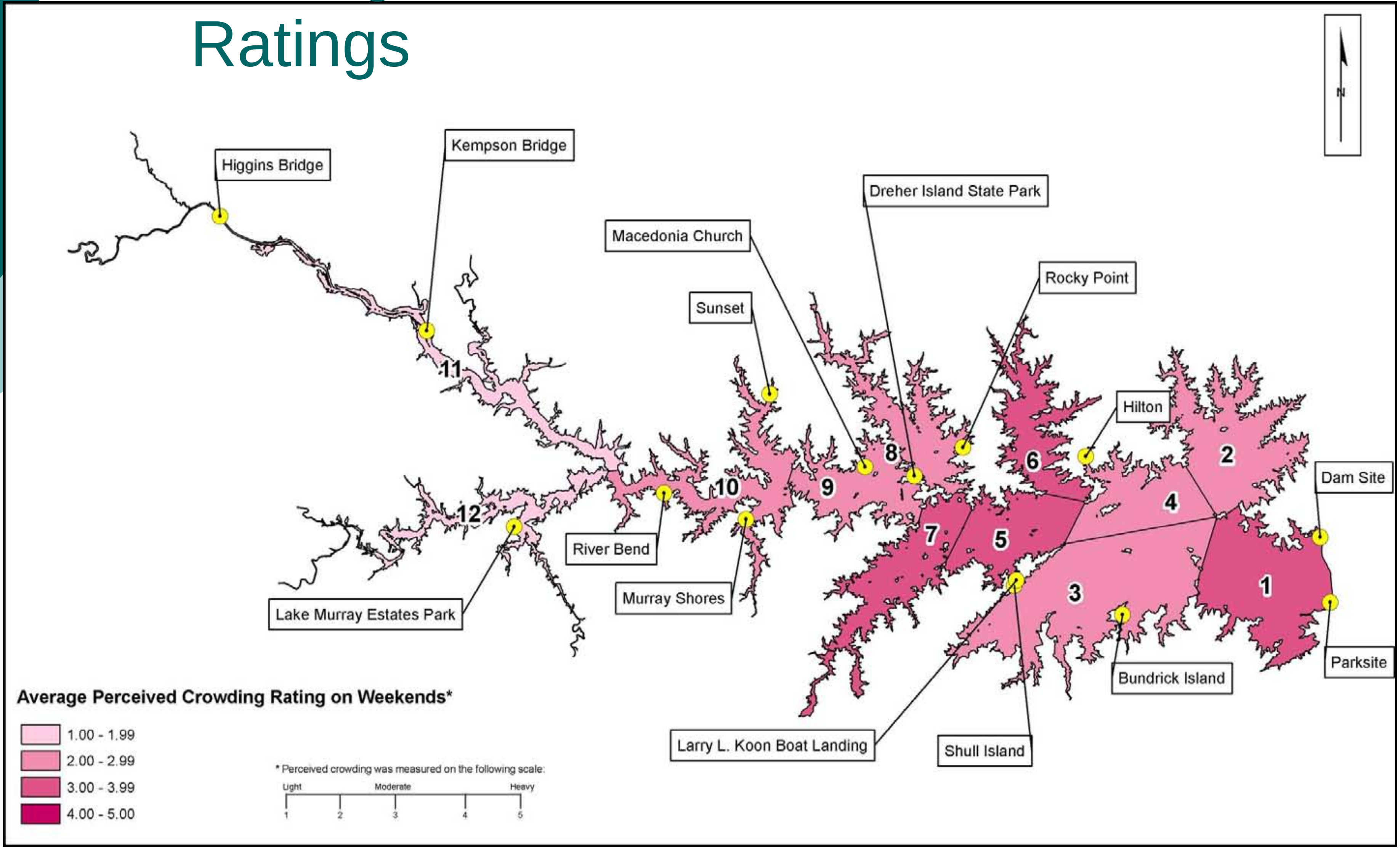
Crowdedness Ratings for Lake Murray Sites



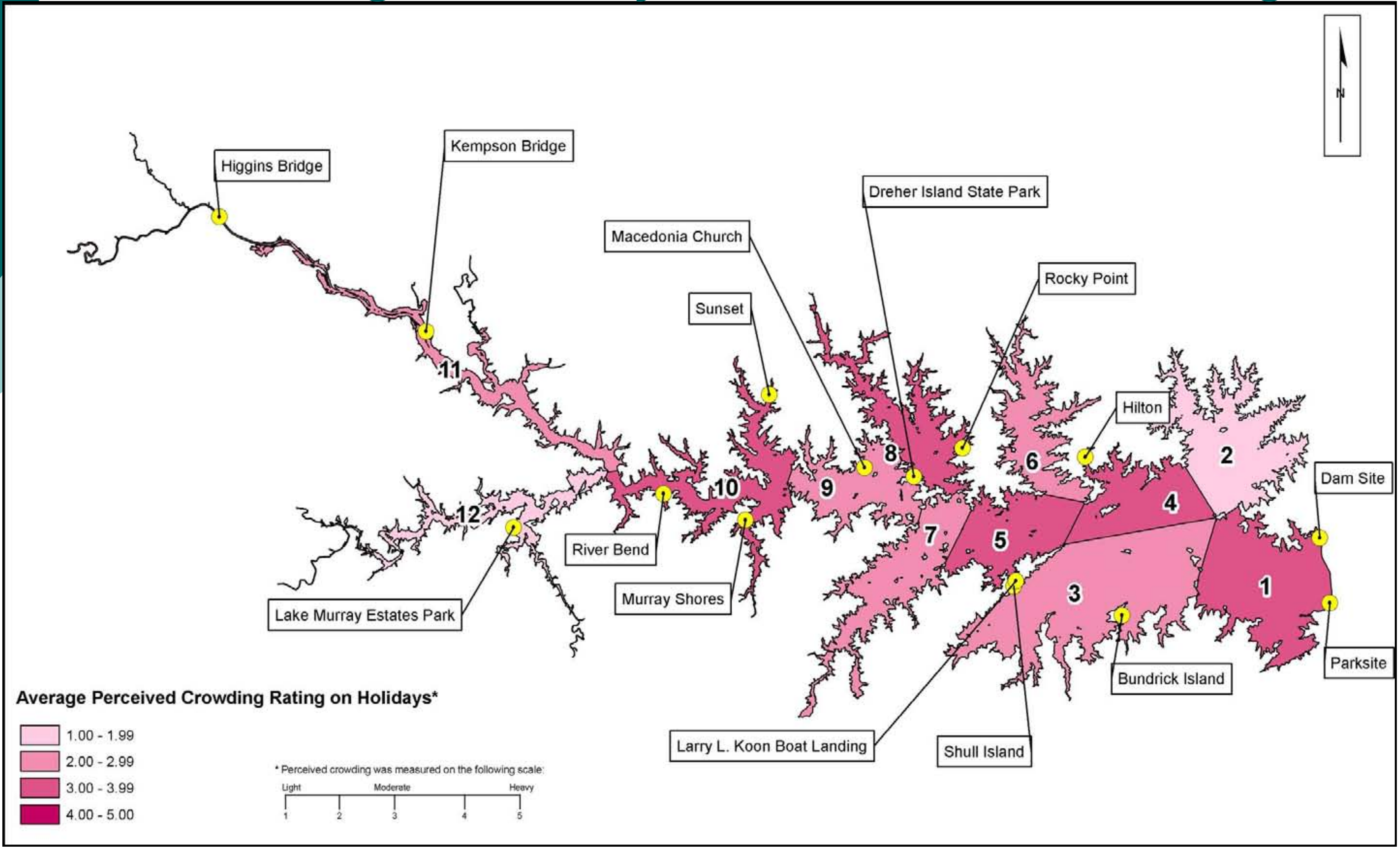
Average Weekday Crowdedness Ratings



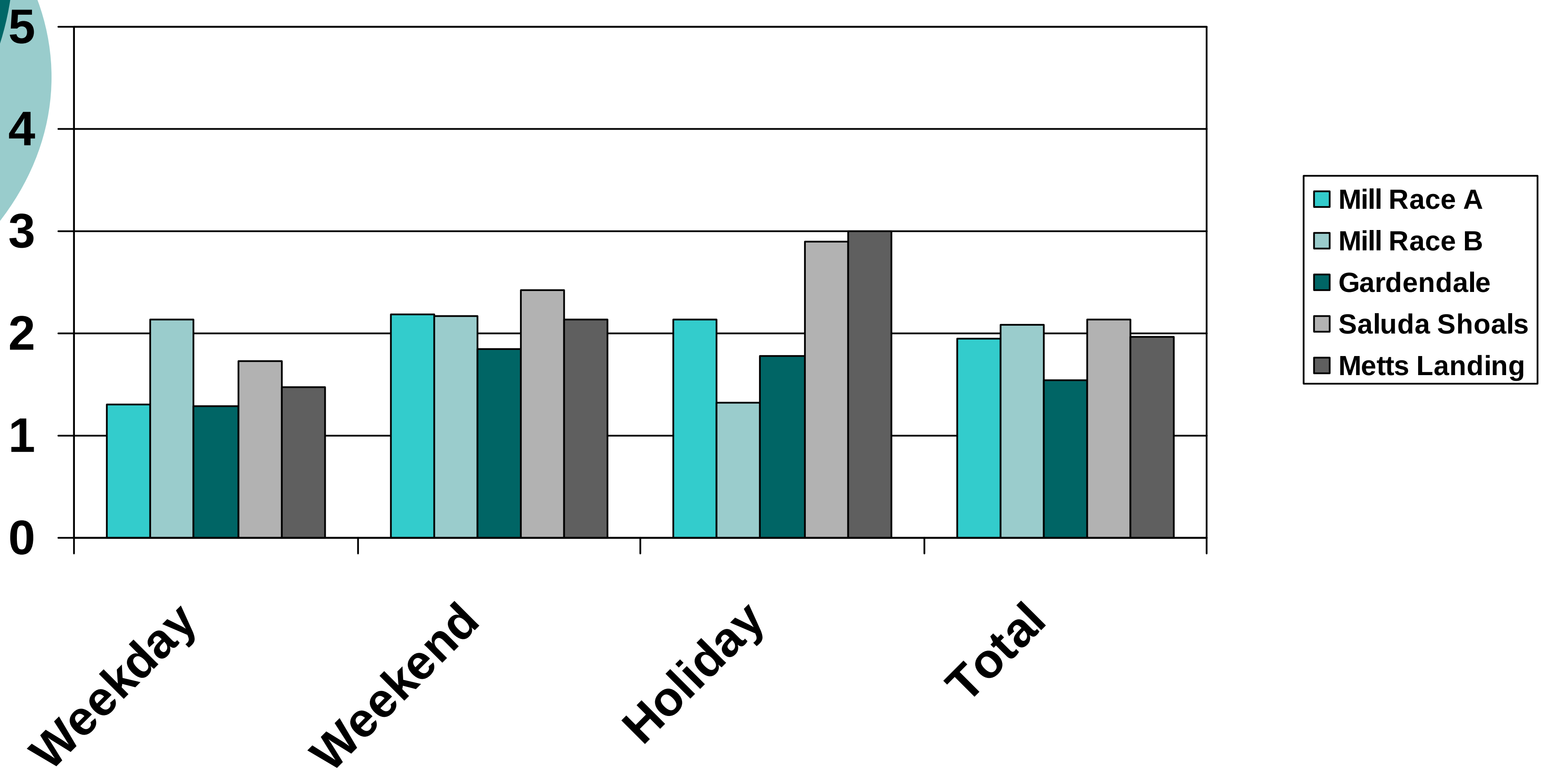
Average Weekend Crowdedness Ratings



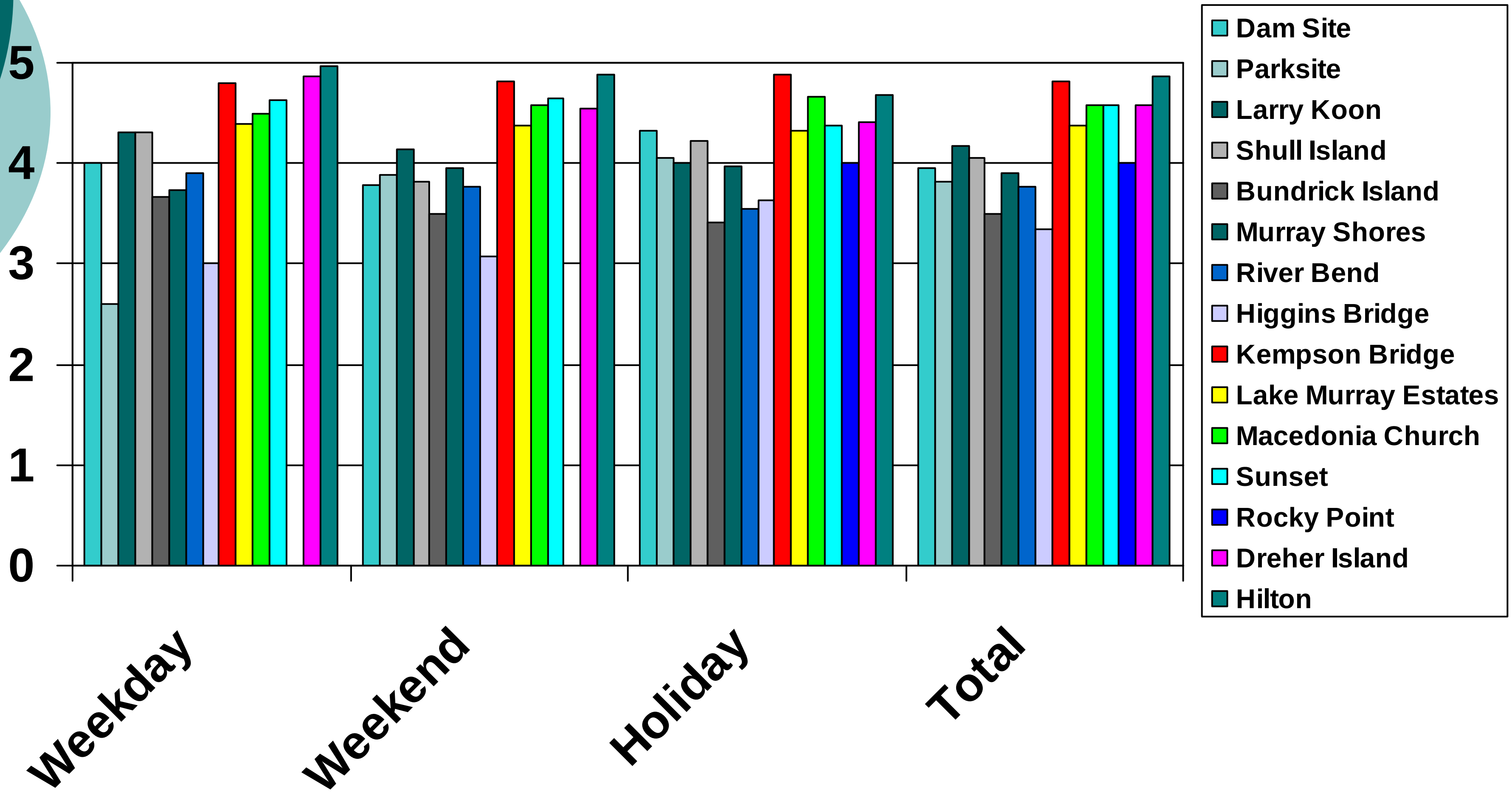
Average Holiday Crowdedness Ratings



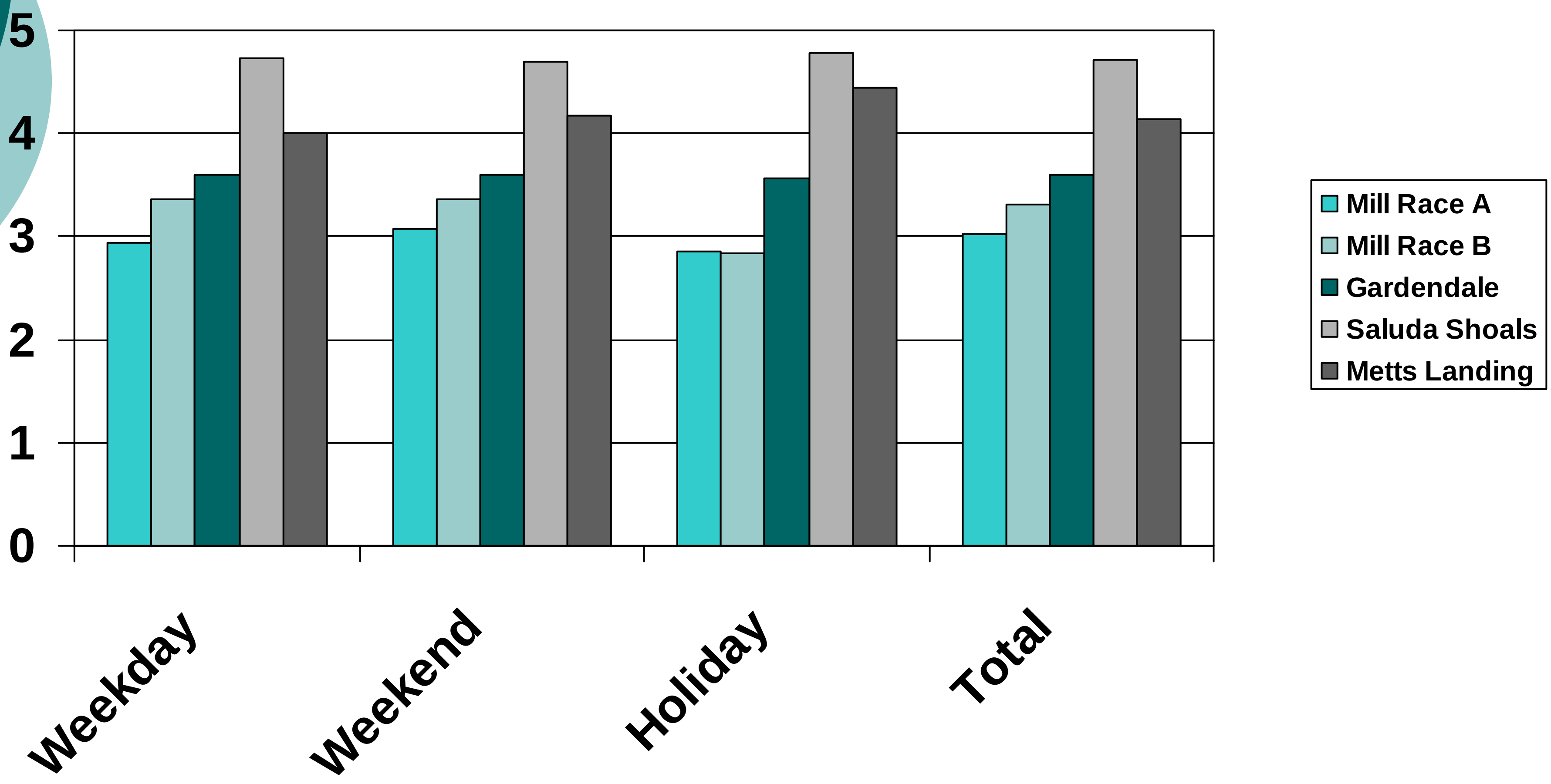
Crowdedness Ratings for Lower Saluda River Sites



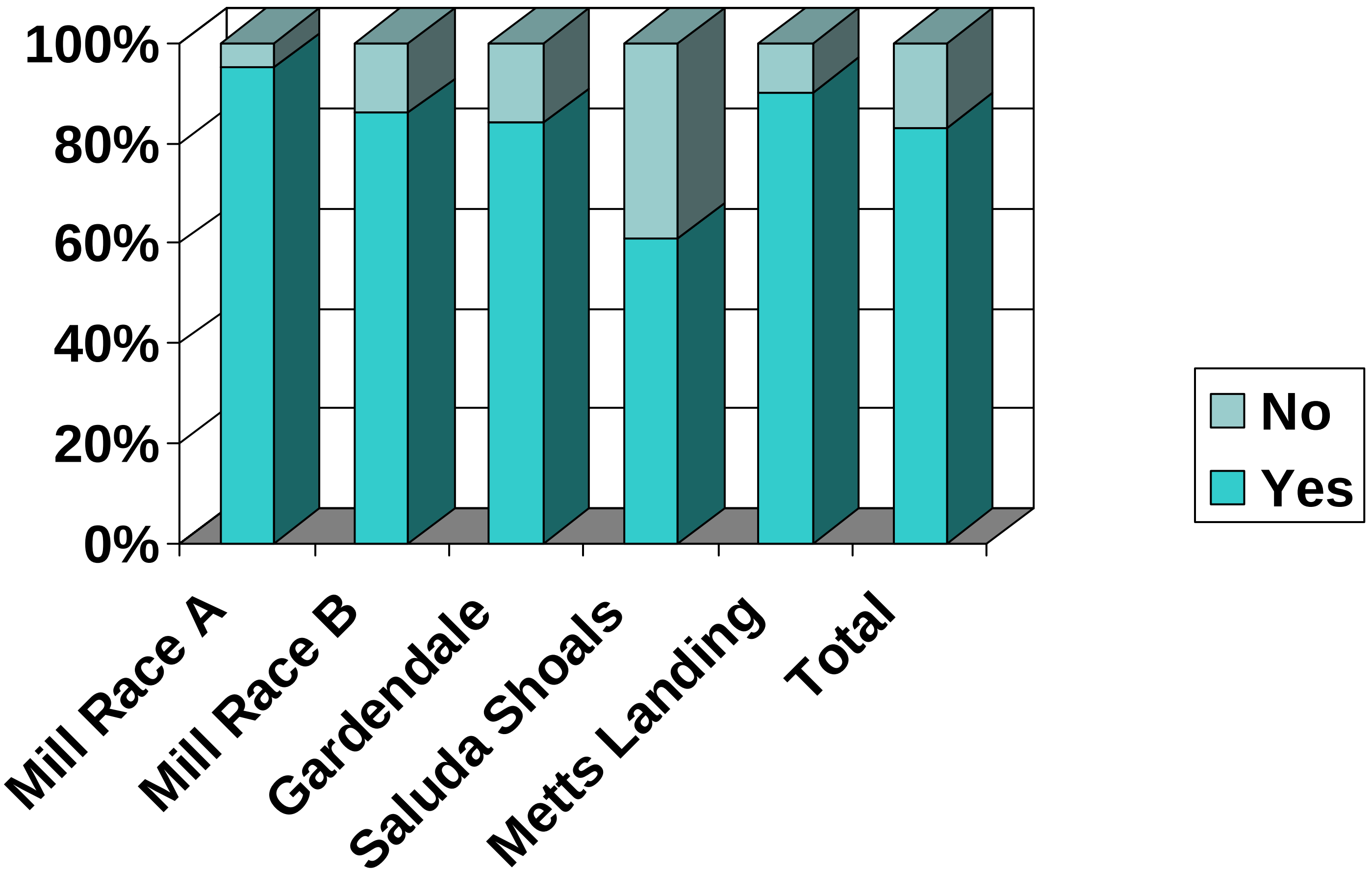
Condition Ratings for Lake Murray Sites

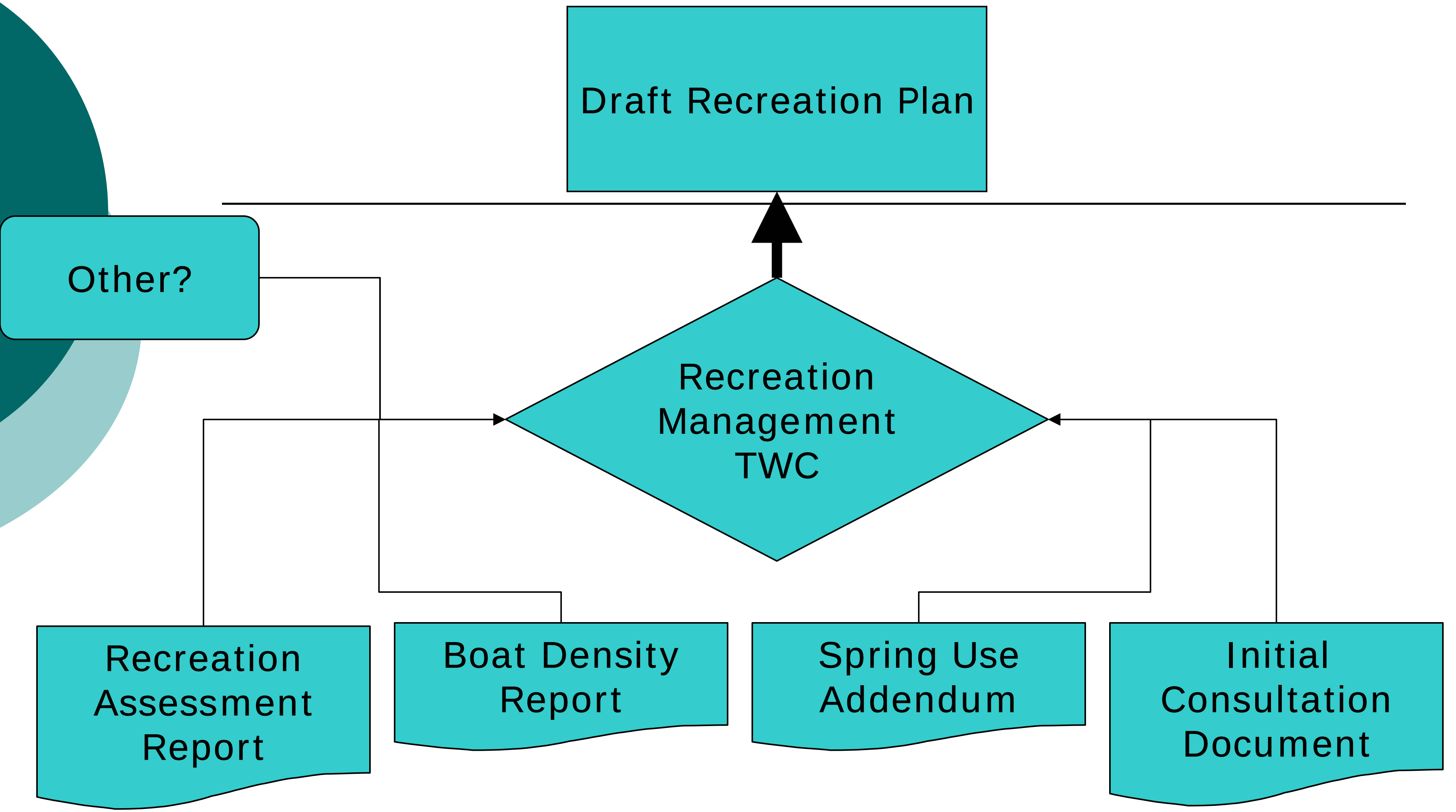


Condition Ratings for Lower Saluda River Sites

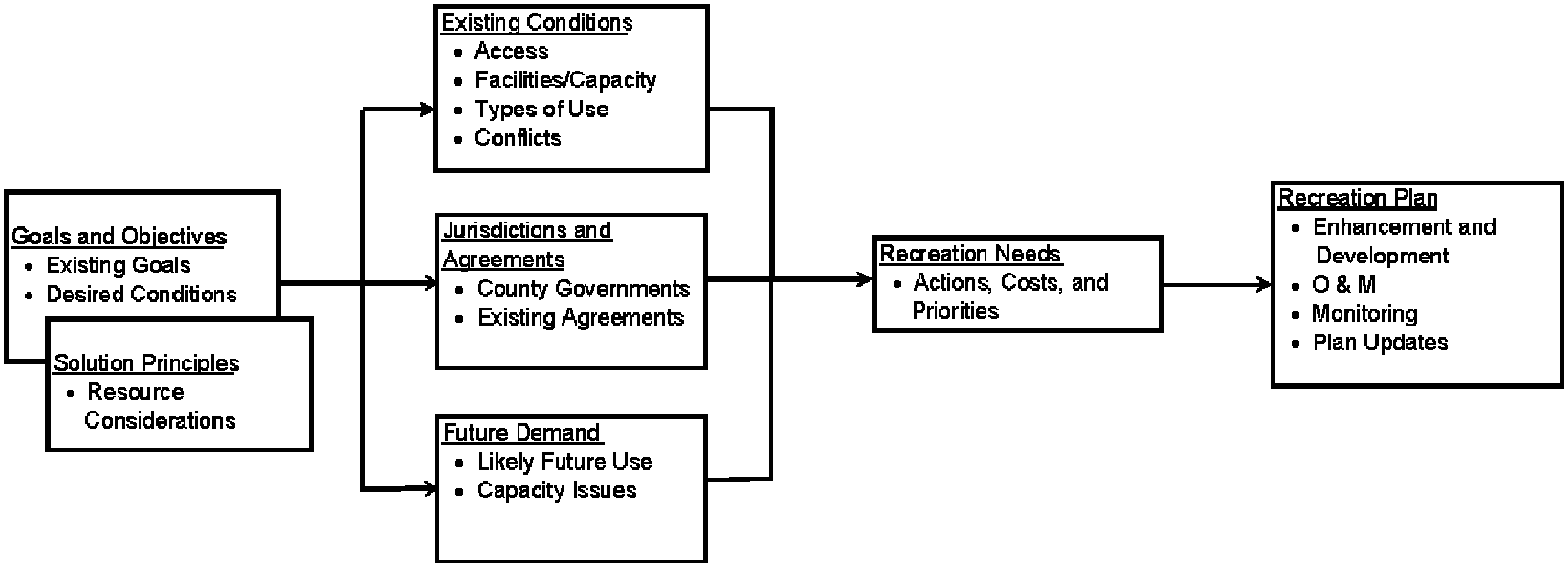


Knowledge of the Presence of Siren and Strobe Lights on the LSR




Draft Recreation Plan
Other?
Recreation Management TWC
Recreation Assessment Report
Boat Density Report
Spring Use Addendum
Initial Consultation Document

Recreation Plan Development
Stepwise Process Diagram



Step 1
Determine Desired Future Condition

Step 2
Establish Baseline Conditions

Step 3
Determine What Is Needed And When

Step 4
Decide How Needs Will Be Met And Who is Responsible

KLEINSCHMIDT ASSOCIATES

Step 3 – Determine What is Needed and When

- Ideas for better or different access.
  - Lower Saluda River Corridor Plan and Update
  - state park on the south side of the reservoir
  - multi-lane boating facility that can accommodate large tournaments
  - consideration of a boat ramp for small trailered boats at Gardendale or further downstream, but above I26, to allow safer upstream motoring towards Metts Landing
- Potential facility enhancements or upgrades
- Potential new facilities, or other management actions.
- What are the priorities regarding identified needs both in terms of resources and time? How do priorities compare across the entire Project?

Questions?

Major Upcoming Events prior to the next Quarterly Public Meeting

- Conduct lower Saluda River (LSR) IFIM Study
- Conduct Recreational Flow Assessment on the LSR
- Recalibration of the Operations Model using extended water year data obtained from USGS
- Conduct Scope of Recreational Study Addendum
- Draft Application Development

Comments/Questions

Saluda Hydro Relicensing Quarterly Public Meeting

Relicensing Process Update

January 11, 2007

Agenda

- Welcome
- Resource Group Updates
- Process and Schedule Update for 2007
- Public Comments/Questions

Saluda Hydro Relicensing Resource Conservation Groups

- Lake and Land Management
- Fish and Wildlife
- Water Quality
- Operations
- Cultural Resources
- Recreation
- Safety

Lake and Land Management Update

Issues addressed to date

In-lake/Shoreline Woody Debris

Buffer Zone Management

Erosion/Sedimentation

Moorings

Public, Private, Commercial Marina policies and criteria

Multi-Use, Common Area policies and criteria

Fringeland Sales

Excavations

Dock Size/criteria

Shoreline Stabilization procedures/techniques

Environmentally Sensitive Area policies

Limited Brushing below elevation 360

Issues to be addressed in 2007

- Land Reclassification/Rebalancing
- Special Recreation Areas
- Public Uses of Fringelands
- Landowner/Public Education

Develop draft Shoreline Management Plan in Fall 2007

New Shoreline Management Plan

What to expect ?

Fish & Wildlife
Resource Conservation Group

Shane Boring
Kleinschmidt Associates

Fish & Wildlife RCG Meetings

Date	*Discussion Topics / (Presenter)*
November 10, 2005	**Development of Mission Statement**
	Saluda Hydro System Control (Lee Xanthakos, SCE&G)
December 7, 2005*	**401 Water Quality Certification for Hydro Projects (Gina Kirkland, SCDHEC)**
	Lower Saluda River Site-Specific Water Quality Standard (Shane Boring, KA)
	Water Quality Update: L. Murray & Lower Saluda (Andy Miller, SCDHEC)
	Water Quality Analysis & CE-QUAL-W2 Modeling for L. Murray (A. Sawyer and J. Ruane, REMI)
February 22, 2006	**Formation of Technical Working Committees**
	Review of Study Requests

* Joint Meeting with Water Quality RCG

Fish & Wildlife Technical Working Committees (TWC's)

- Diadromous Fish
- Rare, Threatened, and Endangered Species
- Instream Flow/Aquatic Habitat
- Terrestrial Resources
- Freshwater Mussels/Benthic Macroinvertebrates
- Fish Entrainment

Diadromous Fish TWC Meetings

Dick Christie, SCDNR	Prescott Brownell, NMFS
Gerrit Jobsis, Am. Rivers	Amanda Hill, USFWS
Ron Ahle, SCDNR	Alan Stuart, Kleinschmidt
Steve Summer, SCANA	Shane Boring, Kleinschmidt
Gerrit Jobsis, Am. Rivers	Diad. Fish Coord., SCDNR

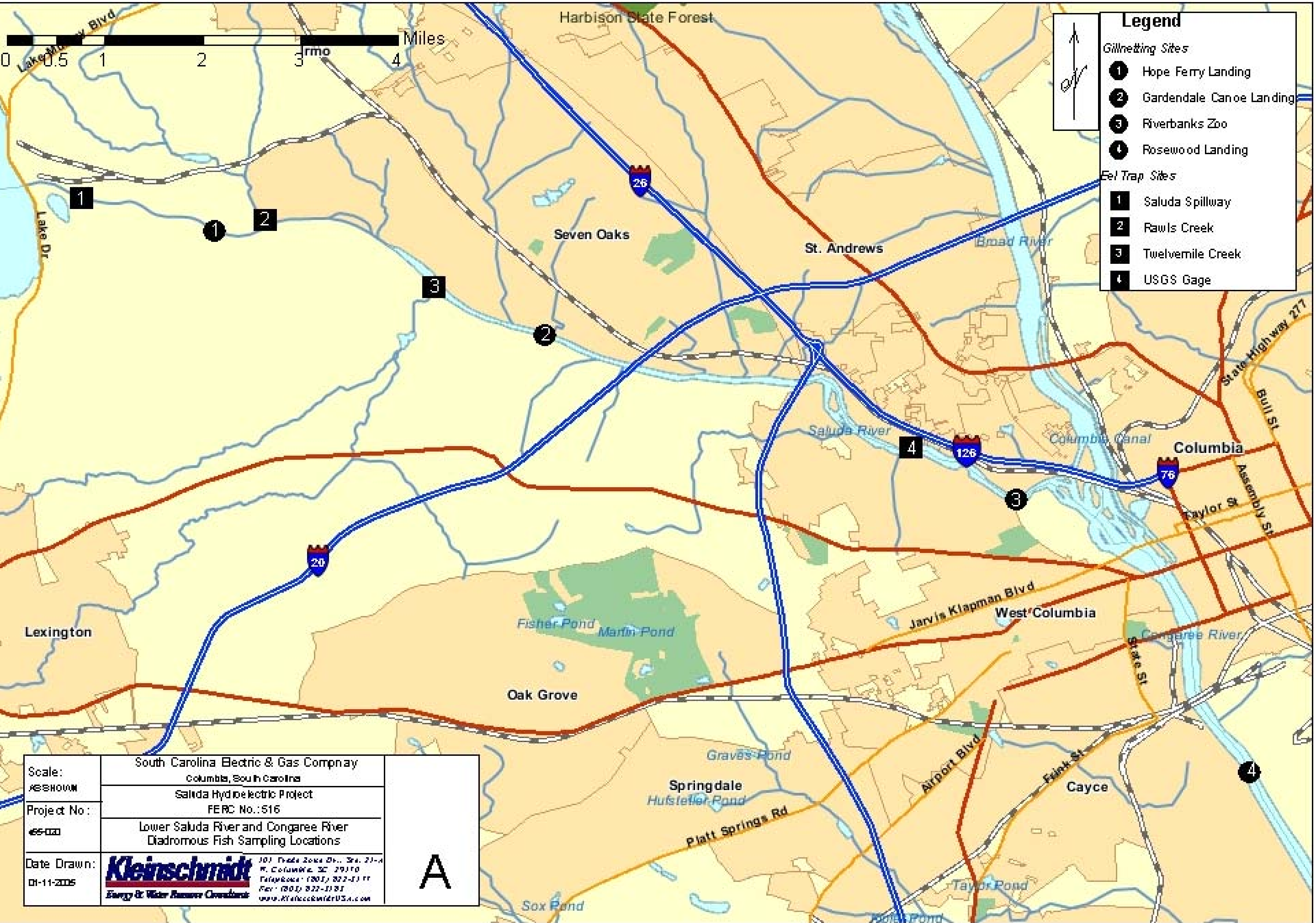
Meetings:

November 11, 2004 **February 22, 2006**

April 17, 2006

Diadromous Fish Studies

- Lower Saluda and Congaree Rivers sampled during Spring 2005 & 2006
- Gillnet sampling for blueback herring, Am. shad, hickory shad
- Eel pots to sample for adult and sub-adult American eels
- Telemetry study to determine migratory patterns of spawning Am. shad



Legend
Gillnetting Sites
1 Hope Ferry Landing
2 Gardendale Canoe Landing
3 Riverbanks Zoo
4 Rosewood Landing
Eel Trap Sites
1 Saluda Spillway
2 Rawls Creek
3 Twelvemile Creek
4 USGS Gage
Miles
0 0.5 1 2 3 4
Harbison State Forest
Seven Oaks
St. Andrews
Broad River
Saluda River
Columbia Canal
Columbia
Lexington
Oak Grove
Fisher Pond
Martin Pond
West Columbia
Congaree River
Jarvis Klapman Blvd
Taylor St
Assembly St
Bull St
State Highway 277
State St
Springdale
Hufstetler Pond
Graves Pond
Platt Springs Rd
Airport Blvd
Frink St
Cayce
Taylor Pond
Sox Pond
Lake Dr
Scale:
AS SHOWN
Project No:
Date Drawn:
01-11-2005
South Carolina Electric & Gas Compnay
Columbia, South Carolina
Saluda Hydroelectric Project
FERC No.: 516
Lower Saluda River and Congaree River
Diadromous Fish Sampling Locations
Kleinschmidt
Energy & Water Resource Consultants
A

Diadromous Sampling Results

- 2005 Gillnetting: 14 species, but no shad or herring
- 2006 Gillnetting: 15 species, no shad or herring
  - Reports available on website
- No eels captured during sampling
  - > 25,000 trap hours
  - Several incidental captures outside of sample period

Experimental Eel Traps

- Installed at Saluda Spillway and USGS gage below dam
- Designed to capture in-migrating juvenile eels
- None captured to date

American Shad Telemetry Study

- Objective: determine migration patterns of American shad during spawning run
- 50 American shad implanted with acoustic tags - Spring 2007
- Monitored using array of receivers in Lower Saluda, Broad and Congaree

Fish Entrainment TWC

Alan Stuart, Kleinschmidt

Amanda Hill, USFWS

Hal Beard, SCDNR

Shane Boring, Kleinschmidt

Wade Bales, SCDNR

Tom Bowles, SCANA

Fish Entrainment TWC

- Study plan for a desktop entrainment study was developed and approved by the TWC
- Draft entrainment report being review by SCE&G, will be issued to Agencies in early 2007

Rare, Threatened, and Endangered Species TWC

Gerrit Jobsis, Am. Rivers

Amanda Hill, USFWS

Ron Ahle, SCDNR

Shane Boring, Kleinschmidt

Bob Seibels, Riverbanks Zoo*

*Retired

Meetings:

March 8, 2006

May 3, 2006

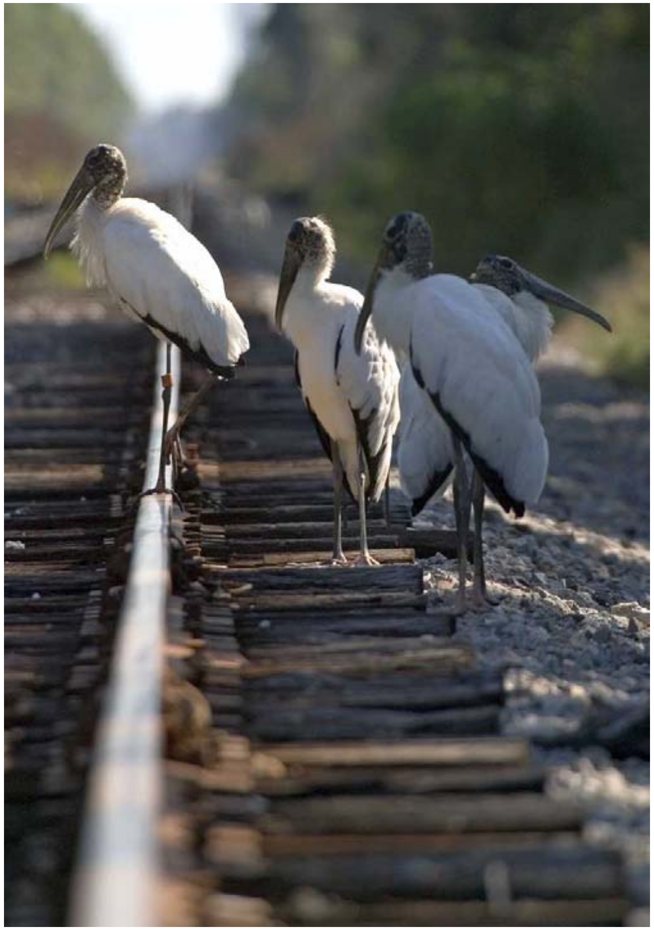
July 26, 2006

Rare, Threatened, and Endangered Species TWC

- 47 species in surrounding counties (federally-listed, candidate, proposed, species of concern)
- Developing tool to track species occurrence and potential habitat
- Will provide baseline for license application and for Section 7 (ESA) consultation

Lake Murray Wood Stork Surveys

- Conducted Feb.-Nov. 2005 & 2006
- No wood storks observed during 2005
- Small number of storks (<20) during late summer/early fall 2006
- Likely post-breed migrants from coastal colonies



Rare, Threatened, and Endangered Species Studies

- Rocky shoals spider lily
  - Survey conducted May 2006
  - Two RSSL plant located in Ocean Boulevard rapid area of LSR
  - Vigorous populations in confluence area
- Shortnose sturgeon
  - Permit issued by NMFS
  - Sampling to begin February 2007

Terrestrial Resources TWC

Dick Christie, SCDNR

Amanda Hill, USFWS

Bob Perry, SCDNR

Buddy Baker, SCDNR

Buddy Baker, SCDNR

Ron Ahle, SCDNR

Brandon Stutts, SCANA

Shane Boring, Kleinschmidt

Bob Seibels, Riverbanks Zoo (retired)

Meetings:

March 8, 2006

May 3, 2006

July 26, 2006

Terrestrial Resources TWC

- Bird survey study request
  - TWC determined could be addressed through existing data
  - Data compiled from multiple sources (Riverbanks Zoo, Columbia Audubon, local birders)
  - Final species list compiled (198 species); will be included in license application

Terrestrial Resources TWC

- Waterfowl surveys
  - Objective: document waterfowl usage on L. Murray during winter months (Dec.-Feb.)
  - Monthly aerial survey (Univ. of Ga. – Savannah River Ecology Lab)
  - 3 Surveys completed

Freshwater Mussels/Benthic Macroinvertebrate TWC

Ron Ahle, SCDNR	**Amanda Hill, USFWS**
Scott Harder, SCDNR	**Jennifer Price, SCDNR**
Gerrit Jobsis, Am. Rivers	**Jim Glover, SCDNR**
Shane Boring, Kleinschmidt	**Steve Summer, SCANA**

Meetings:

May 3, 2006 **June 14, 2006**
July 26, 2006

Freshwater Mussel Survey

- 61 sites in L. Murray, Lower Saluda and Congaree Rivers, selected tribs (July & August 2006)
- 15 species documented
- 6 federal species of concern

Benthic Macroinvertebrate Study

- Sept. – Nov. 2006
- Objective: assess aquatic invertebrate community of LSR
- Included artificial substrate and multi-habitat components
- Report forthcoming

Instream Flow/Aquatic Habitat TWC

- Dick Christie, SCDNR
- Scott Harder, SCDNR
- Gerrit Jobsis, Am. Rivers
- Wade Bales, SCDNR
- Hal Beard, SCDNR
- Alan Stuart, Kleinschmidt
- Brandon Kulik, Kleinschmidt
- Amanda Hill, USFWS
- Buddy Baker, SCDNR
- Ron Ahle, SCDNR
- Steve Summer, SCANA
- Prescott Brownell, NMFS
- Shane Boring, Kleinschmidt

Instream Flow/Aquatic Habitat TWC

- Meetings
  - June 16, 2006
  - September 7, 2006
  - October 16, 2006
  - November 27, 2006
  - December 19, 2006

Lower Saluda R. Instream Flow Study

- Collection of channel profile (velocity, depth, width) and micro-habitat data
- Used to model available habitat for target species at various river flows
- Target species currently being developed by TWC

Instream Flow/Aquatic Habitat TWC: Study Request Status

- Potential for Self-Sustaining Trout Fishery in the LSR
  - Technical paper has been drafted and reviewed by TWC
- Floodplain Flow Evaluations
  - Evaluating influence of Saluda on floodplain inundation, particularly Congaree NP
  - Use existing NPS (USC) model to examine potential for Saluda to enhance inundation during low-water periods
- GIS-based habitat assessment of L. Murray
  - Use existing aerial photography and Env. Sensitive Areas (ESA) maps

Questions??

Water Quality
Resource Conservation Group

Shane Boring
Kleinschmidt Associates

Water Quality RCG Meetings

Date	*Discussion Topics / (Presenter)*
November 9, 2005	**Development of Mission Statement**
	Saluda Hydro System Control (Lee Xanthakos, SCE&G)
December 7, 2005*	**401 Water Quality Certification for Hydro Projects (Gina Kirkland, SCDHEC)**
	Lower Saluda River Site-Specific Water Quality Standard (Shane Boring, KA)
	Water Quality Update: L. Murray & Lower Saluda (Andy Miller, SCDHEC)
	Water Quality Analysis & CE-QUAL-W2 Modeling for L. Murray (A. Sawyer and J. Ruane, REMI)
February 21, 2006	**Formation of Technical Working Committee**
	Review of Study Requests

* Joint Meeting with Fish & Wildlife RCG

Water Quality TWC

Gina Kirkland, SCDHEC

Alan Stuart, Kleinschmidt

Jim Ruane, REMI

Gerrit Jobsis, Am. Rivers

Reed Bull, Midlands Striper Club

Richard Kidder, LMA

Roy Parker, LMA

Dan Tufford, USC

Tom Bowles, SCE&G

Amanda Hill, USFWS

Ron Ahle, SCDNR

Andy Miller, SCDHEC

Shane Boring, Kleinschmidt

Water Quality TWC Meetings

- February 21, 2006
- March 6, 2006 (via conference call)
- March 24, 2006
- May 3, 2006
- May 23, 2006
- August 23, 2006
- November 23, 2006

W-2 Reservoir Water Quality Model

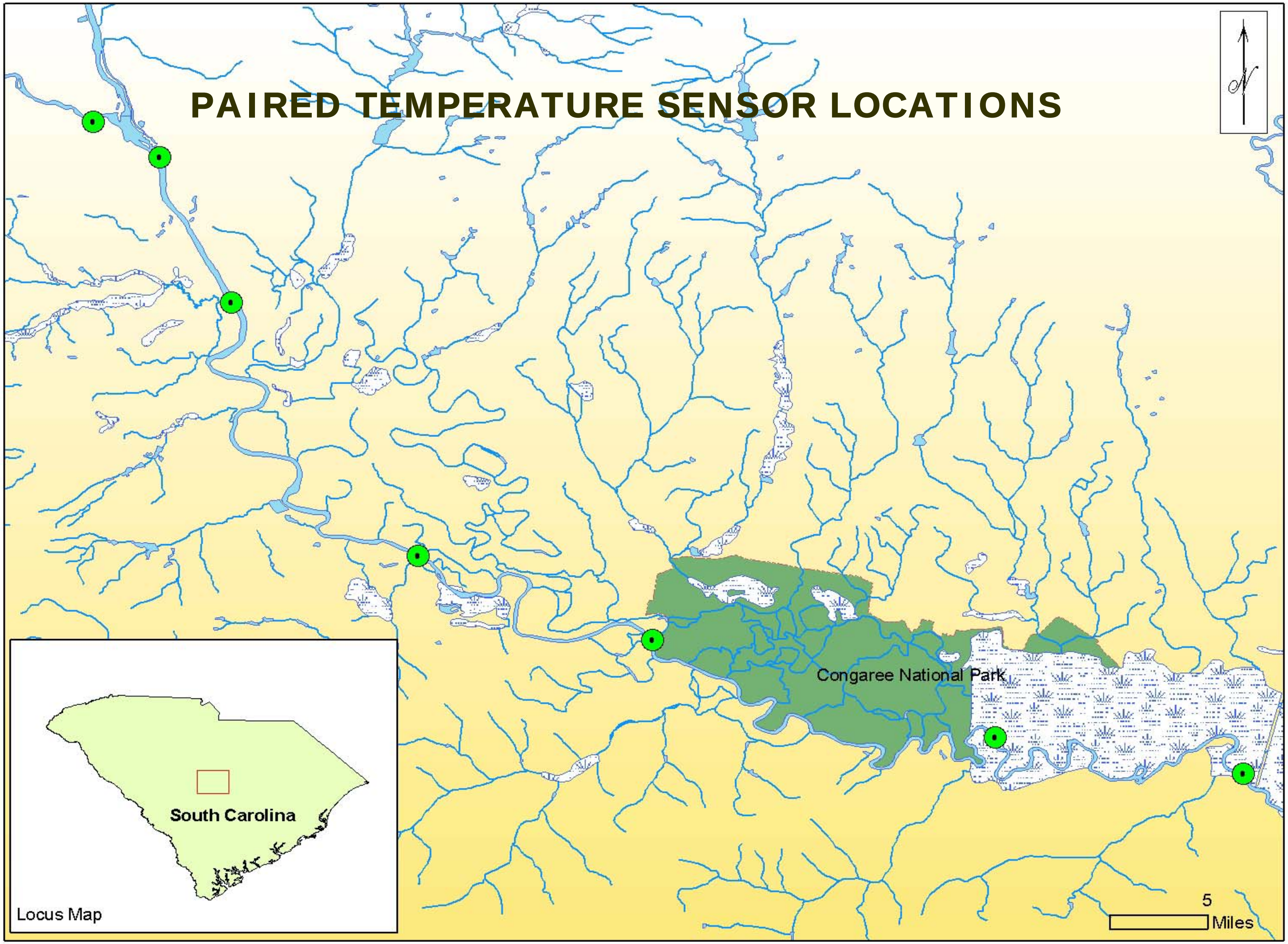
- Will be used to evaluate effects of project operations on summer habitat for striped bass, particularly operation of unit 5
- Developed by Jim Ruane (Reservoir Environmental Man., Inc.)
- Final report expected January 31, 2007

Downstream Impacts of Coldwater Releases

- Study Plan was developed and is being executed

- Objective: to document downstream extent and mixing characteristic of coldwater Project releases

- Paired temperature sensors deployed at 7 locations in Saluda and Congaree; control point below dam and on Broad R.


PAIRED TEMPERATURE SENSOR LOCATIONS
N
Congaree National Park
South Carolina
Locus Map
5
Miles

Turbine Venting Testing

- Unit testing completed in Fall 2006
- Aimed at determining aeration potential at different gate setting and unit combinations
- Report forthcoming in Spring 2007

Questions??

Operations RCG

Hydrologic Model
Development and Application

Objectives

- Oversee creation of hydrologic model
  - Establish baseline: current operation
- Utilize the model to evaluate potential operational changes
  - Existing and future constraints

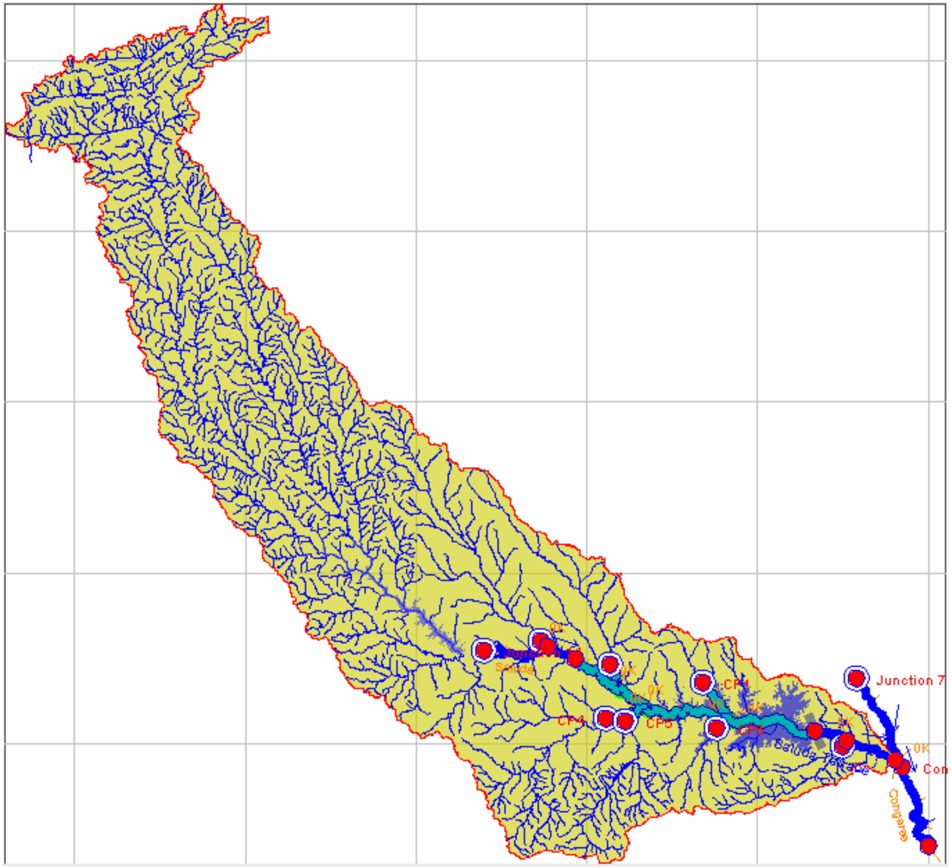
Hydrologic Model

- Selected HEC-Res Sim
  - Flexibility
  - Standard for relicensing efforts
  - HEC-Ras for lower Saluda River

Develop Model Structure

- Physical parameters
  - Watershed
  - Lake storage curve
  - River geometry (for HEC Ras)
- Hydrology
  - Storage and outflows known, some inflows gaged

Saluda Watershed – 2520 Sq. Mi.



Establish Baseline

- Run model with current operation parameters, available USGS data
- Calibration: does model simulate observed conditions?
  - Using inflows, model missed at high and low stages
  - Using mass balance, model very accurately matched observed conditions

Model Complete

- Used Mass Balance method of calibration
  - Very accurate simulation
  - Limited period of record; gage below dam has best outflow measurement, limited to 1988

Next Steps

- Await input from other RCG's
  - Stakeholder requests
  - Stage and/or flow at given location
  - Prioritization
- After <u>all</u> requests are submitted, run simulation

Potential constraints

- Stakeholder requests
  - Pond levels
  - Minimum flow releases
  - Recreation or special releases
- Impacts on operation
  - Pond level management
  - Energy generation

Model Results

- Simulation determines frequency and magnitude of violating each constraint (request)
- Stakeholders determine acceptability of outcome, adjust constraints as needed
- Re-submit constraints – iterative process
- Compromise with other requests

Questions?

Saluda Hydroelectric Project Cultural Resource Investigations

Saluda HYDRO RELICENSING

S&ME

Primary Participants

- Federal Energy Regulatory Commission (FERC)
- South Carolina Electric & Gas (SCE&G)
- State Historic Preservation Office (SHPO)
- Catawba Indian Nation
- Advisory Council on Historic Preservation (ACHP)

Other Participants

- South Carolina Department of Natural Resources (SCDNR)
- South Carolina Institute of Archaeology and Anthropology (SCIAA)
- Eastern Band of Cherokee Indians (ECBI)
- Other Federally Recognized Indian Tribes (on a limited basis)
- Cultural Resource Conservation Group (CRCG)
- The Public

Laws, Regulations, and Guidelines

- National Environmental Policy Act (NEPA)
- National Historic Preservation Act (NHPA)
  - Section 106 and its implementing regulations
    36 CFR Part 800 - Protection of Historic Properties
- FERC Guidelines for EA and HPMP Preparation
- Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation
- SHPO Guidelines for Archaeological Investigations and Survey of Historic Properties

Saluda Hydroelectric Project Cultural Resource Investigations

- Reconnaissance Survey to Identify High Probability Areas and Historic Structures within the Area of Potential Effects (Completed November 2005).

- Intensive Survey of High Probability Areas (In progress. Fieldwork will be completed 1/12/07, draft report completed by March 2007).

- Historic Properties Management Plan (Begin February 2007, estimated completion by June 2007).

- Mitigation of Adverse Effects (to be determined in consultation with SHPO, FERC, and consulting parties)

Results of Stage I Reconnaissance Survey

- 42 previously recorded archaeological sites
- 40 new archaeological sites identified
- Seven previously recorded structures that are listed or eligible for the National Register of Historic Places (NRHP)
- Eight newly recorded structures (one eligible for the NRHP)

Stage II Intensive Survey Areas

- 735 acres on 139 islands in Lake Murray
- 89 miles of shoreline in 177 areas along Lake Murray
- 1.5 miles of riverbank along the lower Saluda River (originally four*)
- 2 islands in the Lower Saluda River (originally seven*)

* Based on recent geomorphic analysis, it was determined that areas downstream from Saluda Shoals Park are not being affected by erosion and do not need to be surveyed.

Results of Stage II Intensive Survey (as of 12/31/06)

- 174 newly recorded archaeological sites
- 37 sites revisited from Stage I survey
- Pre-contact sites ranging from the Paleoindian through Mississippian Periods (11,500 – 500 years ago)
- Historic sites – 18th through early 20th farmsteads, cemeteries, roads, quarries, and other types of resources.

Prehistoric Artifacts

Arrowheads and Spear Points

Different types of raw materials: Chert, Rhyolite, Jasper, Quartz, and Quartzite

Historic Resources

Site 38LX531

- Located along the Lower Saluda River
- Almost 12 acres in size
- Excellent preservation, deeply buried artifacts, and numerous features (e.g., hearths, pits, etc.)

Site 38LX531

- Occupations ranging from approximately 800 to 11,500 years ago.
- Produced oldest credible radiocarbon date in SC (10,140 rcybp +/- 60).
- Could be one of the most interesting and important sites in the Southeastern U.S.

Questions

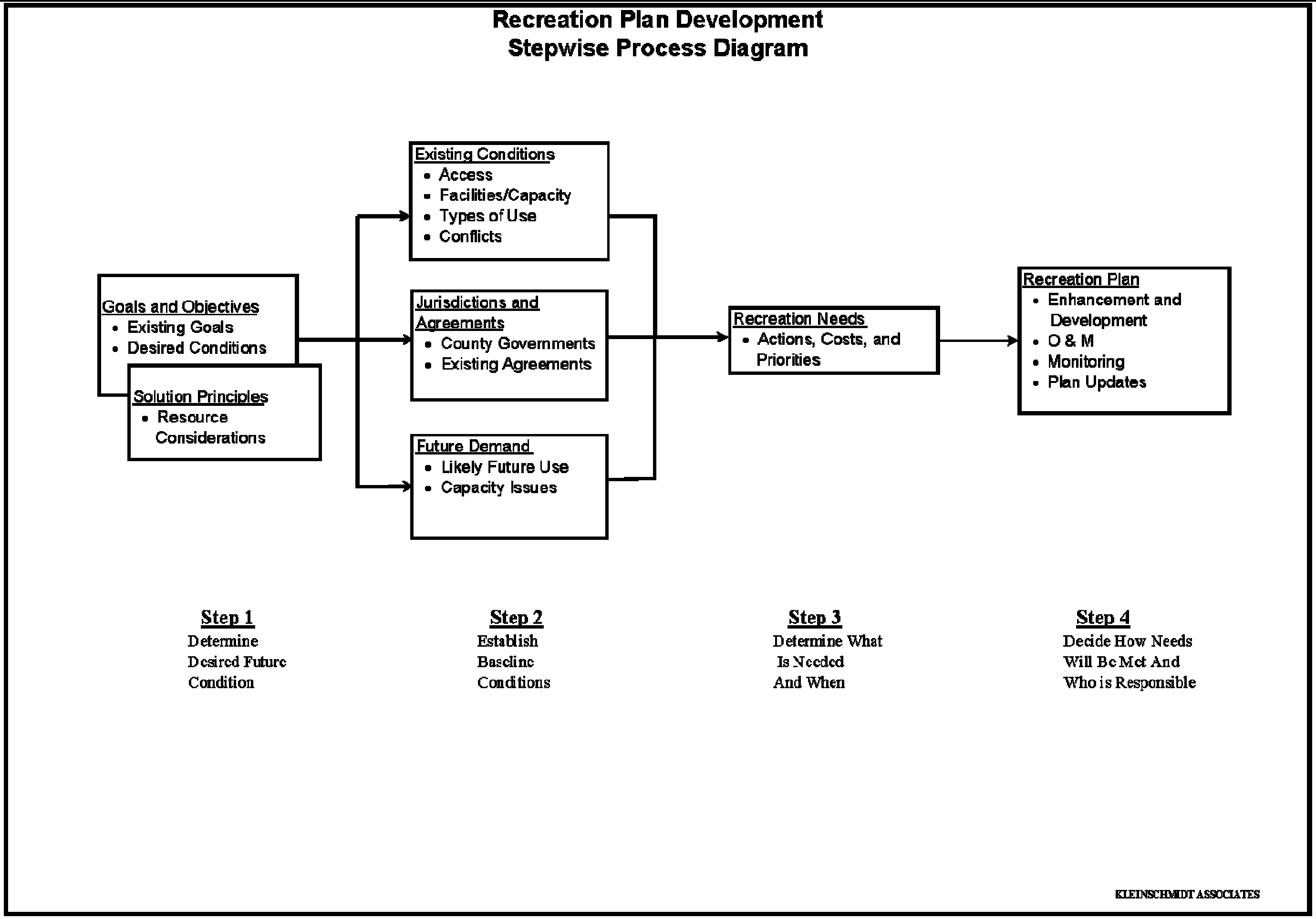
Recreation RCG Update

The mission of the Recreational RCG is to ensure adequate and environmentally-balanced public recreational access and opportunities related to the Saluda Hydroelectric Project for the term of the new license. The objective is to assess the recreational needs associated with the lower Saluda River and Lake Murray and to develop a comprehensive recreation plan to address the recreation needs of the public for the term of the new license. This will be accomplished by collecting and developing necessary information, understanding interests and issues and developing consensus-based recommendations.

Meetings

- November 18, 2005
- January 11, 2006
- February 15, 2006
- April 17, 2006
- July 21, 2006
- October 25, 2006

Standard Process



Work Products

- Work Plan
- Vision Statement
- Solution Principles
- Standard Process Form
- Recreation Plan
- Issues Matrix

Identified Issues

- Ensure that recreational facilities and opportunities are protected and enhanced for current and future users, on and near the lake and river
- Conservation of lands
- Using the concept of adaptive management in future recreation planning
- Downstream flows
- Lack of a communication system that would encompass information to better inform the public of existing and projected conditions regarding lake levels and river flows as related to anticipated hydro operations and maintenance
- Protection of the cold water fishery on the lower Saluda River
- Impacts of lake level on recreational use of the lake
- Consideration of The Lower Saluda River Corridor Plan and the Lower Saluda Scenic River Corridor Plan Update and their related public access sites and greenway-trail concepts

Recreation Management TWC

Deal with future facilities, existing and future sites, policy, etc.

- David Hancock
- Dick Christie
- George Duke
- Jennifer Summerlin
- Kelly Maloney
- Leroy M. Barber Jr.
- Malcolm Leaphart
- Marty Phillips
- Patrick Moore
- Steve Bell
- Tim Vinson
- Tommy Boozer
- Tony Bebber
- Van Hoffman
- Dave Anderson (Facilitator)

Meetings in 2006

March 3

March 17

March 24

April 7

April 17

July 19

Downstream Flows TWC

Propose recreational flows for the lower Saluda River and determine the effects of project operations on recreational use of the LSR

- Bill Marshall
- Charlene Coleman
- Guy Jones
- Jennifer Summerlin
- Karen Kustafik
- Kelly Maloney
- Malcolm Leaphart
- Patrick Moore
- Tony Bebber
- Dave Anderson (Facilitator)

Meetings in 2006

March 1

April 18

September 20

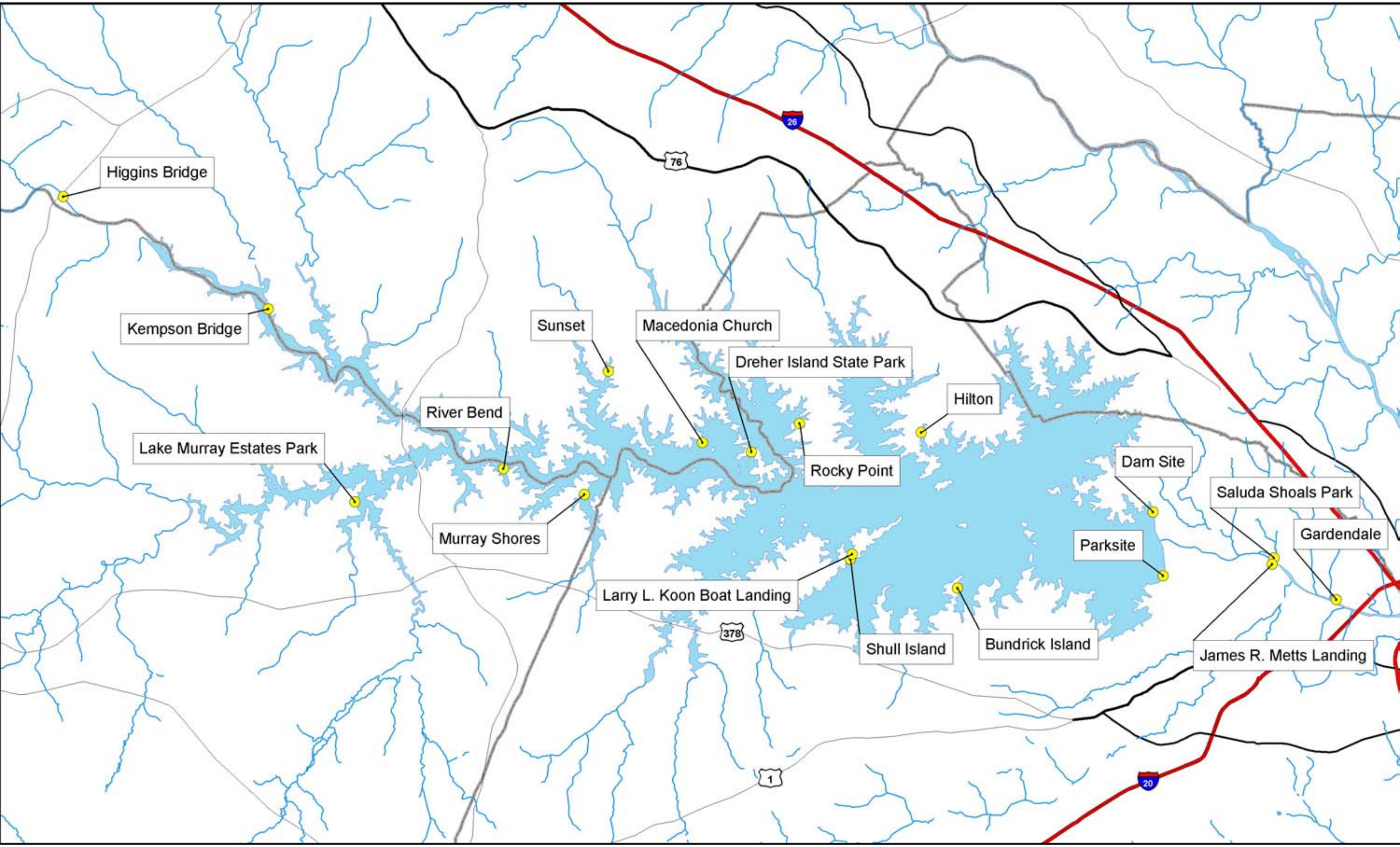
Lake Levels TWC

Determine an appropriate lake level for recreational activities and examine the effects of various lake levels on recreation.

- Bill Argentieri
- Dave Anderson
- Dick Christie
- Lee Barber
- Steve Bell
- Tim Vinson
- Alan Stuart (Facilitator)

Recreation Assessment Study

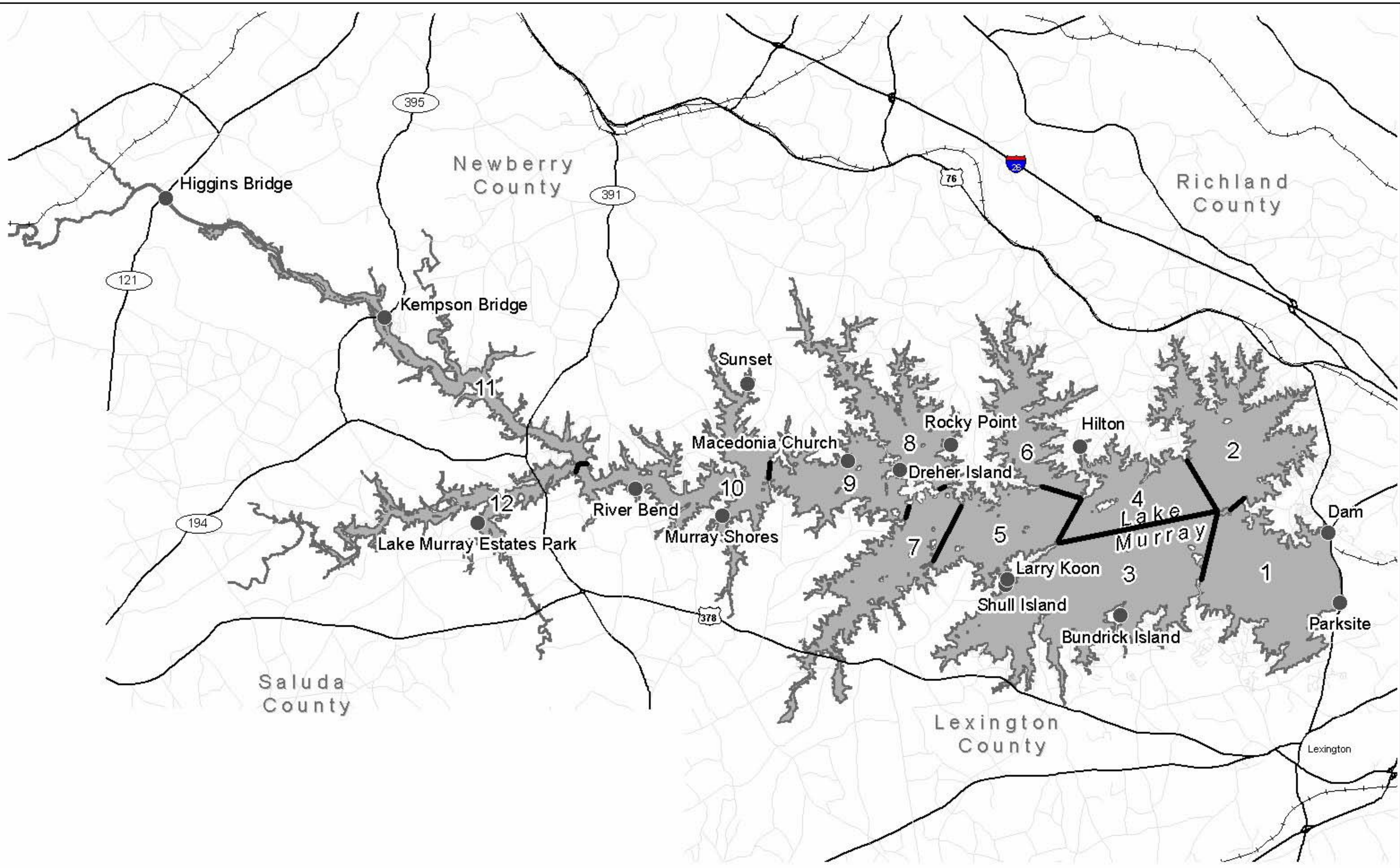
- Characterize existing recreational use of SCE&G's recreation sites on Lake Murray and the lower Saluda River.
- Identify future recreational needs relating to public recreation sites on Lake Murray and the lower Saluda River.



Higgins Bridge
Kempson Bridge
Sunset
Macedonia Church
Dreher Island State Park
Hilton
River Bend
Lake Murray Estates Park
Rocky Point
Dam Site
Saluda Shoals Park
Gardendale
Parksite
Murray Shores
Larry L. Koon Boat Landing
Shull Island
Bundrick Island
James R. Metts Landing
26
76
378
1
20

Boating Density Study

- Identify the area available for boating activities on Lake Murray by segment.
- Assess boat densities occurring under normal (weekend) and peak (holiday) use conditions on Lake Murray by segment.
- Analysis of whether recreational use of Lake Murray is currently above, below, or at a desirable by segment.



395
Newberry
County
391
Higgins Bridge
121
Kempson Bridge
26
76
Richland
County
Sunset
11
Rocky Point
Hilton
Macedonia Church
8
6
2
Dreher Island
9
10
12
4
River Bend
Lake
Murray
Dam
Murray Shores
194
Lake Murray Estates Park
7
5
Larry Koon
3
1
Shull Island
378
Bundrick Island
Parksite
Saluda
County
Lexington
County
Lexington

Downstream Flows Study

- Characterize currently available recreation opportunities on the lower Saluda River.
- Understand the "rate of change" of the lower Saluda River at various flows at various river reaches.
- Identify potential public safety issues associated with lower Saluda River flows.

Schedule

- **Late 2005/Early 2006**—Finalize Mission Statement, Standard Process Form, Solution Principles, and Work Plan
- **Mid-2006**—Complete identification of studies, literature reviews, etc. that need to be completed to address issues and tasks identified in the Work Plan
- **Late 2006**—Begin compilation of existing information, review preliminary study results, and draft an outline of the Recreation Plan
- **2007**—Complete any studies identified in Task 8 and review results; draft recommendations to SHRG, complete draft Recreation Plan
- **2008**—Finalize Recreation Plan and provide comments on Draft License Application

Questions?

Safety RCG Update

The Mission of the Safety Resource Conservation Group (SRCG) is, through good faith cooperation, to make Lake Murray and the lower Saluda River as safe as reasonably possible for the public. The objective is to develop a consensus-based Recreational Safety Plan proposal for inclusion in the FERC license application. This will be accomplished by gathering or developing data relevant to Saluda Hydroelectric Project safety-related interests/issues, seek to understand those interests/issues and that data, and consider all such interests/issues and data relevant to and significantly affecting safety on Lake Murray and the lower Saluda River.

Meetings

- November 16, 2005
- January 10, 2006
- February 14, 2006
- April 6, 2006 (Safety/Operations)
- April 18, 2006
- July 20, 2006
- October 24, 2006

Work Products

- Work Plan
- Safety Program
- RCG Recommendations
- Safety Plan
- Issues Matrix

Identified Issues

- River level fluctuations and their effect on safety
- Lake levels and lake level fluctuations and their effect on safety
- Boat traffic/congestion in cove areas
- Placement and maintenance of shoal markers
- Power lines impeding sail boat navigation
- Water quality and its effect on safety
- Amphibious aircraft using Lake Murray
- Systematic collection of accident data

Hazardous Areas TWC

Identify unmarked hazards and propose potential solutions for unmarked hazards on Lake Murray

- Bill Argentieri
- David Price
- Joy Downs
- Kenneth Fox
- Norm Nicholson
- Skeet Mills
- Steve Bell
- Tommy Boozer
- Dave Anderson (Facilitator)

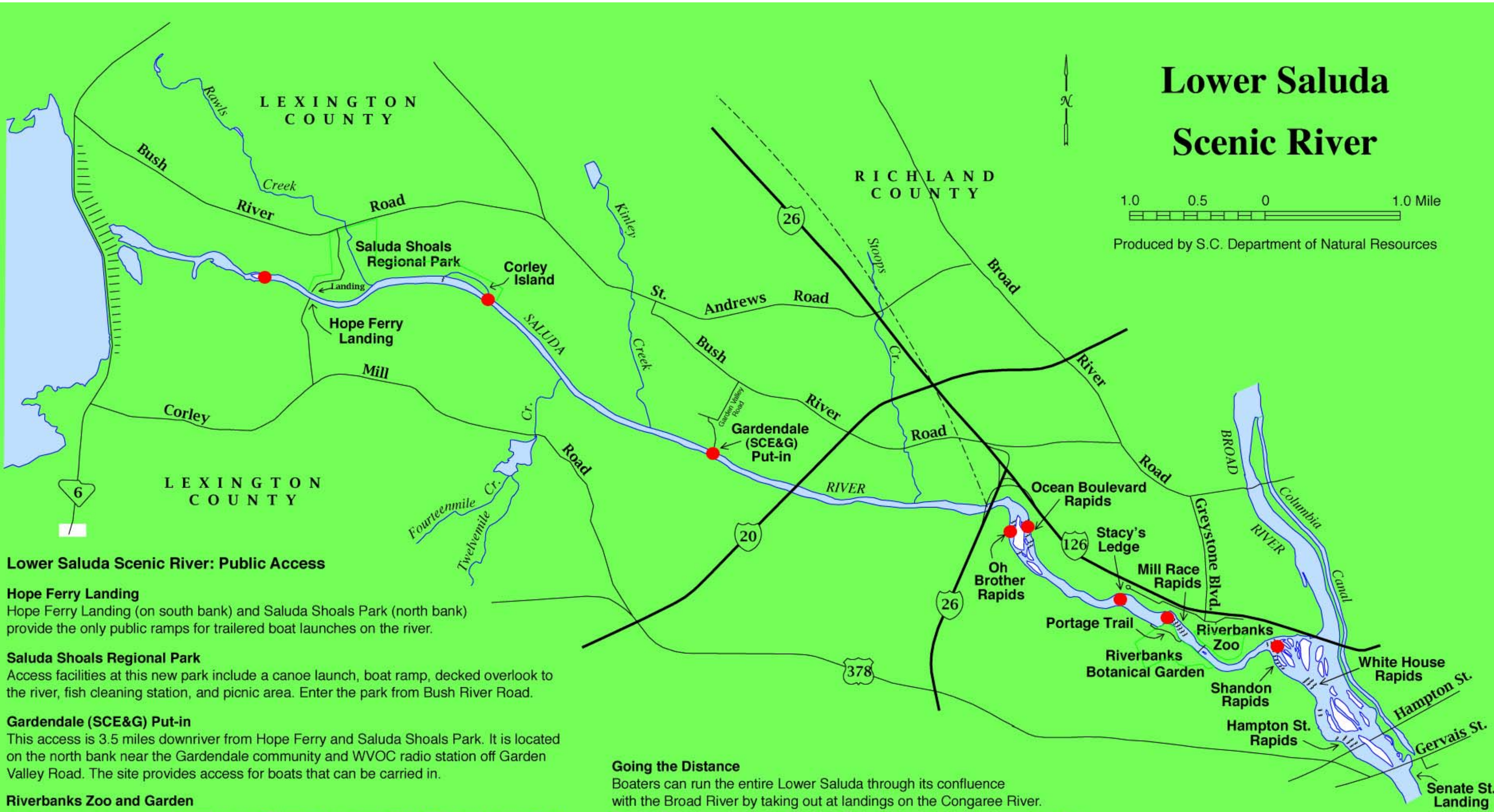
Safety Program TWC

Complete a draft of the Safety Program for approval by the Safety RCG

- Mike Waddell
- Bill Mathias
- David Price
- Patrick Moore
- Charlene Coleman
- Bill Argentieri
- Alan Stuart
- Randy Mahan
- Marty Phillips (Facilitator)

Downstream Flows Study

- Characterize currently available recreation opportunities on the lower Saluda River.
- Understand the “rate of change” of the lower Saluda River at various flows at various river reaches.
- Identify potential public safety issues associated with lower Saluda River flows.



Lower Saluda Scenic River: Public Access

Hope Ferry Landing

Hope Ferry Landing (on south bank) and Saluda Shoals Park (north bank) provide the only public ramps for trailered boat launches on the river.

Saluda Shoals Regional Park

Access facilities at this new park include a canoe launch, boat ramp, decked overlook to the river, fish cleaning station, and picnic area. Enter the park from Bush River Road.

Gardendale (SCE&G) Put-in

This access is 3.5 miles downriver from Hope Ferry and Saluda Shoals Park. It is located on the north bank near the Gardendale community and WVOC radio station off Garden Valley Road. The site provides access for boats that can be carried in.

Riverbanks Zoo and Garden

In addition to a zoo and botanical garden, Riverbanks offers nature trails and a pedestrian bridge with views of Mill Race Rapids, historic structures, and native wildlife. Carry-in boat access is available at the west end of the parking lot by walking a short trail to the river. Riverbanks is located off Greystone Blvd. Open daily from 9-5 pm, admission is charged.

Going the Distance

Boaters can run the entire Lower Saluda through its confluence with the Broad River by taking out at landings on the Congaree River. Senate Street landing below Gervais Street bridge provides access only for boats that can be carried in (and parking is limited). Senate Street landing is 10 miles downstream from Hope Ferry and Saluda Shoals Park. Public landings with ramps are located 2 and 3 miles downstream on the east and west banks of the Congaree.

Schedule

- **Late 2005/Early 2006**—Finalize Mission Statement and Work Plan
- **Mid-2006**—Complete identification of studies, literature reviews, etc. that need to be completed to address issues and tasks identified in the Work Plan
- **Late 2006**—Begin compilation of existing information, review preliminary study results, and draft an outline of the Recreation Safety Plan
- **2007**—Complete any studies identified in Task 9 and review results; draft recommendations to SHRG, complete draft Recreational Safety Plan
- **2008**—Finalize Recreational Safety Plan and provide comments on Draft License Application

Questions?

Milestones and Events for 2007

- Continue Studies in Spring/Summer
- Issue Draft Application/Shoreline Management Plan September/October 2007

  (90 day comment period)
- Develop any Informational Needs in response to Comments

SOUTH CAROLINA ELECTRIC & GAS COMPANY

LAKE MURRAY SHORELINE MANAGEMENT PLAN OUTLINE

Executive Summary

1.0 Introduction

2.0 Purpose and Scope of the Shoreline Management Plan

3.0 Shoreline Management Plan Goals and Objectives

- 3.1 Consultation

4.0 Inventory of Existing Resources

- 4.1 Soils and Geology
- 4.2 Water Quality
  - 4.2.1 Water Quality Standards
- 4.3 Aquatic Resources
- 4.4 Terrestrial Resources
  - 4.4.1 Threatened and Endangered Species
- 4.5 Land Use and Aesthetics
- 4.6 Cultural Resources
- 4.7 Recreation Facilities
  - 4.7.1 Lake Murray
  - 4.7.2 Lower Saluda River
- 4.8 Recreation Use
  - 4.8.1 Fisheries Management
  - 4.8.2 Public Hunting
  - 4.8.2 Water craft
    - 4.8.2.1 Sailboats
    - 4.8.2.2 Jet skis

ALTERNATIVE GENERATION EVALUATION

FOR

SALUDA HYDRO

SALUDA HYDRO

SALUDA HYDRO

- TOTAL GENERATION 206 MW

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5   70 MW

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5   70 MW
- START TIME <15 MIN.

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5 70 MW
- START TIME <15 MIN.
- RELIABILITY >95%

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5   70 MW
- START TIME <15 MIN.
- RELIABILITY >95%
- QUICK START RESERVE   206 MW

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5 70 MW
- START TIME <15 MIN.
- RELIABILITY >95%
- QUICK START RESERVE 206 MW
- BLACKSTART VC SUMMER

SALUDA HYDRO

- TOTAL GENERATION 206 MW
- UNITS 1-4 34 MW EA.
- UNIT 5 70MW
- START TIME <15 MIN.
- RELIABILITY >95%
- QUICK START RESERVE 206 MW
- BLACKSTART VC SUMMER
- LAKE LEVEL MANAGEMENT

ALTERNATIVE GENERATION
TO
SALUDA HYDRO

EVALUATION OF VIABLE OPTIONS

EVALUATION CONSIDERATIONS

EVALUATION CONSIDERATIONS

- ELECTRIC GENERATING EQUIPMENT

EVALUATION CONSIDERATIONS

- ELECTRIC GENERATING EQUIPMENT
- PLANT SITING

EVALUATION CONSIDERATIONS

- ELECTRIC GENERATING EQUIPMENT
- PLANT SITING
- CAPITAL AND O&M DOLLARS

EQUIPMENT EVALUATION

EQUIPMENT EVALUATION

- CAPACITY 200 MW

EQUIPMENT EVALUATION

- CAPACITY 200 MW
- START TIME <15 MIN.

EQUIPMENT EVALUATION

- CAPACITY 200 MW
- START TIME <15 MIN.
- EFFICIENCY

EQUIPMENT EVALUATION

- CAPACITY 200 MW
- START TIME <15 MIN.
- EFFICIENCY
- RELIABILITY

EQUIPMENT EVALUATION

- CAPACITY 200 MW
- START TIME <15 MIN.
- EFFICIENCY
- RELIABILITY
- PROVEN TECHNOLOGY

EQUIPMENT ALTERNATIVES

EQUIPMENT ALTERNATIVES

- DIESEL GENERATORS

EQUIPMENT ALTERNATIVES

- DIESEL GENERATORS
- GAS TURBINES (AERO DERIVED)

DIESEL GENERATORS

DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW

DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW
- GENSET

DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW
- GENSET
- 80-100 UNITS

DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW
- GENSET
- 83-100 UNITS
- START TIME 10 MIN.

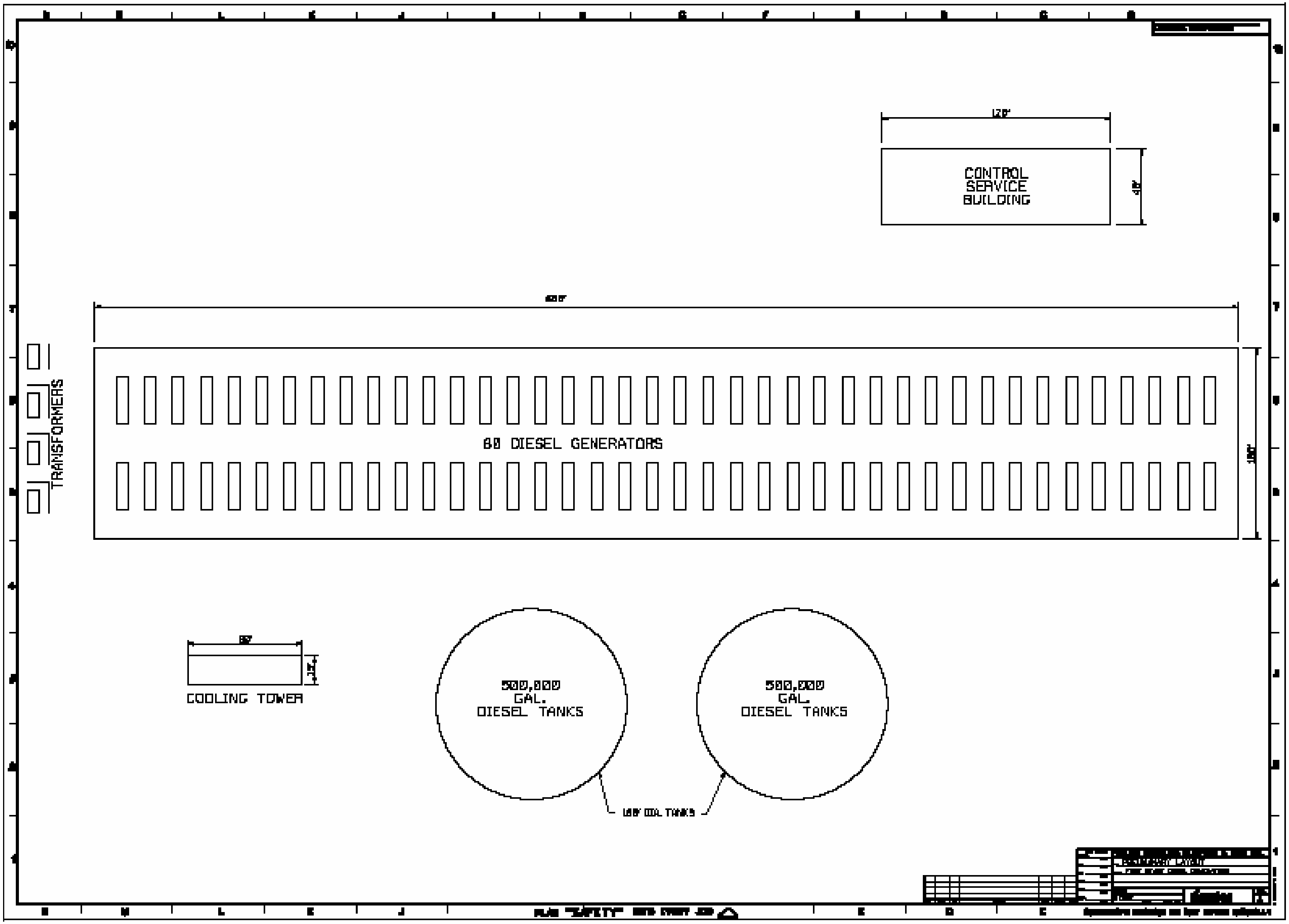
DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW
- GENSET
- 83-100 UNITS
- START TIME 10 MIN.
- EFFICIENCY 37%

DIESEL GENERATORS

- SIZE 2 – 2 1/2 MW
- GENSET
- 83-100 UNITS
- START TIME 10 MIN.
- EFFICIENCY 37%
- RELIABILITY 90%

DIESEL GENSET


CONTROL
SERVICE
BUILDING
TRANSFORMERS
60 DIESEL GENERATORS
COOLING TOWER
500,000
GAL.
DIESEL TANKS
500,000
GAL.
DIESEL TANKS

GAS TURBINES(AERO DERIVED)

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW
- GENERAL ELECTRIC LM6000

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW
- GENERAL ELECTRIC LM6000
- 4 UNITS

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW
- GENERAL ELECTRIC LM6000
- 4 UNITS
- START TIME 10 MIN.

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW
- GENERAL ELECTRIC LM6000
- 4 UNITS
- START TIME 10 MIN.
- EFFICIENCY 40%

GAS TURBINES(AERO DERIVED)

- SIZE 50 MW
- GENERAL ELECTRIC LM6000
- 4 UNITS
- START TIME 10 MIN.
- EFFICIENCY 40%
- RELIABILITY 90%

PLANT SITING EVALUATION

PLANT SITING EVALUATION

- PERMITTING

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABLITY

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABLITY
- INTERCONNECTIONS

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABLITY
- INTERCONNECTIONS
- PLANT LAYOUT /CONSTRUCTABILITY

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABLITY
- INTERCONNECTIONS
- PLANT LAYOUT /CONSTRUCTABILITY
- LAND AVAILABILITY

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABLITY
- INTERCONNECTIONS
- PLANT LAYOUT /CONSTRUCTABILITY
- LAND AVAILABILITY
- PSC APPROVAL

PERMITTING

PERMITTING

- AIR EMISSIONS

PERMITTING

- AIR EMISSIONS
- WATER INTAKE

PERMITTING

- AIR EMISSIONS
- WATER INTAKE
- WATER DISCHARGE

PERMITTING

- AIR EMISSIONS
- WATER INTAKE
- WATER DISCHARGE
- STORM WATER CONTROL

PERMITTING

- AIR EMISSIONS
- WATER INTAKE
- WATER DISCHARGE
- STORM WATER CONTROL
- WETLANDS

PERMITTING

- AIR EMISSIONS
- WATER INTAKE
- WATER DISCHARGE
- STORM WATER CONTROL
- WETLANDS
- COUNTY REGULATIONS

PERMITTING

- AIR EMISSIONS
- WATER INTAKE
- WATER DISCHARGE
- STORM WATER CONTROL
- WETLANDS
- COUNTY REGULATIONS
- SCHEDULE IMPACT 1-2 YEARS

DOLLARS EVALUATION

DOLLARS EVALUATION

- CAPITAL COST

DOLLARS EVALUATION

- CAPITAL COST
- LIFE CYCLE COST 30 YRS

COST OF:

COST OF:

- LAND

COST OF:

- LAND
- PERMITTING

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT
- BALANCE OF PLANT

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT
- BALANCE OF PLANT
- ENGINEERING

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT
- BALANCE OF PLANT
- ENGINEERING
- CONSTRUCTION

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT
- BALANCE OF PLANT
- ENGINEERING
- CONSTRUCTION
- START-UP

COST OF:

- LAND
- PERMITTING
- GENERATING EQUIPMENT
- BALANCE OF PLANT
- ENGINEERING
- CONSTRUCTION
- START-UP
- PROJECT MANAGEMENT

PARAMETERS / ASSUMPTIONS

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED
- COST OF MONEY EXCLUDED

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED
- COST OF MONEY EXCLUDED
- PROVEN GENERATION TECHNOLOGY

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
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- COST OF MONEY EXCLUDED
- PROVEN GENERATION TECHNOLOGY
- NEW PLANT SITE

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED
- COST OF MONEY EXCLUDED
- PROVEN GENERATION TECHNOLOGY
- NEW PLANT SITE
- NATURAL GAS AVAILABLE

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED
- COST OF MONEY EXCLUDED
- PROVEN GENERATION TECHNOLOGY
- NEW PLANT SITE
- NATURAL GAS AVAILABLE
- TRANSMISSION CONNECTION AVAILABLE

PARAMETERS / ASSUMPTIONS

- ORDER OF MAGNITUDE ESTIMATE
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL $
- 2010 DOLLARS FOR LIFE CYCLE $
- ESCALATION EXCLUDED
- COST OF MONEY EXCLUDED
- PROVEN GENERATION TECHNOLOGY
- NEW PLANT SITE
- NATURAL GAS AVAILABLE
- TRANSMISSION CONNECTION AVAILABLE
- WATER AVAILABLE

CAPTITAL COST DIESEL GEN

LAND	$100,000
PERMITTING	$160,000
EQUIPMENT	$40,500,000
BALANCE OF PLANT	$38,000,000
ENGINEERING	$500,000
CONSTRUCTION	$7,000,000
START-UP	$250,000
PROJECT MGMT	$250,000
TOTAL	$86,850,000

CAPITAL COST GAS TURBINES

- LAND $100,000
- PERMITTING $160,000
- EQUIPMENT $58,800,000
- BALANCE OF PLANT $18,780,000
- ENGINEERING $600,000
- CONSTRUCTION $11,400,000
- START-UP $200,000
- PROJECT MGMT $300,000
- TOTAL $90,390,000

CAPITAL COST SALUDA HYDRO

LAND	NA
RE-LICENSING	<$12 MILLION
EQUIPMENT	$20,000,000
BALANCE OF PLANT	In- above
ENGINEERING	In-above
CONSTRUCTION	In-above
START-UP	In-above
PROJECT MGMT	In-above
TOTAL	$32,000,000

LIFE CYCLE COSTS 30 YEARS (includes capital, O&M, fuel)

SALUDA	$174,000,000
GAS TURBINES	$508,230,000
DIESEL GEN'S	$705,000,000

SALUDA ADVANTAGES

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST
- BETTER RELIABILITY

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST
- BETTER RELIABILITY
- NO AIR EMISSIONS

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST
- BETTER RELIABILITY
- NO AIR EMISSIONS
- NO NEW PLANT SITING IMPACT

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST
- BETTER RELIABILITY
- NO AIR EMISSIONS
- NO NEW PLANT SITING IMPACT
- AVAILABLE QUICK START RESERVE

SALUDA ADVANTAGES

- LOWER LIFE CYCLE COST
- BETTER RELIABILITY
- NO AIR EMISSIONS
- NO NEW PLANT SITING IMPACT
- AVAILABLE QUICK START RESERVE
- VCS BLACKSTART CAPABILTY

ALT GENERATION IMPACTS

ALT GENERATION IMPACTS

- HIGHER RATES FOR ELECTRICITY

ALT GENERATION IMPACTS

- HIGHER RATES FOR ELECTRICITY
- HIGHER EMISSIONS

ALT GENERATION IMPACTS

- HIGHER RATES FOR ELECTRICITY
- HIGHER EMISSIONS
- LAND USE

QUESTIONS?

Hydrology 101

Jonathan A. Quebbeman, PE
Kleinschmidt Associates

October 26, 2006

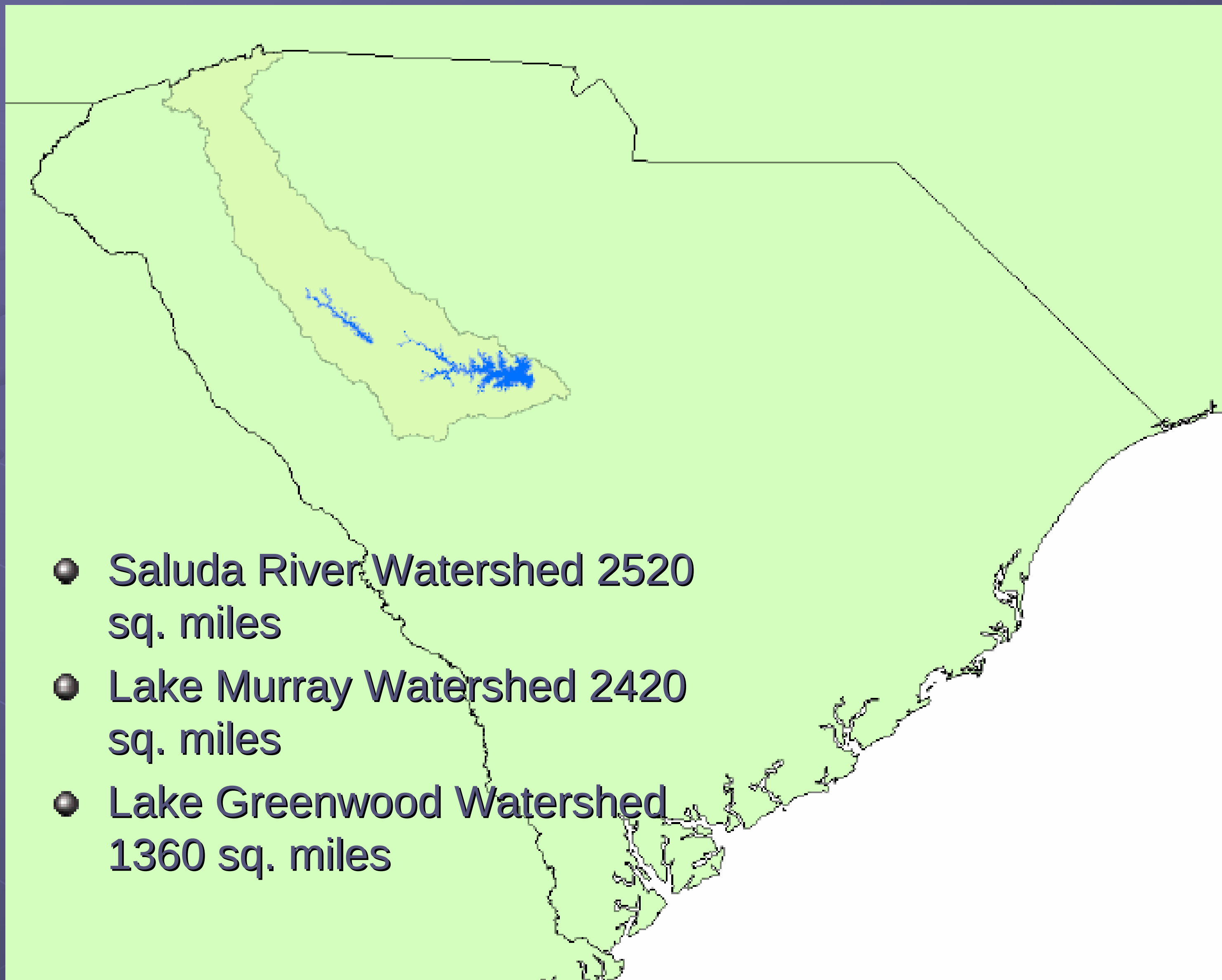
Schedule & Topics

- Hydrology
  - What is it
  - Why is it Important
- Watersheds
- Precipitation
- Runoff & Routing
- Lake Murray Data
- Questions

Watersheds

- Who lives in a Watershed?
- What is a Watershed?
  - A boundary encompassing all the area draining to a specific point
- Watershed Characteristics – Define Runoff
  - Land Cover, Percent Developed
  - Slopes
  - Area
  - Shape

Saluda River Watershed



- Saluda River Watershed 2520 sq. miles
- Lake Murray Watershed 2420 sq. miles
- Lake Greenwood Watershed 1360 sq. miles

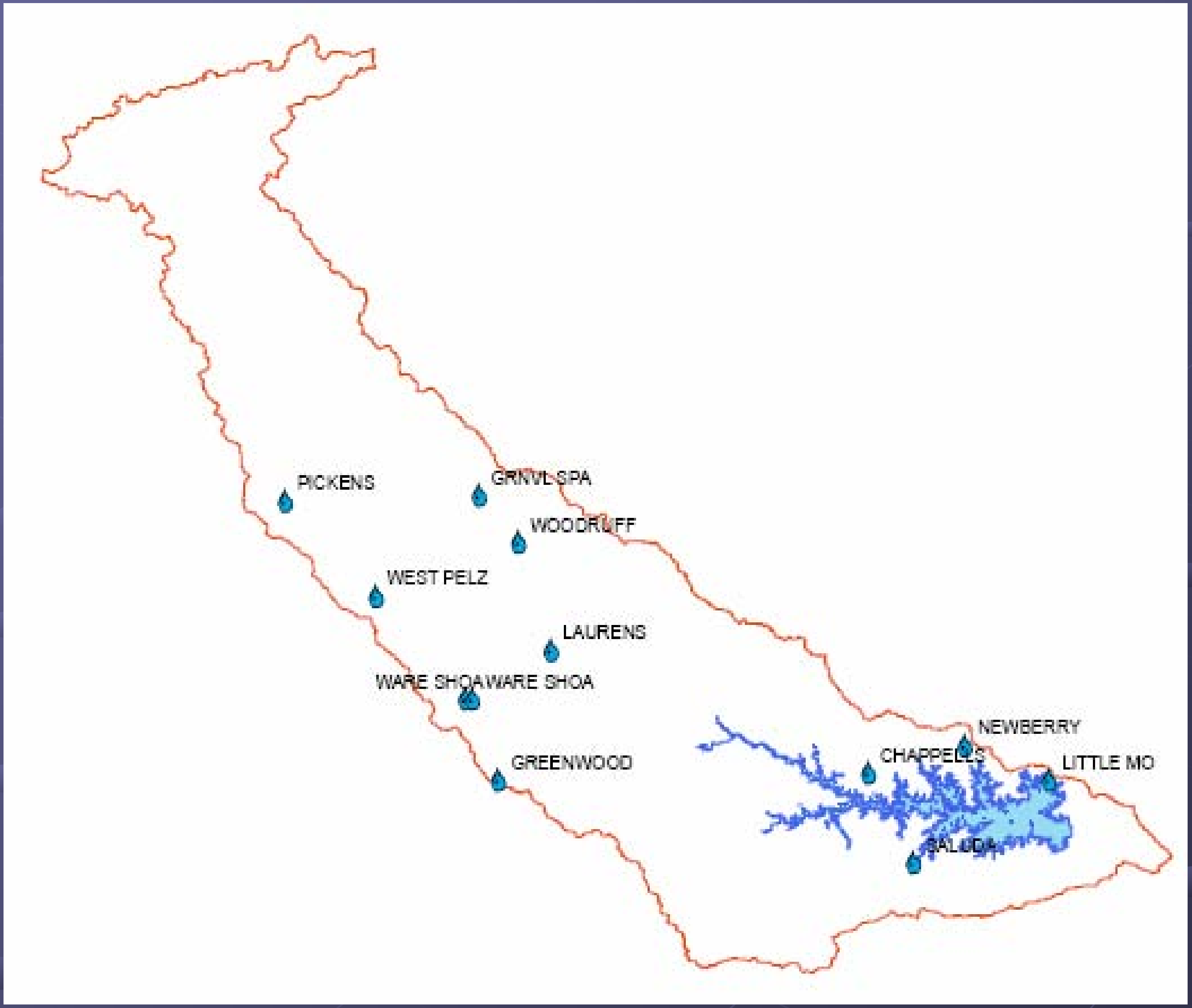
Hydrology

- What is Hydrology?
  - The study of waters of the earth, especially with relation to the effects of precipitation and evaporation upon the occurrence and character of water in streams, lakes, and on or below the land surface
- Why is it important to understand?
  - It affects all of us
  - No Control

Precipitation

- What Happens to the Rain?
  - 1 inch of Rain will produce less than 1 inch of runoff
  - Losses
    - Initial Abstraction
    - Infiltration
    - Evaporation (Average 47” Total, 31” Lost)
- How do we measure Rainfall Totals?
  - Gauging Stations

Precipitation Gages

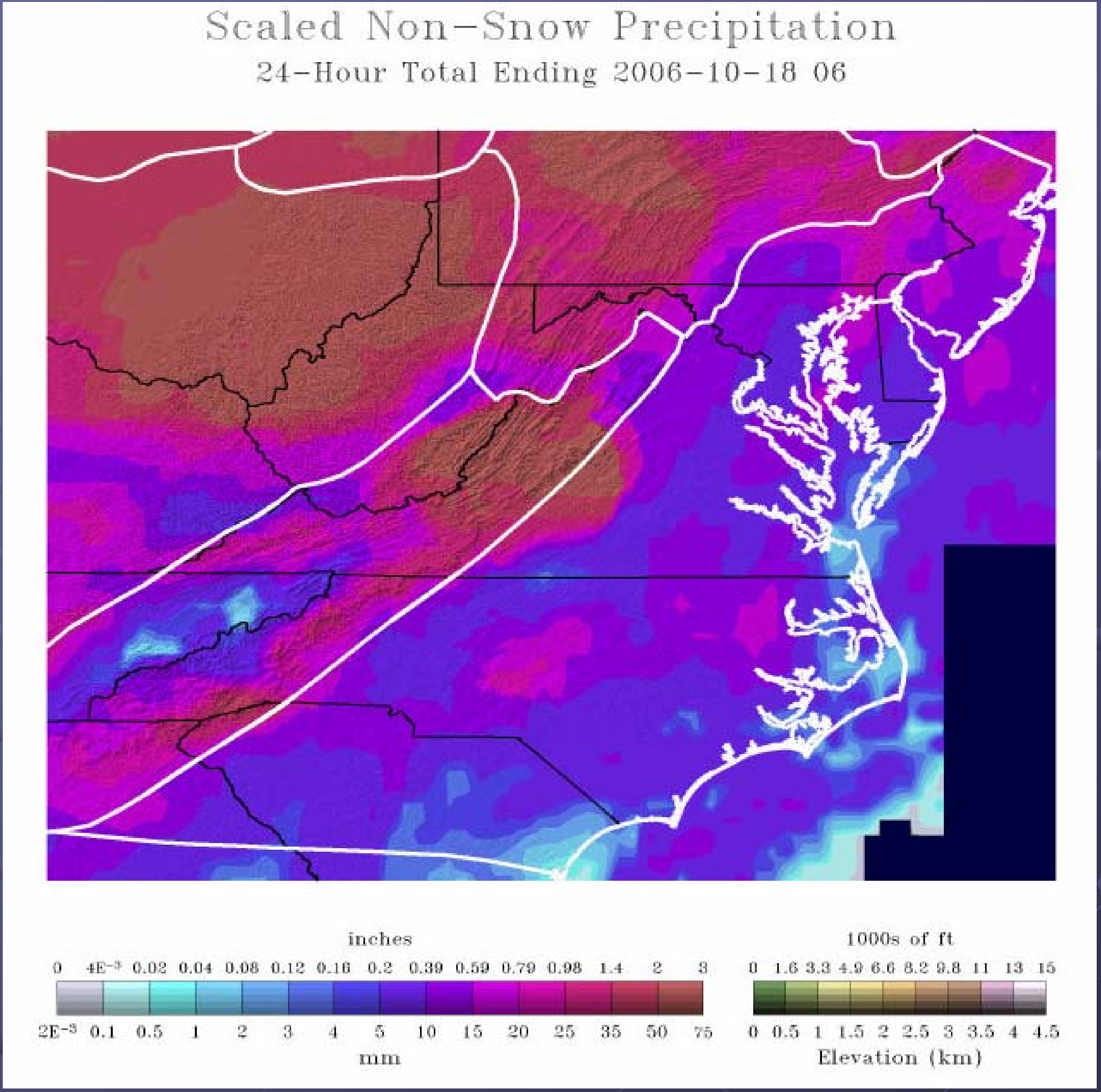


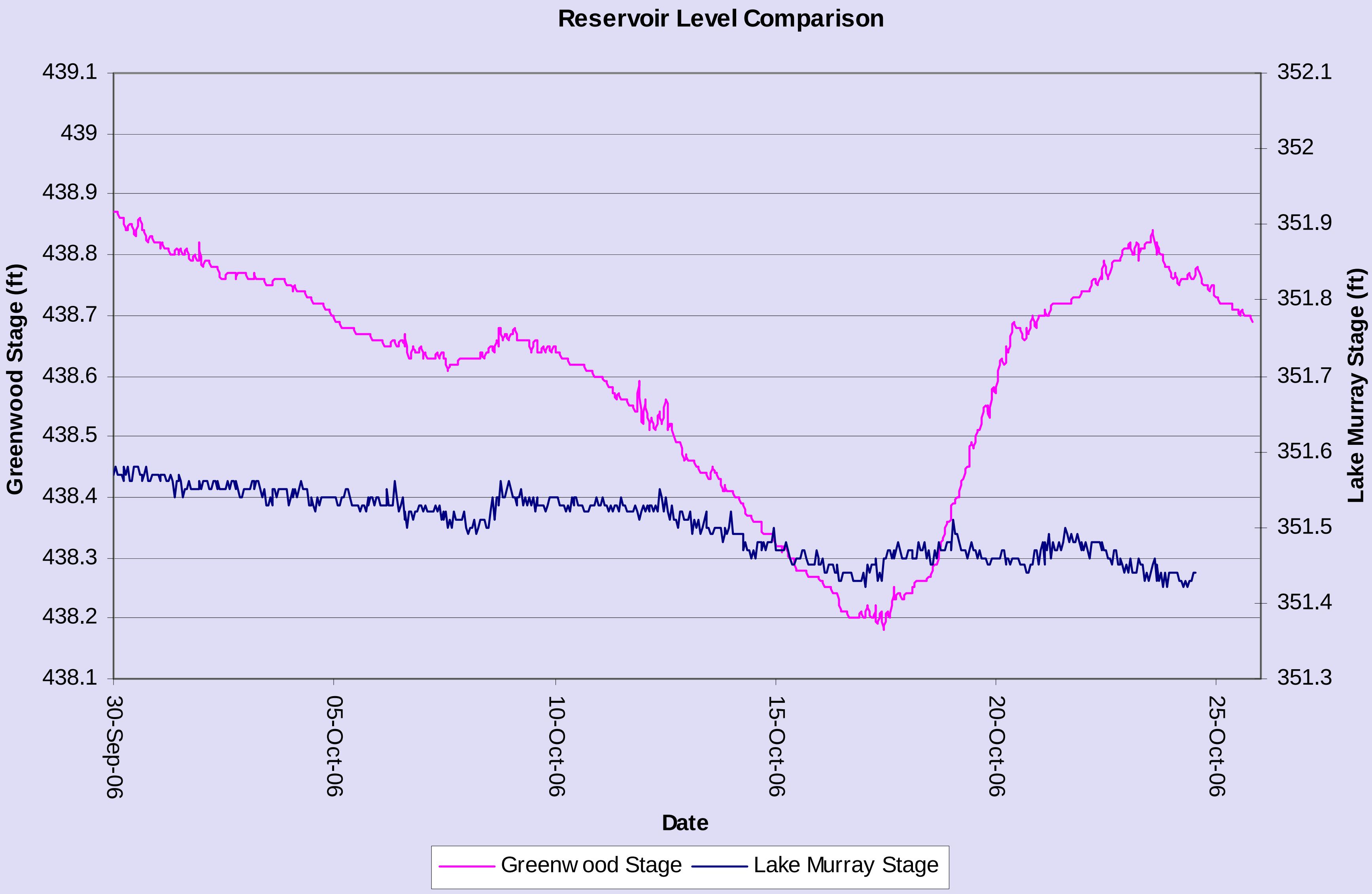
Runoff & Routing

- How much runoff is there?
  - Depends on how much is ‘lost’
  - Depends on the Drainage Area
- How does it pass downstream?
  - ‘Routes’ through streams and reservoirs
  - Streams attenuate flows
  - Reservoirs attenuate flows

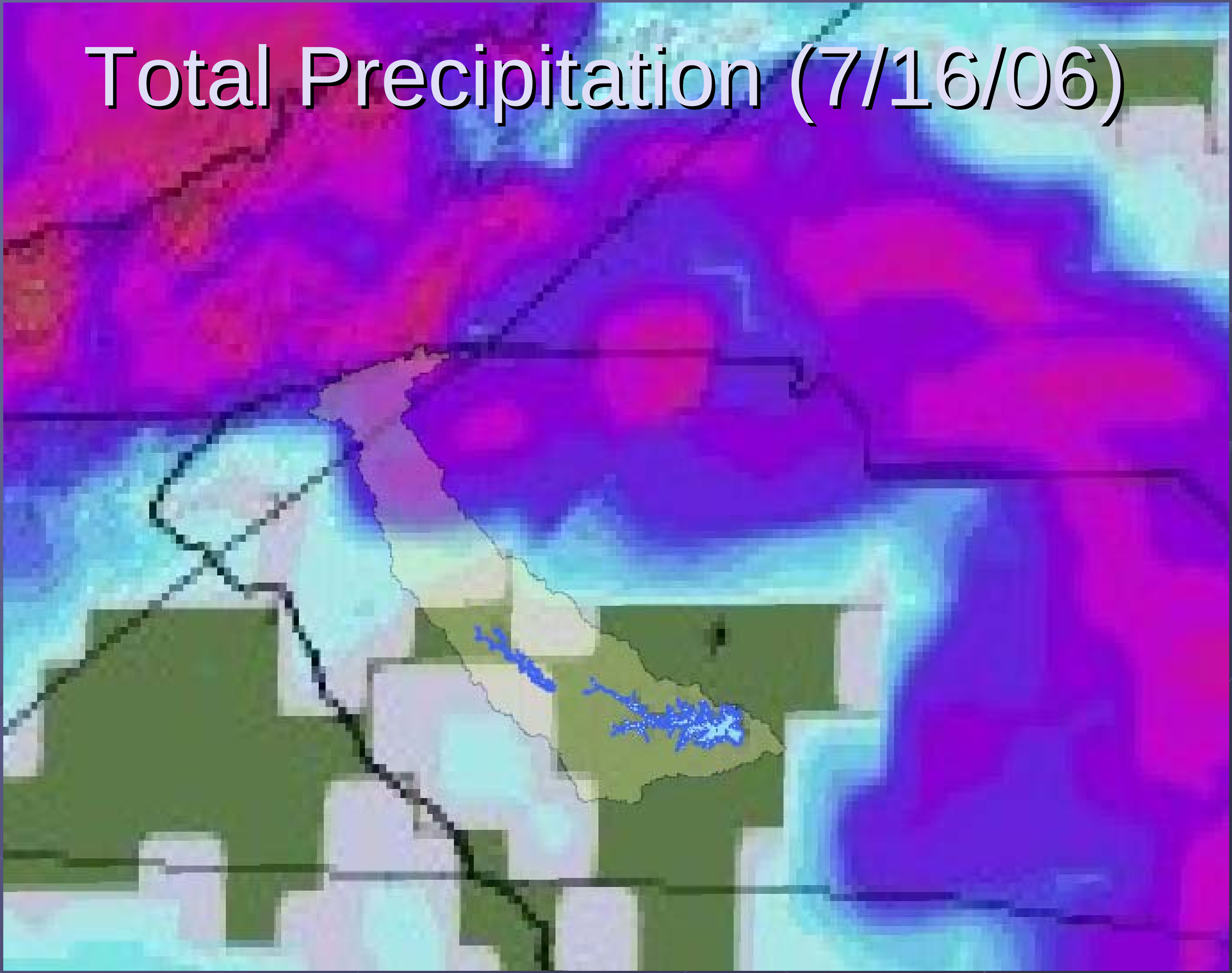
Lake Murray

- Effects of Precipitation
  - (Recent Example of Routing)


Scaled Non-Snow Precipitation
24-Hour Total Ending 2006-10-18 06
inches
0 4E-3 0.02 0.04 0.08 0.12 0.16 0.2 0.39 0.59 0.79 0.98 1.4 2 3
2E-3 0.1 0.5 1 2 3 4 5 10 15 20 25 35 50 75
mm
1000s of ft
0 1.6 3.3 4.9 6.6 8.2 9.8 11 13 15
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5
Elevation (km)

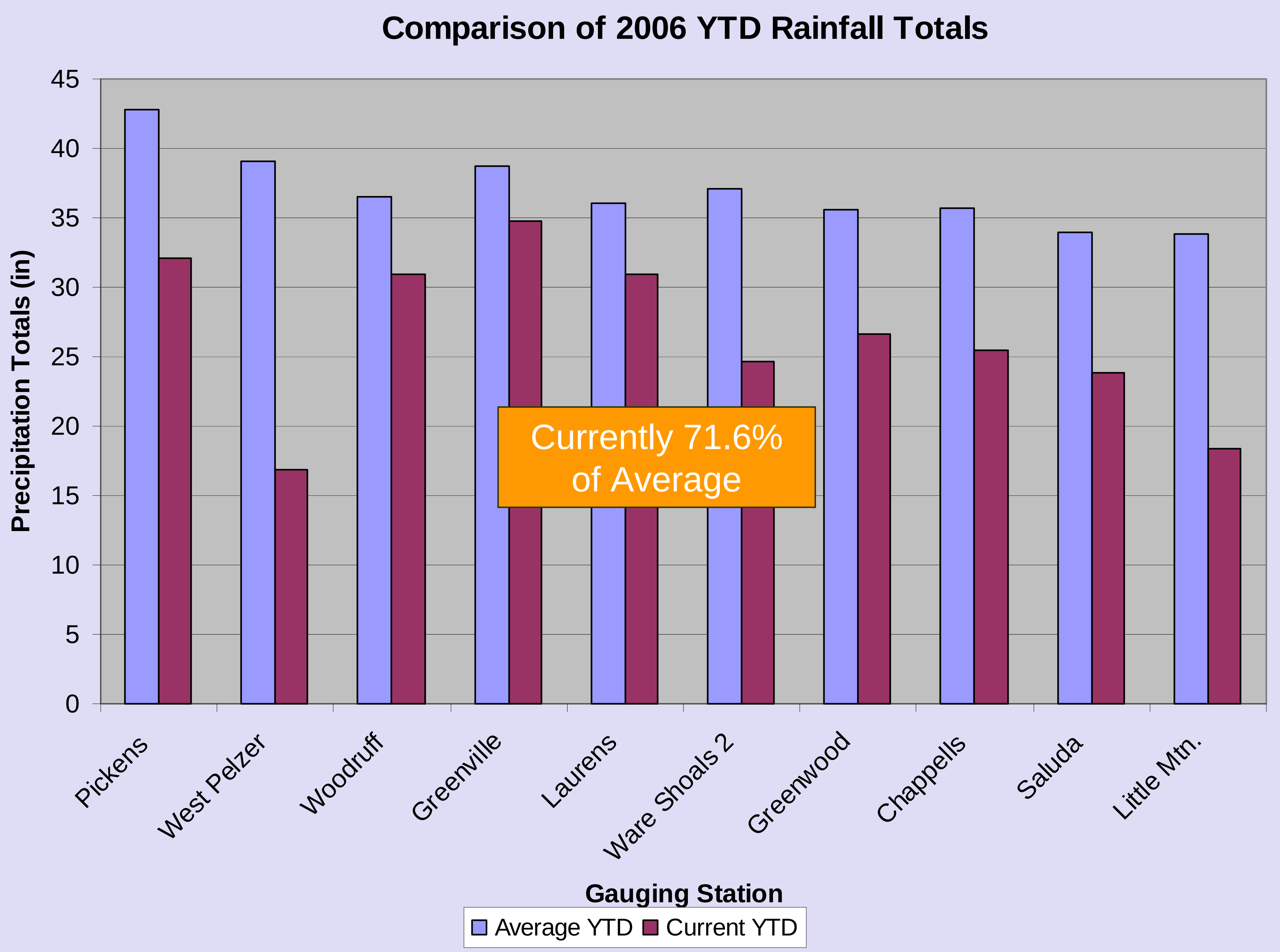

Reservoir Level Comparison
Greenwood Stage (ft)
Lake Murray Stage (ft)
439.1
439
438.9
438.8
438.7
438.6
438.5
438.4
438.3
438.2
438.1
352.1
352
351.9
351.8
351.7
351.6
351.5
351.4
351.3
30-Sep-06
05-Oct-06
10-Oct-06
15-Oct-06
20-Oct-06
25-Oct-06
Date
Greenw ood Stage
Lake Murray Stage

Total Precipitation (7/16/06)



Lake Murray

- Effects of Precipitation
  - (Recent Example)
- Summer of 2006 Precipitation



Comparison of 2006 YTD Rainfall Totals
Precipitation Totals (in)
0
5
10
15
20
25
30
35
40
45
Currently 71.6% of Average
Pickens
West Pelzer
Woodruff
Greenville
Laurens
Ware Shoals 2
Greenwood
Chappells
Saluda
Little Mtn.
Gauging Station
Average YTD
Current YTD

Summary & Questions

- Only Precipitation in Watershed Contributes
- Not all Precipitation will result in direct runoff
- Precipitation can vary widely across the watershed
- Runoff into Lake Murray partly controlled by upstream routing
- Conditions vary annually
- Questions?

South Carolina Electric & Gas Saluda Project

Reservoir Operations Modeling Using:

Army Corps of Engineers

HEC-ResSim

Kleinschmidt

Energy & Water Resource Consultants

Saluda HYDRO RELICENSING

Afternoon Schedule

- Model Development & Calibration (1st hour)
- Break (20 minutes)
- Future Developments & Potential Results (2nd hour)
- Questions (30 minutes)

Saluda HYDRO RELICENSING

Mission Statement

"...establish a baseline of current hydrologic, hydraulic and operational conditions, and aid in analyzing and understanding the potential upstream and downstream effects of potential changes to project operation...."

Model Objectives

- Assess impact of various environmental constraints on project operation
- Assess various project operation schemes for feasibility
- Determine “realistic” plan for future operations

Selected Model – HEC-ResSim

- Publicly available Army Corp of Engineers software (HEC-5)
- Specifically created for reservoir modeling and management
- Flexibility in managing large datasets
- Rule based decisions on daily timesteps
- Application of seasonal rules
- Ability to prioritize rules

US Army Corps of Engineers ®

Saluda HYDRO RELICENSING

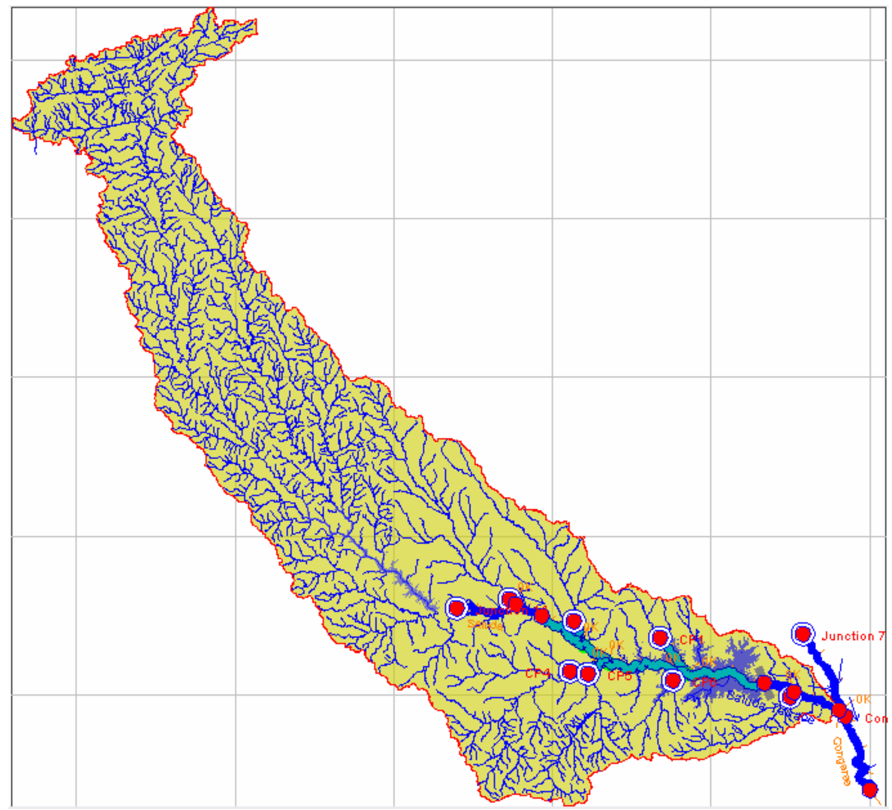
Model Development

- Model Area
  - Includes *Virtual Inflow* from entire watershed
  - Inputs located directly upstream and downstream of Lake Murray
- Input data
  - Reservoir stage/storage data
  - Historic dam releases (Outflow Hydrograph)
  - Historic water levels (Stage data)

Saluda HYDRO RELICENSING

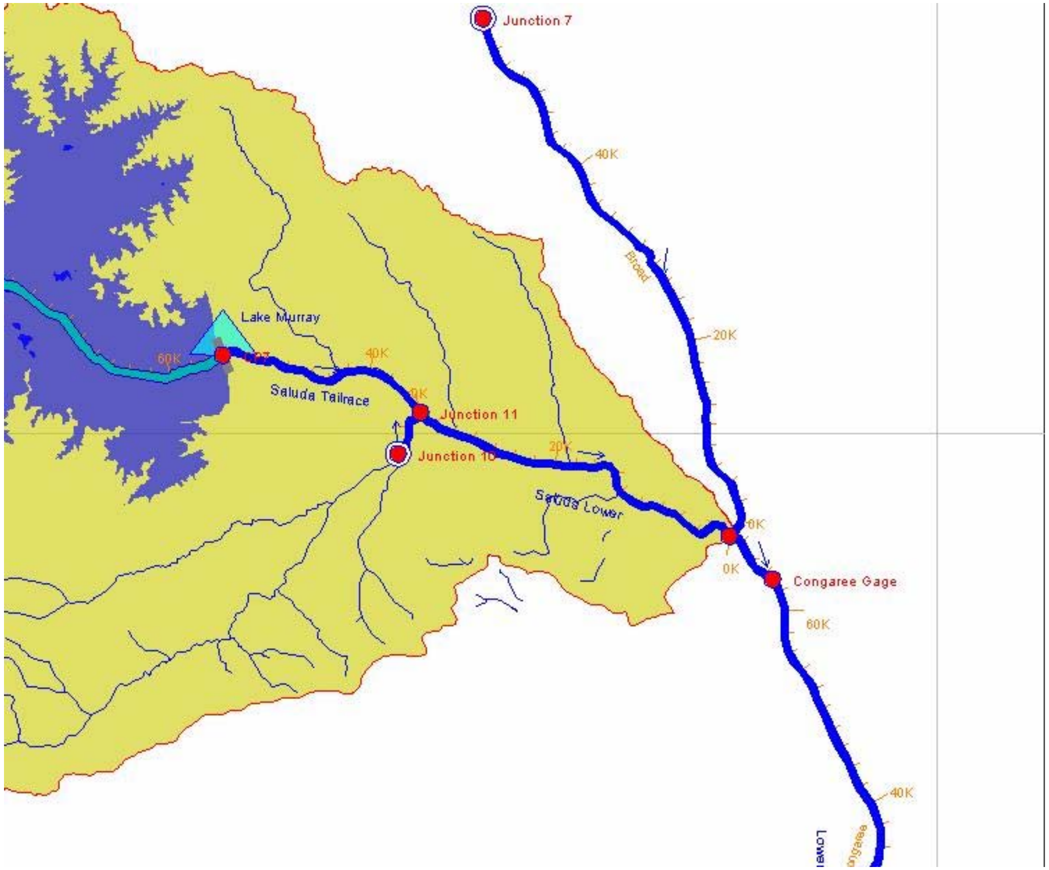
Model Development (cont)

- Components
  - Upstream Inflows
  - Lake Murray
  - Downstream Gages
  - Broad & Congaree River Gages

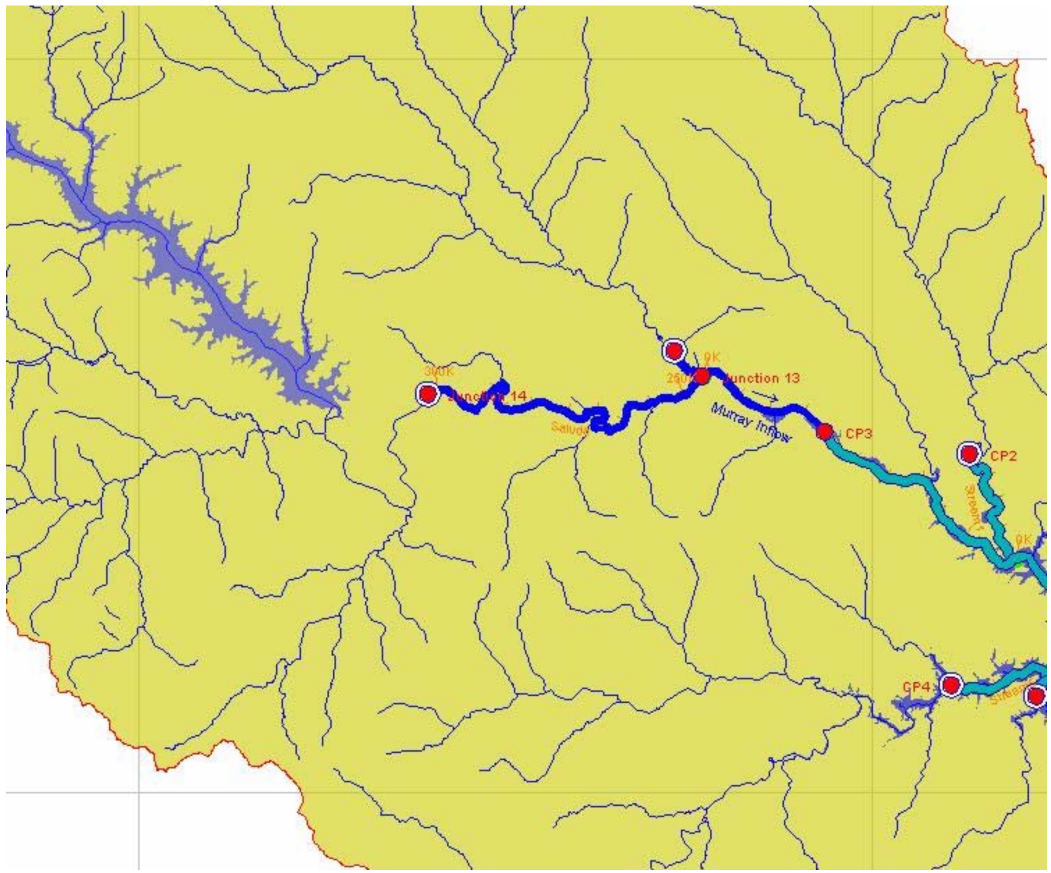


Saluda HYDRO RELICENSING

Data Layout - Downstream

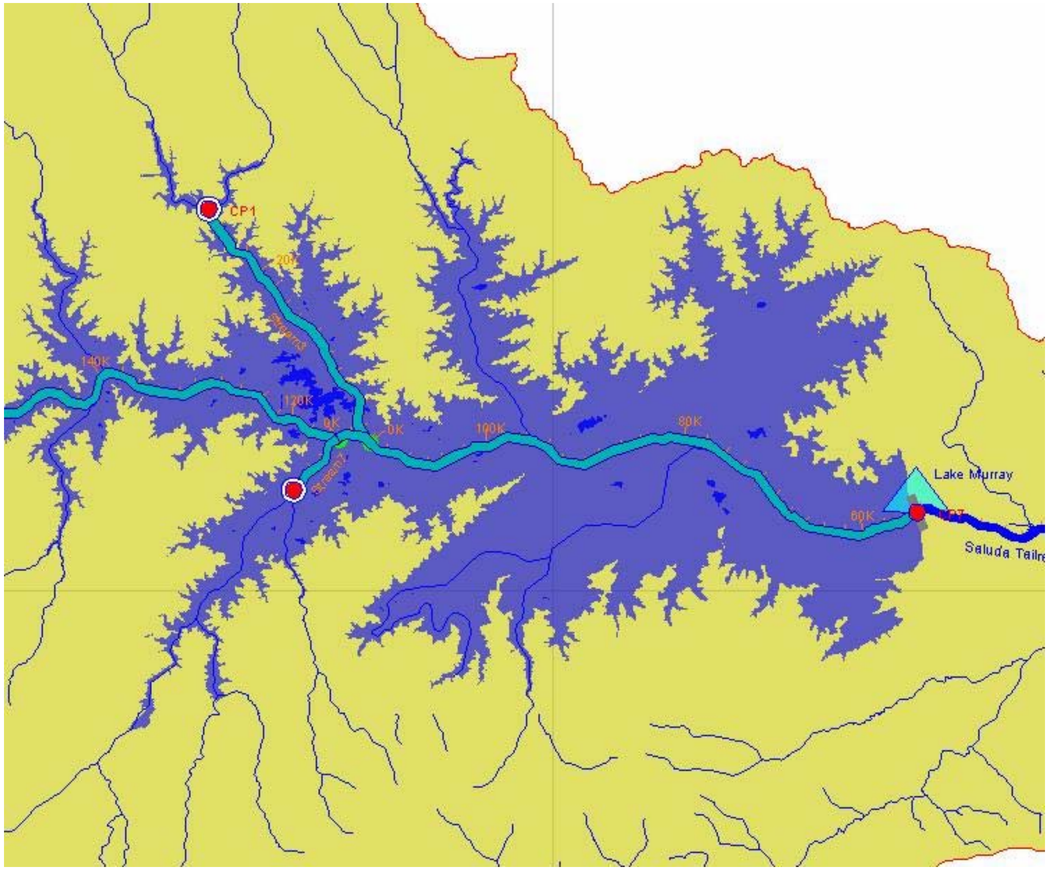


Data Layout - Upstream



Saluda HYDRO RELICENSING

Data Layout – Lake Murray



Available Data Sources

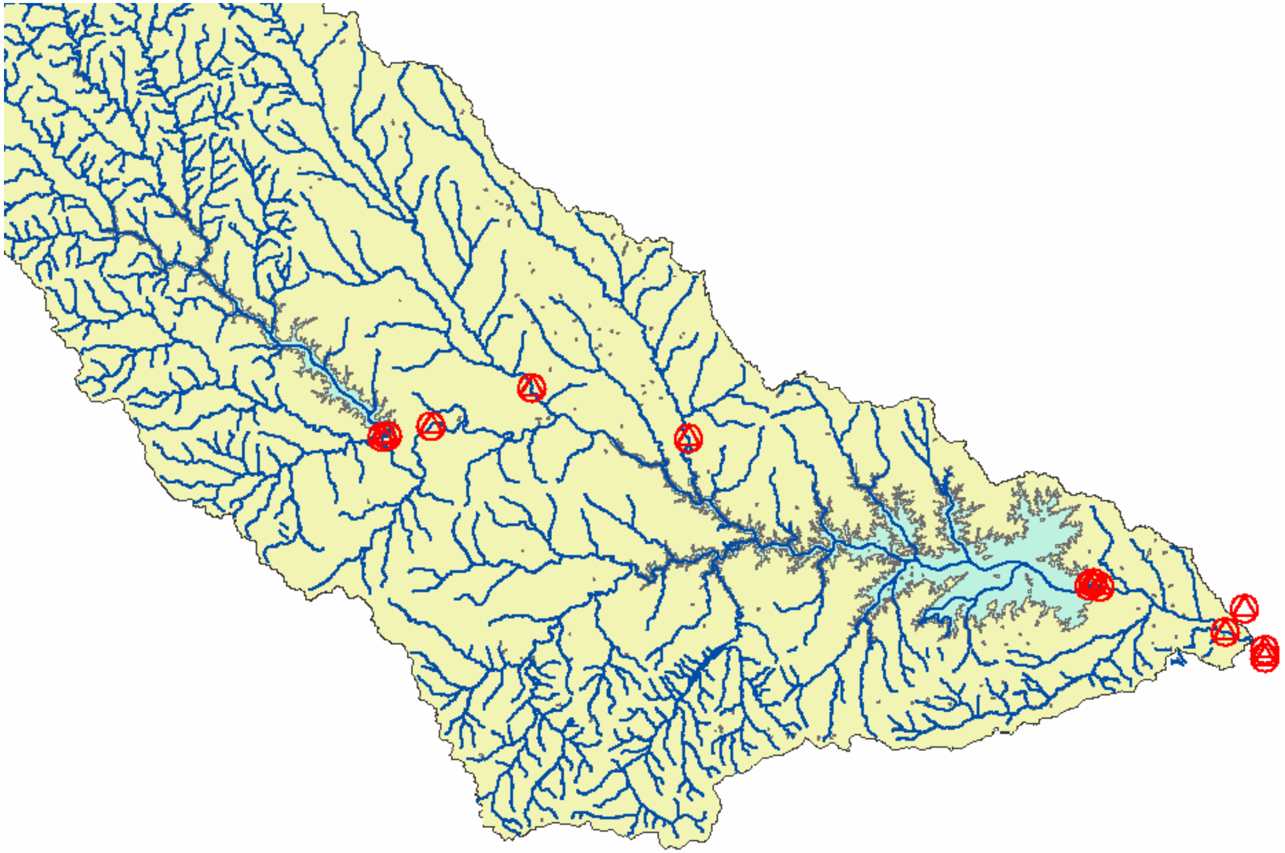
- Operations Data
  - Generation MWh (SCE&G)
  - Lake Level (USGS)
  - Downstream Flows (USGS)
- NWS – Precipitation data
- USGS – Flow Data
  - Flow Model Hydrology output

Available Data Sources (cont.)

- USGS gages
  - Saluda River at Chappells
    - 1360 sq. miles,1926-Present
  - Bush River near Prosperity
    - 115 sq. miles, 1990-Present
  - Little River near Silverstreet
    - 230 sq. miles, 1990-Present
  - Saluda River downstream of Lake Murray
    - 2420 sq. miles, 1988-present
  - Saluda River at Columbia
    - 2520 sq. miles, 1925-Present

Saluda HYDRO RELICENSING

USGS Gage Locations



Model Process

- Develop model of watershed system
- Calibrate to historical conditions
  - Historical model used to derive system inflows
- Using derived inflows, run simulations using proposed constraints to assess impacts on the Project

Saluda HYDRO RELICENSING

Model Process

- Two Methods Tested for Developing Inflow Data:
  - 1) Upstream Gage Rating
    - Utilize available USGS gage data and adjust for ungaged areas
  - 2) Mass Balance
    - Hindcast from outflow and lake level data historical lake level data

Saluda HYDRO RELICENSING

Method 1 - Gage Rating

Known:

1. Lake Stages
2. Outflow
3. Gaged Inflow Rates

Unknown:

1. Lake Direct Inflow
2. Evaporation

Little River Gage

Bush River Gage

Chappells River Gage

Lake Murray

Saluda Gage (d/s)

Fact:

Upstream Stream Gages cover approximately 1,705 sq. miles of a total lake watershed of 2,422 sq. miles (70%). Thirty Percent of direct Lake inflow remains ungaged.

Approach:

Increase upstream gages by a factor to account for any ungaged areas.

Saluda HYDRO RELICENSING

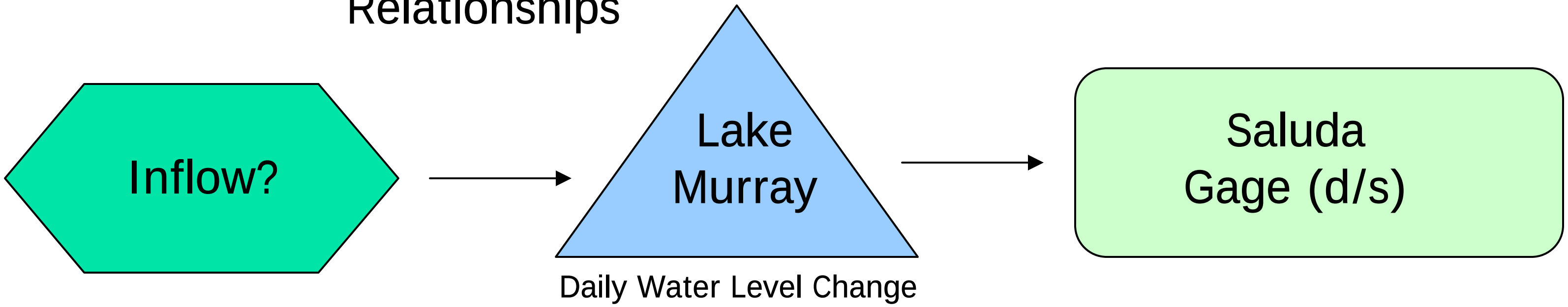
Method 2 - Mass Balance

<u>Known:</u>

1. Lake Stages
2. Outflow
3. Stage-Volume Relationships

<u>Unknown:</u>

1. Inflow



<u>Fact:</u>

<u>Inflow = Change in Storage (Water Level) + Outflow</u>

<u>Approach:</u>

Back calculate inflow using smoothed lake level data and gaged outflows

Saluda HYDRO RELICENSING

Calibration Procedure

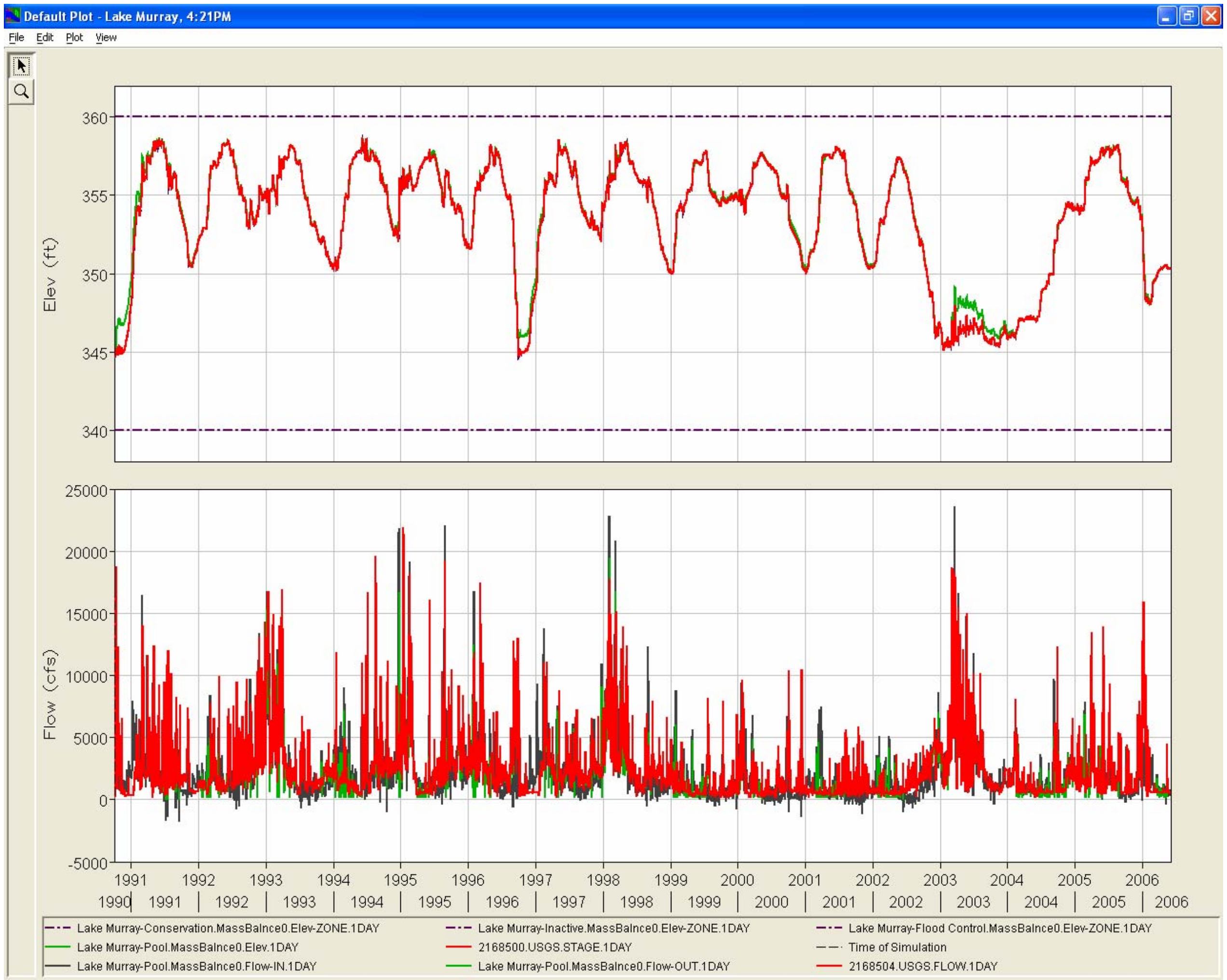
1. Develop inflow hydrograph
2. Have model follow stage hydrograph by automatically adjusting discharge
   - Depends on how much flow is entering to decide how much to release
   - Must follow historically observed water levels (stage)
3. Compare calculated stage to observed stage
4. Compare correlation between calculated outflows and observed outflows (USGS gage)
5. Inflow that produces a 'good' fit would be considered calibrated
   - Both Methods were tested with this procedure

Saluda HYDRO RELICENSING

Calibration Results

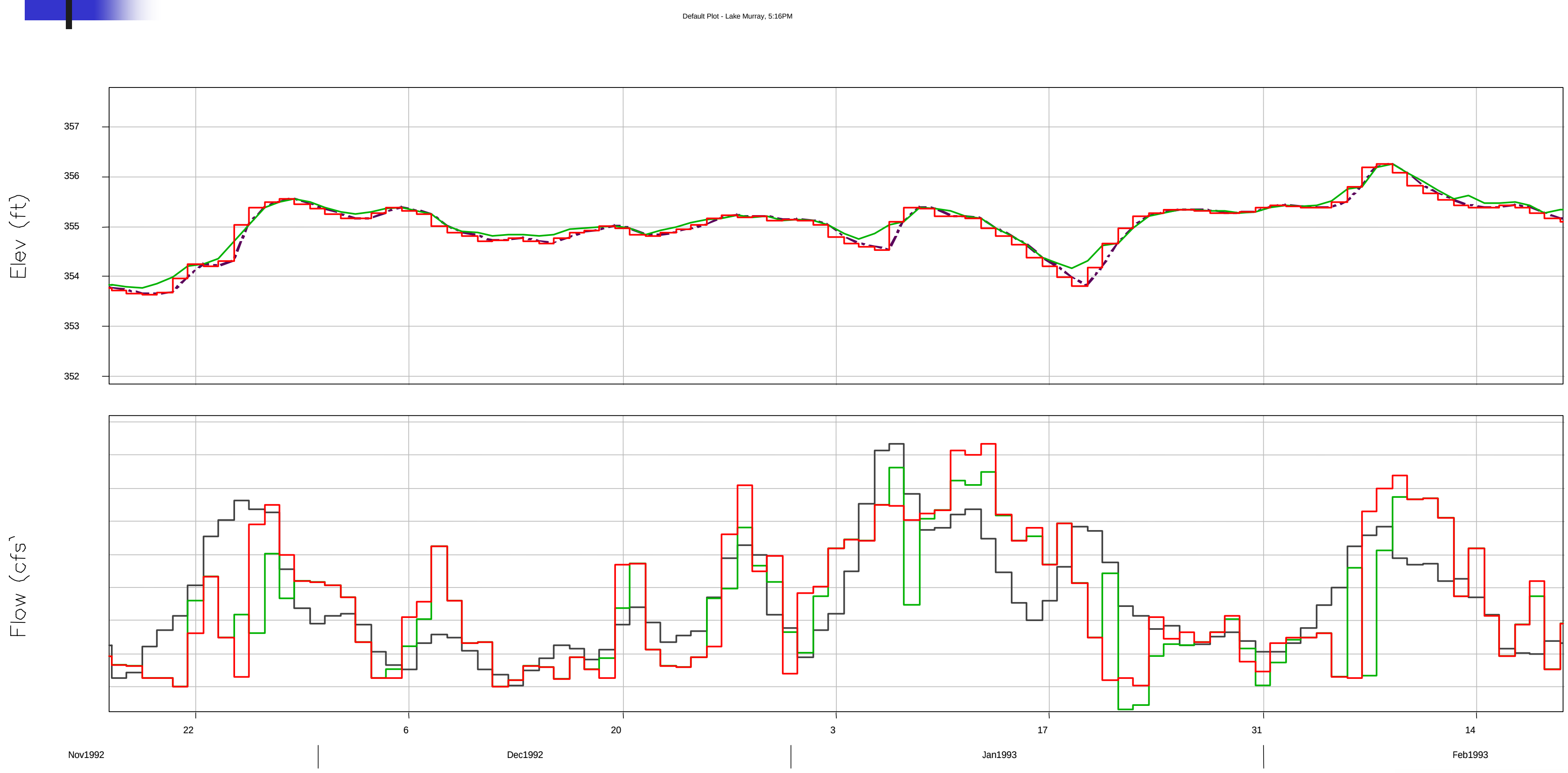
Stage

Discharge

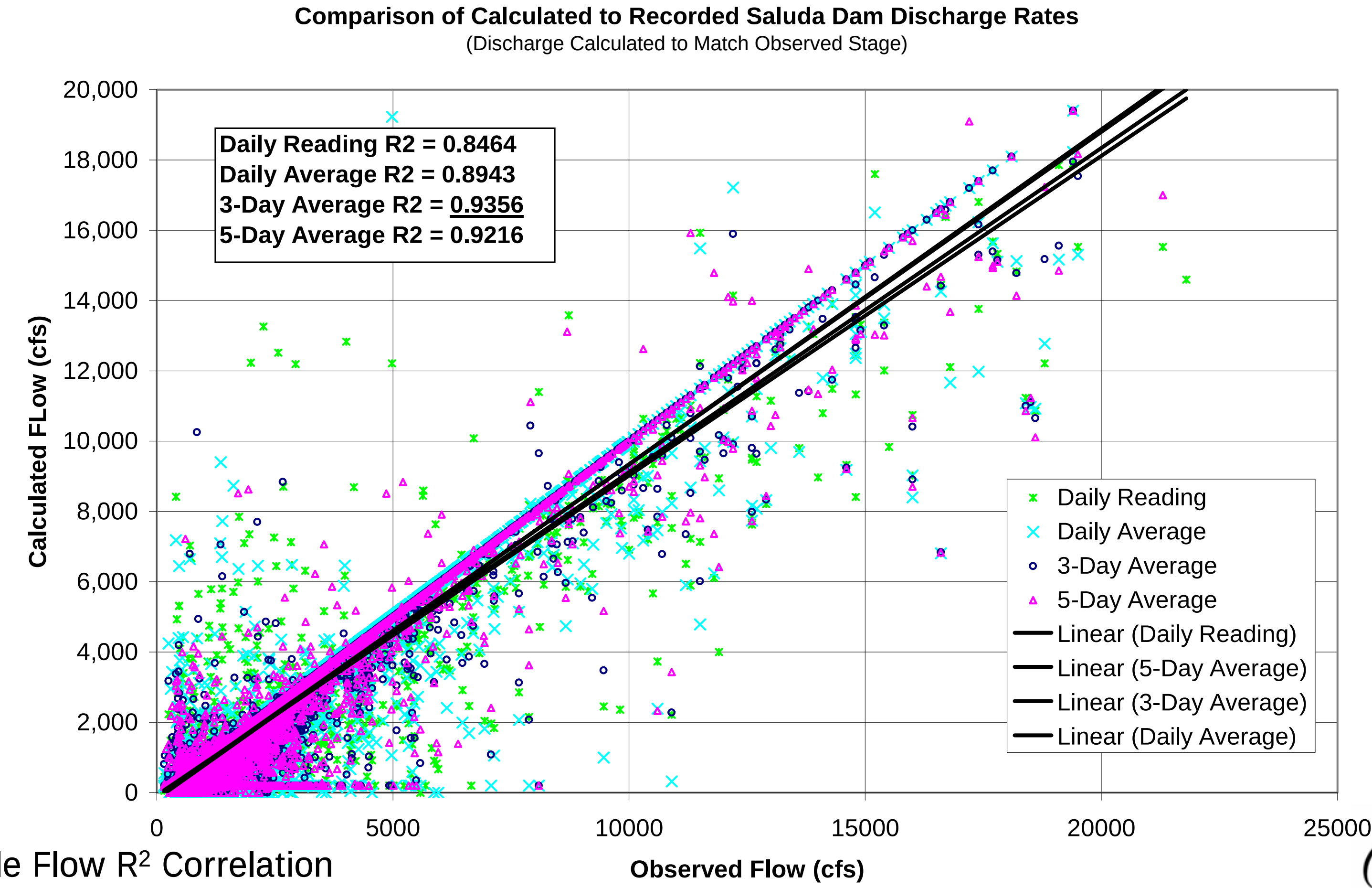


Saluda HYDRO RELICENSING

Calibration Results (cont)



Calibration Results (cont)



*Sample Flow R^2 Correlation

Saluda HYDRO RELICENSING

Calibration Discussion

- Lake level measurements
  - 0.1 feet of variation ~ 2200 cfs on a daily basis. SCE&G notes 0.06 feet is typical "noise" in lake level readings
  - Can result in excessive negative inflows (common problem with hindcast modeling)
  - Lake level data needed to be "smoothed" for mass balance method

Calibration Discussion

- Accuracy of gages downstream of Lake Murray are suspect due to variations in volume
- Gages upstream have limited common period of record (1990-present)
- Low stage periods have poor correlation (result of drawdowns, accuracy of stage storage data)

Saluda HYDRO RELICENSING

Calibration Conclusion

- Mass balance method produced best correlation between both lake levels and outflows.
- **Mass balance method produced a highly correlated inflow hydrograph which is now ready for constraint analysis**

Saluda HYDRO RELICENSING

Break

- 20 minutes
- Calibration Questions?

Saluda HYDRO RELICENSING

Future Developments & Potential Results

- With a calibrated model… (i.e. we know inflow)
  - Evaluate Environmental Constraints
    - Temporal Stage Impacts
    - Temporal Discharge Impacts
  - Determine frequencies that constraints may be violated
- Further Evaluations
  - Downstream flow routing (confluence with Broad R.)
  - Flood Frequency Evaluation

Saluda HYDRO RELICENSING

Sample Constraints

- Flow
  - Minimum flow between June 1st and August 1st and should be a minimum of 20,000 cfs for extreme whitewater course
- Stage
  - Maintain Lake Murray at elevation 380.0' year-round

Saluda HYDRO RELICENSING

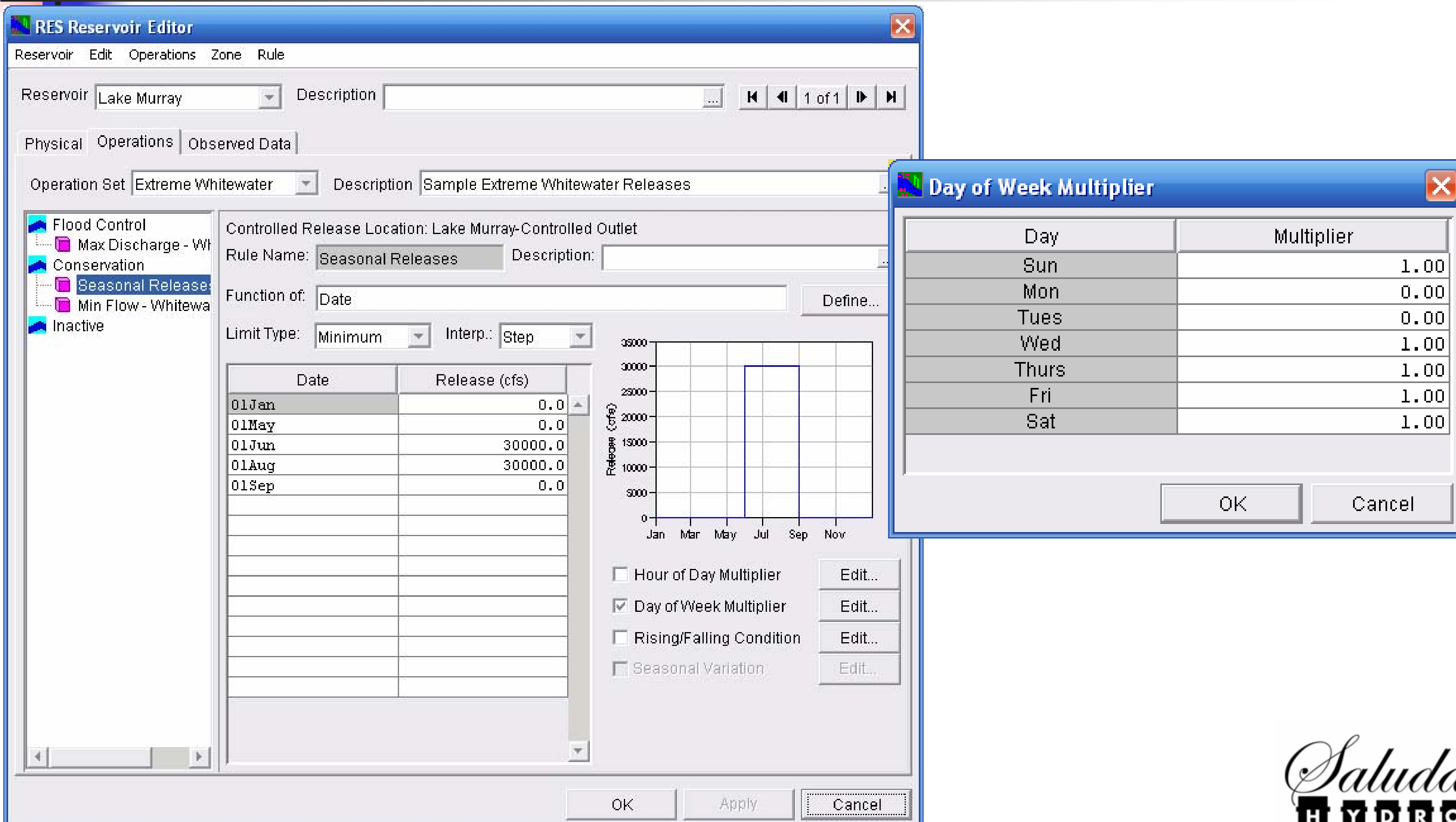
Constraint Requests

- Provide
  - Specific Elevations
  - Specific Flows

Extreme Example Application

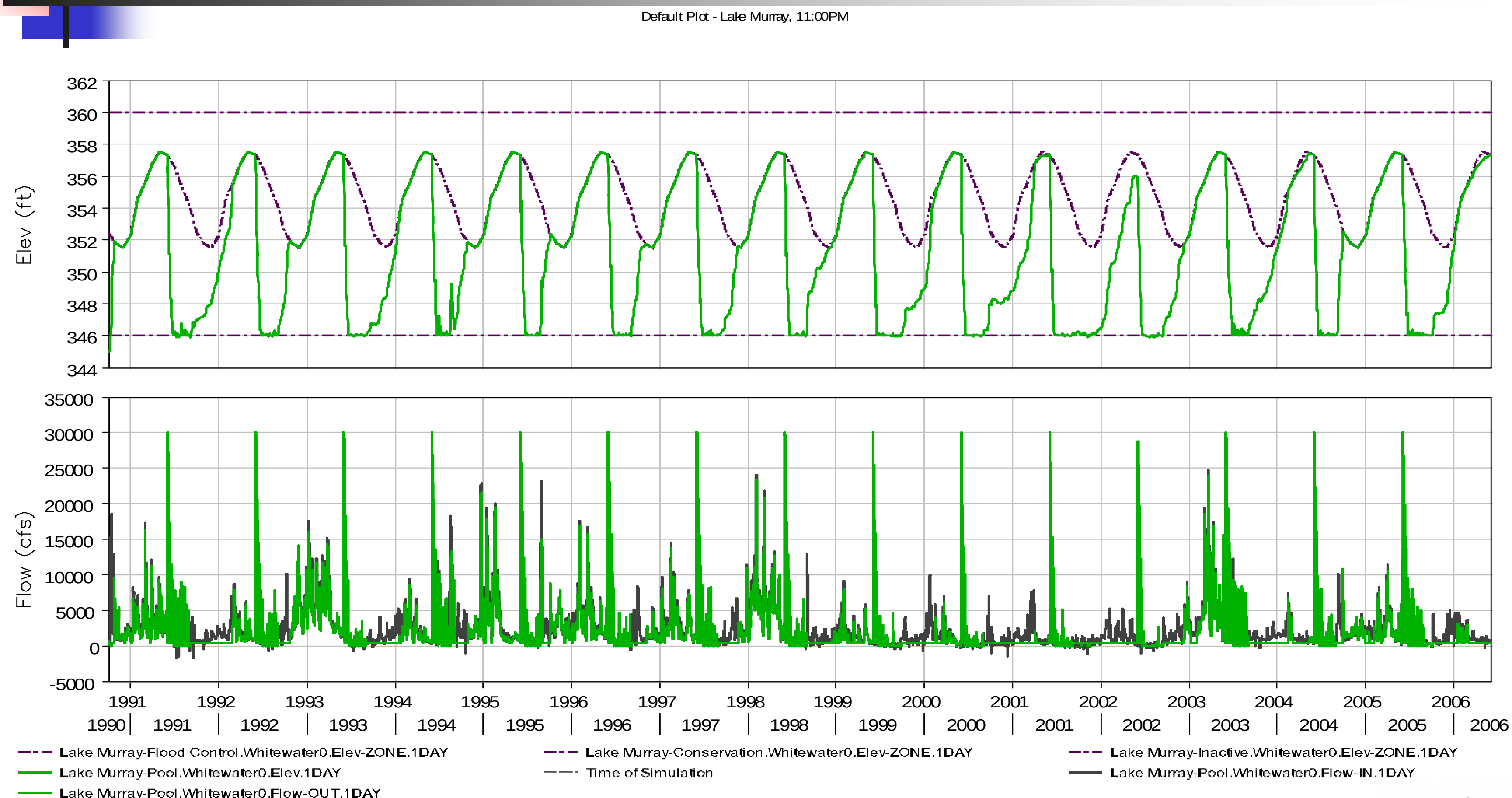
- Extreme Flow Releases during Summer Months
- Information Provided
  - Operate during June, July & August
  - Minimum flow of 30,000 cfs
  - Not required on Mondays or Tuesdays

Constraint Setup Example



Saluda HYDRO RELICENSING

Extreme Example Output



Extreme Example Tables

//LAKE MURRAY-FLOOD CONTROL/ELEV-ZONE/01OCT1990/1DAY/WHITEWATER0/

File Edit View

Ordinate	Date / Time	LAKE MURRA... ELEV-ZONE WHITEWATER0	LAKE MURRA... ELEV-ZONE WHITEWATER0	LAKE MURRA... ELEV-ZONE WHITEWATER0	LAKE MURRA... ELEV WHITEWATER0	LAKE MURRA... FLOW-IN WHITEWATER0	LAKE MURRA... FLOW-OUT WHITEWATER0
239	27 May 91 22:...	360.00	357.36	346.00	357.36	2,723	2,861
240	28 May 91 22:...	360.00	357.35	346.00	357.35	3,392	3,529
241	29 May 91 22:...	360.00	357.35	346.00	357.35	3,497	3,635
242	30 May 91 22:...	360.00	357.34	346.00	357.34	4,006	4,143
243	31 May 91 22:...	360.00	357.34	346.00	357.34	4,354	4,492
244	01 Jun 91 22:...	360.00	357.33	346.00	357.33	4,829	4,966
245	02 Jun 91 22:...	360.00	357.31	346.00	356.23	5,285	30,000
246	03 Jun 91 22:...	360.00	357.28	346.00	356.43	4,894	400
247	04 Jun 91 22:...	360.00	357.26	346.00	356.59	4,044	400
248	05 Jun 91 22:...	360.00	357.23	346.00	355.32	1,645	30,000
249	06 Jun 91 22:...	360.00	357.21	346.00	354.08	916	27,136
250	07 Jun 91 22:...	360.00	357.18	346.00	352.96	1,106	23,957
251	08 Jun 91 22:...	360.00	357.16	346.00	351.98	932	21,153
252	09 Jun 91 22:...	360.00	357.13	346.00	351.09	721	19,006
253	10 Jun 91 22:...	360.00	357.11	346.00	351.10	474	400
254	11 Jun 91 22:...	360.00	357.08	346.00	351.13	1,073	400
255	12 Jun 91 22:...	360.00	357.06	346.00	350.37	1,618	17,257
256	13 Jun 91 22:...	360.00	357.03	346.00	349.69	2,317	15,626
257	14 Jun 91 22:...	360.00	357.01	346.00	349.06	2,337	14,106
258	15 Jun 91 22:...	360.00	356.98	346.00	348.49	1,985	12,720
259	16 Jun 91 22:...	360.00	356.96	346.00	347.98	2,043	11,507
260	17 Jun 91 22:...	360.00	356.94	346.00	348.11	2,827	400
261	18 Jun 91 22:...	360.00	356.91	346.00	348.26	3,091	400
262	19 Jun 91 22:...	360.00	356.89	346.00	347.83	3,261	11,223
263	20 Jun 91 22:...	360.00	356.86	346.00	347.45	3,397	10,513
264	21 Jun 91 22:...	360.00	356.84	346.00	347.13	4,024	9,925
265	22 Jun 91 22:...	360.00	356.81	346.00	346.80	3,150	9,310
266	23 Jun 91 22:...	360.00	356.79	346.00	346.44	1,879	8,636
267	24 Jun 91 22:...	360.00	356.76	346.00	346.48	1,059	400
268	25 Jun 91 22:...	360.00	356.74	346.00	346.51	940	400

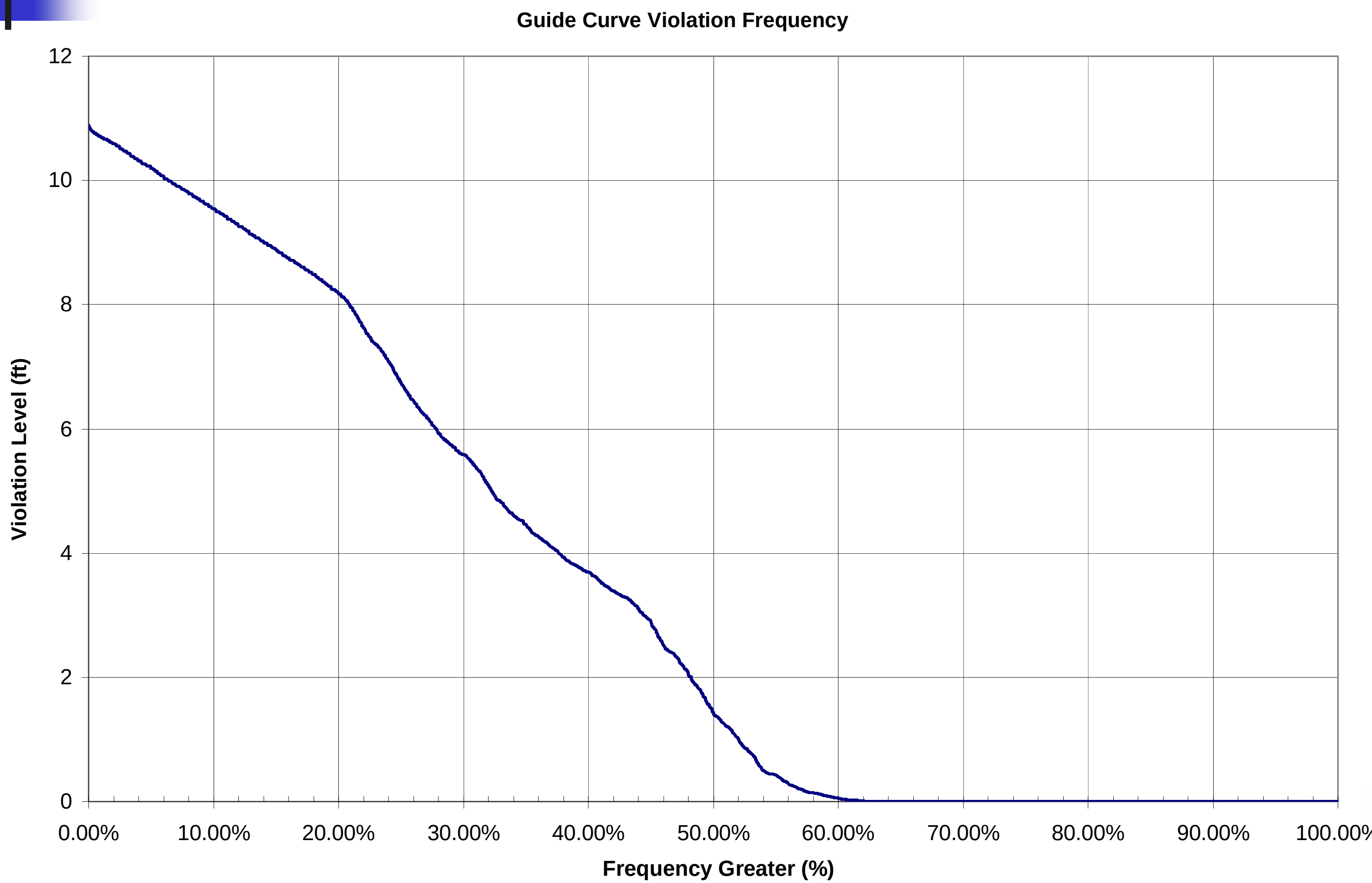
Saluda HYDRO RELICENSING

Interpretation of Example Results

- Interpretation of Results
  - Operation following this constraint visually drains the reservoir to a minimum of 346.0’
  - Dry years may not have sufficient inflow to return to Guide Curve
  - 50% of the days have greater than a 1.7’ reduction from the Guide Curve

Saluda HYDRO RELICENSING

Example Guide Curve Violation Frequency & Magnitude



Saluda HYDRO RELICENSING

Constraint Compilation

- Assemble all stage & flow constraints into HEC-ResSim model
- Evaluate various constraints to determine reasonableness

Next Steps

- Develop resource constraints in terms of *FLOW* and *ELEVATION* for model input and analysis
- Run model simulations using constraint inputs
- Determine impact of constraints on:
  - Project Operations
  - Project Generation
  - Downstream flows
  - Flood Frequencies

Questions?

Saluda HYDRO RELICENSING

Lake and Land Management Resource Conservation Group Update

Alan Stuart
Kleinschmidt Associates
July 18, 2006

Lake and Land Management RCG Mission Statement

The mission of the Saluda Hydro Relicensing Lake and Land Management Resource Conservation Group is to **gather and/or develop information, study and consider all issues relevant to and impacting upon the Saluda Hydroelectric Project Shoreline Management Plan (SMP) and supporting guidelines**. The outcome should be the development of a consensus-based, updated SMP for submittal in the Project 516 license application. It should include/consider properties within the Project Boundary Line (PBL) for Project 516, upstream and downstream, and such areas beyond the PBL which SCE&G, through its SMP, can materially influence.

Lake and Land Management RCG Meetings

Date	*Discussion Topics*
November 2, 2005	**Development of Mission Statement**
February 9, 2006	**Formation of Technical Working Committee**
April 26, 2006	**Convened meeting to discuss TWC Progress and develop draft outline of the Shoreline Management Plan**
August 22, 2006	**Next Meeting scheduled**

Lake and Land Management TWC

Tommy Boozer, SCE&G
Alan Stuart, Kleinschmidt
Tom Ruple, LMA
Ron Ahle, SCDNR
Steve Bell, Lake Watch
Roy Parker, Lake Murray Assoc.
Van Hoffman, SCANA Services
Bill Mathias, LMA
Rhett Bickley, Lexington County
Alison Guth, Kleinschmidt

David Hancock, SCE&G
Randy Mahan, SCANA Services
Amanda Hill, USFWS
Bill Argentieri, SCE&G
Joy Downs, LMA.
Tony Bebber, SC Parks Recreation and Tourism
Dick Christie, SCDNR
Ron Scott, Lexington Co.

Lake and Land Management TWC Accomplishments

Completed First **Drafts** of:

- Buffer Zone Management Guidelines
- Shoreline Woody Debris
- Bank Stabilization Guidelines/Permitting
- Erosion and Sedimentation Guidelines
- Residential Dock Permitting
- Limited Brushing Guidelines
- Excavation Guidelines
- Environmentally Sensitive Areas Mapping and Management
- Perennial and Intermittent Stream mapping

Lake and Land Management TWC Additional Items addressed

- Moorings
- Boat and Personal Water Craft Lifts
- Permitted water withdrawals
- Aquatic Plant Management

Lake and Land Management TWC: Outstanding Issues to be discussed

- Multi-slip Dock Permitting
- Sale of Fringe lands
- Land Reclassification (including Re-balancing for recreational and wildlife needs)
- General Permit Conditions
- Shoreline Management Education Program
- Commercial Marinas
- Lower Saluda River Corridor

Schedule

- Draft of New Shoreline Management Plan to SCE&G Management for review – April 2007
- Draft of Shoreline Management Plan for Lake and Land Management RCG review – July 2007
- Draft Shoreline Management Plan – September 2007

Questions??

Status of Fish & Wildlife Resource Conservation Group

Shane Boring
Kleinschmidt Associates

Fish and Wildlife RCG Mission Statement

The mission of the Fish and Wildlife RCG is to develop a Protection, Mitigation, and Enhancement Agreement (PM&E Agreement) relative to fisheries and wildlife management for inclusion within the Saluda Hydroelectric Project license application. The objective of the PM&E Agreement shall be to assure the development and implementation of a level of integrated management best adapted to serve the public interests. To achieve this mission, the Fish and Wildlife RCG shall identify the need for, define the scope of, and manage or influence as appropriate, data collection and/or studies relative to potentially impacted fish, wildlife, and plant species and ecological communities, ecosystems and/or habitat within the Saluda Hydroelectric Project.

Fish & Wildlife RCG Meetings

Date	*Discussion Topics / (Presenter)*
November 10, 2005	**Development of Mission Statement**
	Saluda Hydro System Control (Lee Xanthakos, SCE&G)
December 7, 2005*	**401 Water Quality Certification for Hydro Projects (Gina Kirkland, SCDHEC)**
	Lower Saluda River Site-Specific Water Quality Standard (Shane Boring, KA)
	Water Quality Update: L. Murray & Lower Saluda (Andy Miller, SCDHEC)
	Water Quality Analysis & CE-QUAL-W2 Modeling for L. Murray (A. Sawyer and J. Ruane, REMI)
February 22, 2006	**Formation of Technical Working Committees**
	Review of Study Requests

* Joint Meeting with Water Quality RCG

Fish & Wildlife Technical Working Committees (TWC's)

- Diadromous Fish
- Rare, Threatened, and Endangered Species
- Instream Flow/Aquatic Habitat
- Terrestrial Resources
- Freshwater Mussels/Benthic Macroinvertebrates
- Fish Entrainment

Diadromous Fish TWC Meetings

Dick Christie, SCDNR | **Prescott Brownell, NMFS**

Gerrit Jobsis, Am. Rivers | **Amanda Hill, USFWS**

Ron Ahle, SCDNR | **Alan Stuart, Kleinschmidt**

Steve Summer, SCANA | **Shane Boring, Kleinschmidt**

Gerrit Jobsis, Am. Rivers | **Amanda Hill, USFWS**

Diadromous Fish Coordinator, SCDNR

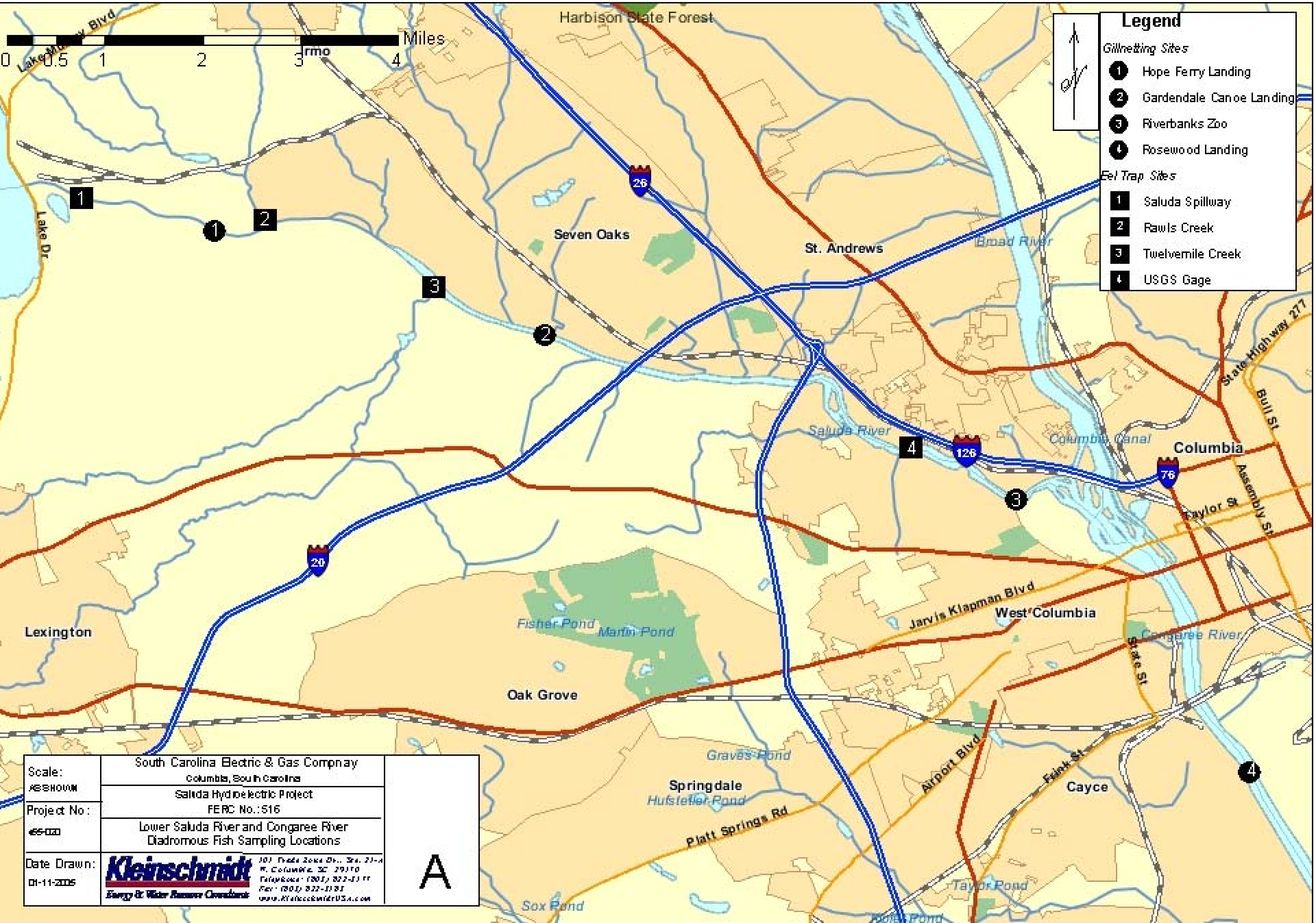
Meetings:

November 11, 2004 | **February 22, 2006**

April 17, 2006

Diadromous Fish Studies

- Lower Saluda and Congaree Rivers sampled during Spring 2005 & 2006
- Gillnet sampling for blueback herring, American shad, hickory shad
- Eel pots to sample for adult and sub-adult American eels


Legend
Gillnetting Sites
1 Hope Ferry Landing
2 Gardendale Canoe Landing
3 Riverbanks Zoo
4 Rosewood Landing
Eel Trap Sites
1 Saluda Spillway
2 Rawls Creek
3 Twelvemile Creek
4 USGS Gage
0 0.5 1 2 3 4 Miles
Harbison State Forest
Lake Murray Blvd
Lake Dr
Irmo
Seven Oaks
St. Andrews
Broad River
Saluda River
Columbia Canal
Columbia
State Highway 277
Bull St
Assembly St
Taylor St
Jarvis Klapman Blvd
West Columbia
Congaree River
State St
Lexington
Fisher Pond
Martin Pond
Oak Grove
Graves Pond
Springdale
Hufstetler Pond
Platt Springs Rd
Airport Blvd
Frink St
Cayce
Taylor Pond
Sox Pond
26
126
76
20
Scale:
AS SHOWN
Project No:
Date Drawn:
01-11-2005
South Carolina Electric & Gas Compnay
Columbia, South Carolina
Saluda Hydroelectric Project
FERC No.: 516
Lower Saluda River and Congaree River
Diadromous Fish Sampling Locations
Kleinschmidt
Energy & Water Resource Consultants
A

Diadromous Sampling Results

- 2005 Gillnetting: 14 species, but no shad or herring
- 2006 Gillnetting: completed in June, no shad or herring captured
  - Report forthcoming
- No eels captured during sampling
  - Several incidental captures outside of sample period

Experimental Eel Ladder

- Installed at Saluda Spillway
- Designed to capture in-migrating juvenile eels

Fish Entrainment TWC

Alan Stuart, Kleinschmidt

Amanda Hill, USFWS

Hal Beard, SCDNR

Shane Boring, Kleinschmidt

Wade Bales, SCDNR

Tom Bowles, SCANA

Fish Entrainment TWC

- No formal meetings to date
- Study plan for a desktop entrainment study has been developed and approved by the TWC

Rare, Threatened, and Endangered Species TWC

Gerrit Jobsis, Am. Rivers

Ron Ahle, SCDNR

Tom Eppink, SCANA

Amanda Hill, USFWS

Shane Boring, Kleinschmidt

Bob Seibels, Riverbanks Zoo*

*Retired

Meetings:

March 8, 2006

May 3, 2006

Rare, Threatened, and Endangered Species TWC

- 47 species in surrounding counties (federally-listed, candidate, proposed, species of concern)
- Developing tool to track species occurrence and potential habitat
- Will provide baseline for license application and for Section 7 (ESA) consultation

Rare, Threatened, and Endangered Species TWC

- Wood stork surveys
  - Conducted during 2005 (Feb.-Nov.); ongoing
  - No storks observed to date
- Rocky shoals spider lily
  - Survey conducted May 31, 2006
  - Two RSSL plant located in Ocean Boulevard rapid area of LSR
- Shortnose sturgeon
  - Pending issuance of permit, surveys will begin February 2007

Terrestrial Resources TWC

Dick Christie, SCDNR

Bob Perry, SCDNR

Buddy Baker, SCDNR

Brandon Stutts, SCANA

Bob Seibels, Riverbanks Zoo*

*Retired

Amanda Hill, USFWS

Buddy Baker, SCDNR

Ron Ahle, SCDNR

Shane Boring, Kleinschmidt

March 8, 2006

May 3, 2006

Terrestrial Resources TWC

- Bird survey study request
  - TWC determined could be addressed through existing data
  - Data being compiled from multiple sources (Riverbanks Zoo, Columbia Audubon, etc.)
  - Final species list will be included in license application

Terrestrial Resources TWC

- Waterfowl surveys
  - Study plan being developed
  - Will document waterfowl usage on L. Murray during winter months (Dec.-Feb.)
  - Monthly aerial survey (Univ. of Ga. – Savannah River Ecology Lab)

Freshwater Mussels/Benthic Macroinvertebrate TWC

Ron Ahle, SCDNR	**Amanda Hill, USFWS**
Scott Harder, SCDNR	**Jennifer Price, SCDNR**
Gerrit Jobsis, Am. Rivers	**Jim Glover, SCDNR**
Shane Boring, Kleinschmidt	**Steve Summer, SCANA**

Meetings:

May 3, 2006 **June 14, 2006**

Freshwater Mussels/Benthic Macroinvertebrate TWC

- Freshwater mussel survey of Lake Murray, LSR, Congaree
  - Completed July, 2006; report forthcoming
  - Approx. 16 native mussel species documented
- Benthic macroinvertebrate survey

Freshwater Mussels/Benthic Macroinvertebrate TWC

- Benthic macroinvertebrate survey
  - Several years of existing data for LSR (1999-2000; 2002-2005)
  - Study plan being developed to incorporate a multi-habitat component

Instream Flow/Aquatic Habitat TWC

Dick Christie, SCDNR

Scott Harder, SCDNR

Gerrit Jobsis, Am. Rivers

Wade Bales, SCDNR

Hal Beard, SCDNR

Alan Stuart, Kleinschmidt

Brandon Kulik, Kleinschmidt

Amanda Hill, USFWS

Buddy Baker, SCDNR

Ron Ahle, SCDNR

Steve Summer, SCANA

Prescott Brownell, NMFS

Shane Boring, Kleinschmidt

Meetings:

May 3, 2006

June 14, 2006

Instream Flow/Aquatic Habitat TWC: Study Request Status

- Instream Flow Studies
  - Existing study (SCDNR, 1990) being evaluated by TWC for applicability to current relicensing
- Potential for Self-Sustaining Trout Fishery in the LSR
  - Technical paper currently being draft by TWC

Instream Flow/Aquatic Habitat TWC: Study Request Status

- Floodplain Flow Evaluations
  - TWC is gathering existing studies
  - Applicability to current relicensing will be evaluated
- Comprehensive habitat assessment
  - Agencies developing desired habitat categories

Questions??

Water Quality Resource Conservation Group Update

Shane Boring
Kleinschmidt Associates

Water Quality RCG Mission Statement

The Mission of the Water Quality Resource Conservation Group (WQRCG) is to develop water quality related recommendations to be included in the Saluda Hydroelectric Project FERC license application. The goal will be to achieve or exceed levels of compliance for State water quality standards for Lake Murray and the lower Saluda River. A means to work towards that goal is to identify data needs and to gather or develop that data necessary to ensure that water quality standards are currently being met and that they will be maintained in the future. A primary measure of success in achieving the mission and goals will be a published WQRCG Protection, Mitigation, and Enhancement (PM&E) Agreement.

Water Quality RCG Meetings

Date	*Discussion Topics / (Presenter)*
November 9, 2005	**Development of Mission Statement**
	Saluda Hydro System Control (Lee Xanthakos, SCE&G)
December 7, 2005*	**401 Water Quality Certification for Hydro Projects (Gina Kirkland, SCDHEC)**
	Lower Saluda River Site-Specific Water Quality Standard (Shane Boring, KA)
	Water Quality Update: L. Murray & Lower Saluda (Andy Miller, SCDHEC)
	Water Quality Analysis & CE-QUAL-W2 Modeling for L. Murray (A. Sawyer and J. Ruane, REMI)
February 21, 2006	**Formation of Technical Working Committee**
	Review of Study Requests

* Joint Meeting with Fish & Wildlife RCG

Water Quality TWC

Gina Kirkland, SCDHEC

Alan Stuart, Kleinschmidt

Jim Ruane, REMI

Gerrit Jobsis, Am. Rivers

Reed Bull, Midlands Striper Club

Richard Kidder, LMA

Roy Parker, LMA

Dan Tufford, USC

Tom Bowles, SCE&G

Amanda Hill, USFWS

Ron Ahle, SCDNR

Andy Miller, SCDHEC

Shane Boring, Kleinschmidt

Water Quality TWC Meetings

- February 21, 2006
- March 6, 2006 (via conference call)
- March 24, 2006
- May 3, 2006
- May 23, 2006

Water Quality TWC: Study Requests

Request	*Status*
Effects of Project Operations on Summer Habitat for Striped Bass	W-2 Model being developed (Jim Ruane, REMI) to evaluate potential effects of Unit 5
Potential DO and Temperature Effects on Freshwater Mussels	Mussel survey was completed on July 13; report is forthcoming.
Downstream Impacts of Coldwater Releases	Study Plan was developed and is currently being executed; paired temperature sensors deployed at 9 locations.

Water Quality TWC: Study Requests

Request	*Status*
Evaluation of Potential for TMDL Development for L. Murray	SCDHEC continuing to develop TMDL strategy; does not fit into relicensing process and timeline.
Status of Existing Downstream Water Quality Conditions	Hub baffle effectiveness testing completed in Fall 2005; Report issues June 2006.
Cove Water Quality in Lake Murray	SCE&G and LMA have provided information detailing their sampling locations/methods; information being evaluated for adequacy by the TWC.

Questions??

Operations Resource Conservation Group Update

Bret Hoffman
Kleinschmidt Associates

Operations RCG Update

The Mission of the Operations Resource Conservation Group (ORCG) is to oversee the development of a robust hydrologic model for the Saluda Project which will establish a baseline of current hydrologic, hydraulic, and operational conditions, and aid in analyzing and understanding the potential upstream and downstream effects of potential changes to project operations, in support of the missions and goals of all other Saluda Hydroelectric Relicensing RCGs. The objective is to fairly consider those impacts, to include low-flow conditions as a part of developing consensus-based, operations focused recommendations for the FERC license application. Model results are to be presented in readily understandable terms and format. A key measure of success in achieving the mission and goals will be a published Protection, Mitigation, and Enhancement (PM&E) Agreement.

Meetings

- November 1, 2005
- December 6, 2005
- January 26, 2006
- April 6, 2006
- May 3, 2006
- July 11, 2006
- August 23, 2006

Technical Working Committees

- Operations
- Generation Review

Participants

- Representatives from all other RCG's
- Hydrologists from resource agencies, Kleinschmidt, SCE&G

Objective of Model

- Balancing the resources of Lake Murray and the lower Saluda River for a variety of interests
- Take into account the physical limitations (such as storage) and availability of water

Things to balance…

Water Quality

In Lake Fisheries

Recreational Flow Releases

Flood Control

Hydropower

Drought Events

Downstream Fisheries

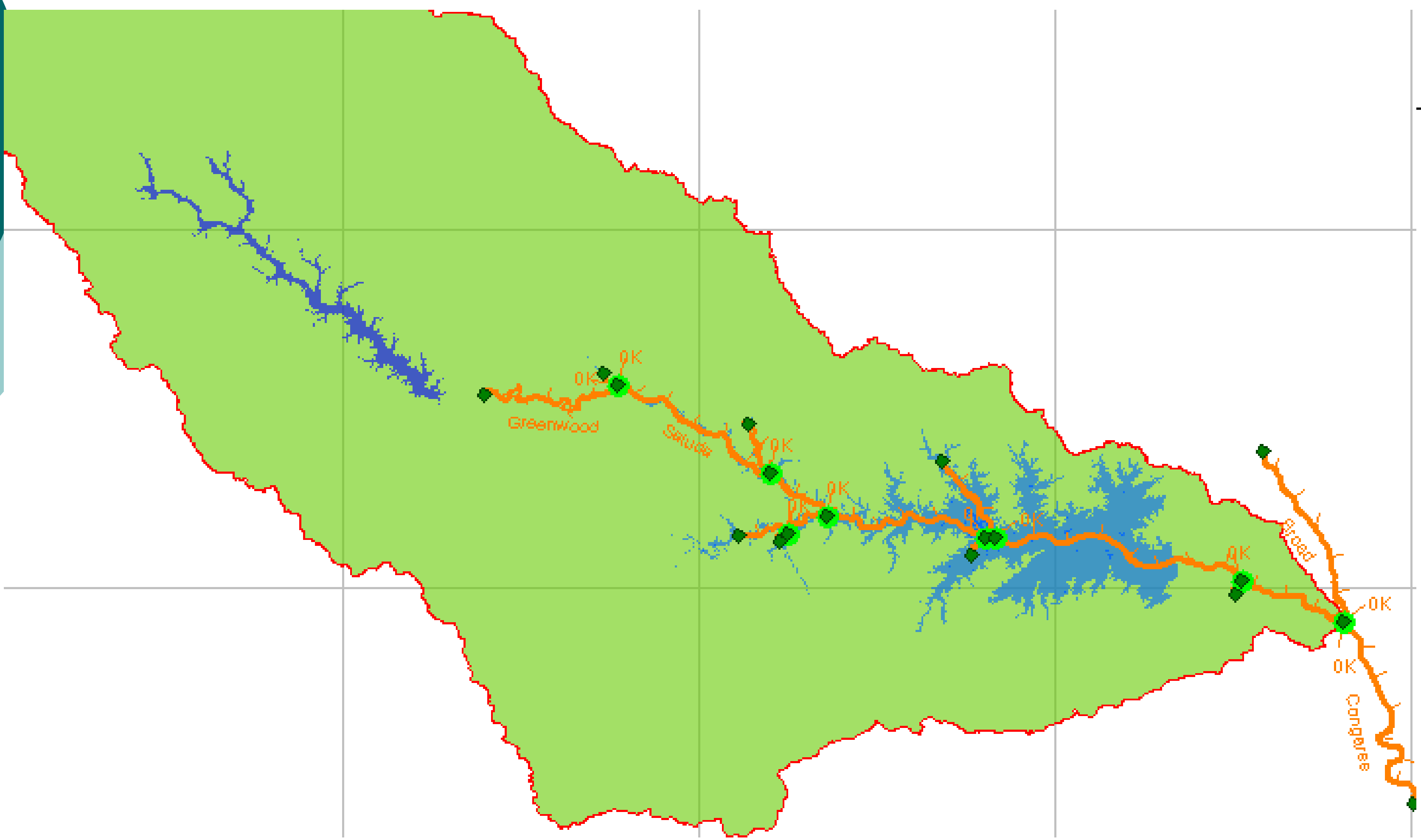
Lake Levels

The Model: HEC Res-Sim

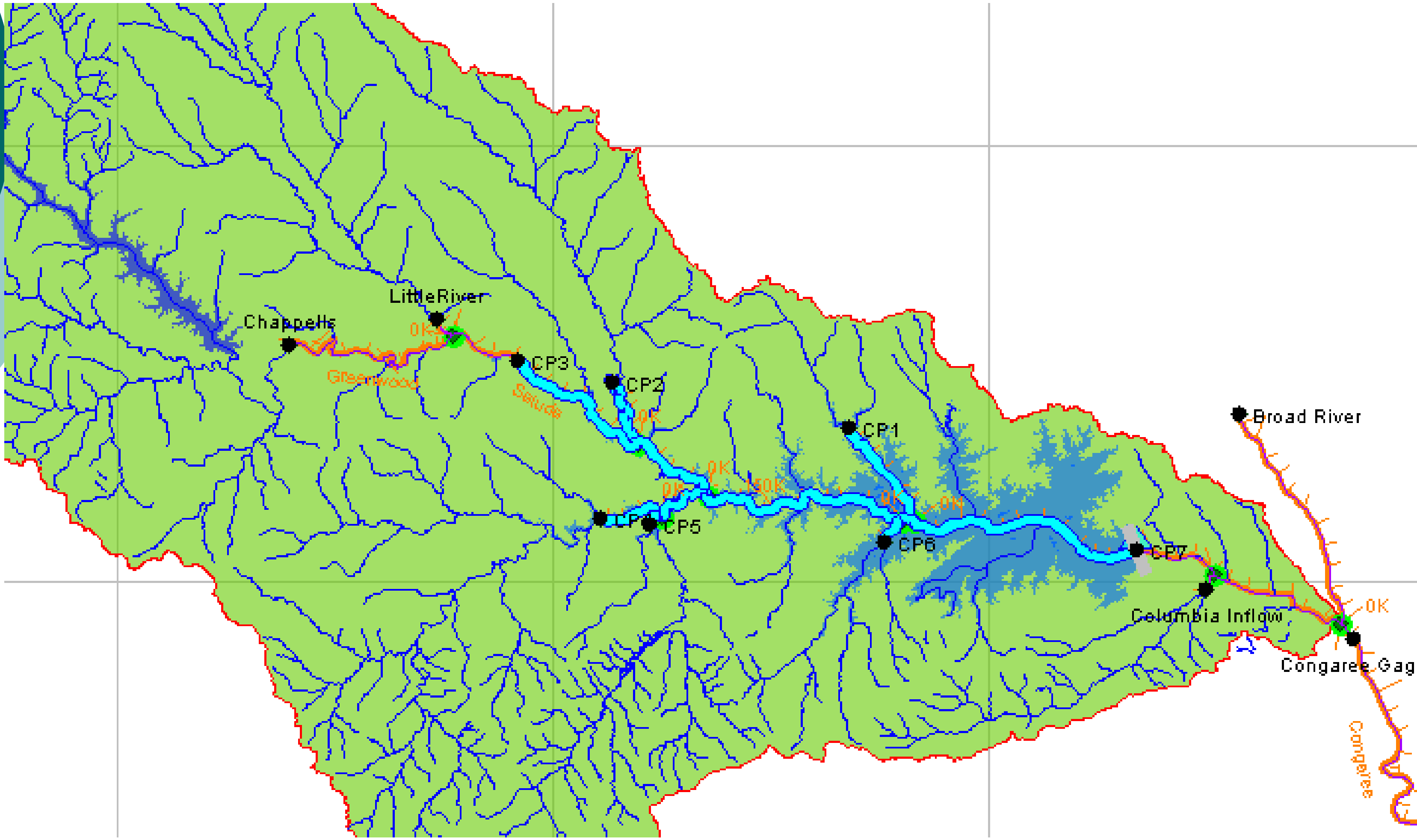
- Reservoir system simulation
- Incorporates user-defined goals with physical, hydrologic inputs
- Long term planning as well as real-time operation
- The national standard for relicensing efforts

Model Structure

- Watershed extents
- Downstream river system
  - Lower Saluda River to confluence
  - Broad River upstream of confluence
  - Congaree River below confluence



Greenwood
Saluda
Broad
Congaree
0K


LittleRiver
Chappells
Greenwood
CP3
Saluda
CP2
CP1
CP5
CP6
CP7
Broad River
Columbia Inflow
Congaree Gage
Congaree

Hydrologic Inputs

- Inflows from gaged sources
  - Lake Greenwood, Bush River, and Little River
- Ungaged inflows
  - Includes basin precipitation runoff
- Outflows, evaporation
- Use historical information for average, wet, and dry years

How to Balance

- All requests are stage and/or flow related
- Run simulation model with requested constraints from RCG's
- Results include frequency and magnitude of violating constraints

Compromise

- Model output is returned to groups and stakeholders
- Stakeholders evaluate outcome, decide if they can live with results
- Iterative process
- Final outcome: Protection, Mitigation, and Enhancement (PM&E) Agreement

Moving Forward

- August 23 TWC, finalize base model
- September, model presented to RCG's
- Identify user-defined inputs, incorporate into model and begin iterative process

Questions??

Saluda Hydroelectric Project Cultural Resource Investigations

Saluda HYDRO RELICENSING

S&ME

Primary Participants

- Federal Energy Regulatory Commission (FERC)
- South Carolina Electric & Gas (SCE&G)
- State Historic Preservation Office (SHPO)
- Catawba Indian Nation
- Advisory Council on Historic Preservation (ACHP)

Other Participants

- South Carolina Department of Natural Resources (SCDNR)
- South Carolina Institute of Archaeology and Anthropology (SCIAA)
- Eastern Band of Cherokee Indians (ECBI)
- Other Federally Recognized Indian Tribes (on a limited basis)
- Cultural Resource Conservation Group (CRCG)
- The Public

CRCG Participants

- Bill Argentieri (SCE&G)
- Miriam Atria (Regional Tourism)
- Steve Bell (LW)
- Rebekah Dobrasko (SHPO)
- George Duke (LMH)
- Ed Fetner (Historian)
- Keith Ganz-Sarto
- Bill Green (S&ME)
- Alison Guth (KA)
- Wenonah Haire (Catawba)
- David Jones (PRT)
- Chris Judge (DNR)
- Richard Kidder (LMA)
- Dave Landis (LMA)
- Jon Leader (SCIAA)
- Chad Long (SHPO)
- Randy Mahan (SCANA)
- Sandra Reinhardt (Catawba)
- Charles Rentz
- Jay Robinson (ICRC)
- Randal Shealy (LMHS)
- Alan Stuart (KA)
- Ken Styer (S&ME)
- Jeanette Wells (ICRC)
- Marianne Zajac (ICRC)

Laws, Regulations, and Guidelines

- National Environmental Policy Act (NEPA)
- National Historic Preservation Act (NHPA)
  - Section 106 and its implementing regulations
    36 CFR Part 800 - Protection of Historic Properties
- FERC Guidelines for EA and HPMP Preparation
- Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation
- SHPO Guidelines for Archaeological Investigations and Survey of Historic Properties

Section 106 of the NHPA *(16 U.S.C. 470f)*

The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking …. shall, prior to the issuance of any license … take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such Federal agency shall afford the Advisory Council on Historic Preservation … a reasonable opportunity to comment with regard to such undertaking.

Protection of Historic Properties
(36 CFR Part 800)

Four Basic Steps to Section 106

1) Initiate the Section 106 Process
2) Identification of Historic Properties
3) Assessment of Adverse Effects
4) Resolution of Adverse Effects

Step 1. Initiate the Section 106 Process

- ✓ Define the Undertaking
- ✓ Identify participants and coordinate with SHPO
- ✓ Define Area of Potential Effects (APE)

Step 2. Identify Historic Properties

- ✓ Stage I Reconnaissance Survey
  - Identify previously recorded historic and archaeological sites
  - Identify areas for additional archaeological survey
  - Record historic structures

Areas examined during the Stage I survey consisted of 620 miles of shoreline along Lake Murray and 25 miles of riverbank on the Saluda, Little Saluda, and Lower Saluda rivers and their major tributaries.

Results of Stage I Reconnaissance Survey

- 42 previously recorded archaeological sites
- 40 new archaeological sites identified
- Seven previously recorded structures that are listed or eligible for the National Register of Historic Places (NRHP)
- Eight newly recorded structures (one eligible for the NRHP)

Stage II Intensive Survey Areas

- 735 acres on 139 islands in Lake Murray
- 89 miles of shoreline in 177 areas along Lake Murray
- Four miles of riverbank along the lower Saluda River
- 19 acres on seven islands in the Lower Saluda River

Stage II Areas Examined to Date

- 71 islands in Lake Murray
- 21 shoreline areas in Lexington Co.
- 2 miles of riverbank in the Lower Saluda River
- Corley Island (Lower Saluda River)

Stage II Areas Remaining

- 68 islands in Lake Murray, mostly small, privately-owned islands
- 79 shoreline areas in Lexington Co.
- 77 shoreline areas in Richland, Newberry, and Saluda counties
- 2 miles of riverbank and six islands in the Lower Saluda River

Results (to date) of Stage II Intensive Survey

- 50 new archaeological sites
- 4 sites revisited from Stage I survey

- 12 prehistoric sites ranging from Early Archaic to Late Woodland (10,000 – 1,000 years ago)
- 31 historic sites, mostly 19th and early 20th century home sites, five cemeteries
- 7 sites with both prehistoric and historic components

Site 38LX531

- Located along the Lower Saluda River
- Almost 12 acres in size
- Excellent preservation, very deeply buried artifacts and numerous features (e.g., hearths)

- Known occupations dating back more than 5,000 years ago
- Potential occupations as much as 13,500 years ago
- Could be one of the most interesting and important sites in the Southeastern U.S.

Questions??

Recreation Resource Conservation Group Update

Dave Anderson
Kleinschmidt Associates

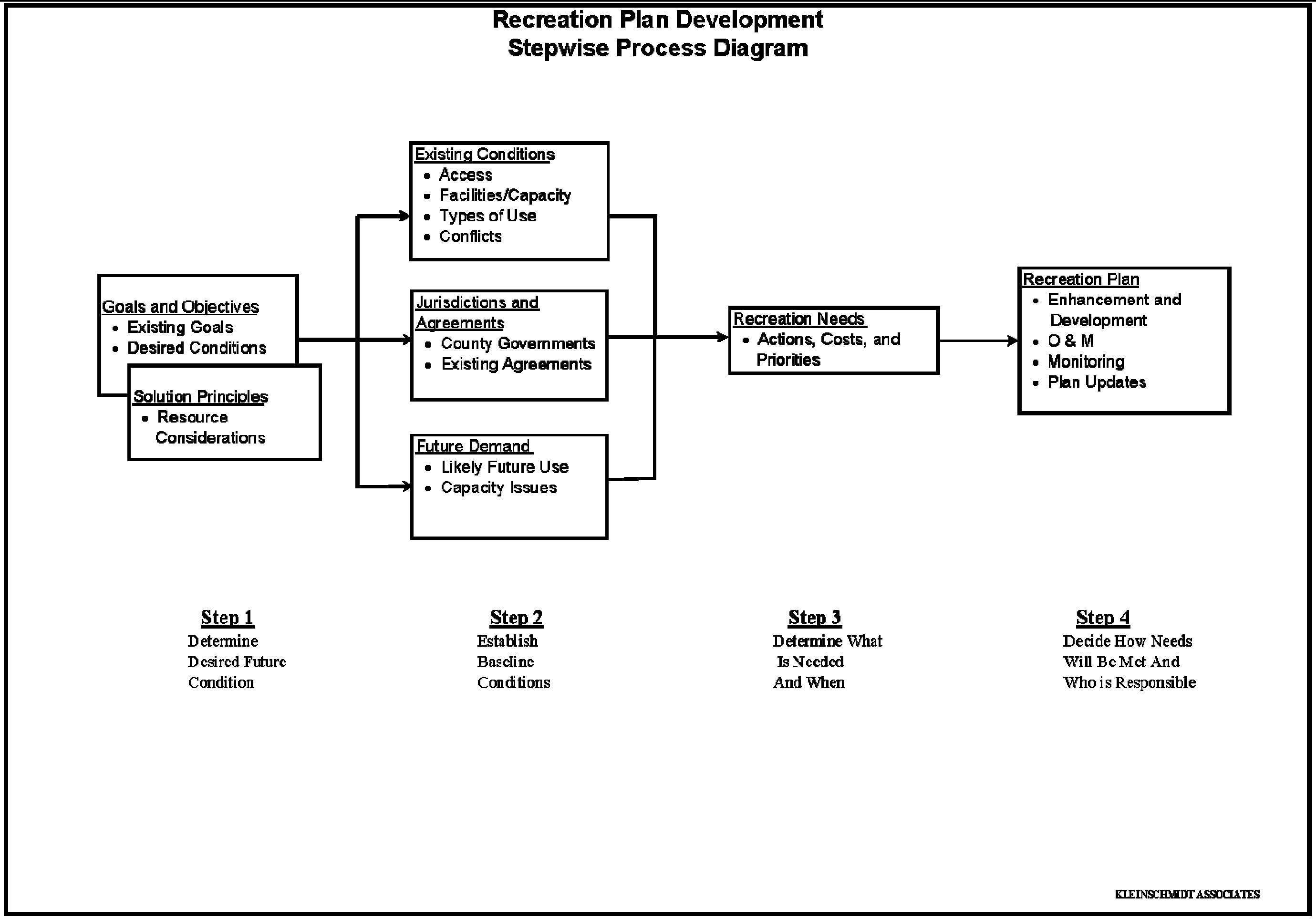
Recreation RCG Mission Statement

The mission of the Recreational RCG is to ensure adequate and environmentally-balanced public recreational access and opportunities related to the Saluda Hydroelectric Project for the term of the new license. The objective is to assess the recreational needs associated with the lower Saluda River and Lake Murray and to develop a comprehensive recreation plan to address the recreation needs of the public for the term of the new license. This will be accomplished by collecting and developing necessary information, understanding interests and issues and developing consensus-based recommendations.

Meetings

- November 18, 2005
- January 11, 2006
- February 15, 2006
- April 17, 2006
- July 21, 2006

Standard Process



Work Products

- Work Plan
- Vision Statement
- Solution Principles
- Standard Process Form
- Recreation Plan

Identified Issues

- Recreational facilities
- Conservation of lands
- Adaptive management
- Downstream flows
- Lake levels

Technical Working Committees

- Recreation Management
- Downstream Flows
- Lake Levels

Ongoing/Planned Studies

- Recreation Assessment
- Boat Density
- Downstream Recreation Flow Assessment

Recreation Assessment

- Characterize existing recreational use of SCE&G's recreation sites on Lake Murray and the lower Saluda River.
- Identify future recreational needs relating to public recreation sites on Lake Murray and the lower Saluda River.

Boat Density (Draft)

- Assess the area available for boating activities on Lake Murray by segment.
- Assess boat densities occurring under normal (weekend) and peak (holiday) use conditions on Lake Murray by segment.
- Analysis of whether recreational use of Lake Murray is currently above, below, or at optimum recreational boating capacity by segment.

Downstream Flows (Draft)

- Characterize existing available recreation opportunities on the lower Saluda River.
- Understand the “rate of change” of the lower Saluda River at various flows at various river reaches.
- Identify potential public safety issues associated with lower Saluda River flows.

Schedule

- **Late 2005/Early 2006**—Finalize Mission Statement, Standard Process Form, Solution Principles, and Work Plan
- **Mid-2006**—Complete identification of studies, literature reviews, etc. that need to be completed to address issues and tasks identified in the Work Plan
- **Late 2006**—Begin compilation of existing information, review preliminary study results, and draft an outline of the Recreation Plan
- **2007**—Complete any studies identified in Task 8 and review results; draft recommendations to SHRG, complete draft Recreation Plan
- **2008**—Finalize Recreation Plan and provide comments on Draft License Application

Questions??

Safety Resource Conservation Group Update

Dave Anderson
Kleinschmidt Associates

Safety RCG Mission Statement

The Mission of the Safety Resource Conservation Group (SRCG) is, through good faith cooperation, to make Lake Murray and the lower Saluda River as safe as reasonably possible for the public. The objective is to develop a consensus-based Recreational Safety Plan proposal for inclusion in the FERC license application. This will be accomplished by gathering or developing data relevant to Saluda Hydroelectric Project safety-related interests/issues, seek to understand those interests/issues and that data, and consider all such interests/issues and data relevant to and significantly affecting safety on Lake Murray and the lower Saluda River.

Meetings

- November 16, 2005
- January 10, 2006
- February 14, 2006
- April 6, 2006 (Safety/Operations)
- April 18, 2006

Work Products

- Work Plan
- Safety Program

Identified Issues

- Fluctuating lake and river levels
- Shoal markers
- Communications
- Boat traffic/congestion
- Systematic collection of accident data
- Ingress/egress on the LSR

Technical Working Committees

- Hazardous Areas

Ongoing/Planned Studies

- Downstream Recreation Flow Assessment

Downstream Flows (Draft)

- Characterize existing available recreation opportunities on the lower Saluda River.
- Understand the “rate of change” of the lower Saluda River at various flows at various river reaches.
- Identify potential public safety issues associated with lower Saluda River flows.

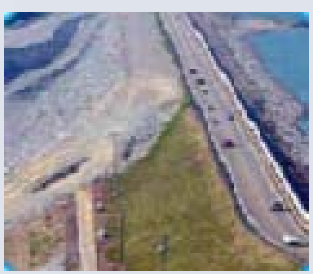
Schedule

- **Late 2005/Early 2006**—Finalize Mission Statement and Work Plan
- **Mid-2006**—Complete identification of studies, literature reviews, etc. that need to be completed to address issues and tasks identified in the Work Plan
- **Late 2006**—Begin compilation of existing information, review preliminary study results, and draft an outline of the Safety Program
- **2007**—Complete any studies identified in Task 9 and review results; draft recommendations to SHRG, complete draft Safety Program
- **2008**—Finalize Safety Program and provide comments on Draft License Application

Questions??

Saluda Hydro Quarterly Public Relicensing Update Meeting

September 22, 2005



SCE&G A SCANA COMPANY

Kleinschmidt Energy & Water Resource Consultants

Saluda Hydro Relicensing Activities

- Notice of Intent issued to FERC on April 29, 2005
- Initial Stage Consultation Document (ICD) issued to FERC on April 29, 2005
- Joint agency/public meeting was held on June 16, 2005
- Agency and public comments to the ICD were received by August 16, 2005

Saluda Hydro Relicensing Activities

- We received 36 study requests, 44 requests for additional information, and 9 requests for potential mitigation

- Respondents included 3 Federal agencies, 3 State agencies, one county agency, two city agencies, one university, one local business, 12 NGOs, and six individuals

Stakeholders in the Relicensing of Saluda Hydro

(Federal, State and Governmental Agencies)

Federal

- National Park Service (NPS)
- United States Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS)

City Government

- Columbia Fire and Rescue
- City of Columbia Parks and Recreation (CPR)

State

- South Carolina State Historical Preservation Office (SCSHPO)
- South Carolina Department of Natural Resources (SCDNR)
- South Carolina Department of Parks Recreation and Tourism (SCPRT)

County Government

- Saluda County
- Newberry County

Stakeholders in the Relicensing of Saluda Hydro

(Non-Governmental Agencies)

National

- American Rivers (AR)
- American Whitewater (AW)
- The Catawba Indian Nation (CIN)

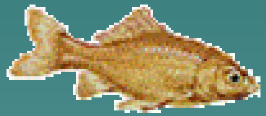
Local

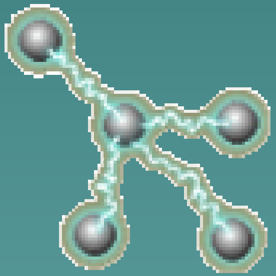
- Lake Murray Homeowner Coalition (LMHC)
- Lake Murray Association (LMA)
- Lake Murray Watch (LW)
- League of Women Voters (LWV)
- Lower Saluda River Scenic River Advisory Council (LSRSC)
- River Runner Outdoor Center (RROC)
- Midlands Striper Club (MSC)

State

- South Carolina Council Trout Unlimited (TU)
- South Carolina Wildlife Federation (SCWF)
- USC Department of Biological Sciences (USC)
- South Carolina Coastal Conservation League (SCCCL)

Resource Conservation Groups





Water Quality

Steve Summer (SCANA)
Alan Stuart (KA)
Jim Ruane (REMI)
Dick Christie (SCDNR)
Ron Ahle (SCDNR)
Steve Bell (LW)
Malcolm Leaphart (TU)
Amanda Hill (USFWS)
Prescott Brownell (NMFS)
Jeff Duncan (NPS)
Bob Keener (LMA)
Norman Ferris (TU)
Rich Kidder (LMA)
Ed Schnep (HS)
Bill Hulslander (CNP)
Rich Kidder (LMA)
Karen Kustifak (CPR)
Don Tyler (LMA)
Suzanne Rhodes (SCWF)

Tom Bowles (SCE&G)
Randy Mahan (SCANA)
Gina Kirkland (SCDHEC)
Gerrit Jobsis (SCCCL)
Shane Boring (KA)
Joy Downs (LMA)
Bill Argentieri (SCE&G)
Bill Marshall (SCDNR)
Mike Sloan (BDFCA)
Daniel Tufford (USC)
Keith Ganz-Sarto (CC)
Brett Bursey (CC)
Larry Michalec (LMHC)
Andy Miller (SCDHEC)
Bob Keener (LMA)
Roy Parker (LMA)
Bob Lavisky (LMA)
Tom Stonecypher (LSRAC)

Fish and Wildlife

Steve Summer (SCANA)
Alan Stuart (KA)
Jim Ruane (REMI)
Dick Christie (SCDNR)
Gerrit Jobsis (AR)
Steve Bell (LW)
Malcolm Leaphart (TU)
Amanda Hill (USFWS)
Alison Guth (KA)
Ed Eudaly (USFWS)
Norman Ferris (TU)
Mark Cantrell (USFWS)
Steve Leech (SCDNR)
Bill East (LMA)
Reed Bull (MSC)

Tom Bowles (SCE&G)
Randy Mahan (SCANA)
Gina Kirkland (SCDHEC)
Hal Beard (SCDNR)
Ron Ahle (SCDNR)
Joy Downs (LMA)
Bill Argentieri (SCE&G)
Shane Boring (KA)
Wade Bales (SCDNR)
Prescott Brownell (NMFS)
Tom Murphy (SCDNR)
Sam Drake (LMA)
Bob Seibels (ZOO)
John Davis (MSC)
Suzanne Rhodes (SCWF)

Lake and Land Management

Alan Stuart (KA)
Gina Kirkland (SCDHEC)
Gerrit Jobsis (AR)
Steve Bell (LW)
Malcolm Leaphart (TU)
Amanda Hill (USFWS)
Prescott Brownell (NMFS)
Rich Kidder (LMA)
Larry Michalec (LMHC)
Ed Schnep (HS)
Bob Keener (LMA)
Rich Kidder (LMA)
Karen Kustifak (CPR)
Don Tyler (LMA)
Daniel Tufford (USC)
Tom Ruple (LMA)

Randy Mahan (SCANA)
Dick Christie (SCDNR)
Ron Ahle (SCDNR)
Joy Downs (LMA)
Bill Argentieri (SCE&G)
Bill Marshall (SCDNR)
Bill East (LMA)
Tony Bebber (SCPRT)
Don Tyler (LMA)
Michael Murrell (LMA)
Patricia Wendling (LMA)
Roy Parker (LMA)
Bob Lavisky (LMA)
Suzanne Rhodes (SCWF)
Tom Brooks (NEW)

Recreation

Randy Mahan (SCANA)
Leroy Barber (LMA)
Dick Christie (SCDNR)
JoAnn Butler (CC)
Steve Bell (LW)
Malcolm Leaphart (TU)
Amanda Hill (USFWS)
Tommy Boozer (SCE&G)
Jim Devereaux (SCE&G)
Alan Stuart (KA)
Malcolm Leaphart (TU)
Karen Kustifak (CPR)
Guy Jones (RROC)
Patricia Wendling (LMA)

Keith Ganz-Sarto (CC)
Charlene Coleman (AW)
James Smith (LMA)
Gerrit Jobsis (AR)
Dave Anderson (KA)
Bill Marshall (SCDNR)
Marty Phillips (KA)
Bill Argentieri (SCE&G)
Charlie Rentz (CC)
Tony Bebber (SCPRT)
Patrick Moore (SCCCL)
Alan Axson (CFD)
Stanely Yalicki (LMA)
Suzanne Rhodes (SCWF)

Operations

Randy Mahan (SCANA)
Larry Michalec (LMHC)
Gerrit Jobsis (AR)
Steve Bell (LW)
Malcolm Leaphart (TU)
Bret Hoffman (KA)
Mike Schimpff (KA)
Mike Summer (SCE&G)
Ray Ammarell (SCE&G)
Charlene Coleman (AW)
Alan Stuart (KA)
Bill Hulslander (CNP)

Bob Keener (LMA)
Dick Christie (SCDNR)
Ron Ahle (SCDNR)
Joy Downs (LMA)
Amanda Hill (USFWS)
Kristina Massey (KA)
Bill Argentieri (SCE&G)
Tom Ruple (LMA)
Jeff Duncan (NPS)
Suzanne Rhodes (SCWF)
James Smith (LMA)
Dave Landis (LMA)

Cultural Resources

Randy Mahan (SCANA)
Chris Judge (SCDNR)
Chad Long (SCSHPO)
Sean Norris (TRC)
Jim Devereaux (SCE&G)
Sandra Reinhardt (CIN)
Alan Stuart (KA)
Keith Ganz-Sarto (CC)
Charlie Rentz (CC)

Bill Green (TRC)
Wenonah G. Haire (CIN)
Alison Guth (KA)
Bill Argentieri (SCE&G)
Rebekah Dobrasko (SCSHPO)
Dave Landis (LMA)

Introducing our Newly formed Resource Group

SAFETY

If you are interested in participating on this Resource Conservation Group please provide your name and contact information to Alison Guth as you leave or email her at Alison.Guth@kleinschmidtusa.com

Resource Conservation Group Operating Protocols

- Draft version submitted on September 9, 2005
- Currently receiving comments from all stakeholders
- Communications Protocols developed draft to be submitted by October 7, 2005

Coming attractions

Woodstork Survey	September 23, 2005
Saluda Turbine Venting Testing	October 3-15, 2005

Resource Group Meetings

Cultural	October 14, 2005
Operations	November 1, 2005
Lake & Land Management	November 2, 2005
Water Quality	November 9, 2005
Fish and Wildlife	November 10, 2005
Safety	November 16, 2005
Recreation	November 18, 2005

Questions