



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.



Methods

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



Boat Count Estimates

WEEKEND DATES

May 5

May 19

June 17

June 24

July 15

August 11

September 22

HOLIDAY DATES

May 26

June 30

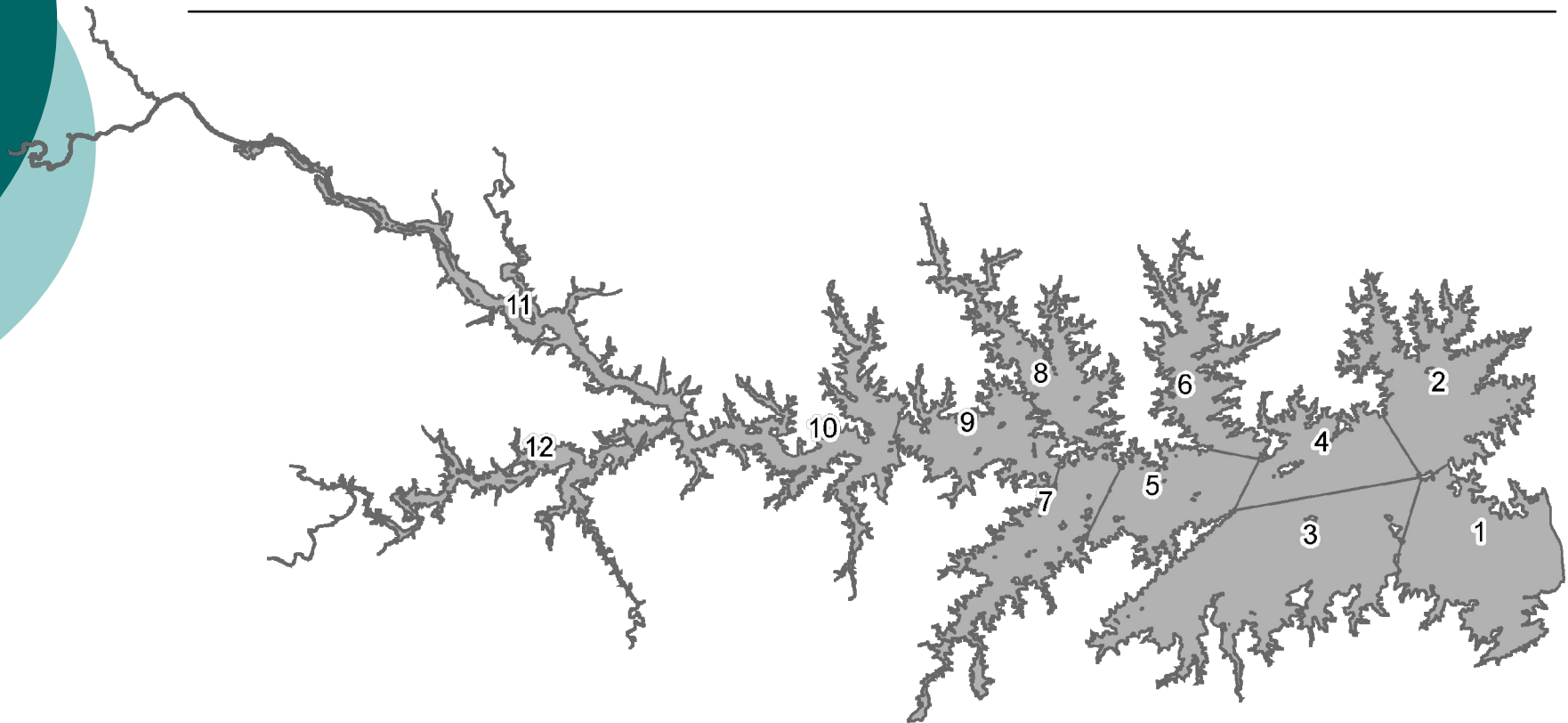
July 4



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

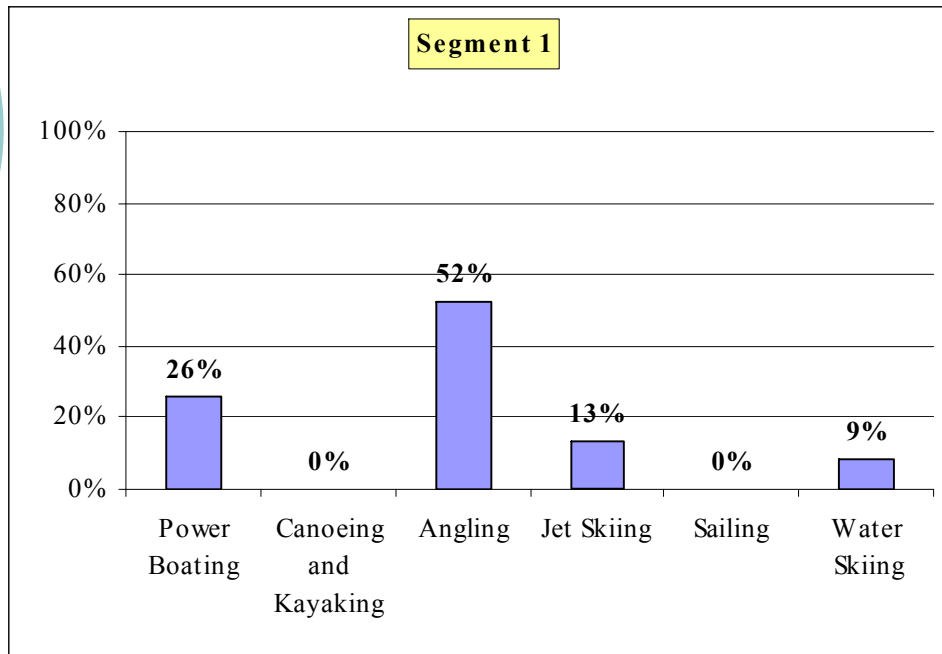
	LOW -5	BASE 0	HIGH 5
Power Boating	18	9	3
Canoeing and Kayaking	2.5	1.3	0.5
Angling	1.0	.5	.06
Jet Skiing	20	12	7
Sailing	10	4.3	2
Water Skiing	20	12	7



Segment #1 – Factor Assessment

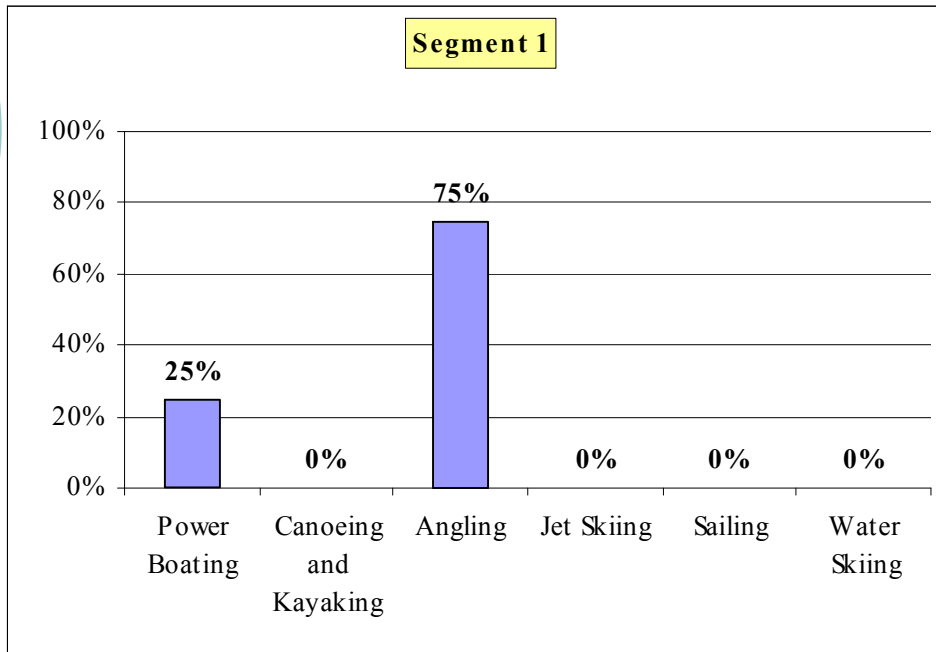
Multiple Use	=	-1
Shoreline Configuration	=	-1
Amount of Open Water	=	1
Available Recreation Access	=	1
Weekend Crowding Rating	=	0
<hr/>		
Total	=	0

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



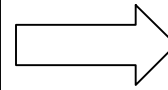
Power Boating	61
Canoeing and Kayaking	0
Angling	182
Jet Skiing	0
Sailing	0
Water Skiing	0
Total	242

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)

Segment #1 – Optimum Boating Use

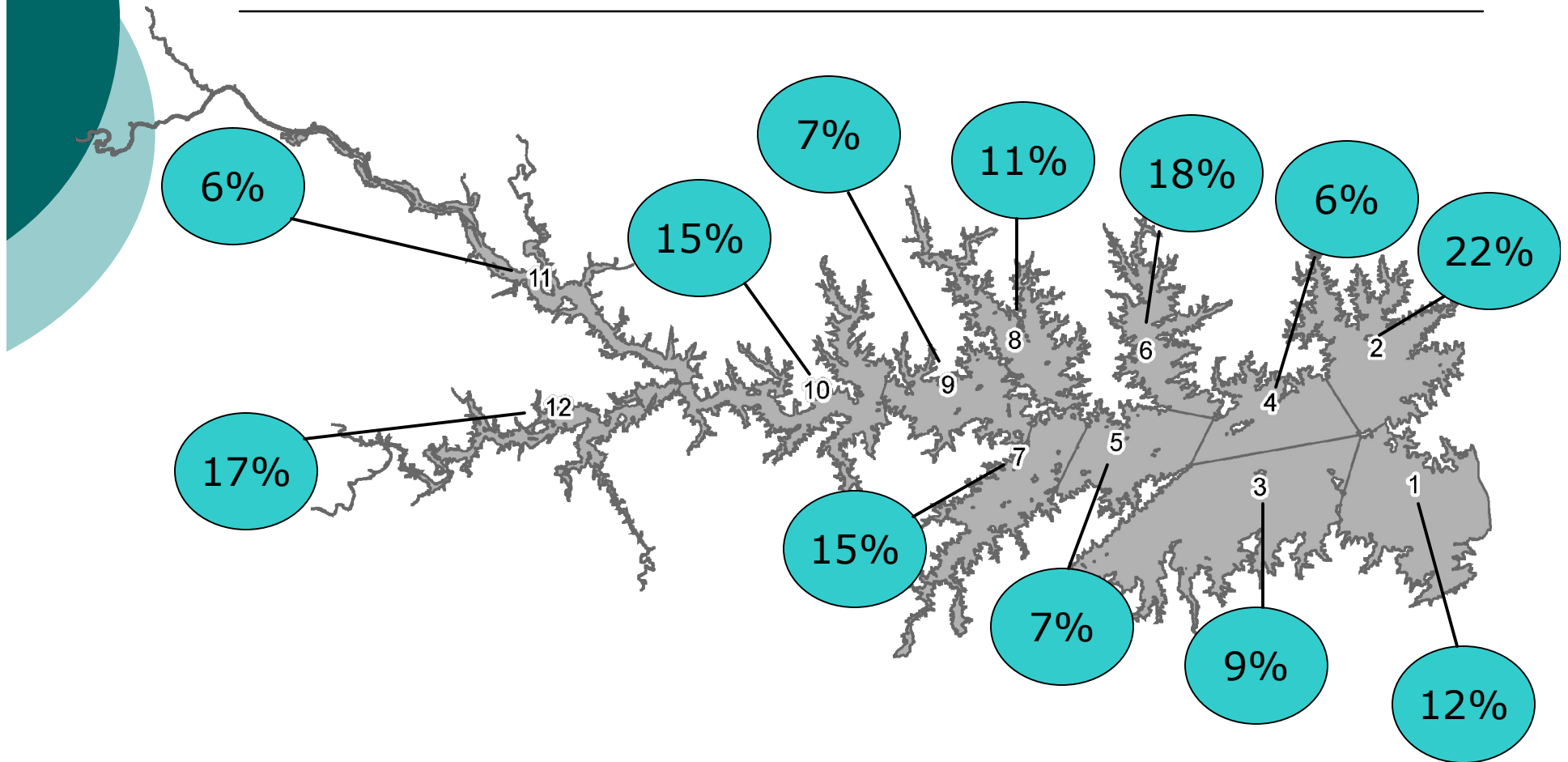
Power Boating	158
Canoeing and Kayaking	0
Angling	660
Jet Skiing	59
Sailing	0
Water Skiing	39
Optimum Boating Use	916 boats



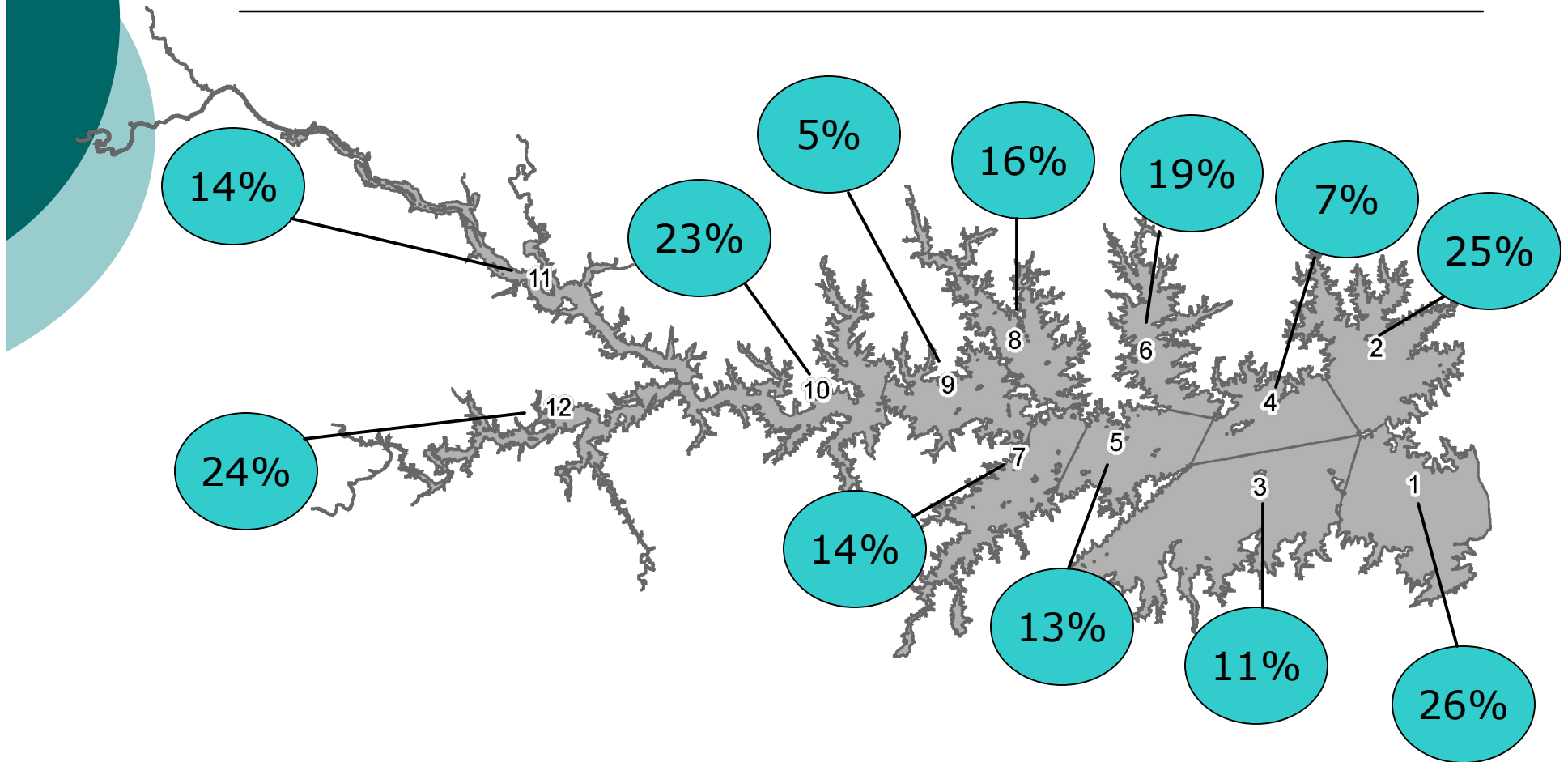
Segment #1 – Recreational Boating Carrying Capacity

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



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 Various Reaches of River
- Use to Calibrate HEC-RAS Model
- If Possible, Enhance Safety Systems



terminology

- 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



Primary Purposes for Releases

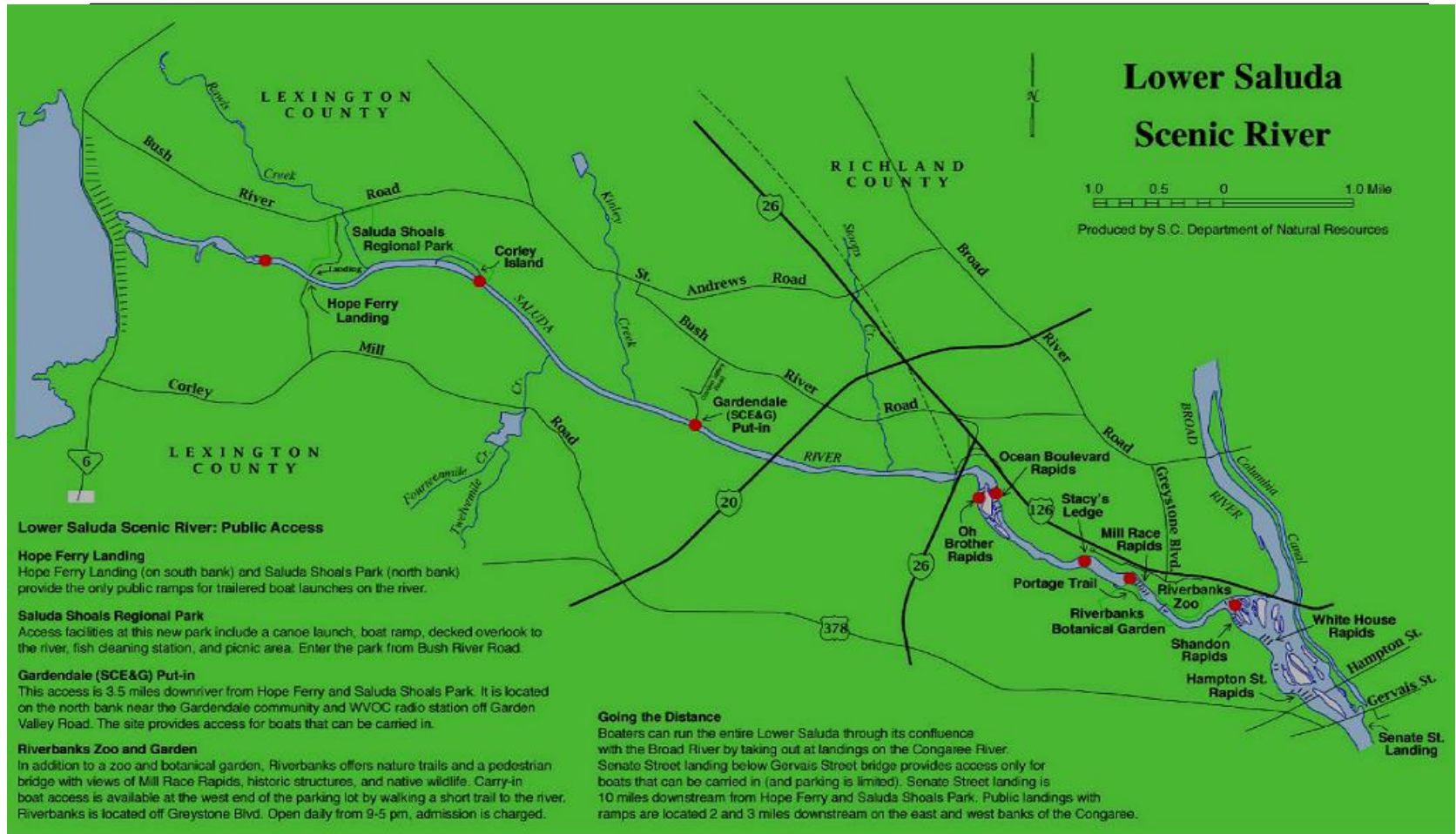
- Lake Level Management
 - Usually a Scheduled Event
 - Long Duration (Several Hours or Even Days)
- Reserve Generation (Reserve Call)
 - Immediate Need for Replacement Power
 - Short Duration (Less Than Two Hours)
- Recreational Releases
 - Planned Events
 - Duration of Several Hours



Data Collection Locations

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

Map of Locations





Field Installation

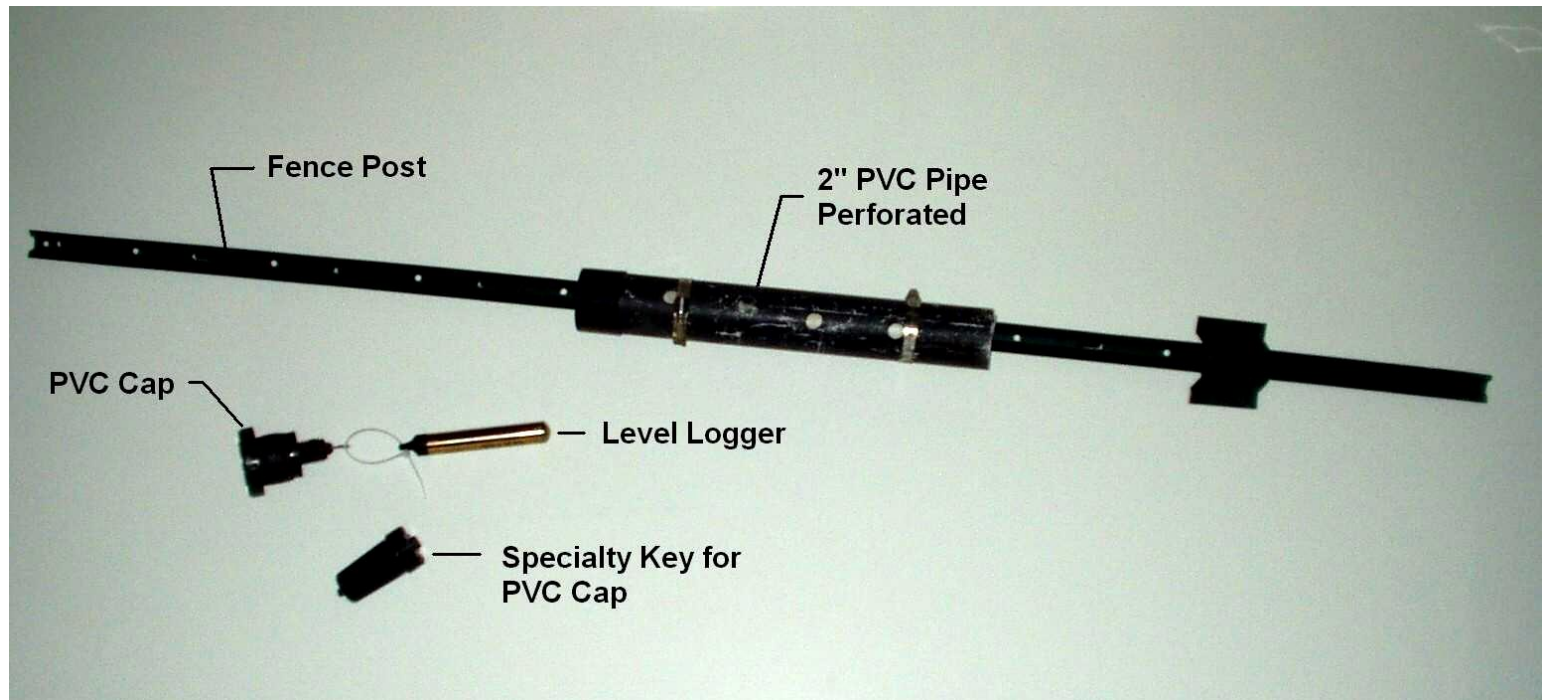
- Challenging Environment
 - Fast-Moving Water, Varying Depths, Rapids
 - Substrate Variations
 - Debris Loading
- Accessibility
- Minimize Equipment
 - Carrying to Location
 - Avoid Drawing Attention (Camandalism)



Data Collection Le e loggers

- 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 variations

LevelLogger Equipment



ypical Site nstallations





Data Collection During Study

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

Flo Release Events

- 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 Varied During Study
 - Shortest Release 1 hr 20 min, Mimics Reserve Call
 - Longest Duration 6 hr, Mimics Recreation Release or Lake Level Management



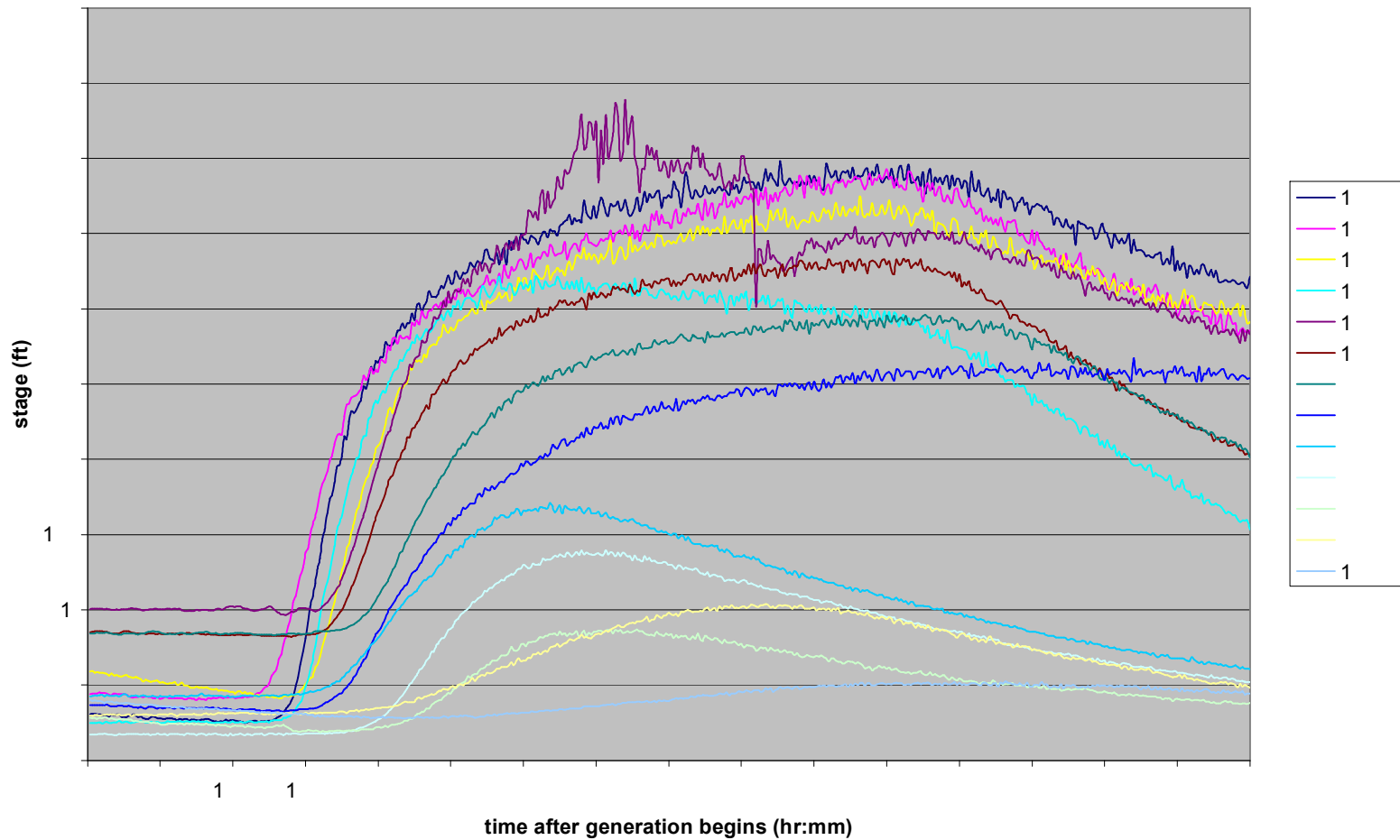
Data Evaluation

- 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

Example of One Location All Floods

Preliminary Study Data

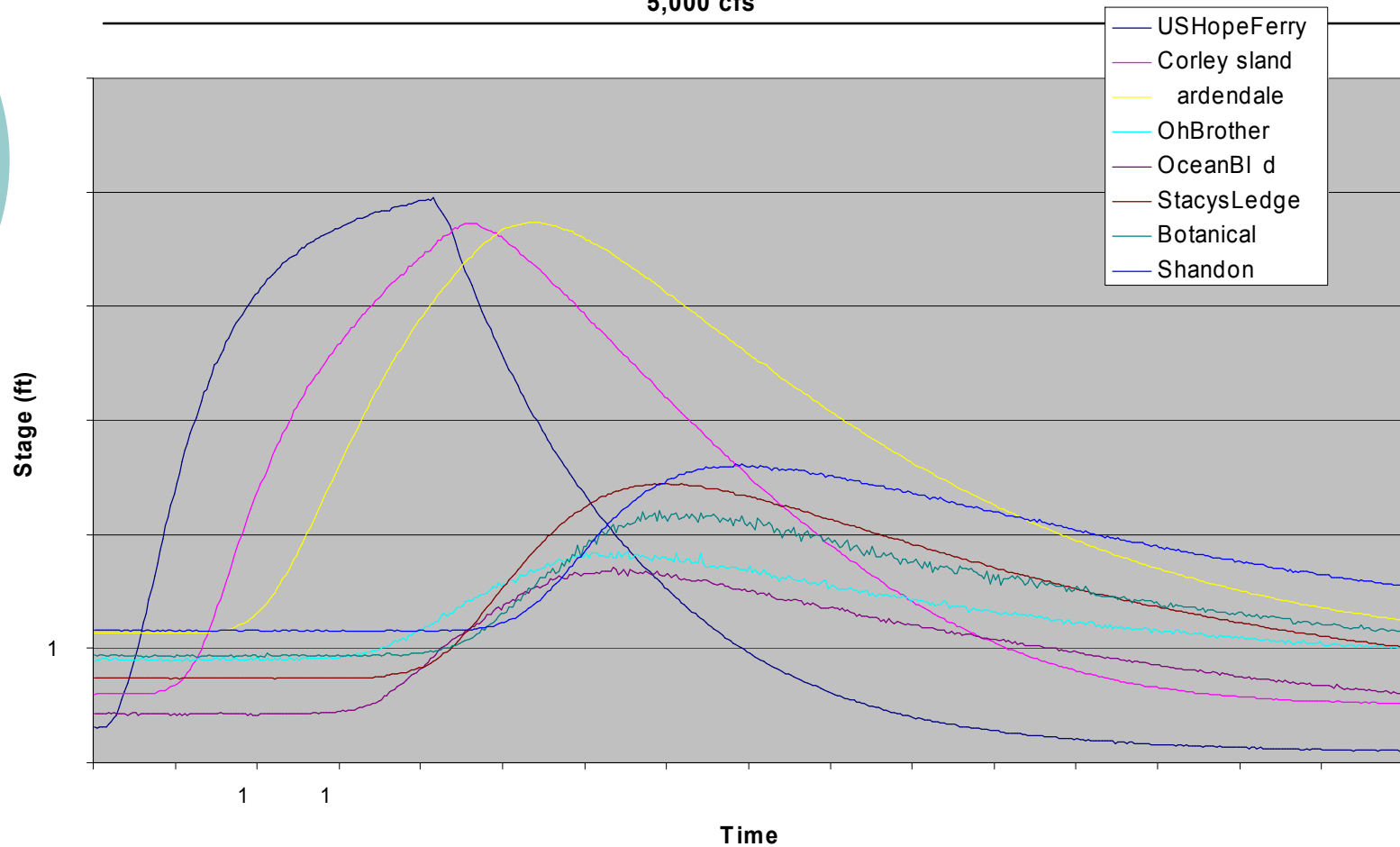
LL #5



Example of One Flood All Locations

Preliminary Study Data

5,000 cfs





Data Evaluation 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



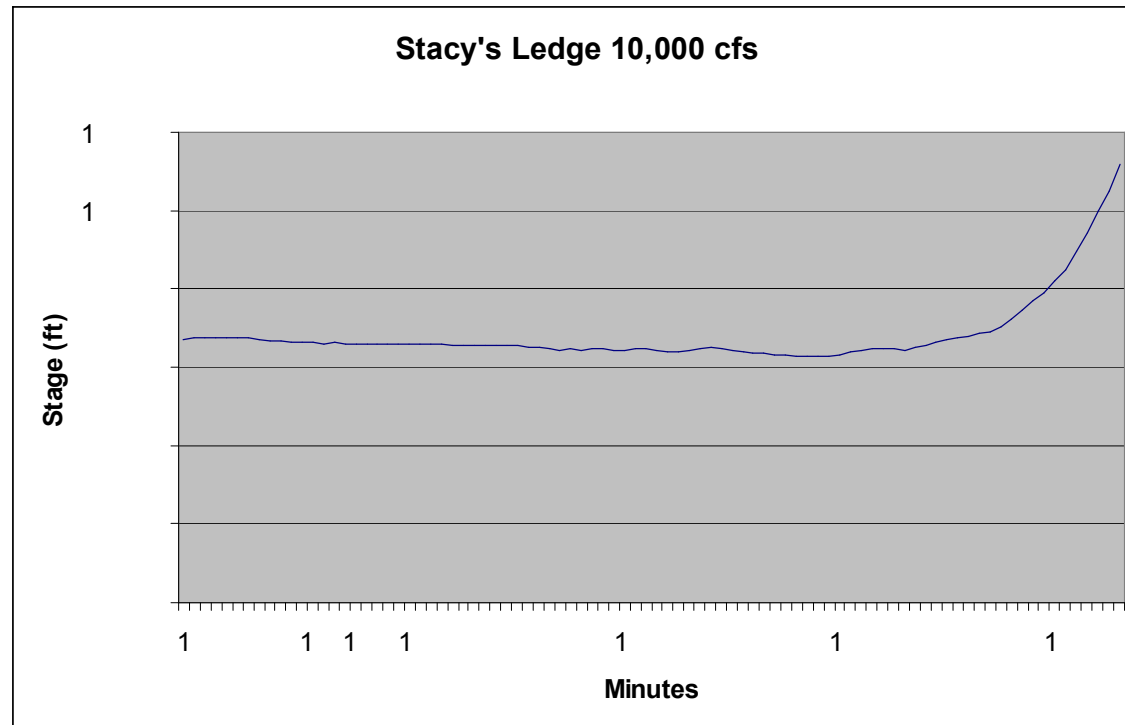
Preliminary Results QA QC

- 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 Evaluation

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

Interpretation Find Arrivals Time

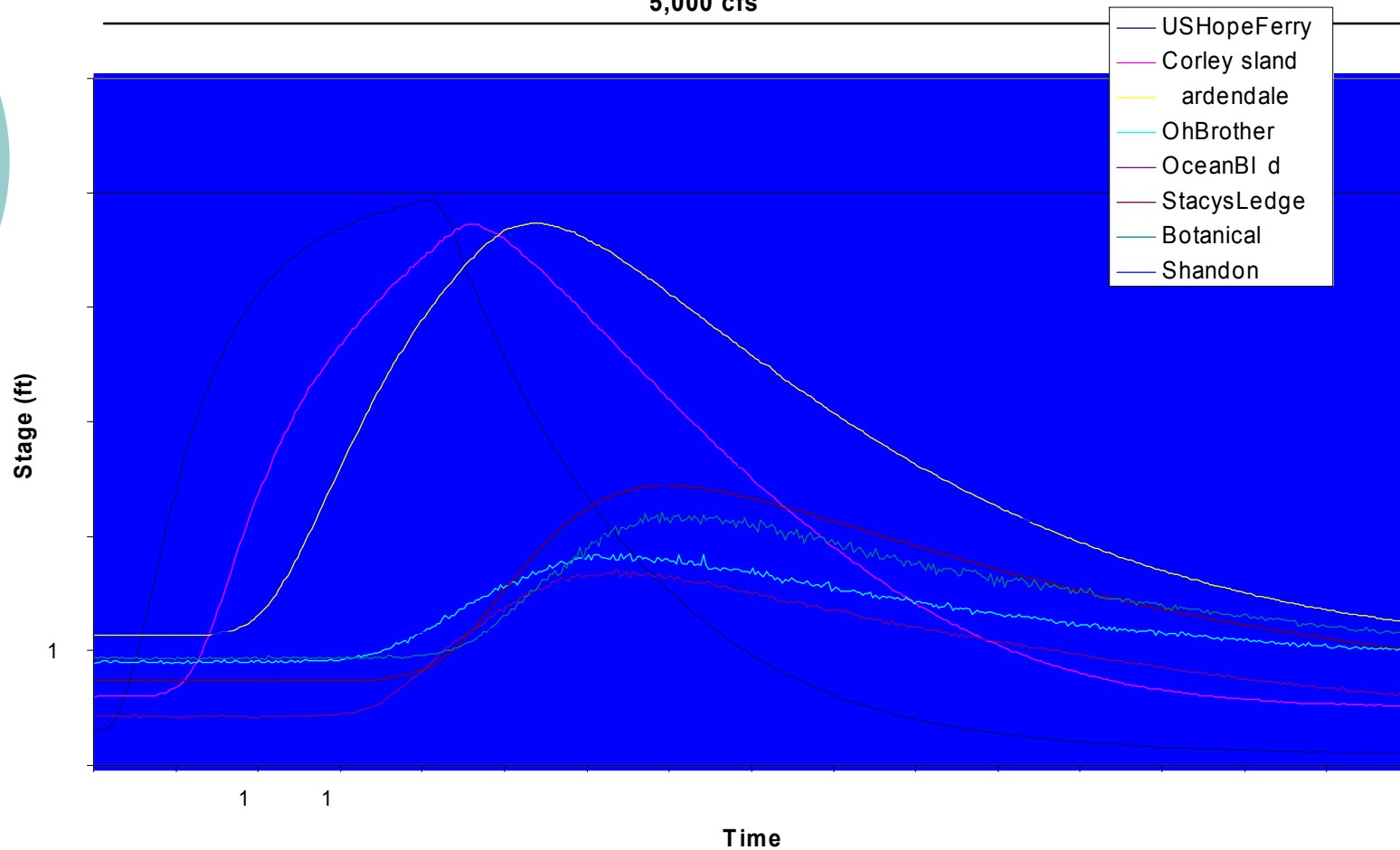


Subtle Stage Variations can Lead to Discrepancies of 15 Minutes or More with Human Interpretation

Interpretation Find Maximum Stage

Preliminary Study Data

5,000 cfs





Accounting for Flow Variations

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



Using the River 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 Various Events

- 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 Flows

- Run Same Flows for 1-12, 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

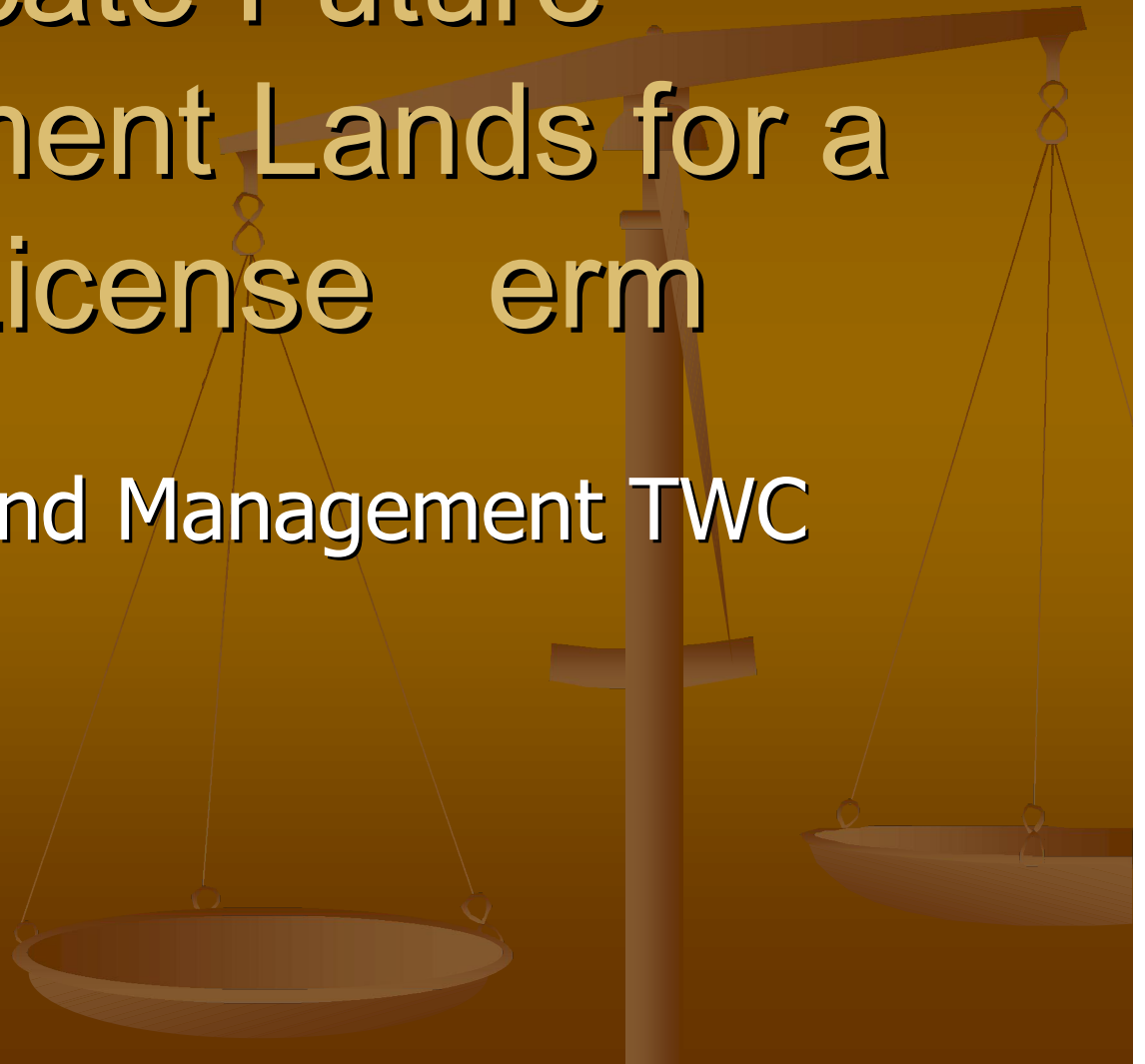


Questions?

Land Rebalancing How to
Allocate Future

Development Lands for a
License Term

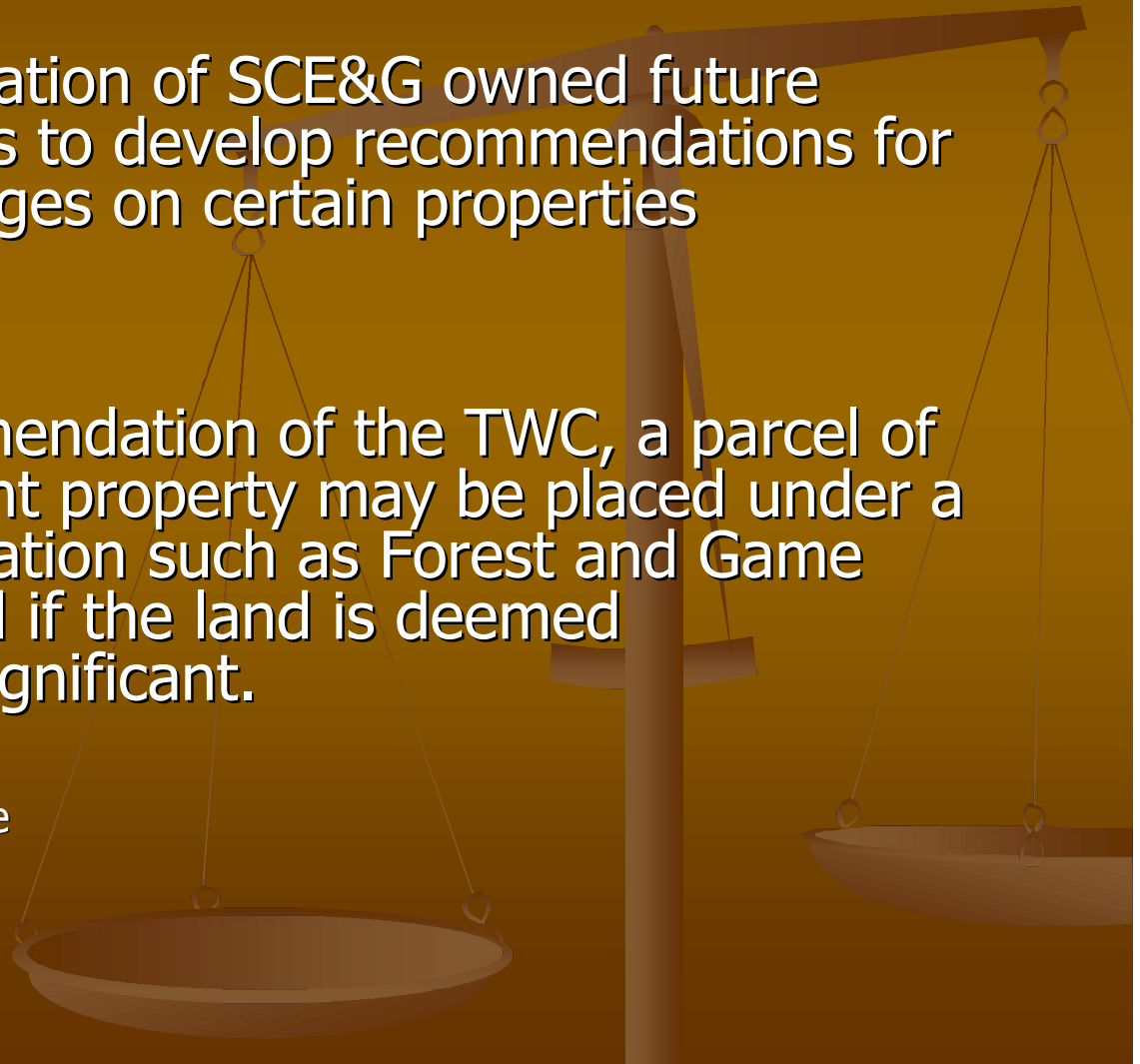
Lake and Land Management TWC



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.

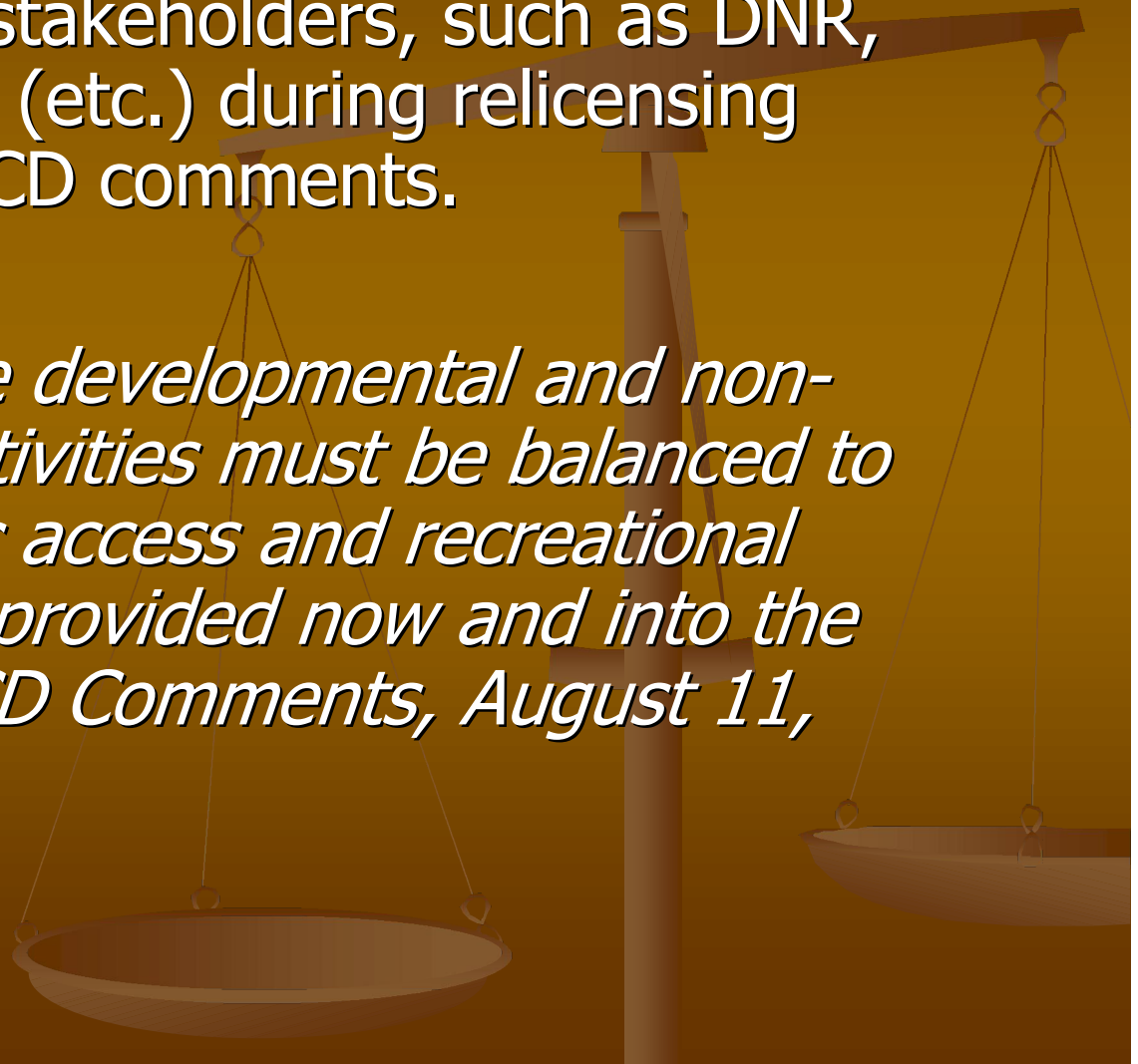
*Technical Working Committee



What Brought his Process About?

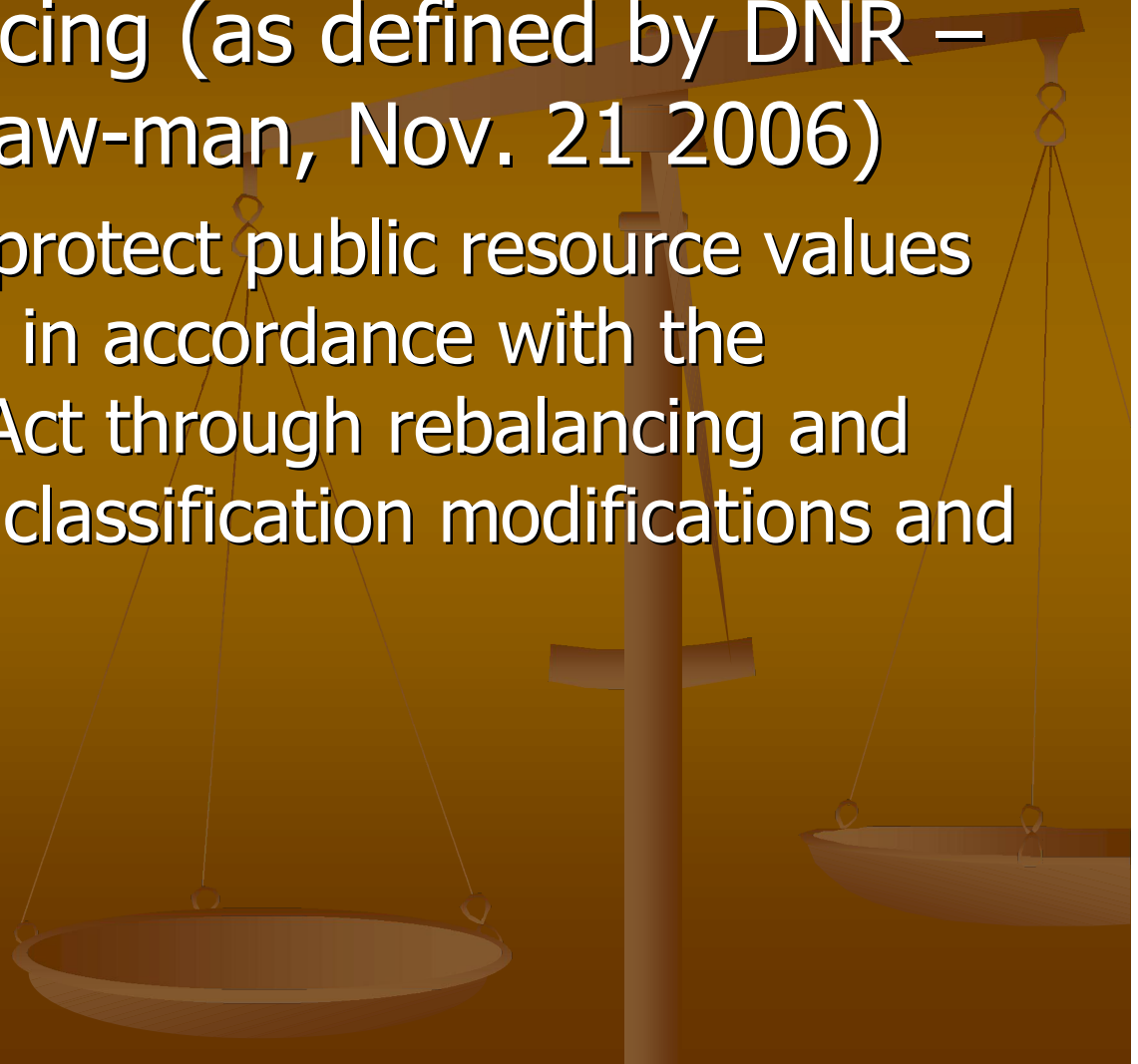
- At the request of stakeholders, such as DNR, LMA, Lake Watch, (etc.) during relicensing meetings and in ICD comments.

“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)



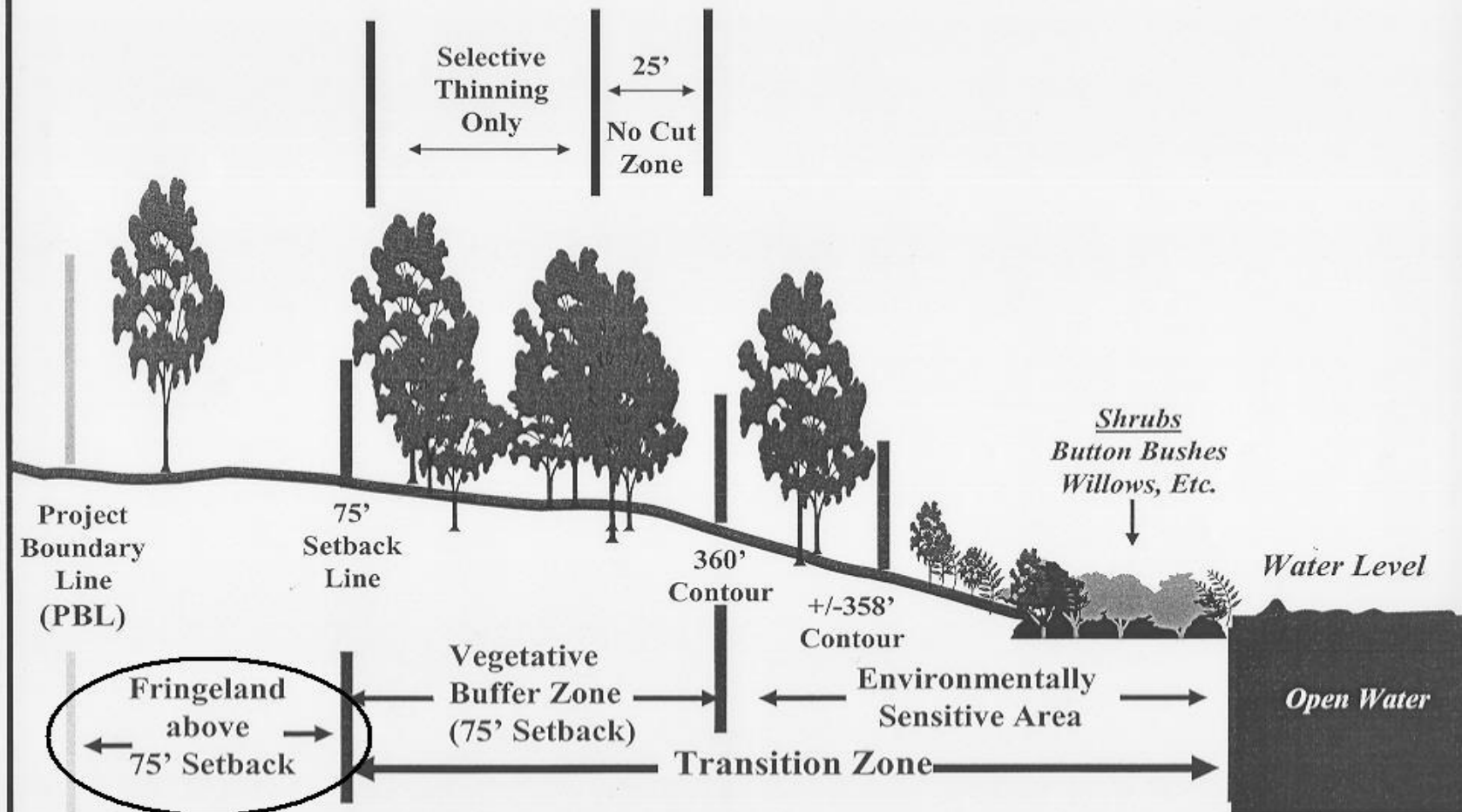
What's Land Rebalancing goal

- 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 o l e d?

Future Development Fringeland Classification Example Lake Murray (FERC Project 516)



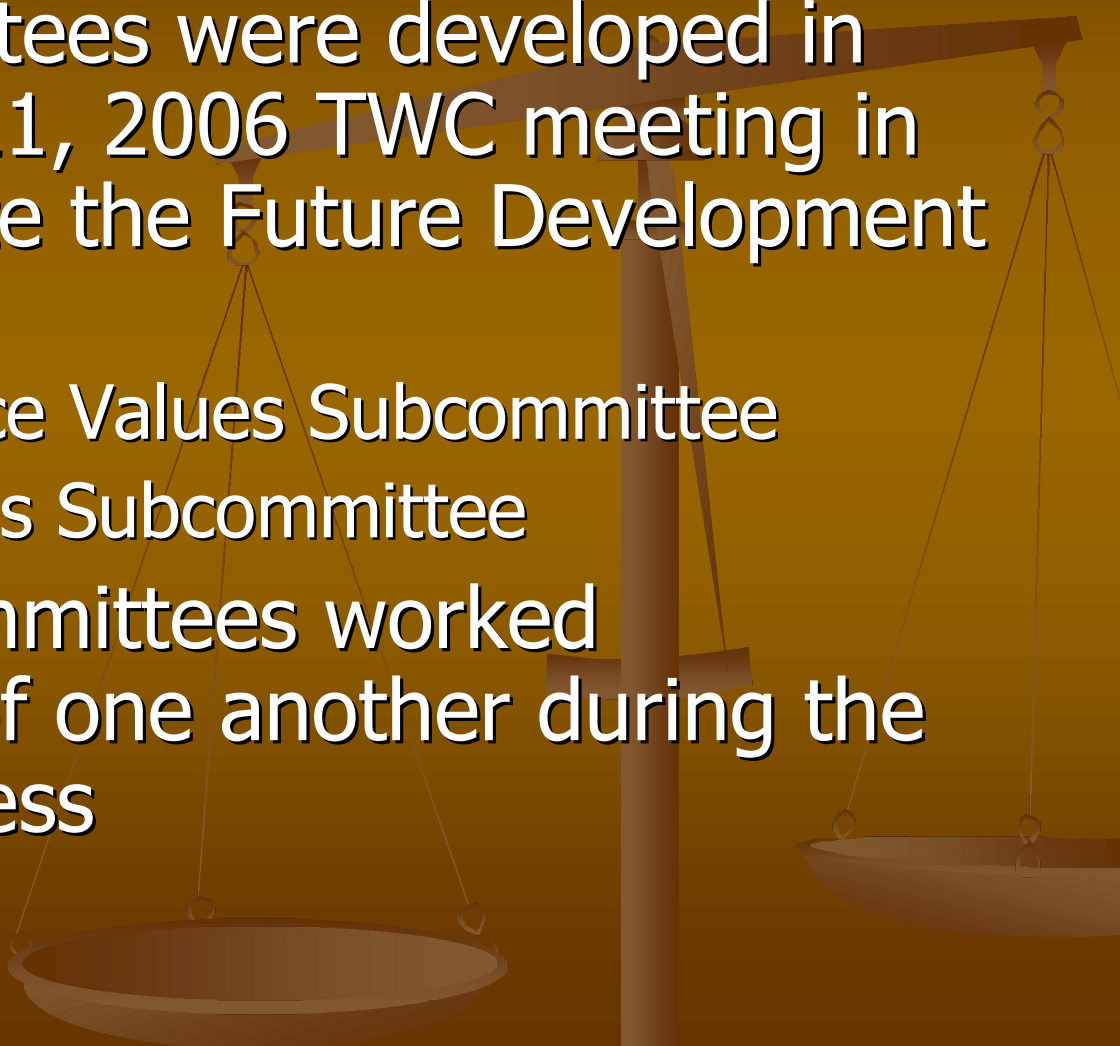
How Does One Determine the Value of a Parcel of Land?

Two Conflicting Values.....

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

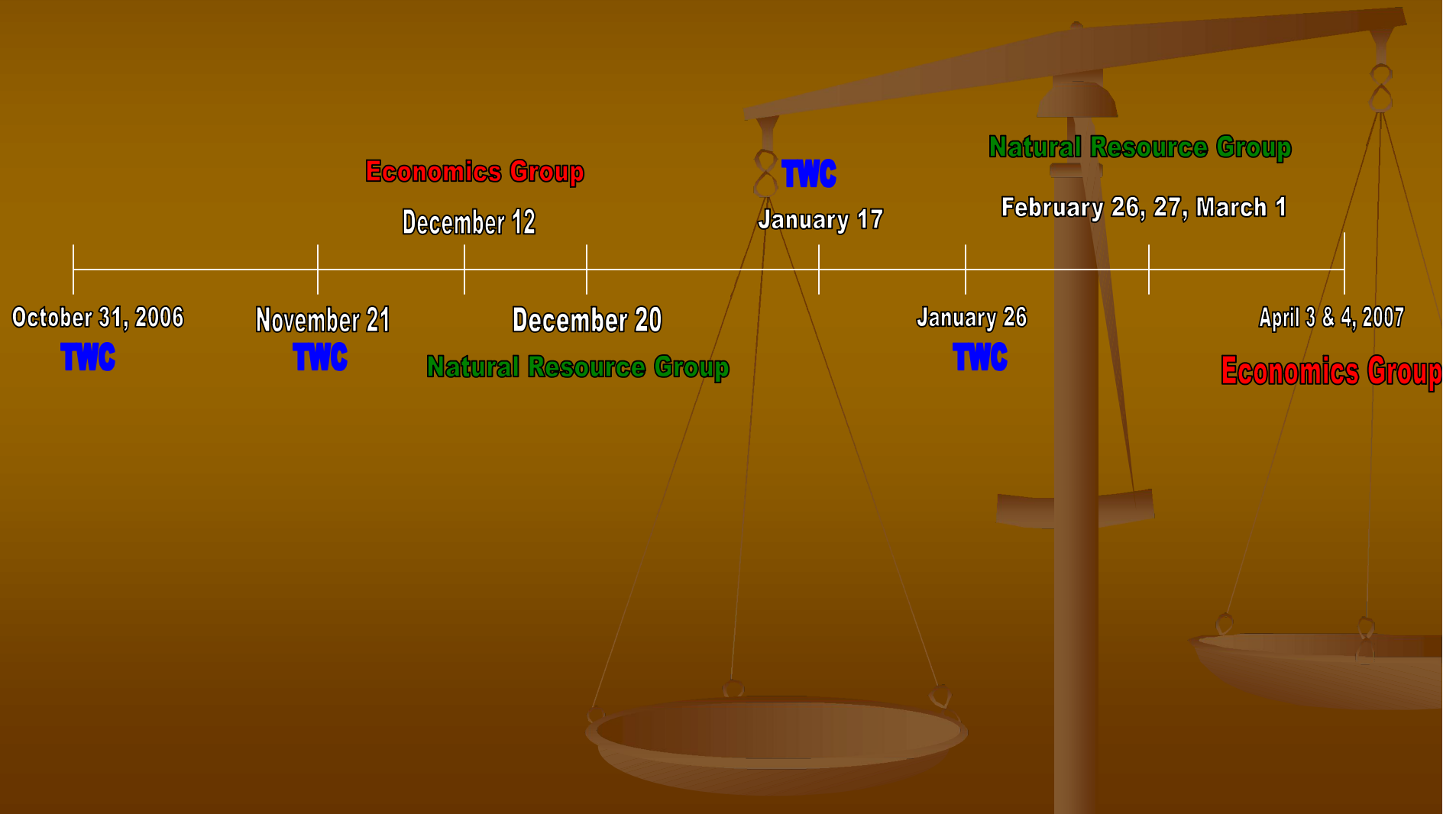


How Was his Process Accomplished?

- 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
- 

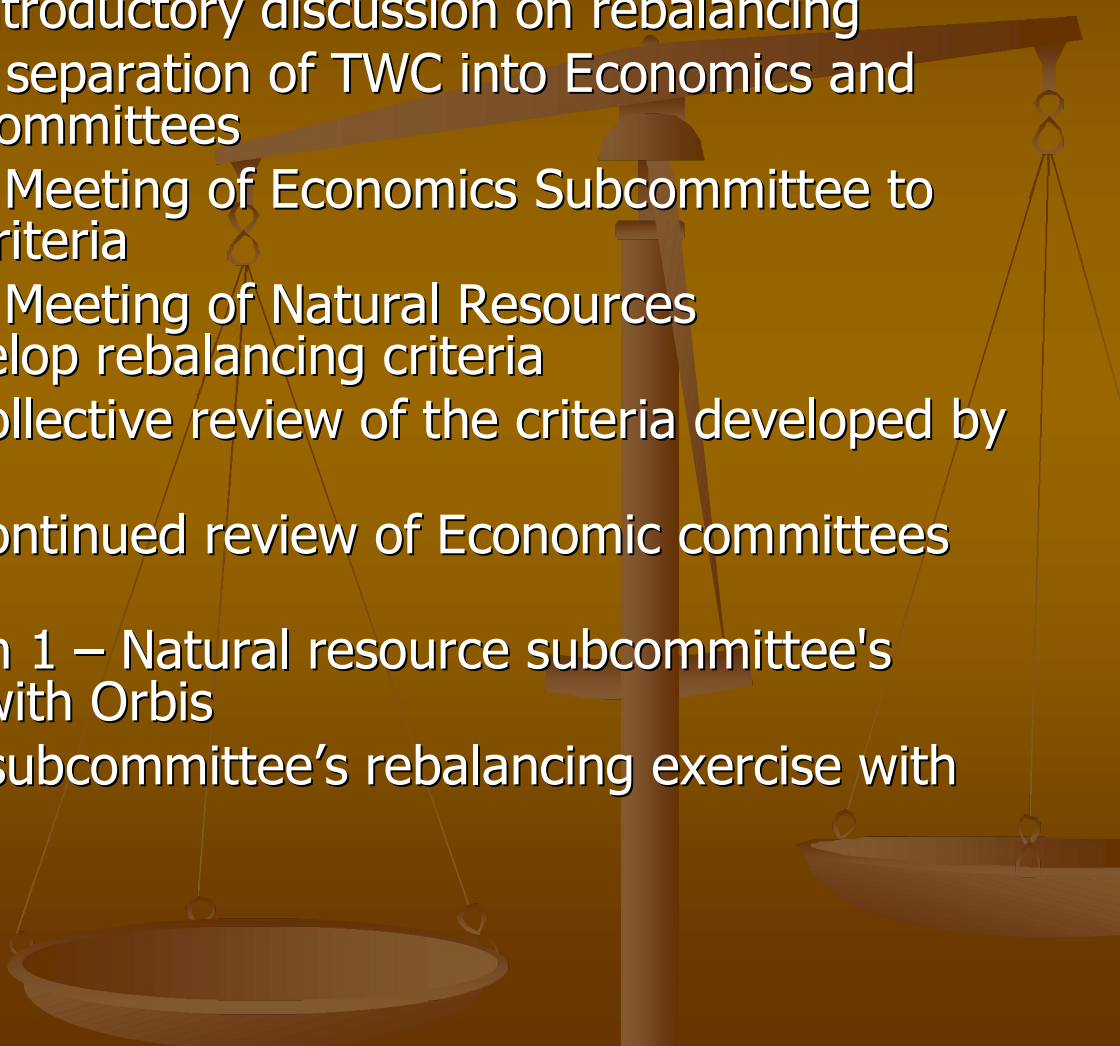
How Was his Process Accomplished

Process Timeline



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
- 

Natural Resource Values 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



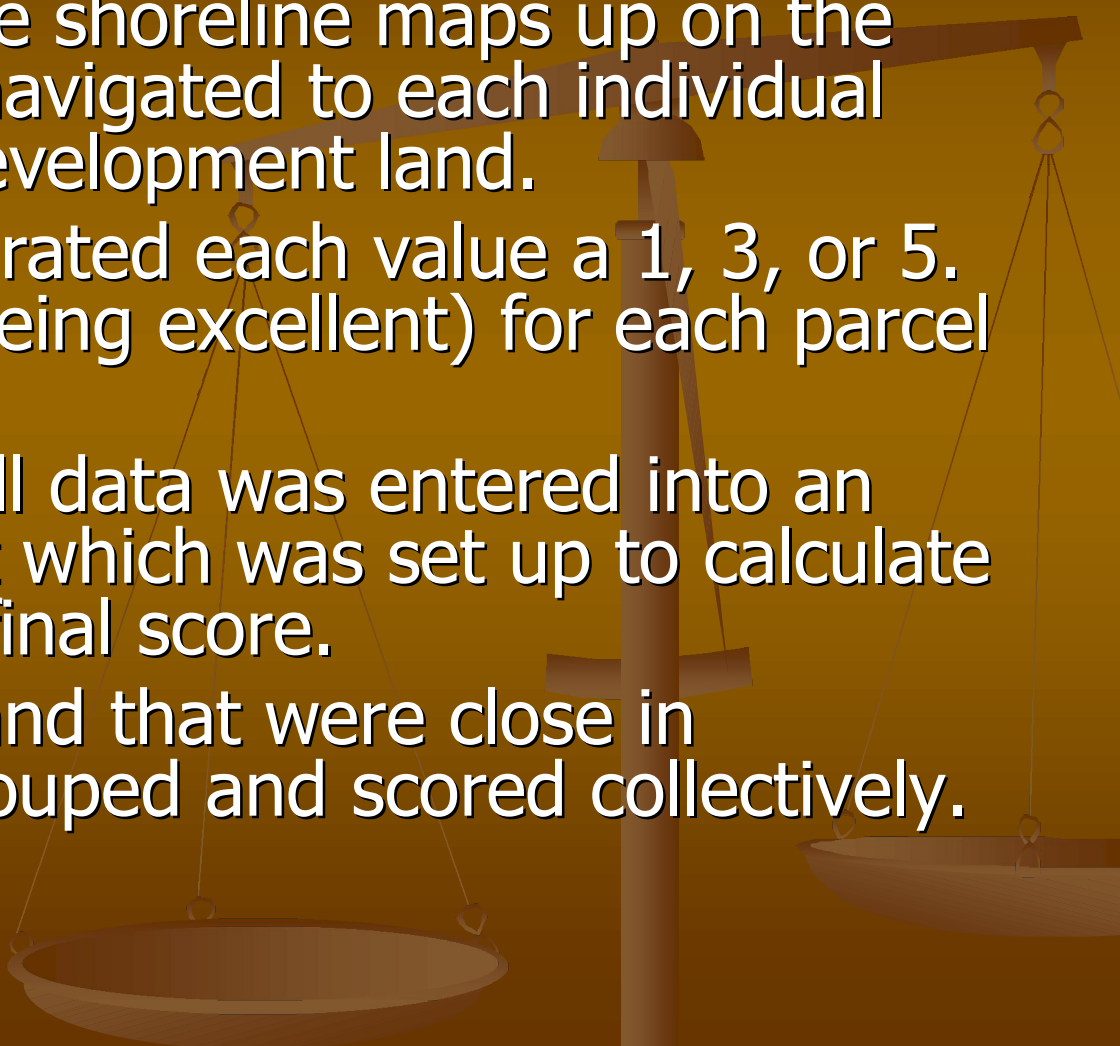
Natural Resource Values Subcommittee

■ 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 Exercise?

- 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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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
<i>Definition:</i>	<i>As the group moves around the lake, these are the numbers that the group assigns to a parcel, or combined parcels of land.</i>	<i>Original parcel numbers as assigned by Orbis.</i>						<i>< 300ft - moderate (1) 300' to 1000' - good (5) >1000' - best (5)</i>		<i>< 10% - - poor (1) 10% to 30% - .. - good (5) >30% - - best (5)</i>
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	fire shoreline 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



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X	Y	Z	AA	AB	AC	AD	AE	AF	AG
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	Additional Comments	
<i>Specific amount or estimate of ESAs or SA's on the property</i>	<i>< 10% ----- poor (1) 10% to 30% -- good (3) >30% ----- best (5)</i>	<i>Specific amount or estimate of habitat that is considered unique on this parcel of land</i>	<i>< 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</i>		<i>< 1 acre - mod (1) 1-5 acres - good (3) 15 acres - best (5)</i>	<i>Sum of all score categories/11</i>		<i>Notes may include why parcels are combined, unique features of the parcel, or parcels that rated low but are specifically important for other reasons</i>	
						0	0		
						0	0	two little pieces on each side of rd	
	5		1		3	2.454545455	27	ESA	
10 percent	5	bald eagle	5		5	3.909090909	43		
10 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	
10 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 in front of prop	5	3	33	dock	
						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		

Economic Values 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



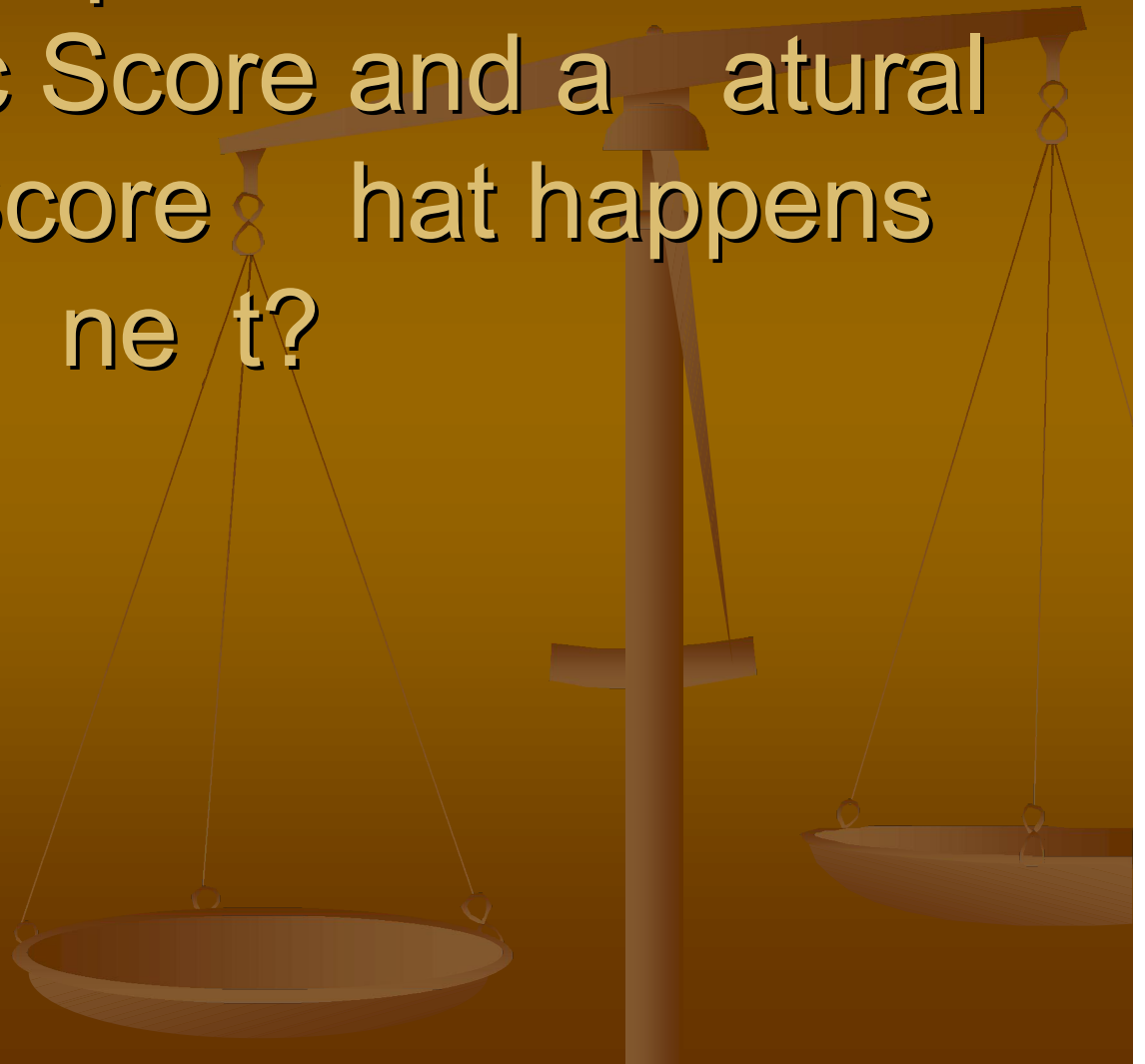
Economic Values Subcommittee

■ 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



o that each parcel has received an Economic Score and a Natural Resource Score. What happens next?





A	B	C	D	E	F	G	H
	Group Chosen #	Parcel # (s) - FDID	Average Final Score	Total Score	Natural Group Ranking	Economics Group Ranking	
<i>Definition:</i>	<i>As the group moves around the lake, these are the numbers that the group assigns to a parcel, or combined parcels of land.</i>	<i>Original parcel numbers as assigned by Orbis.</i>	<i>Sum of all score categories/11</i>				
	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	



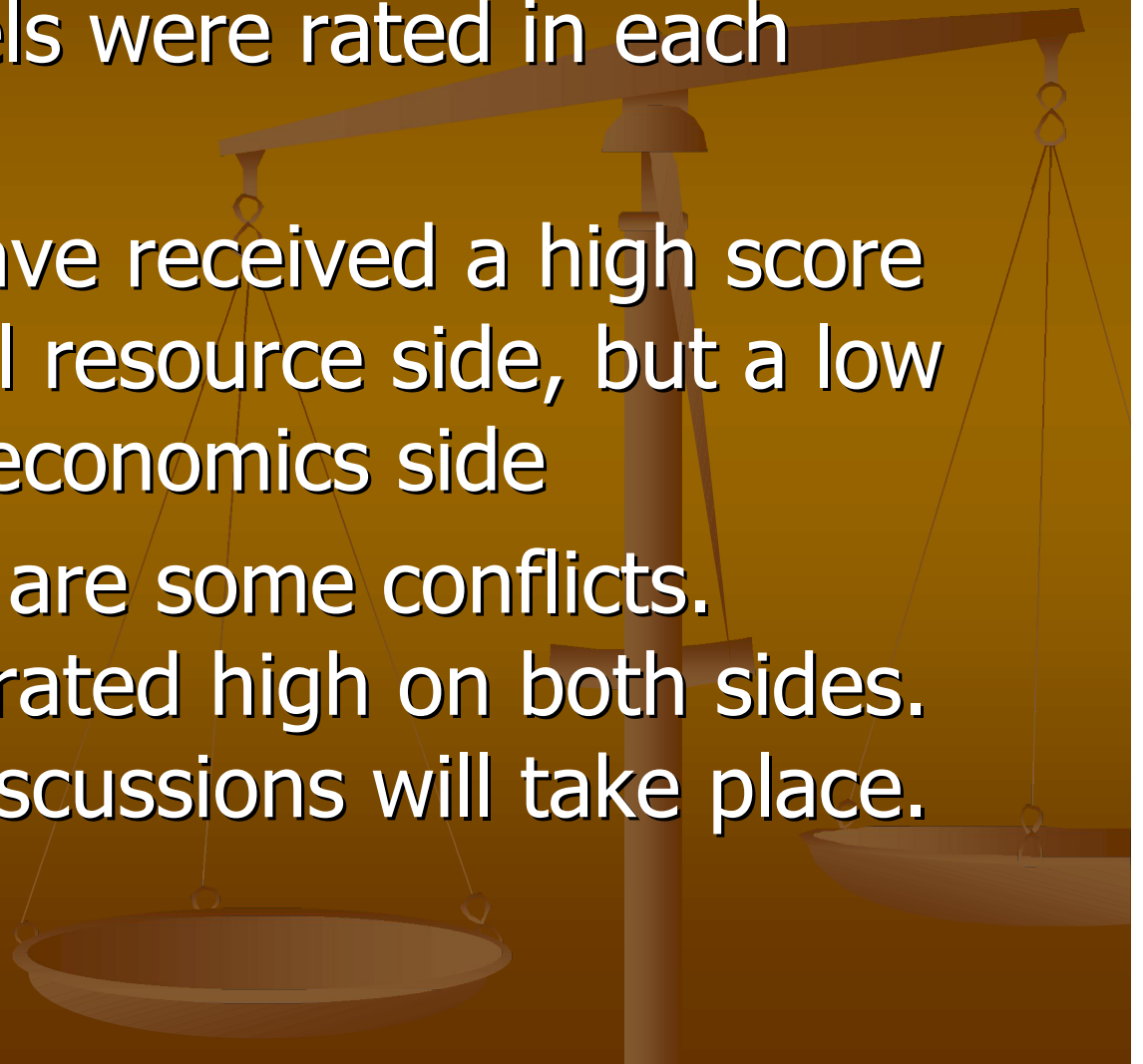
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Natural Resource Group			Economics Group		
Top 5 Scored Parcels			Top 10 Scored Parcels		
Parcel Number	Average Score	Final Score	Parcel Number	Final Score	Average Score
348	4.818181818	53.00	60	60	5
57	4.454545455	49.00	10	58	4.833333333
58	4.454545455	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

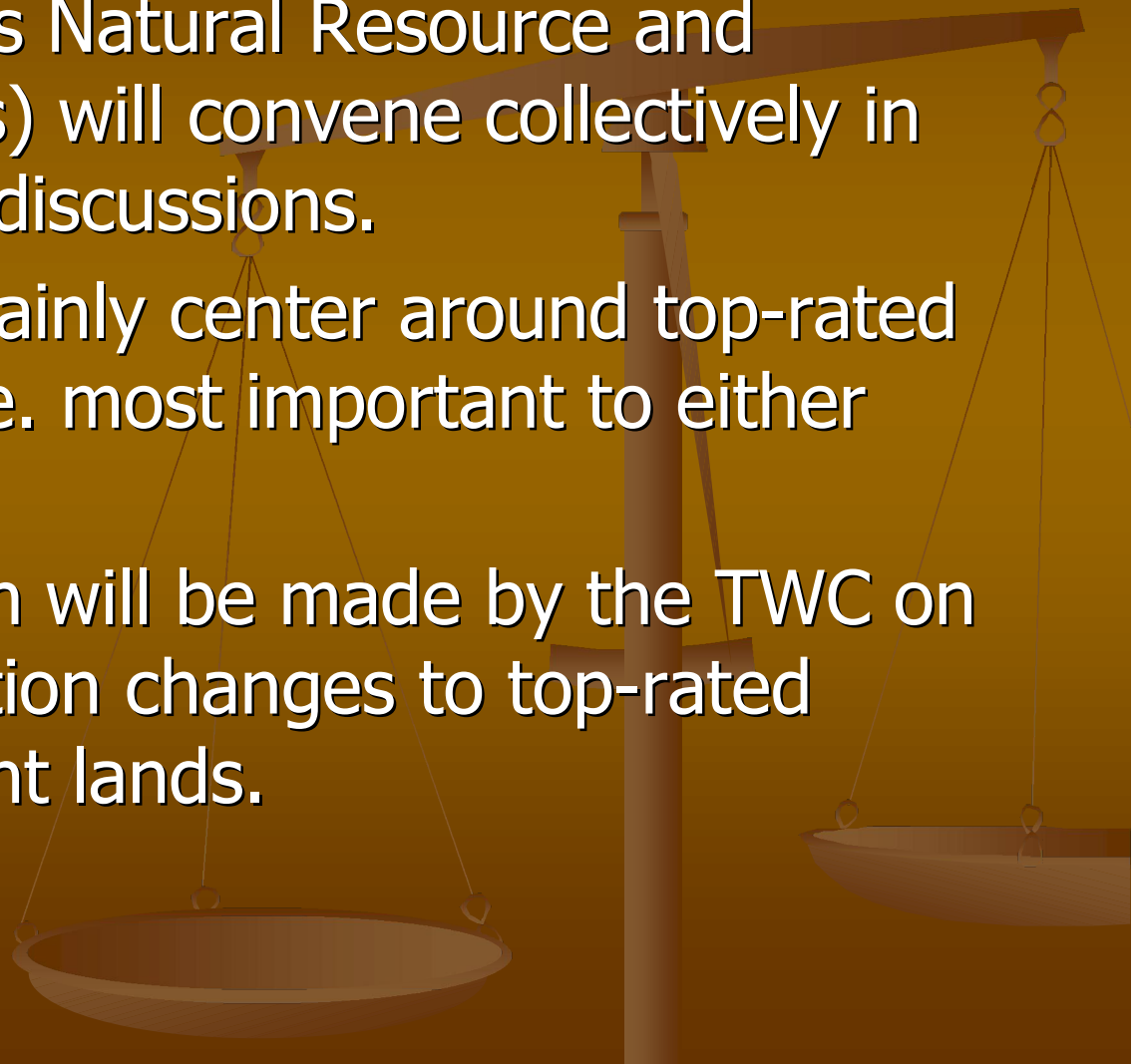
Important Items to Note About Scoring

- 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.



Next 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?



Downstream Flow Analysis for the Lower Saluda River



terminology

- F M Incremental Instream Flow Methodology
- PHABS M Physical Habitat Simulation Model
- Mesohabitat Commonly occurring habitat types
- Guild A group of species having similar resource requirements and foraging strategies and therefore having similar roles in the community

Purpose

- Provide data quantifying the effects of floods on aquatic habitat suitability in the lower Saluda River LSR for target species and lifestages

target Species

- Redbreast Sunfish
- Spotted Sucker
- Blueback Herring
- American Shad
- Shortnose Sturgeon
- Robust Redhorse
- Saluda Darter
- Shorthead Redhorse
- northern Hogsucker
- Spottail Shiner
- Striped Bass
- Brown trout
- Rainbow trout
- Smallmouth Bass

uild Categories

ee S		
S e e	e t ge	S eS 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 eS 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	eSt ge	S eS 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	eSt ge	S eS 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
- Brown trout
- Rainbow trout
- Smallmouth Bass
- Striped Bass

Field Reconnaissance and Habitat Mapping

- Classification and distribution of mesohabitats in the LSR study area



Mesohabitat types

Riffle



Spotted Sucker spawning

Mesohabitat types



Run



juvenile Adult Spotted Sucker

Mesohabitat types

Pool

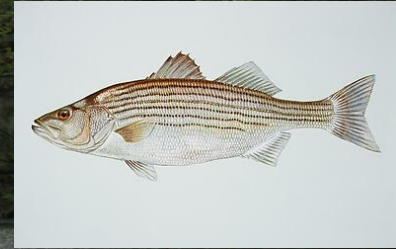


Adult Redbreast Sunfish

Mesohabitat types

Shoal

Adult Striped Bass

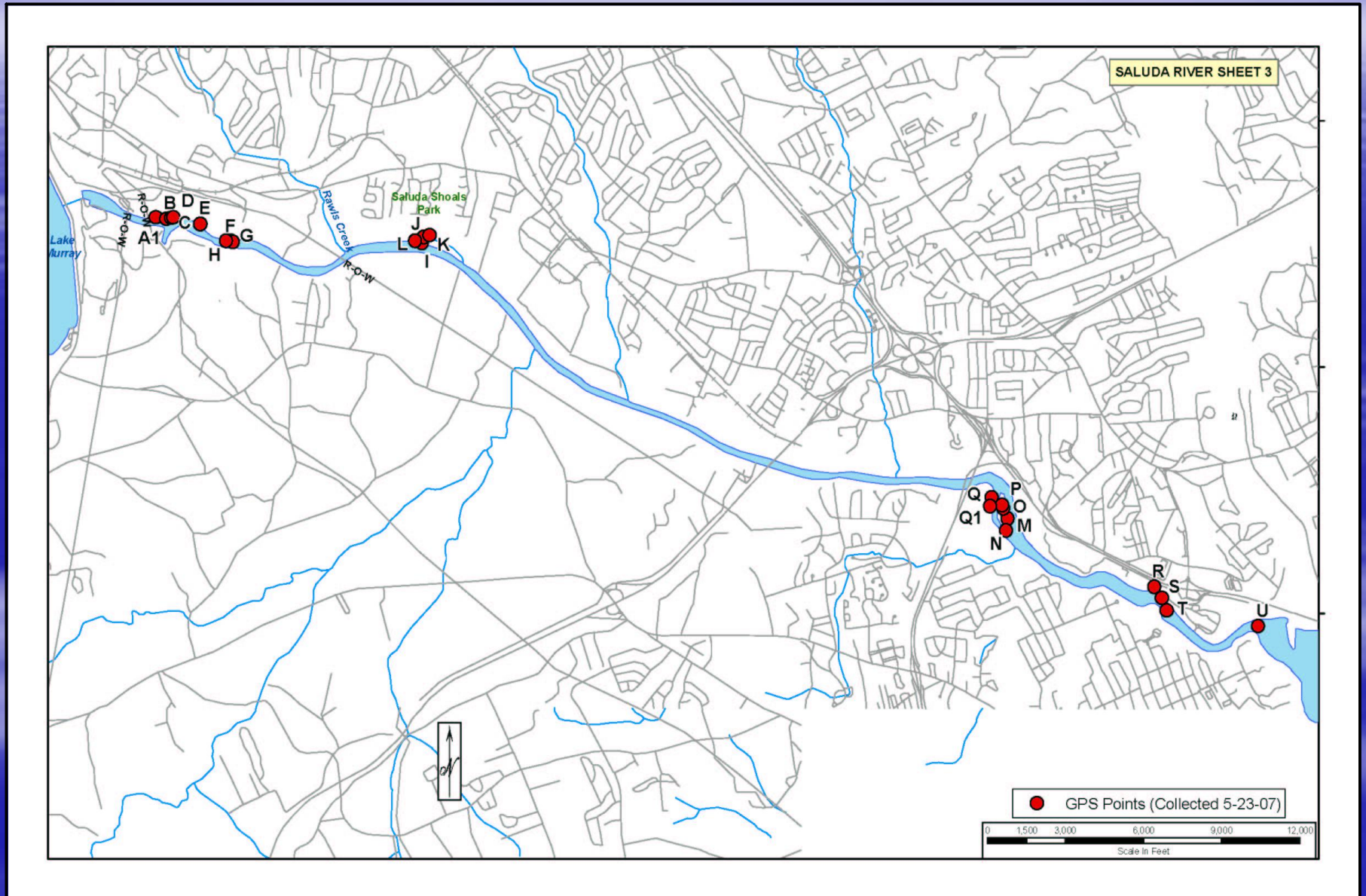


transect Selection

- Approximately 10 transects were selected



ransect Locations



one of Passage

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



Field Data Collection

- Data as collected at three target flows
 - 1 cfs
 - 1 cfs
 - 1 cfs



Field Data Collection

- Cross section surveys and water surface elevations were taken at each transect



Field Data Collection

- velocities flow and slope measurements are taken at each transect



Study Results

- Field data collected at each transect will be entered in the PHABSIM model which will be used to evaluate habitat suitability for target fish species in the LSR at varying flows
- Empirical flow measurements will also be examined in the model to evaluate the role of passage hydraulics at Millrace

Reporting

- A draft report will be prepared for the WC for review and comment in the fall of
- Study results will be used to develop flow recommendations that best meet habitat needs of target species

Questions?





Recreation Assessment Study Report

Quarterly Public Meeting
April 19, 2007



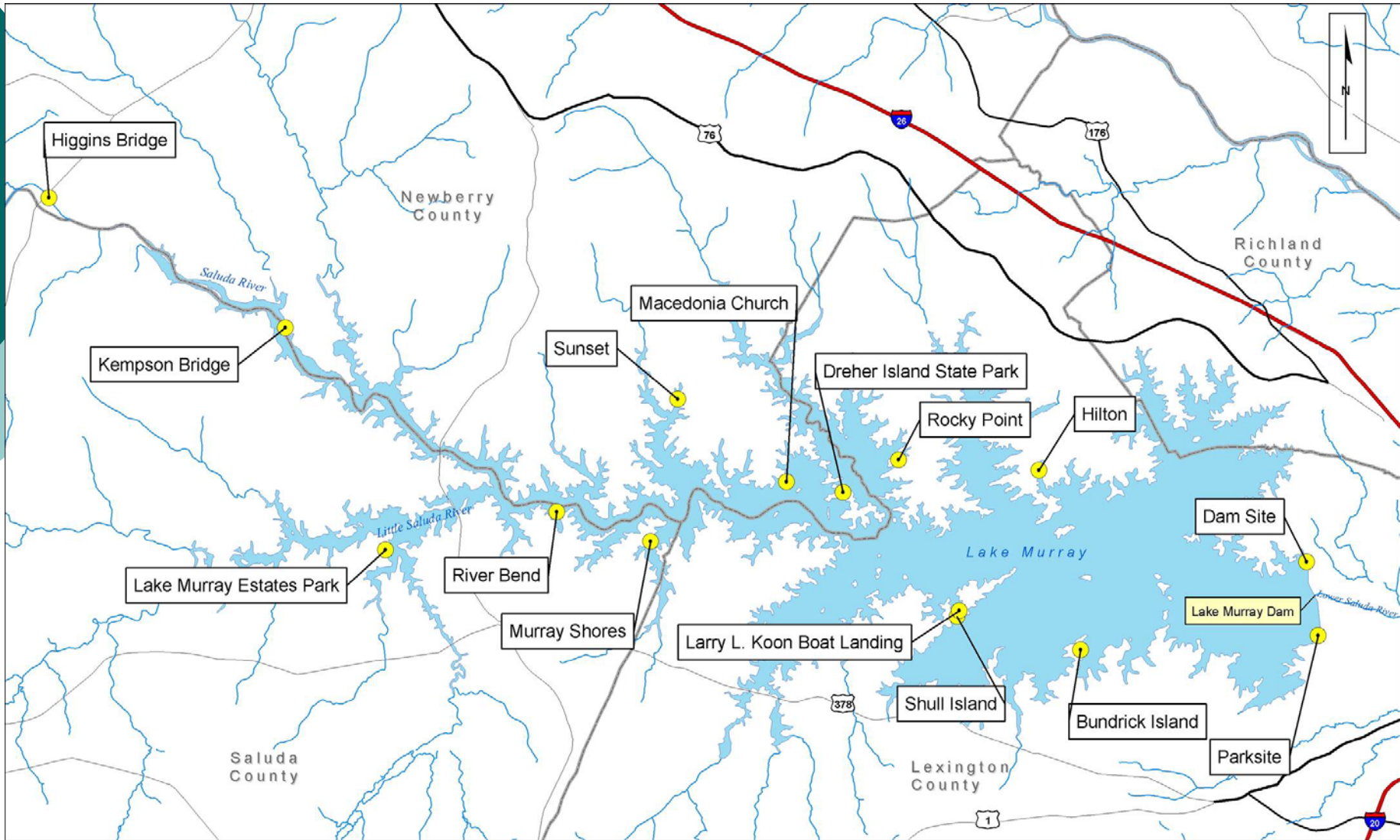
Purpose of Study

- 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

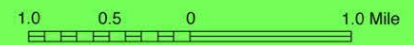




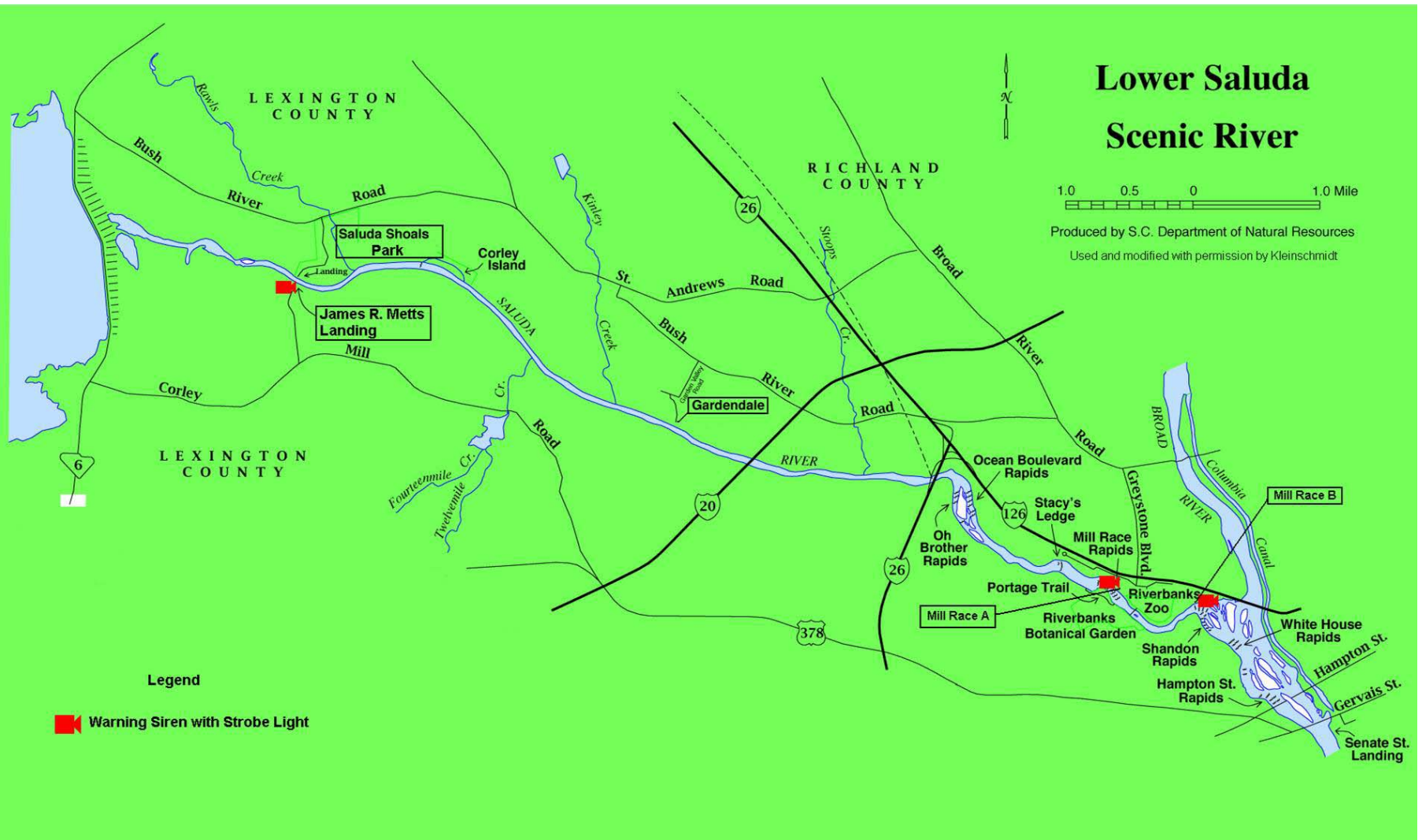
LSR Sites Included in Study

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

Lower Saluda Scenic River



Produced by S.C. Department of Natural Resources
 Used and modified with permission by Kleinschmidt



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:

$$((200 \text{ cars} * 2 \text{ people per car}) * 2) * 31$$

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

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

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	x					
Saluda Shoals	240	x	x	x		x	
James R. Metts Landing	1	x					



Lake Murray Users

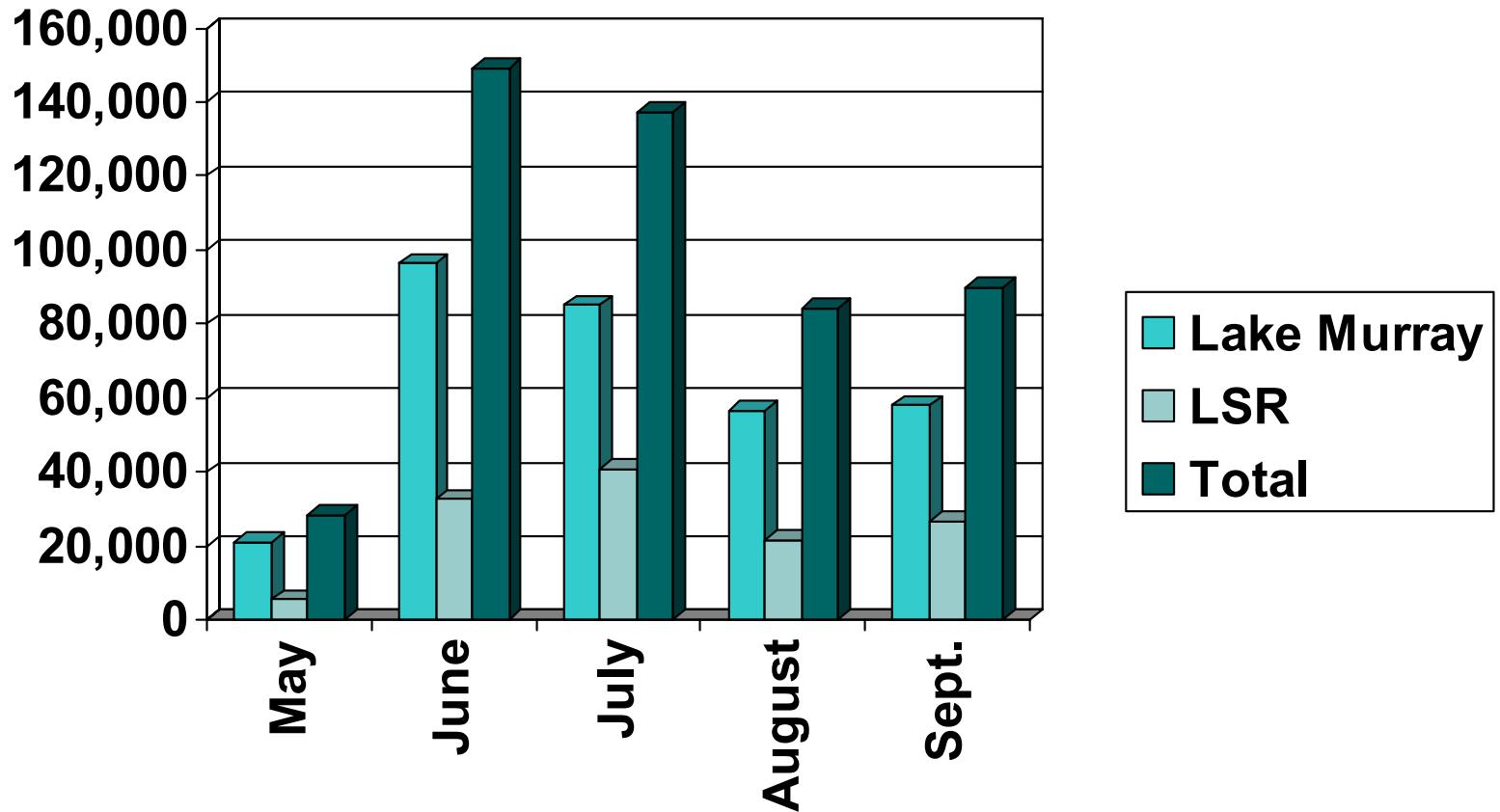
- Mostly male
- Predominantly local residents
- Majority do not own shoreline property
- Location, Location, Location



LSR Users

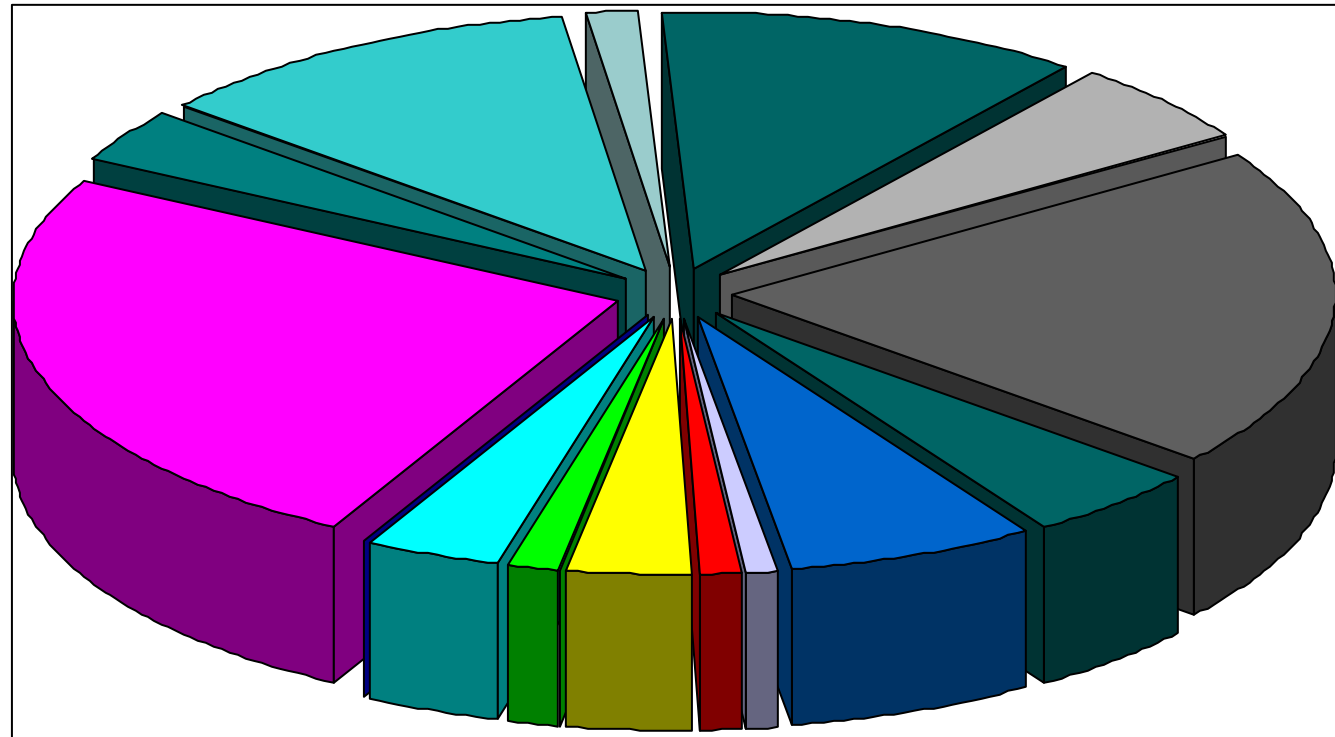
- Mostly male
- Predominantly local residents
- Majority do not own shoreline property
- Not location

Estimated Recreation Days by Month



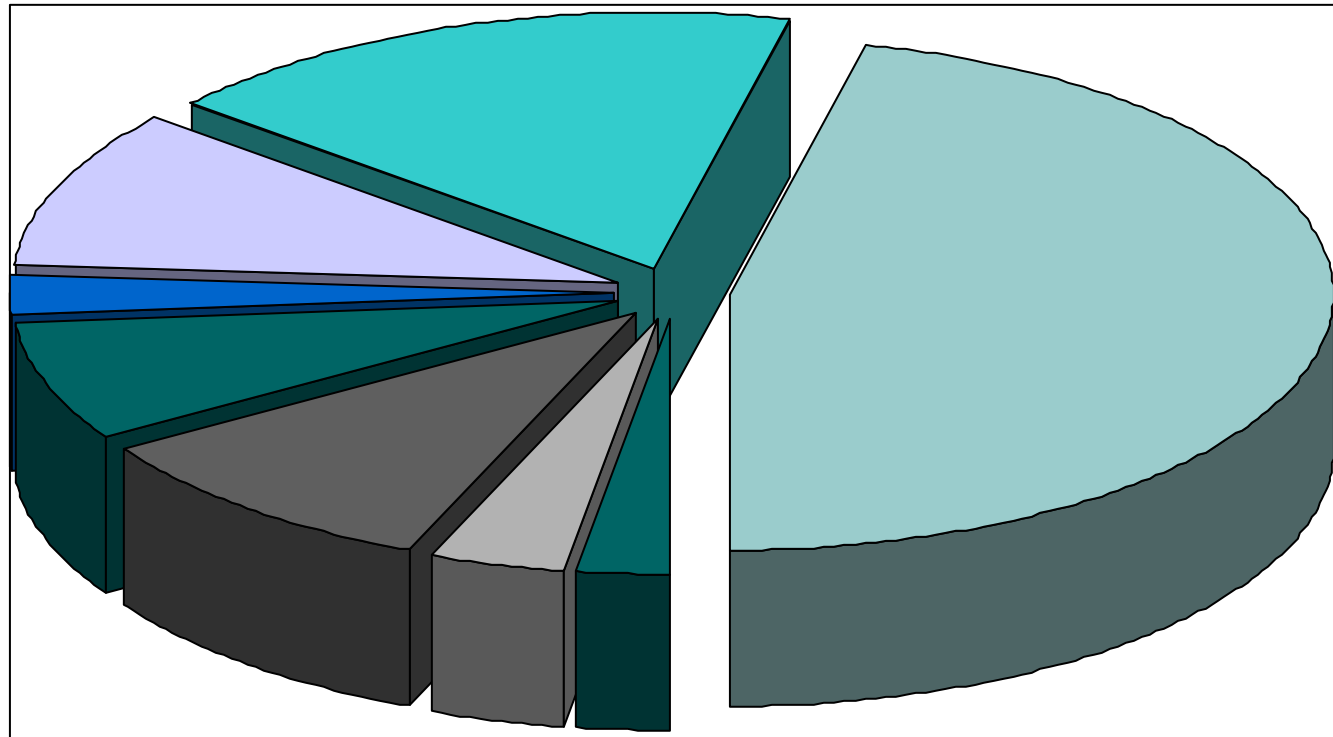
Estimated Recreation Days by Lake Murray Site

- Dam Site
- Parksite
- LKL
- Shull Island
- Bundrick Island
- Murray Shores
- River Bend
- Higgins Bridge
- Kempson Bridge
- Lake Murray Estates Park
- Macedonia Church
- Sunset
- Rocky Point
- Dreher Island
- Hilton



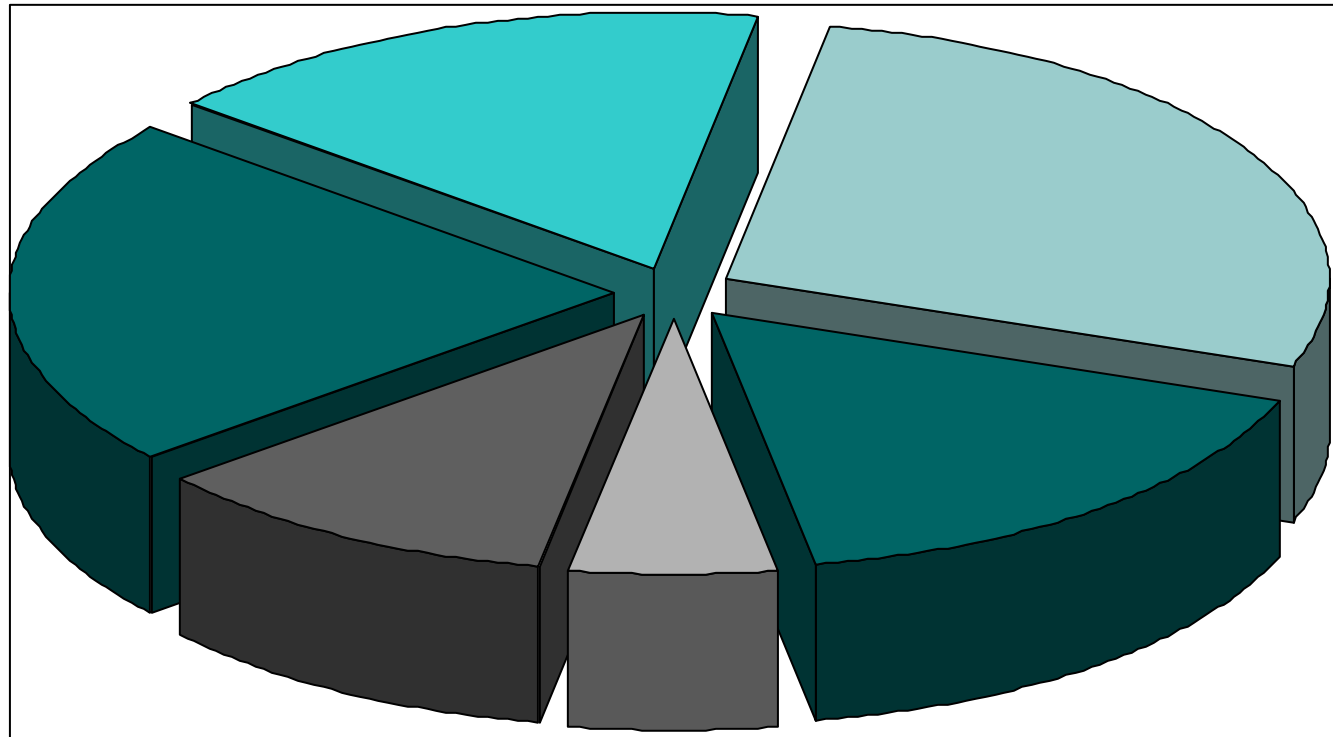
Primary Water-Based Activities on Lake Murray

- Bank Fishing
- Boat Fishing
- Pier/Dock Fishing
- Jet Skiing
- Motor Boating
- Pontoon/Party Boating
- Waterskiing/Tow
- Swimming



Primary Land-Based Activities at Lake Murray Sites

- Camping
- Picnicking
- Sightseeing
- Sunbathing
- Walking/Hiking
- Other



Estimated Recreation Days by Lower Saluda River Site

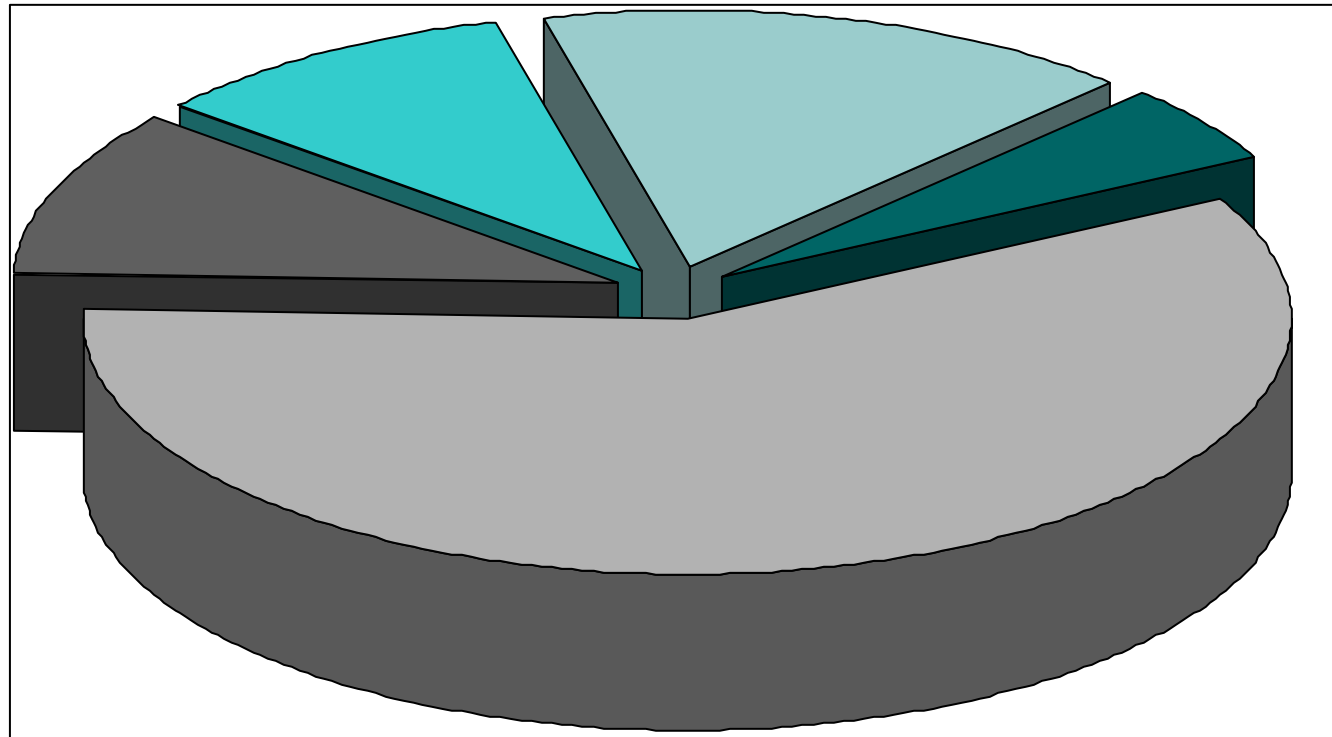
■ Mill Race A

■ Mill Race B

■ Gardendale

■ Saluda Shoals Park

■ Metts Landing



Primary Water-Based Activities on the Lower Saluda River

■ Bank Fishing

■ Boat Fishing

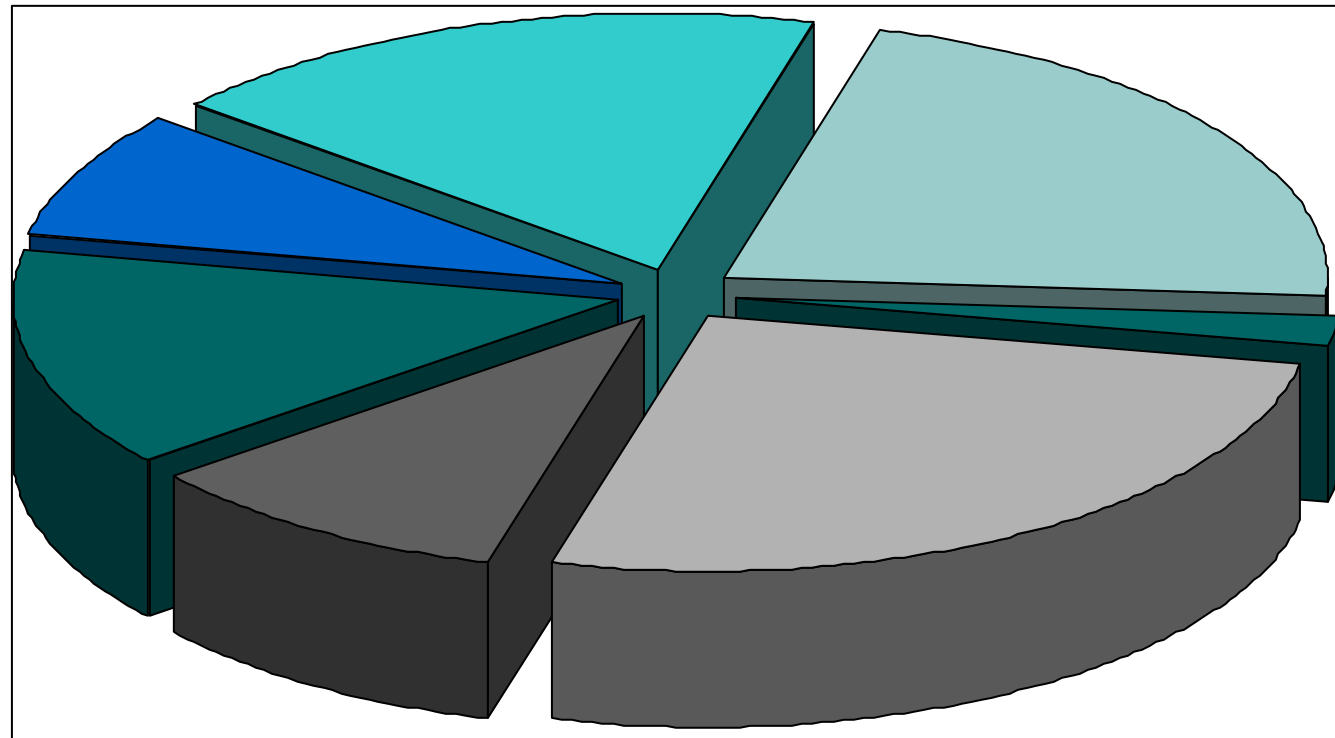
■ Pier/Dock Fishing

■ Flatwater Canoe/Kayak

■ Tubing/Floating

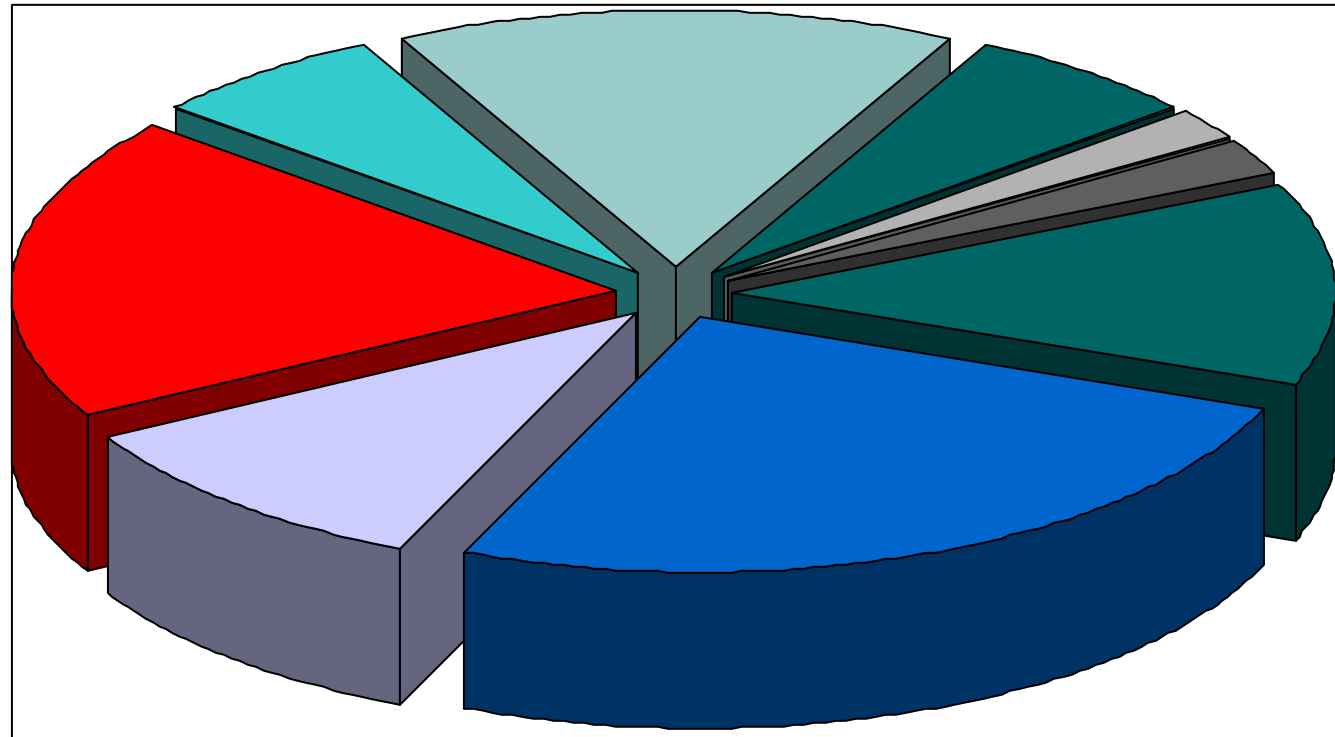
■ Whitewater Canoe/Kayak

■ Swimming

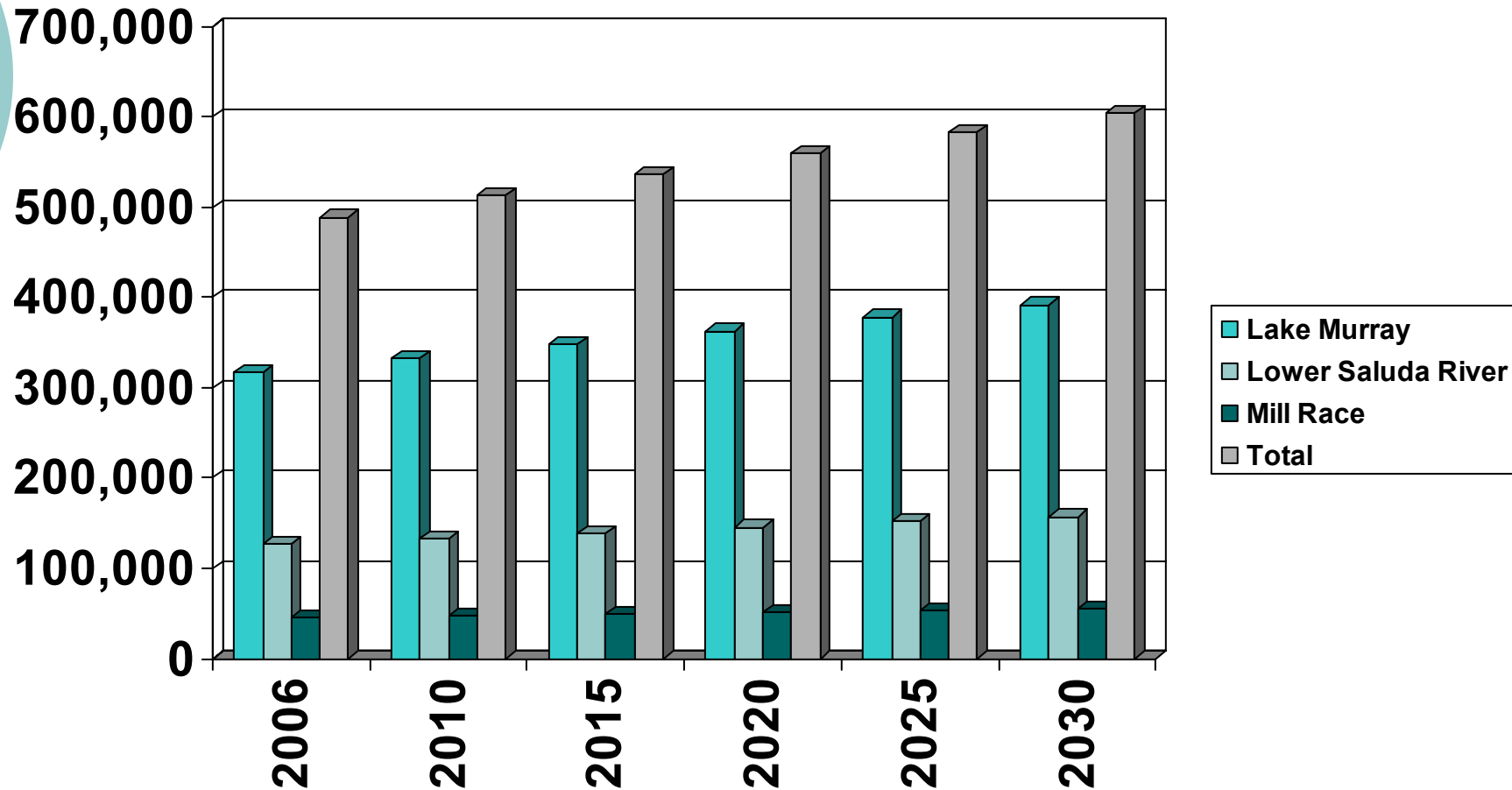


Primary Land-Based Activities at Lower Saluda River Sites

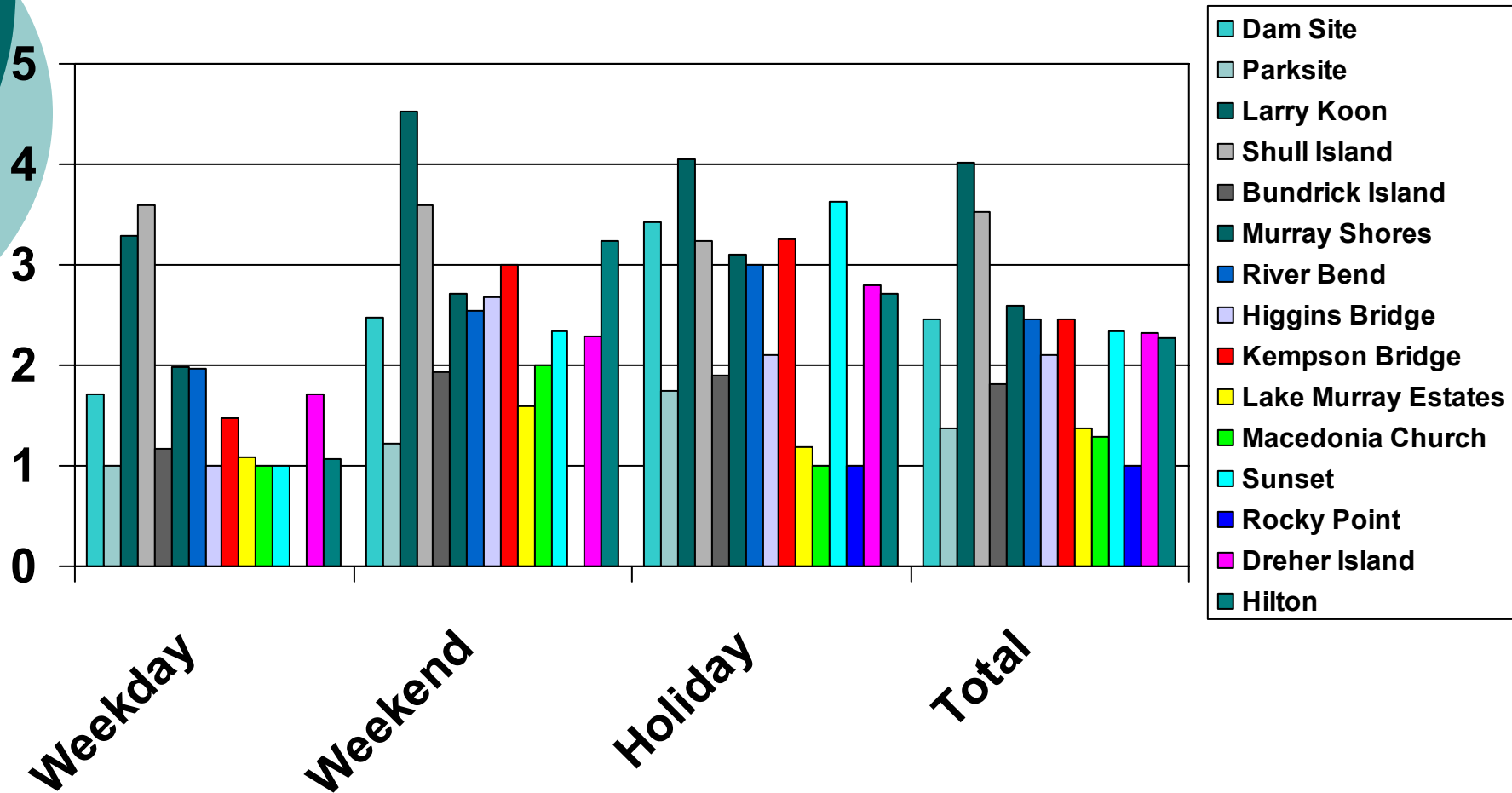
- Bicycling
- Dog Walking
- Event
- Nature Study/Wildlife
- Picnicking
- Playground/Spraypark
- Sightseeing
- Walking/Hiking
- Other



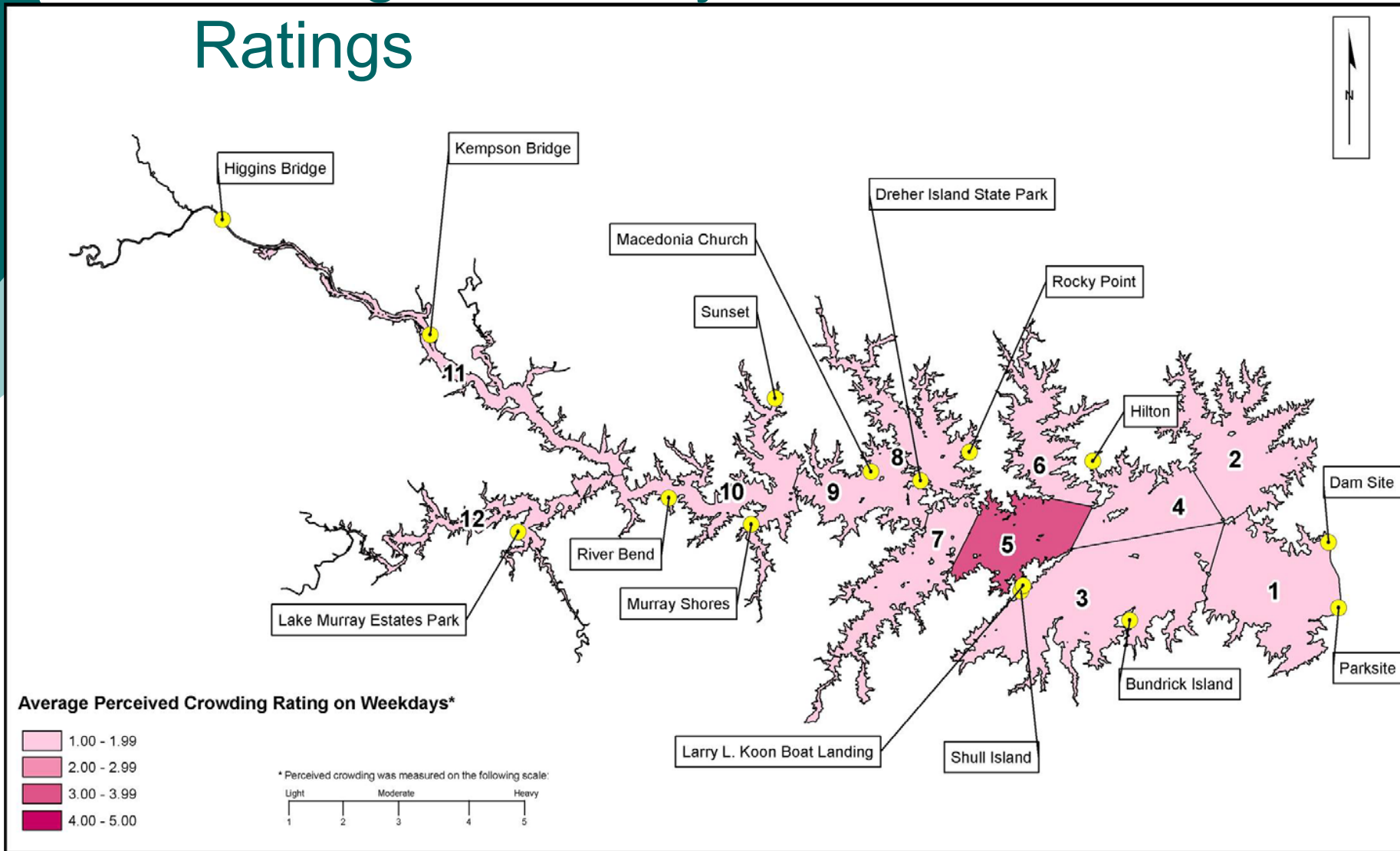
Estimated Future Recreation Days for the Saluda Project



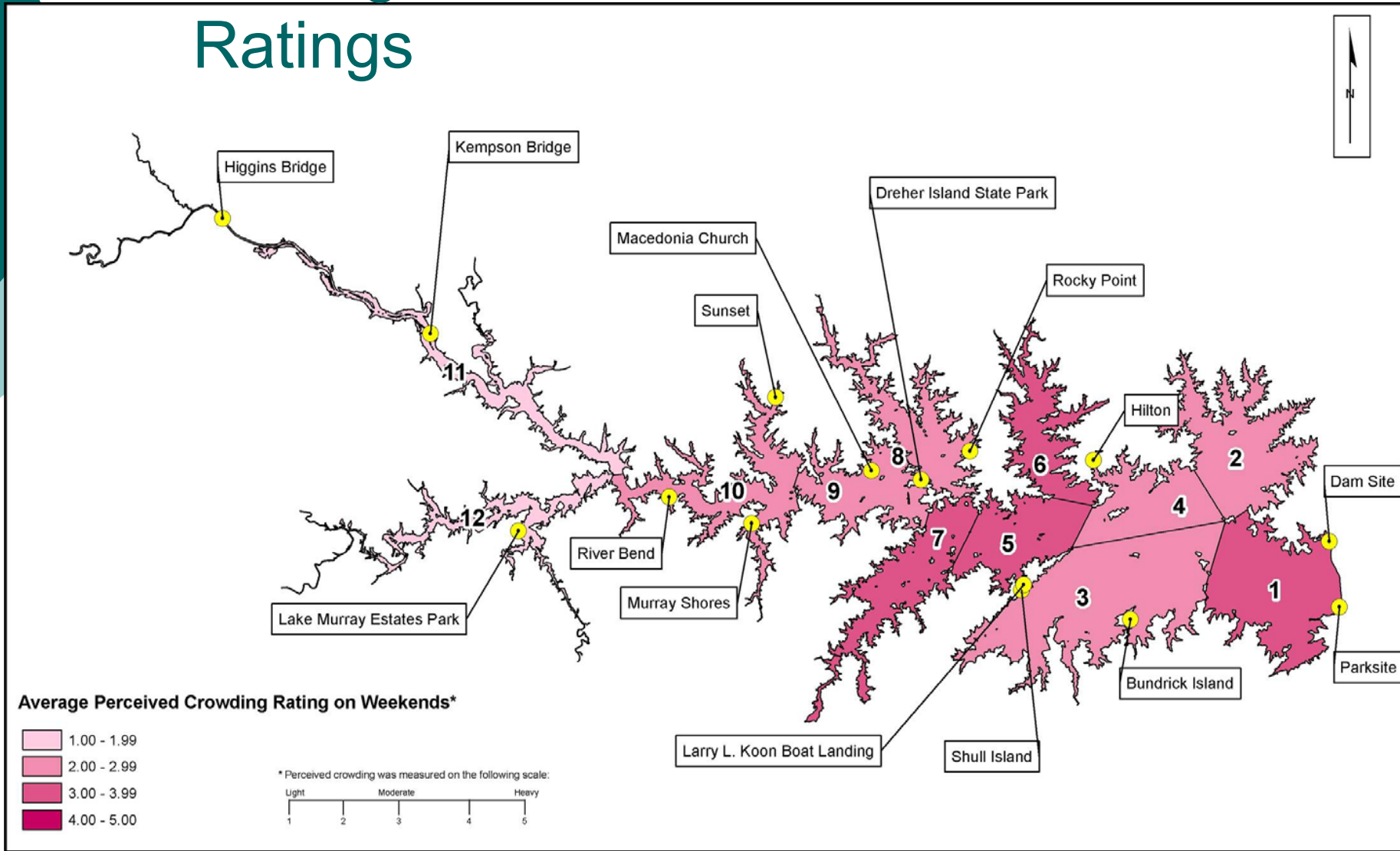
Crowdedness Ratings for Lake Murray Sites



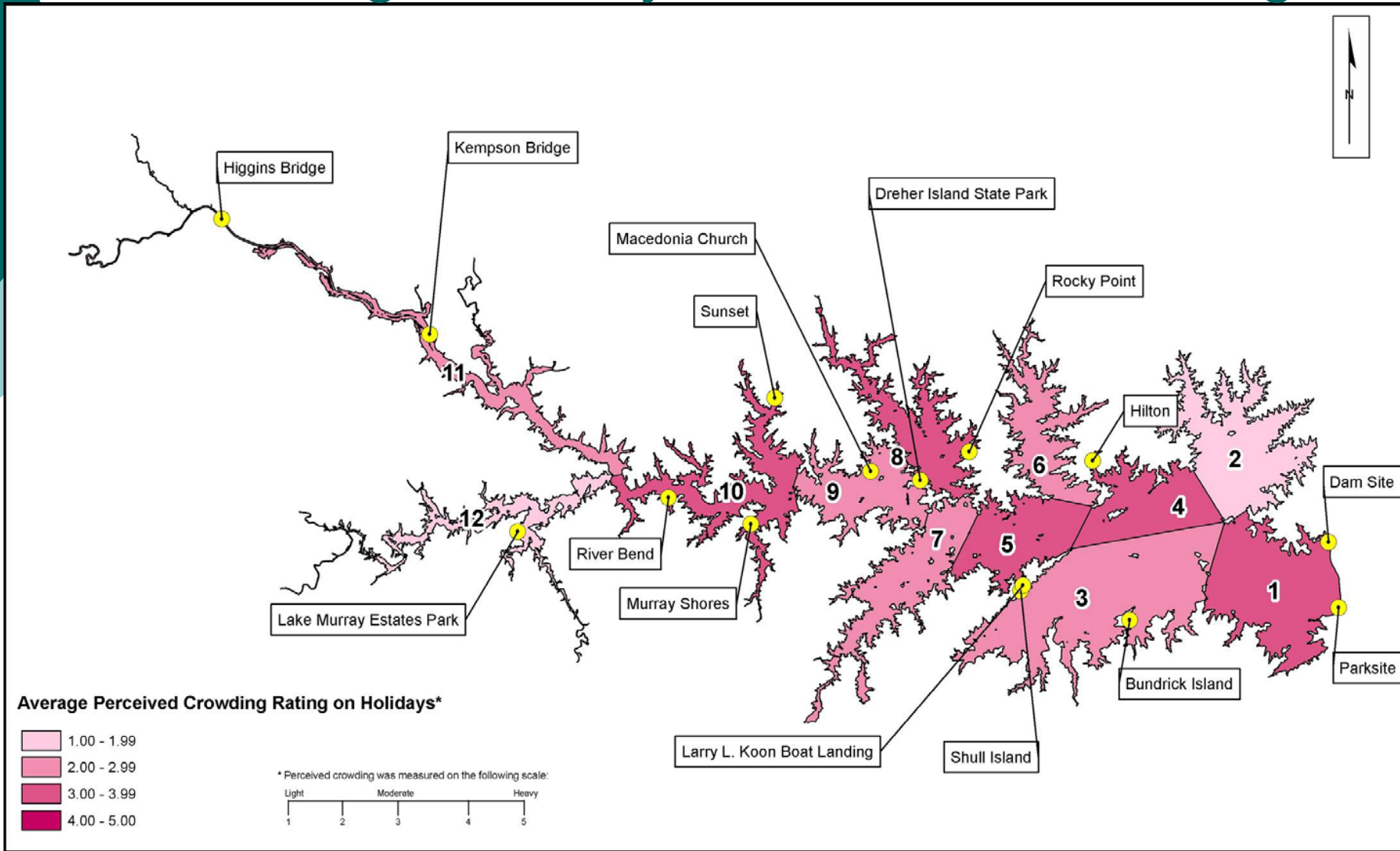
Average Weekday Crowdedness Ratings



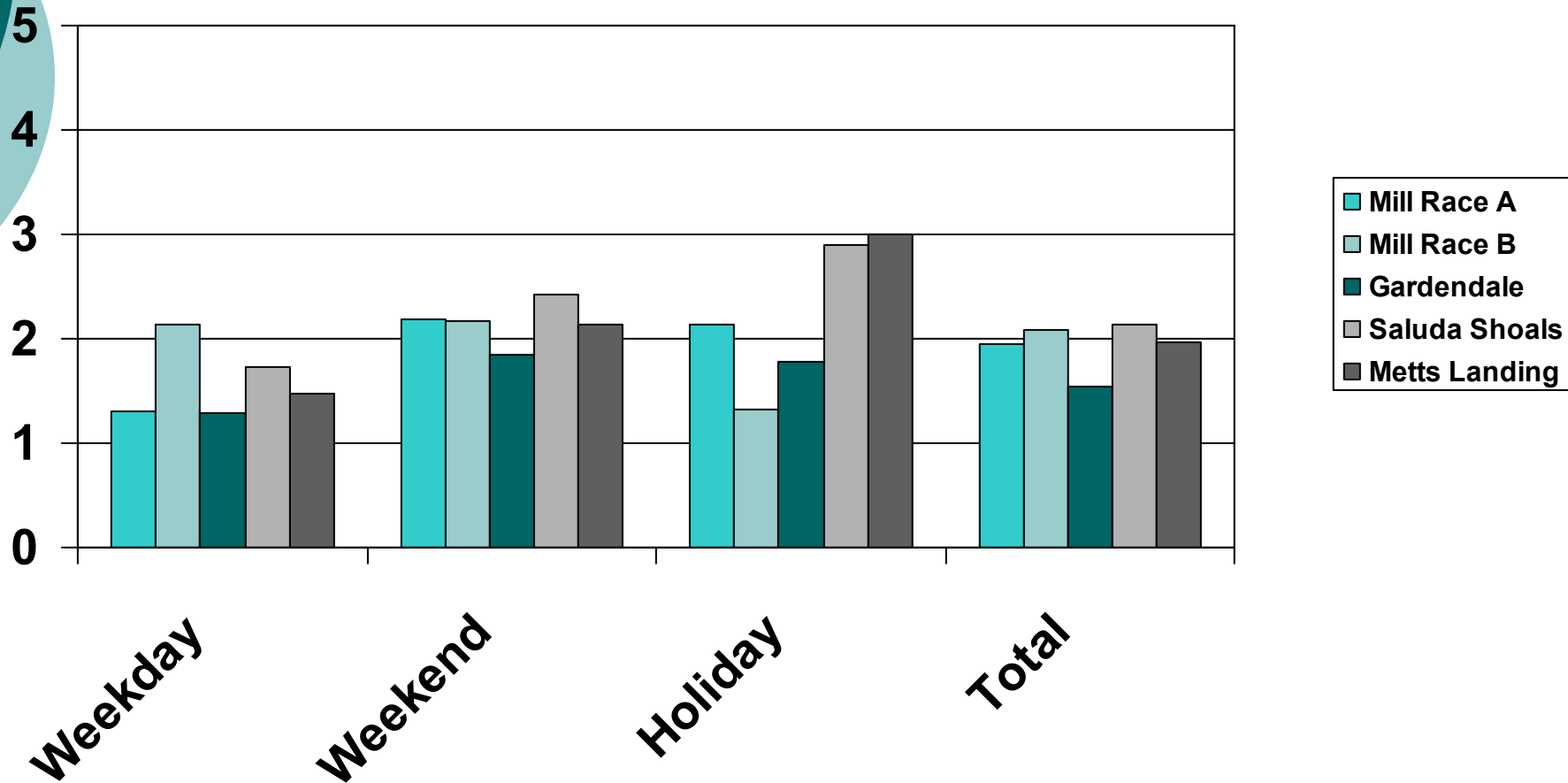
Average Weekend Crowdedness Ratings



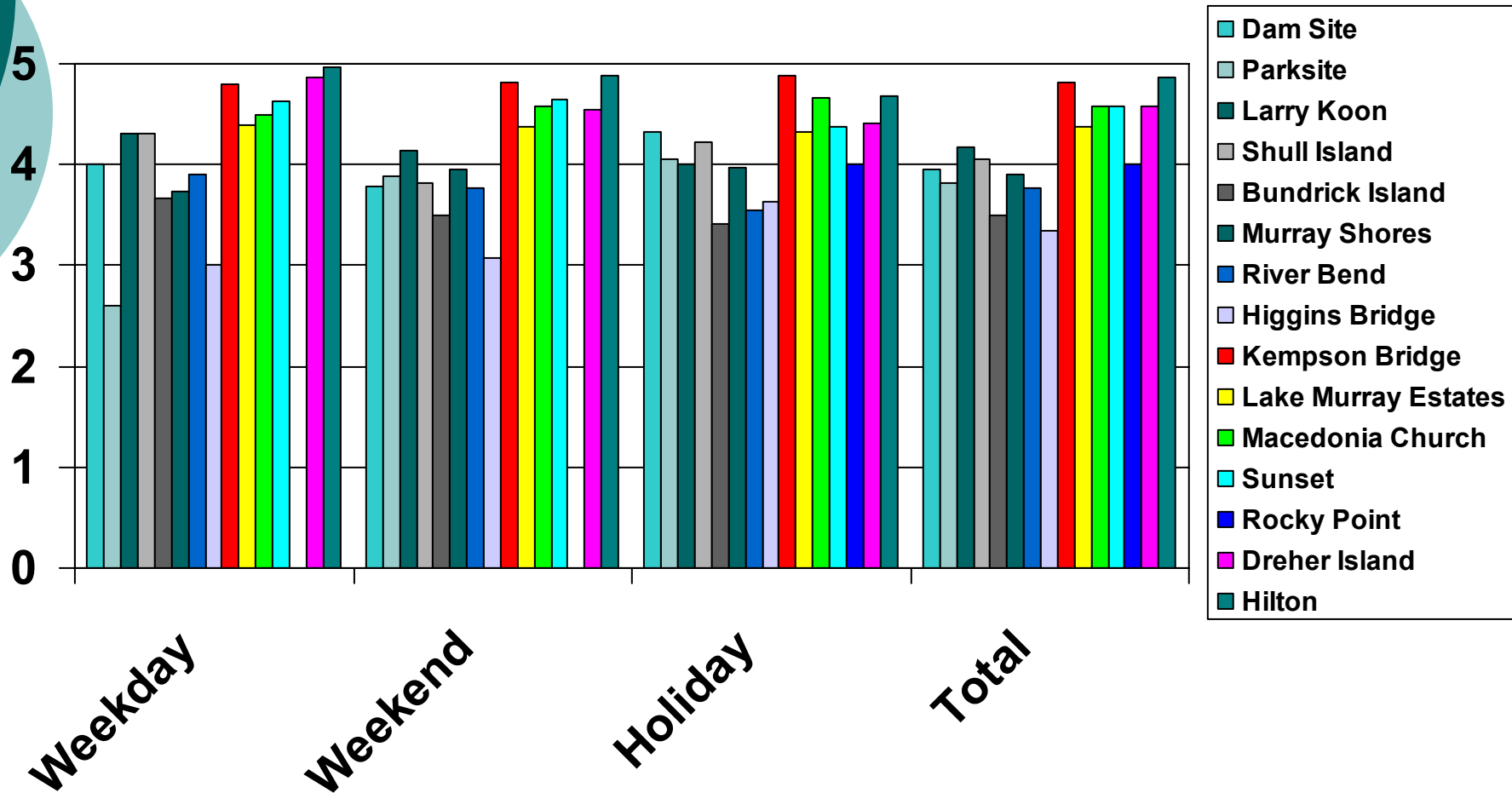
Average Holiday Crowdedness Ratings



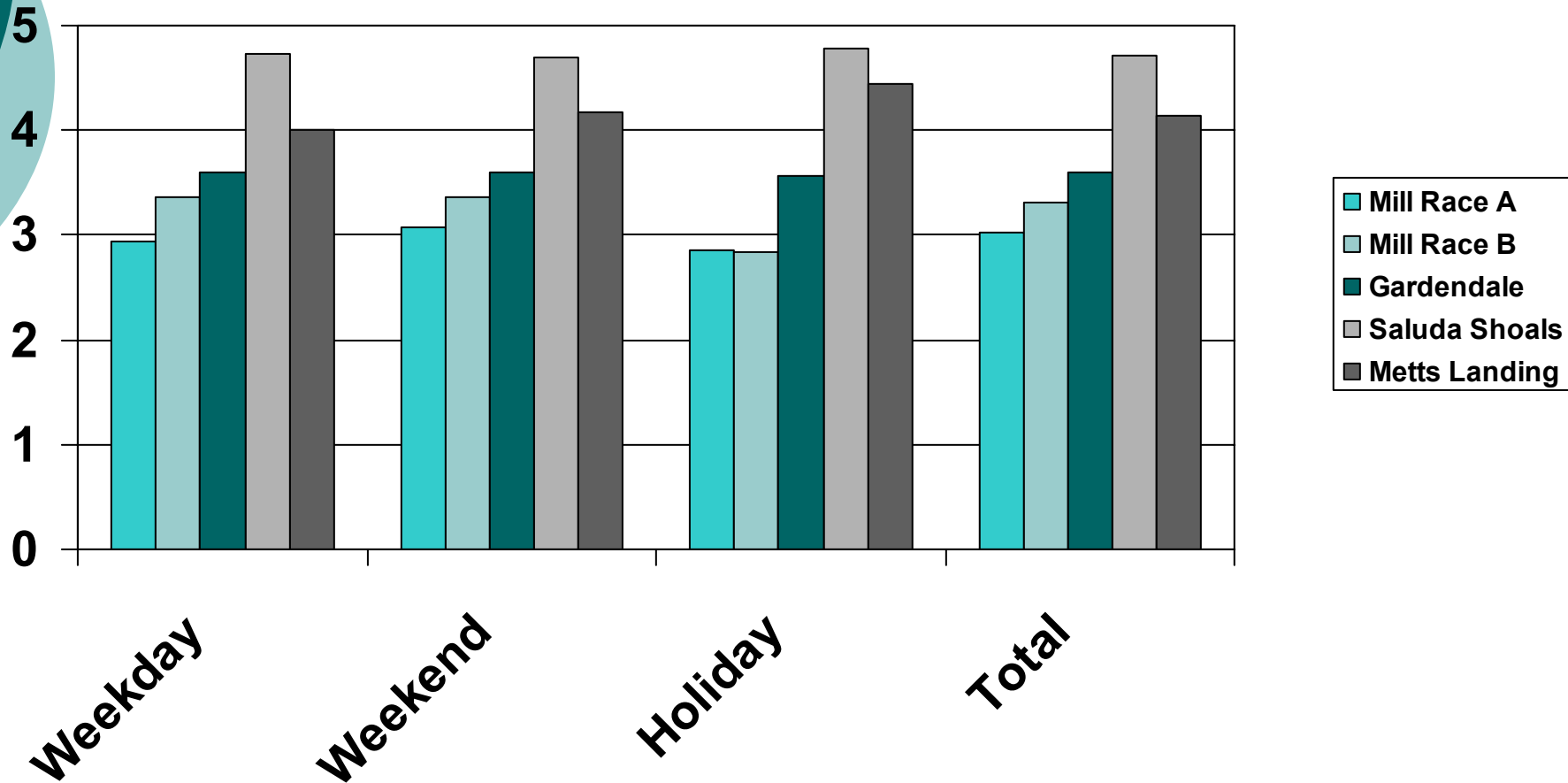
Crowdedness Ratings for Lower Saluda River Sites



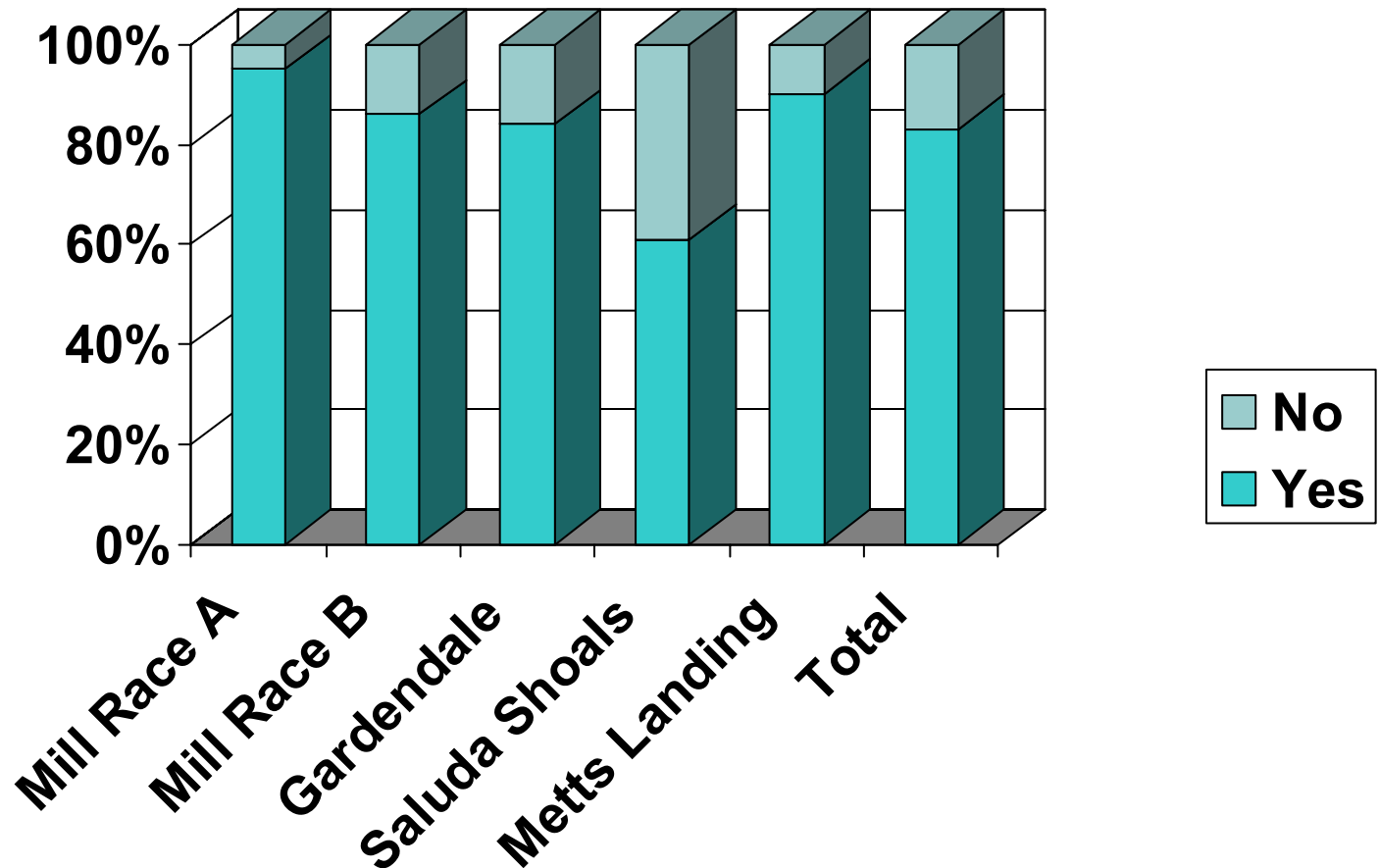
Condition Ratings for Lake Murray Sites

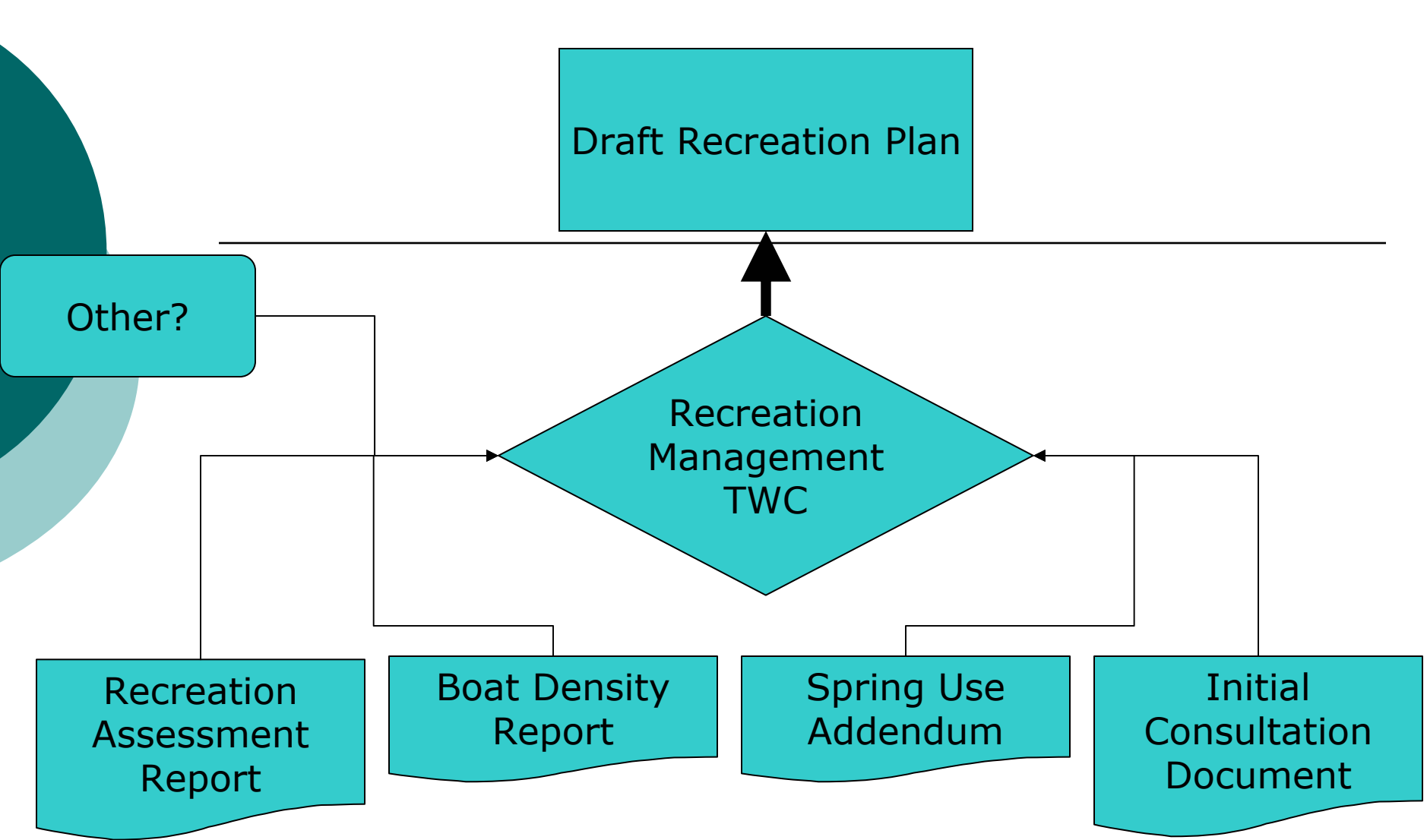


Condition Ratings for Lower Saluda River Sites

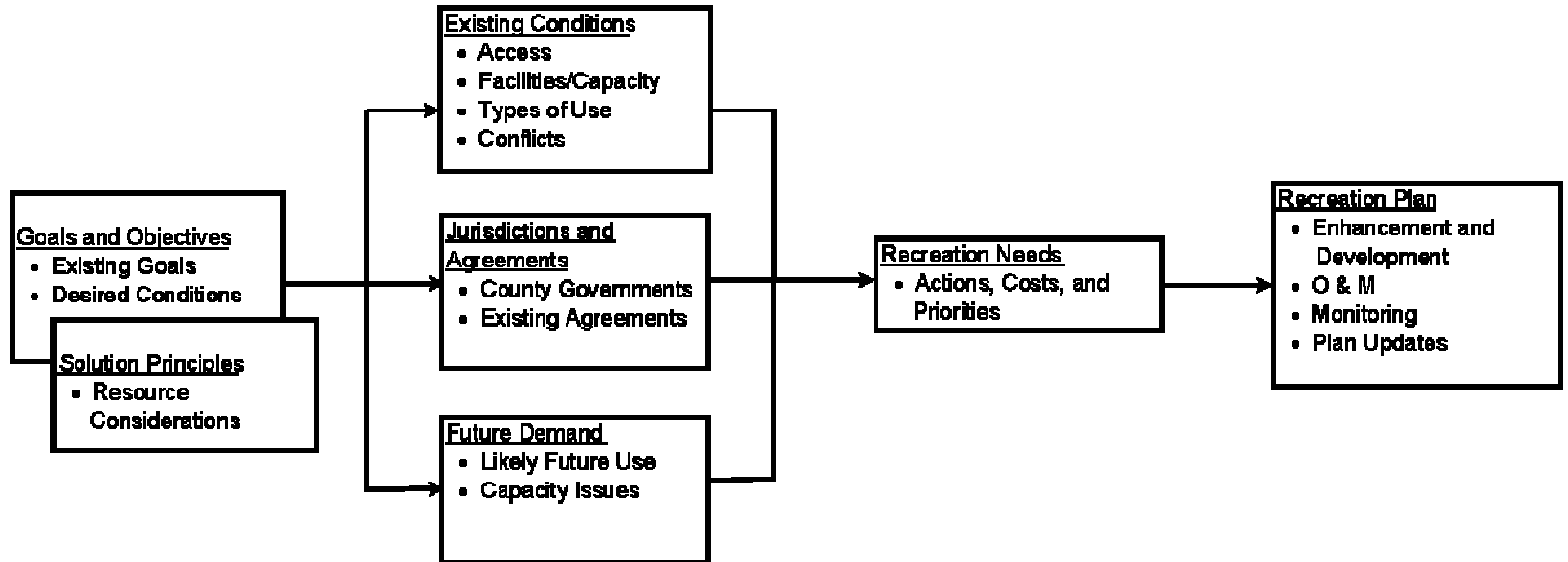


Knowledge of the Presence of Siren and Strobe Lights on the LSR





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

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**

Erosion/Sedimentation

**Public, Private,
Commercial
Marina policies and criteria**

Fringeland Sales

Dock Size/criteria

**Environmentally
Sensitive Area policies**

**Buffer Zone
Management**

Moorings

**Multi-Use, Common Area
policies and criteria**

Excavations

**Shoreline Stabilization
procedures/techniques**

**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

<i>Date</i>	<i>Discussion Topics / (Presenter)</i>
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

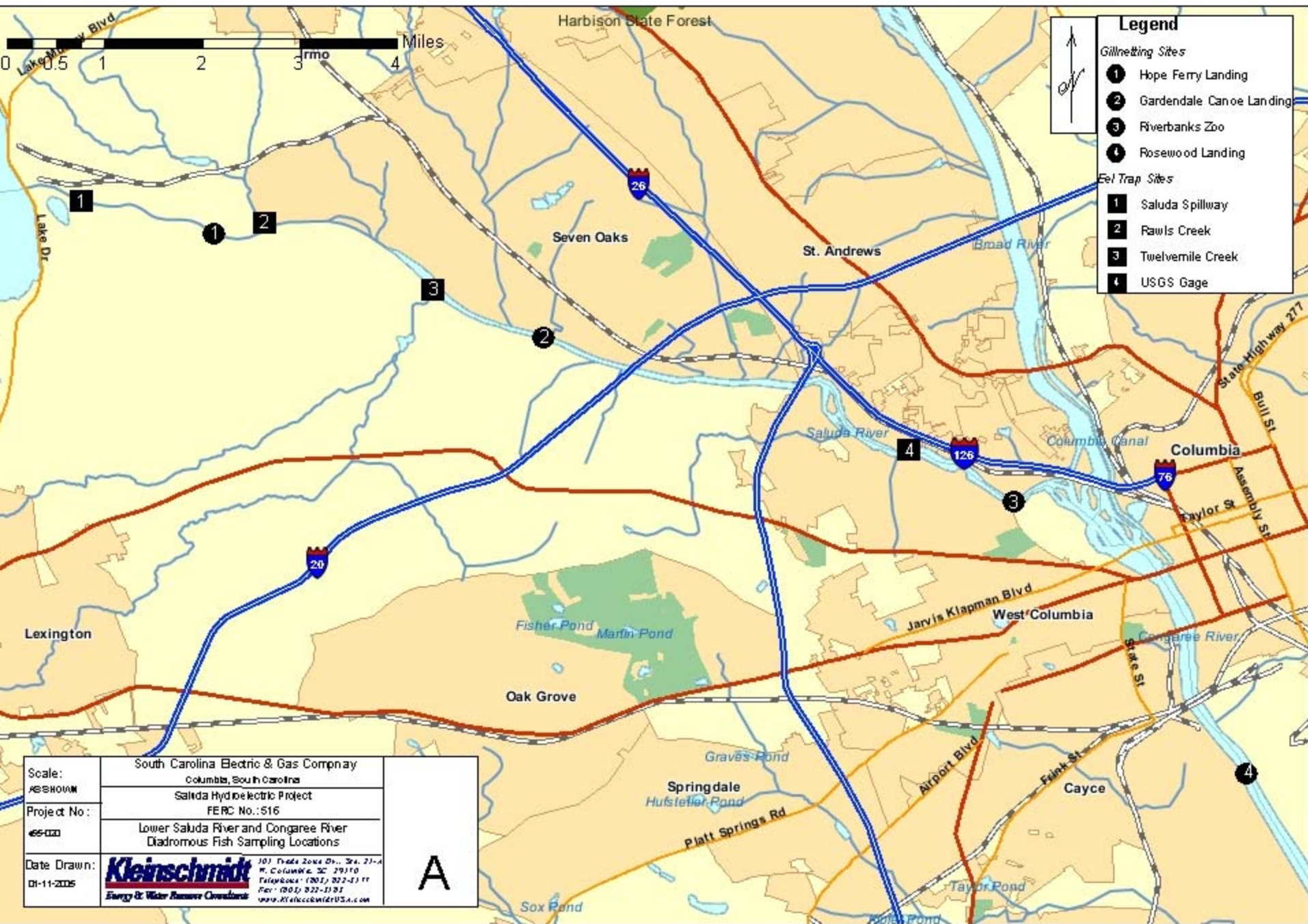
February 22, 2006

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
- Fish Trap Sites*
- ① Saluda Spillway
 - ② Fawls Creek
 - ③ Twelvemile Creek
 - ④ USGS Gage

Scale: AS SHOWN	South Carolina Electric & Gas Company Columbia, South Carolina	A
Project No.: 65-022	Saluda Hydroelectric Project FERC No.: 516	
Date Drawn: 01-11-2005	Lower Saluda River and Congaree River Diadromous Fish Sampling Locations	



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

July 26, 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

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

<i>Date</i>	<i>Discussion Topics / (Presenter)</i>
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

Dan Tufford, USC

Alan Stuart, Kleinschmidt

Tom Bowles, SCE&G

Jim Ruane, REMI

Amanda Hill, USFWS

Gerrit Jobsis, Am. Rivers

Ron Ahle, SCDNR

Reed Bull, Midlands Striper Club

Andy Miller, SCDHEC

Richard Kidder, LMA

Shane Boring, Kleinschmidt

Roy Parker, LMA



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

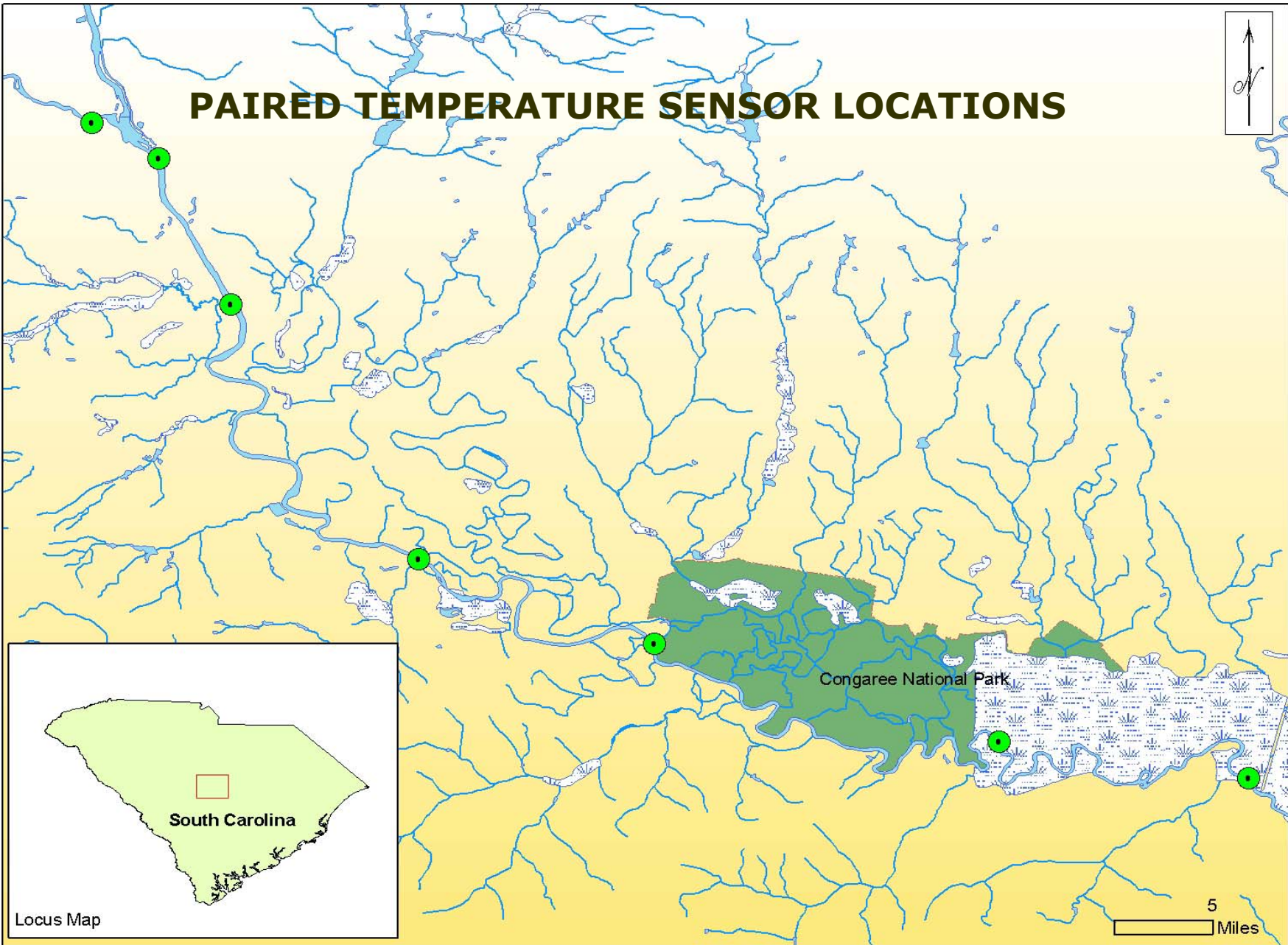
- Will be used to evaluate effects of project operations on summer habitat for striped bass, particularly operation of unit 5
- Developed by Jim Ruane (Reservoir Environmental Man., Inc.)
- Final report expected January 31, 2007



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



Locus Map

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

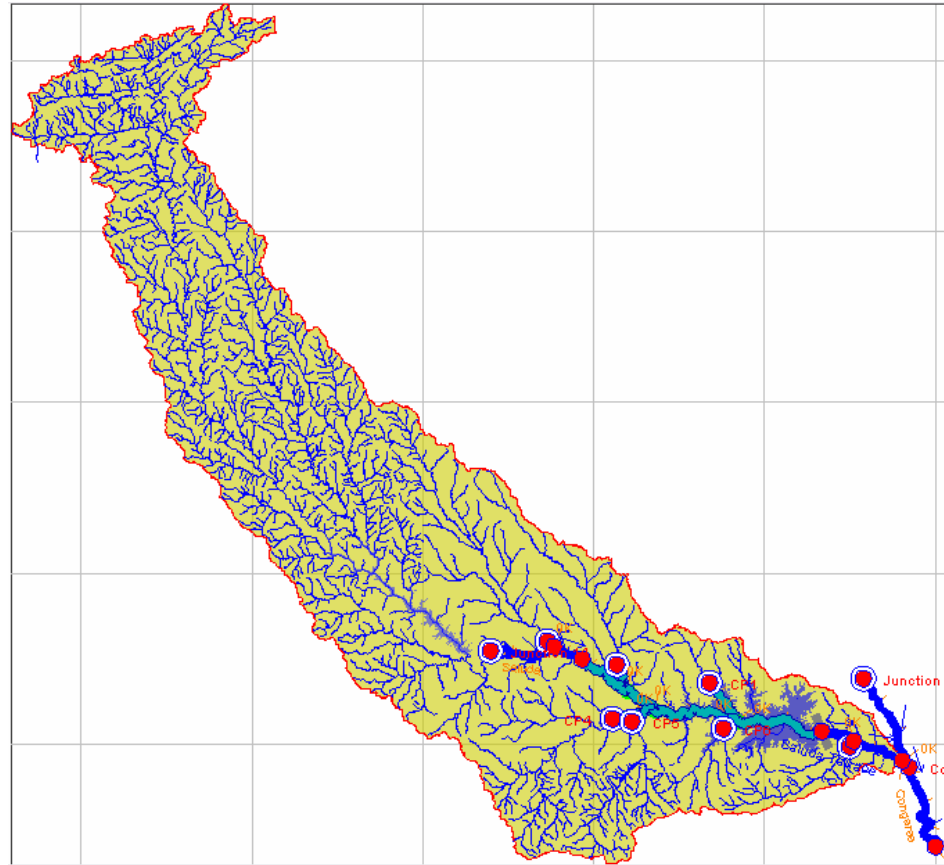
- Selected HEC-Res Sim
 - Flexibility
 - Standard for relicensing efforts
 - HEC-Ras for lower Saluda River



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 all 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
H Y D R O
RELICENSING



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

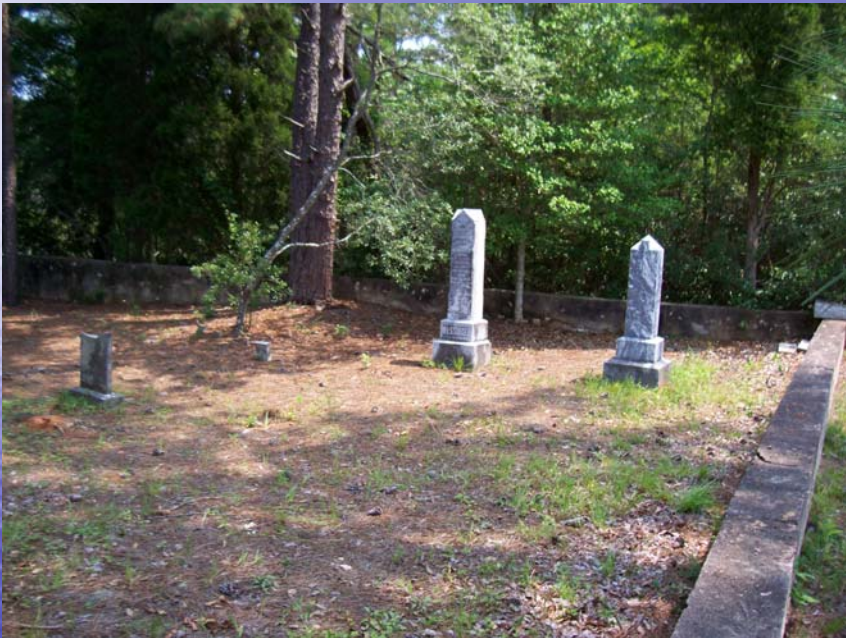


Arrowheads and Spear Points



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

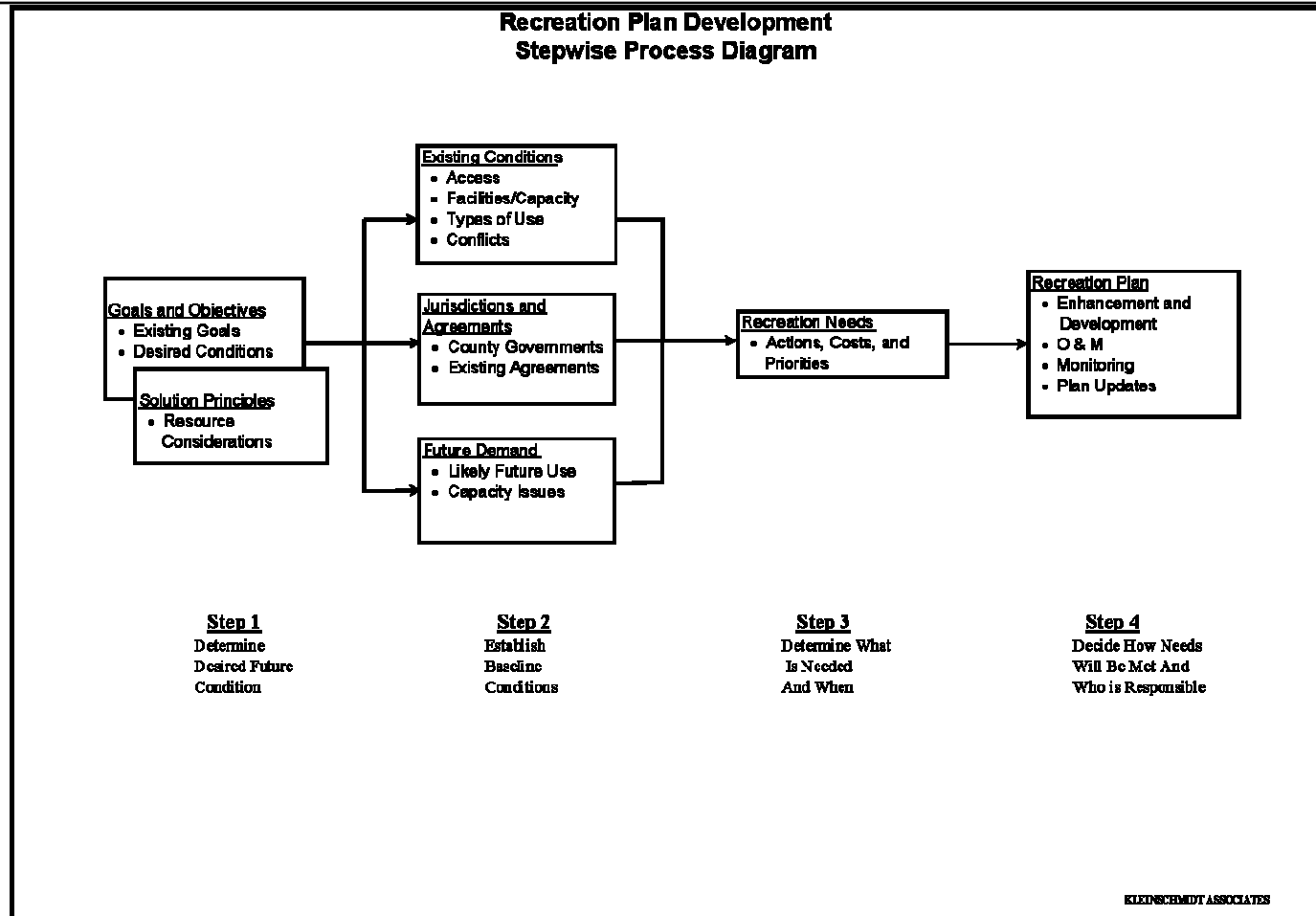
The mission of the Recreational RCG is to ensure adequate and environmentally-balanced public recreational access and opportunities related to the Saluda Hydroelectric Project for the term of the new license. The objective is to assess the recreational needs associated with the lower Saluda River and 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

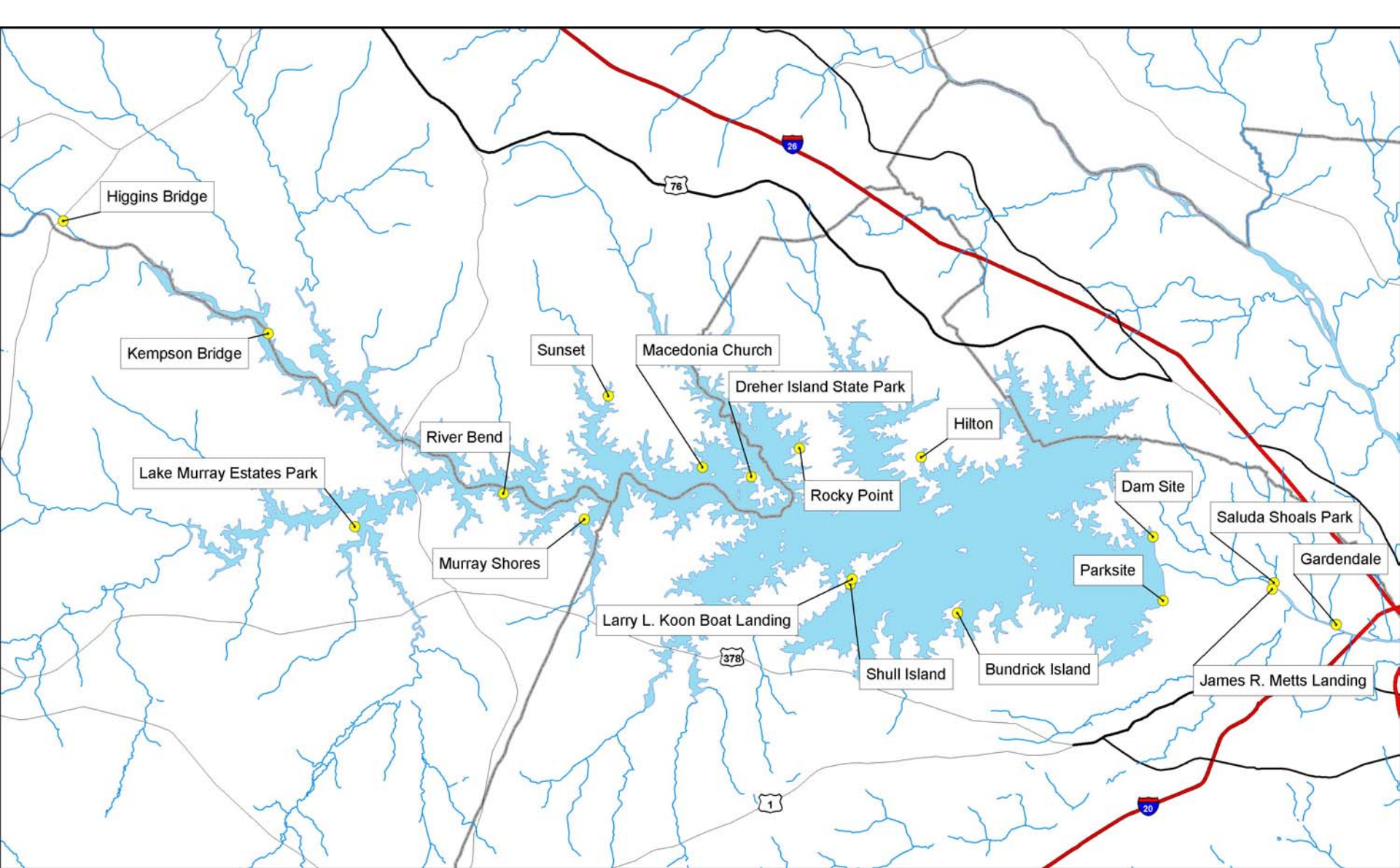
Determine an appropriate lake level for recreational activities and examine the effects of various lake levels on recreation.

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



Recreation Assessment Study

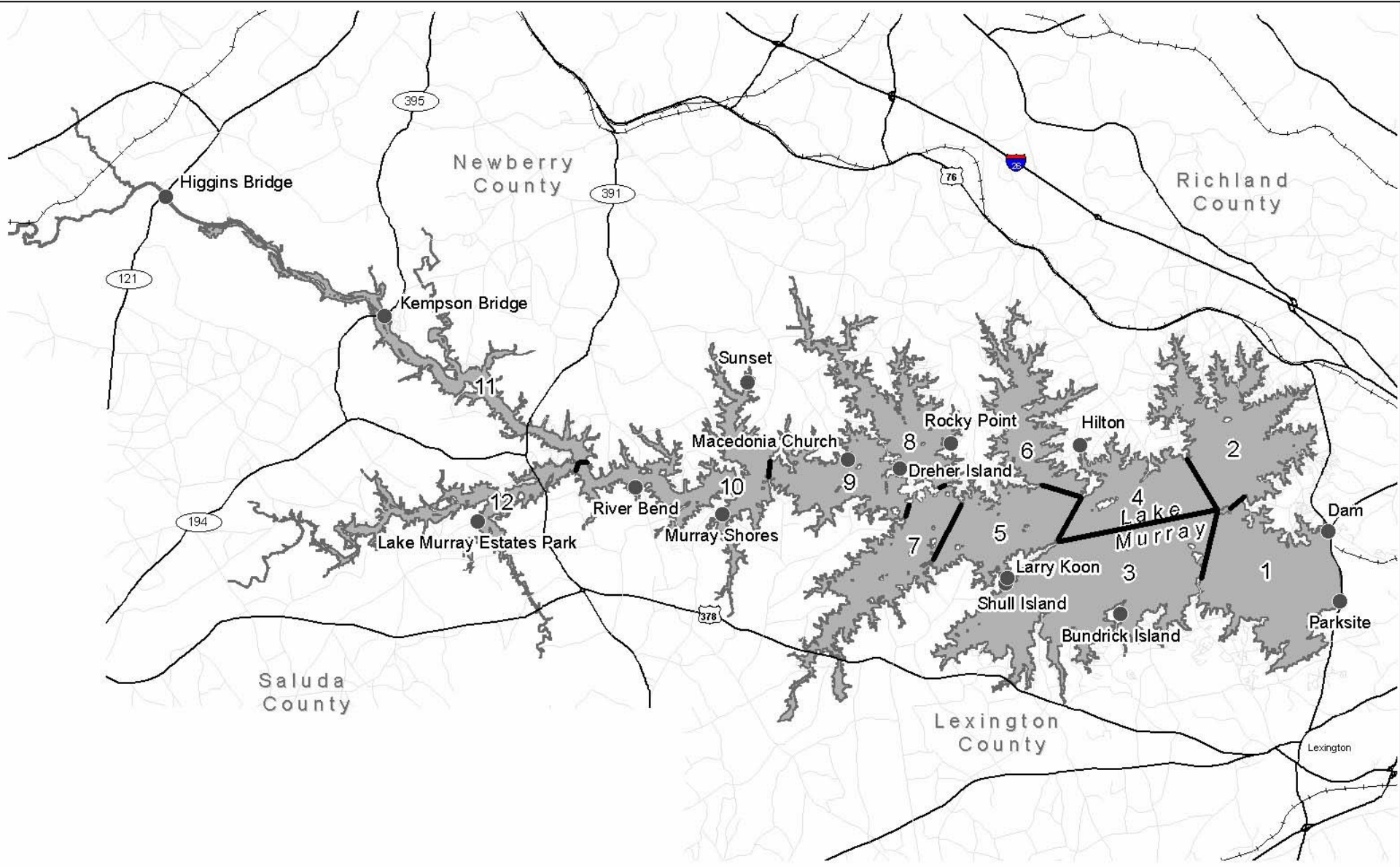
- Characterize existing recreational use of SCE&G's recreation sites on Lake Murray and the lower Saluda River.
- Identify future recreational needs relating to public recreation sites on Lake Murray and the lower Saluda River.





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.





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*

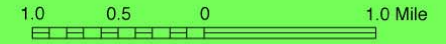
- Mike Waddell
- Bill Mathias
- David Price
- Patrick Moore
- Charlene Coleman
- Bill Argentieri
- Alan Stuart
- Randy Mahan
- Marty Phillips (Facilitator)



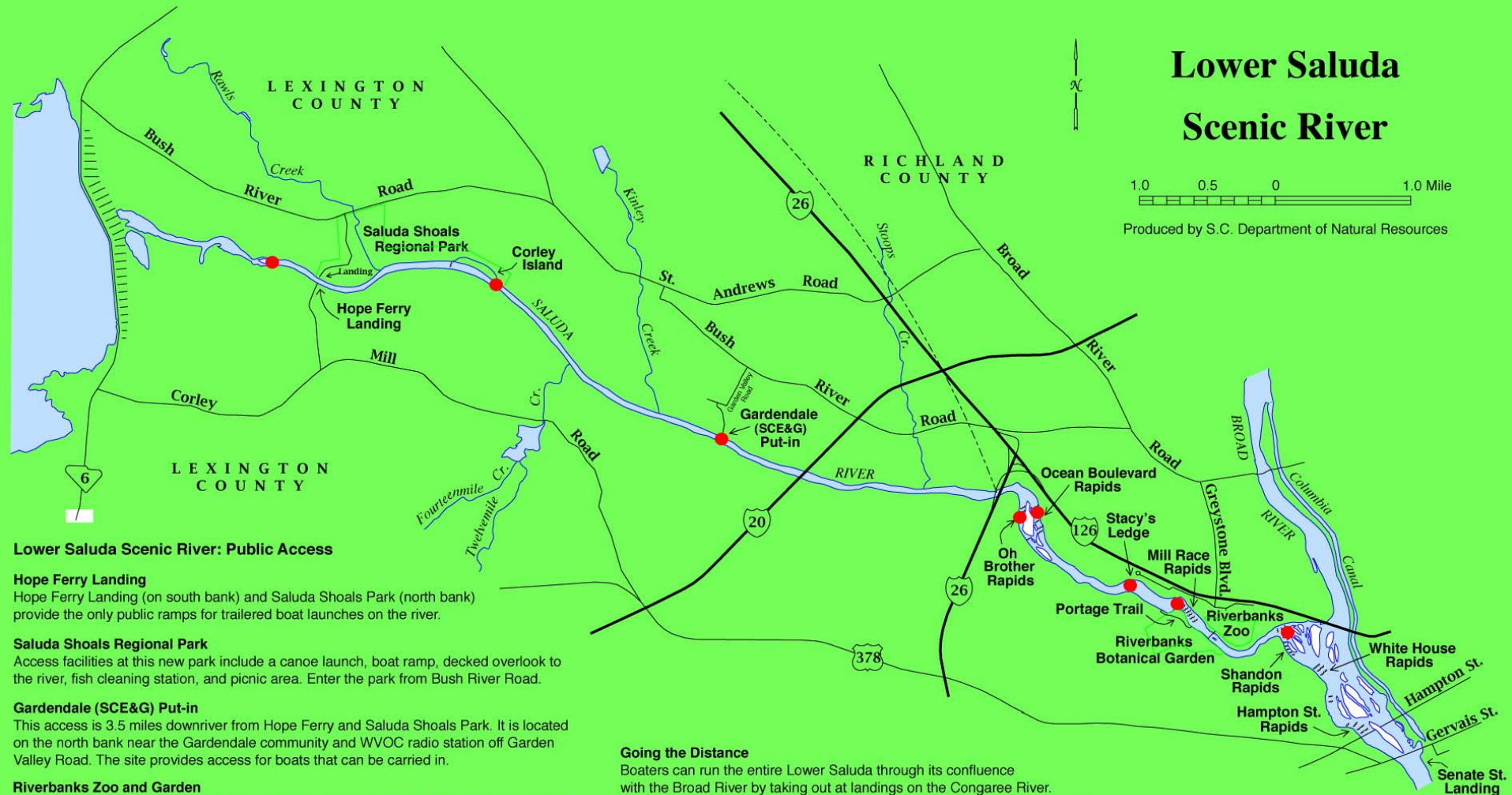
Downstream Flows Study

- 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



Produced by S.C. Department of Natural Resources



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.

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.

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
 - 4.8.2.1 Water craft
 - 4.8.2.1.1 Sailboats
 - 4.8.2.1.2 Jet skis

- 5.0 Shoreline Management Guidelines for Project Lands
 - 5.1 Residential
 - 5.2 Commercial
 - 5.3 Public Use Area
 - 5.4 Multi Purpose Areas

- 6.0 Determination of Shoreline Management Classification

- 7.0 Classification Definitions
 - 7.1 Forest and Game Management
 - 7.2 Future Development
 - 7.3 Recreation

- 8.0 New Shoreline Facilities or Activities Evaluation Process
 - 8.1 Buffer Zone Management
 - 8.1.1 Limited Brushing Below 360 El.
 - 8.1.2 Revegetation of Disturbed Areas
 - 8.1.3 Activities impacting buffer zones
 - 8.2 ESA Identification and Management
 - 8.2.1 Woody Debris & Stump Management
 - 8.3 Erosion and Sedimentation
 - 8.3.1 Excavation Activities
 - 8.4 Shoreline Permitting Program
 - 8.4.1 Docks
 - 8.4.2 Marinas

- 9.0 PROHIBITED ACTIVITIES
 - 9.1 Moorings
 - 9.2 Encroachments

10.0 Water Management Activities

10.1 Water withdrawals

10.2 Discharges

10.3 Aquatic Plant Management Activities

11.0 BEST MANAGEMENT PRACTICES AND PUBLIC

11.1 EDUCATION

11.1.1 Tree Give Away Program

12.0 Safety Programs

12.1 Lake Murray

12.2 Lower Saluda River

13.0 ENFORCEMENT OF THE SHORELINE MANAGEMENT PLAN

14.0 SCE&G PERMITTING FEE POLICIES

15.0 MONITORING AND AMENDMENT PROCESS

15.1 Overall Land Use Monitoring

15.2 Amendment Process

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.

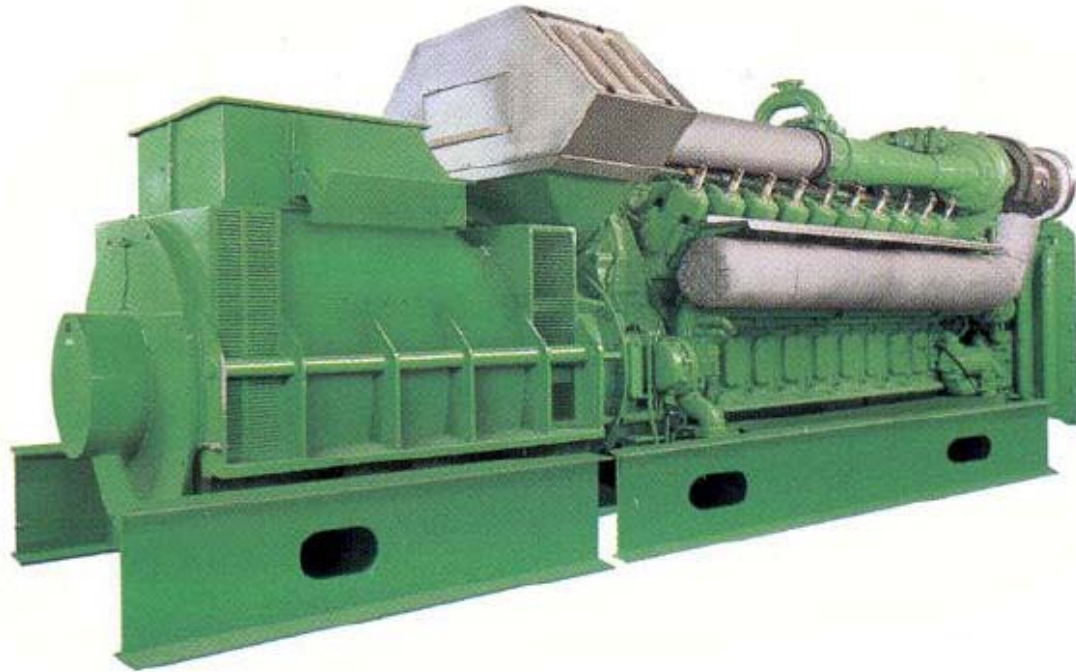
DIESEL GENERATORS

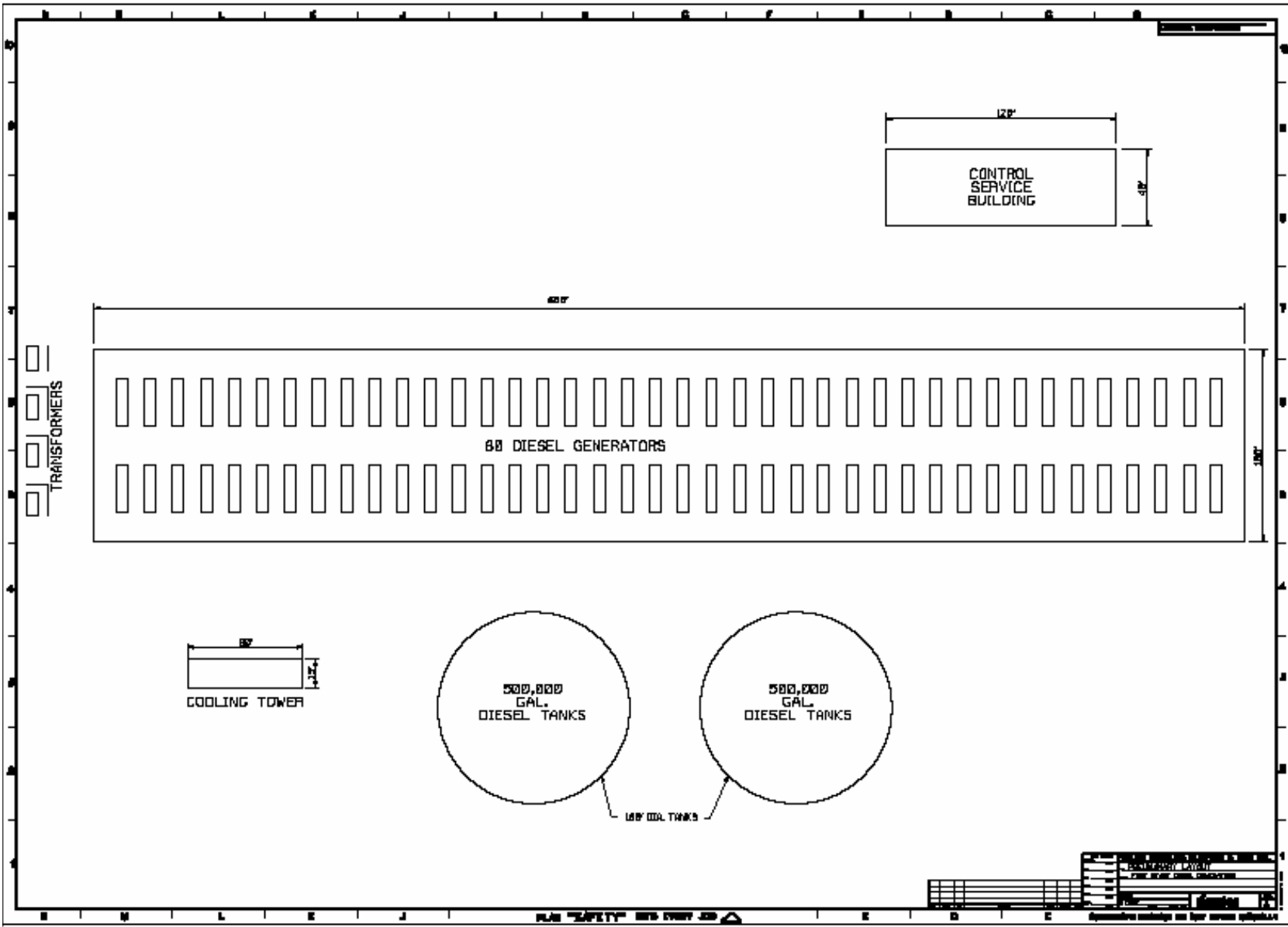
- SIZE 2 – 2 1/2 MW
- GENSET
- 83-100 UNITS
- START TIME 10 MIN.
- EFFICIENCY 37%

DIESEL GENERATORS

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

DIESEL GENSET





PLAN "SAFETY" SEE EVERY JOB

GAS TURBINES(AERO DERIVED)

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 AVAILABILITY

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABILITY
- INTERCONNECTIONS

PLANT SITING EVALUATION

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

PLANT SITING EVALUATION

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

PLANT SITING EVALUATION

- PERMITTING
- WATER AVAILABILITY
- 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
- +25% / -10% ACCURACY
- 2006 DOLLARS FOR CAPITAL \$
- 2010 DOLLARS FOR LIFE CYCLE \$
- ESCALATION EXCLUDED
- 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 CAPABILITY

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

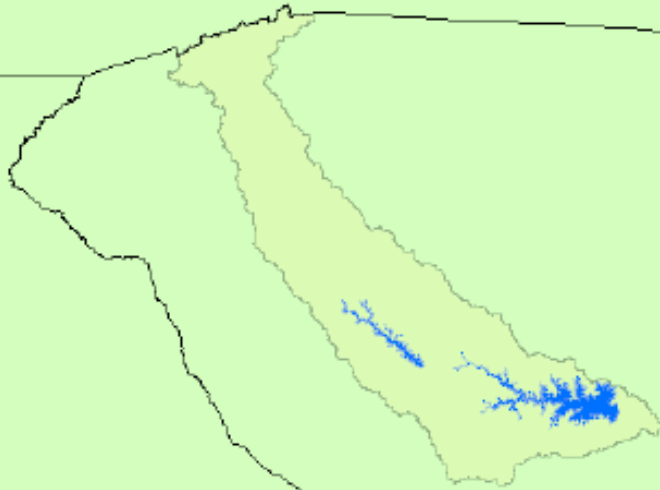
Schedule & Topics

- 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

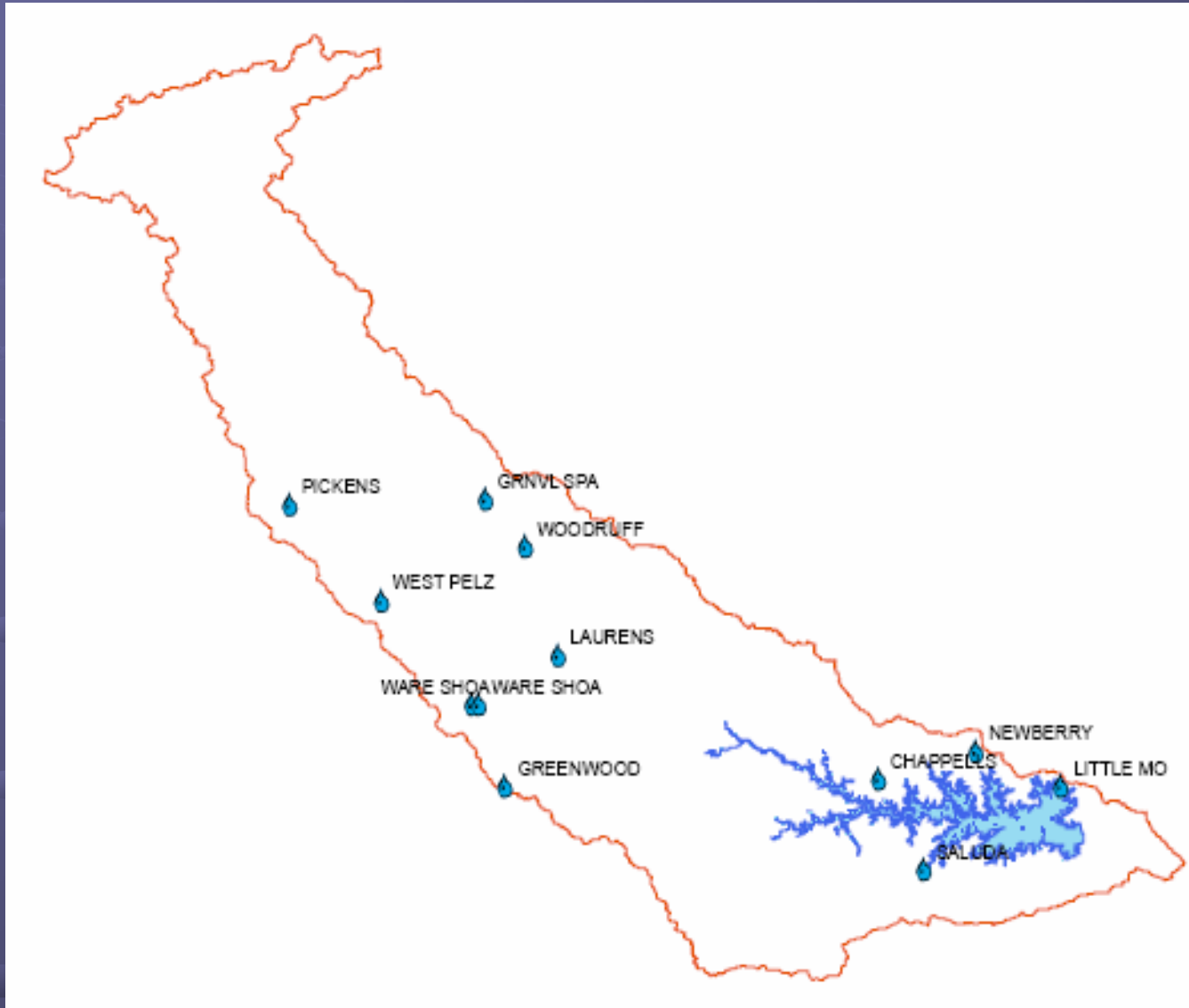
● What Happens to the Rain?

- 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

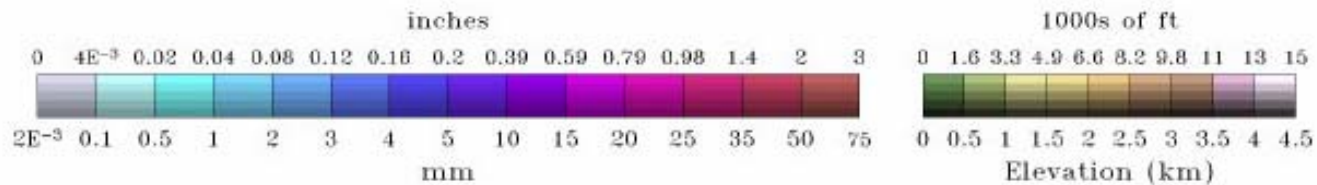
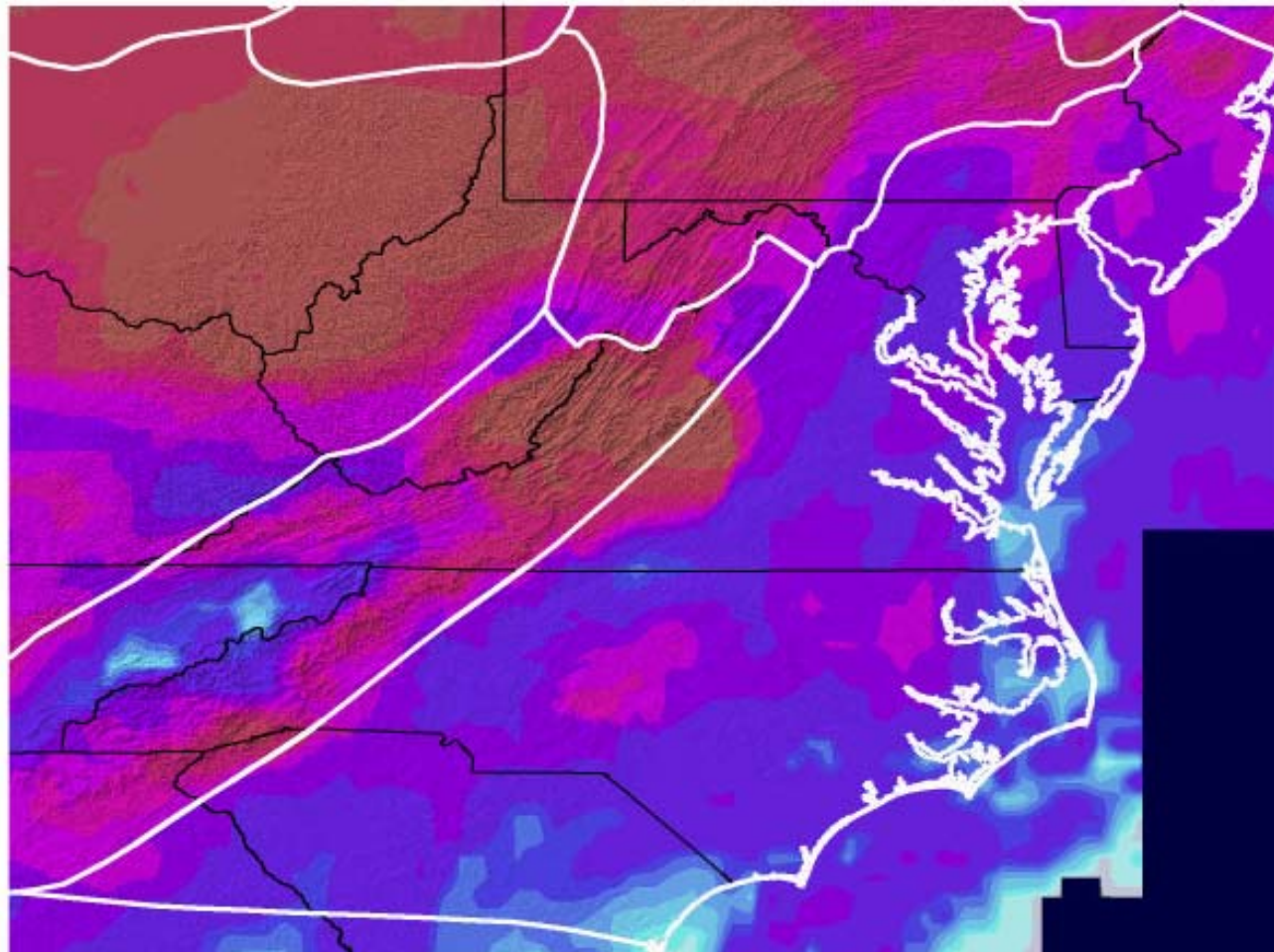
- How much runoff is there?
 - Depends on how much is 'lost'
 - Depends on the Drainage Area
- How does it pass downstream?
 - 'Routes' through streams and reservoirs
 - Streams attenuate flows
 - Reservoirs attenuate flows

Lake Murray

- Effects of Precipitation
 - (Recent Example of Routing)

Scaled Non-Snow Precipitation

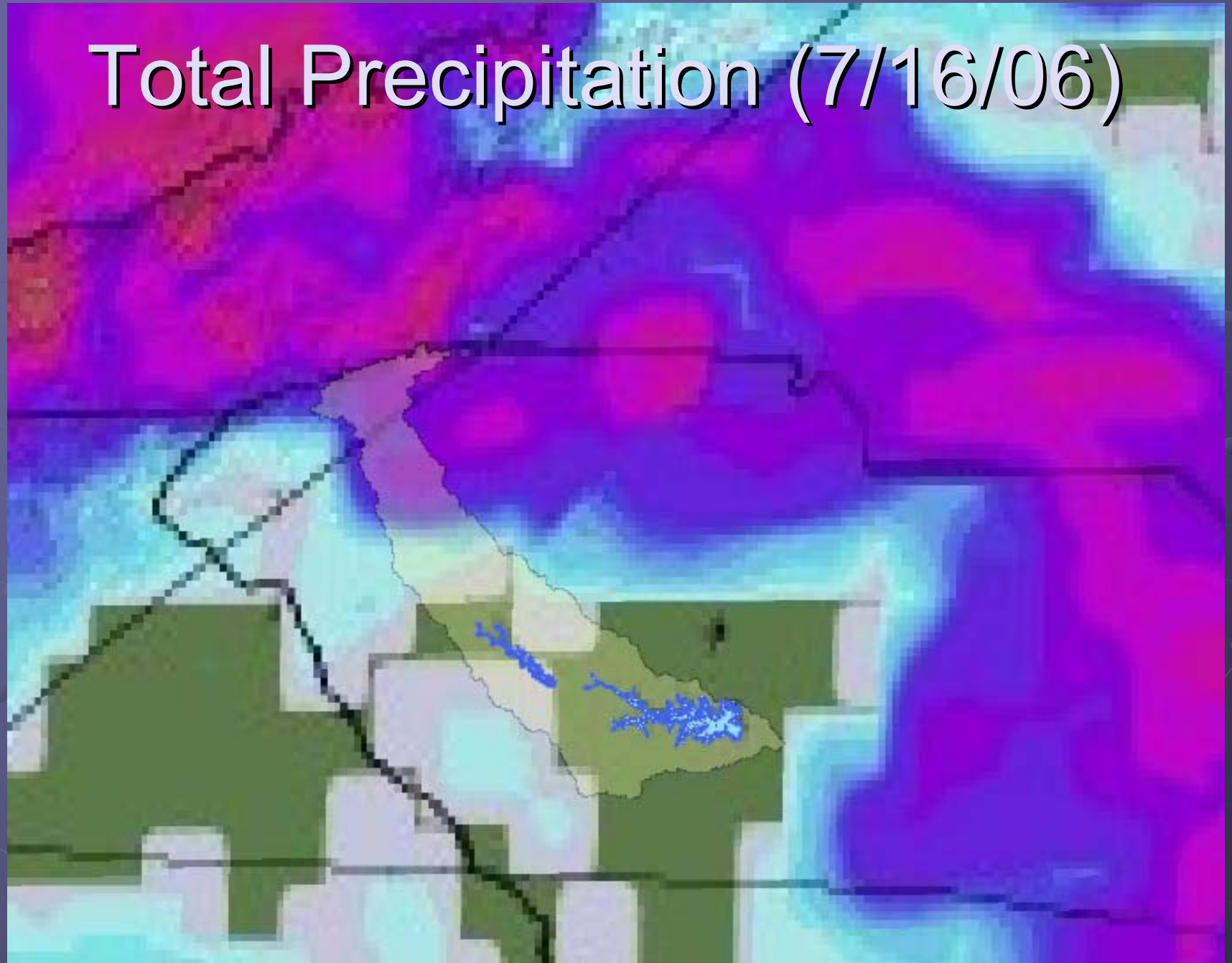
24-Hour Total Ending 2006-10-18 06



Reservoir Level Comparison



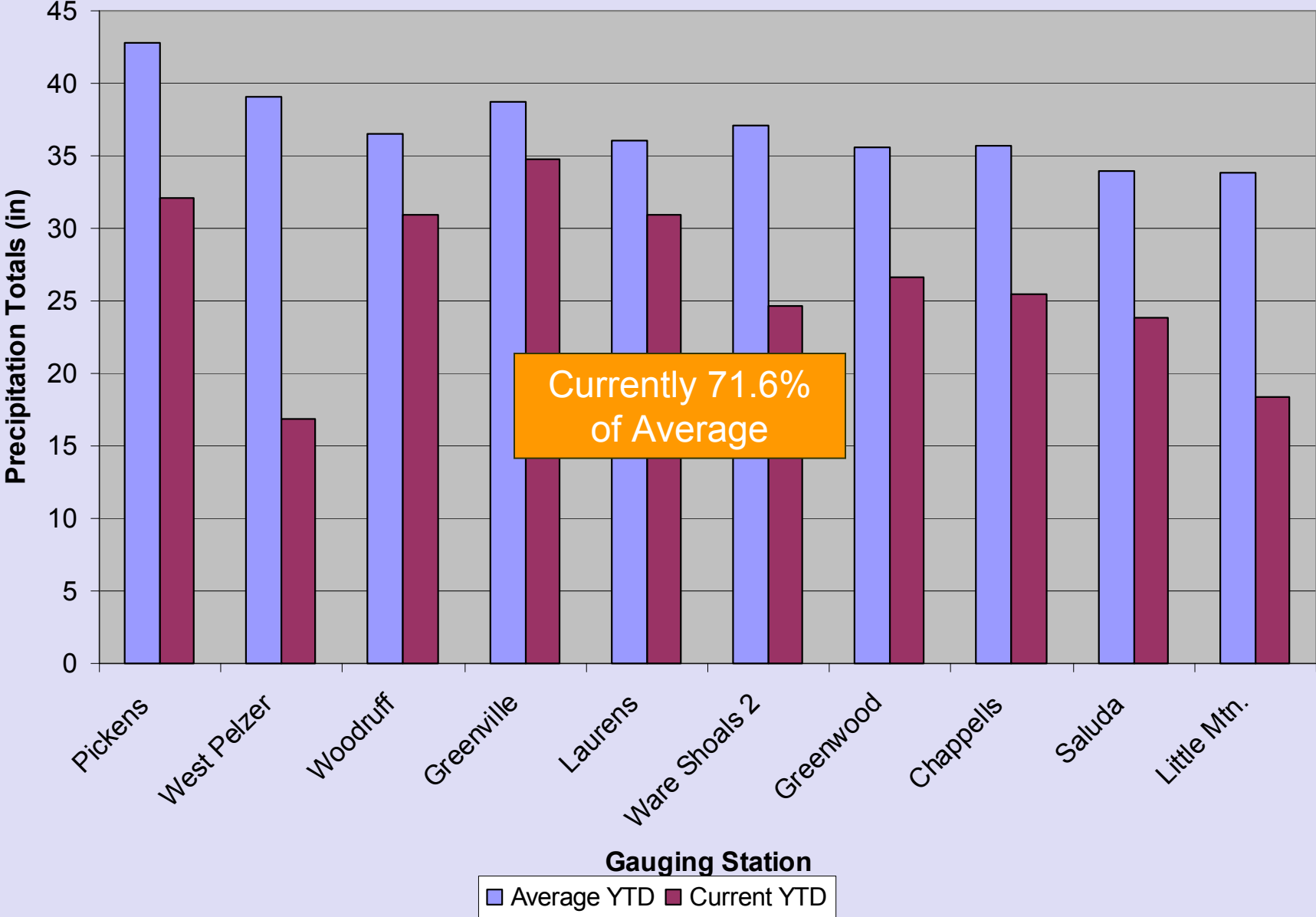
Total Precipitation (7/16/06)



Lake Murray

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

Comparison of 2006 YTD Rainfall Totals



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



Afternoon Schedule

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



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

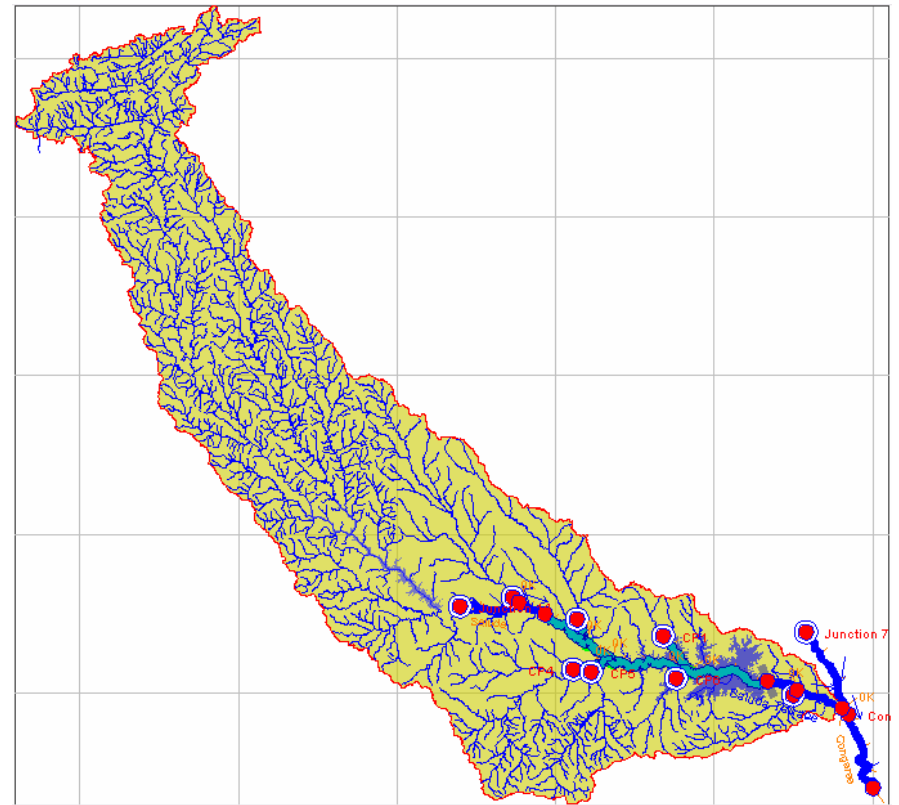


Model Development

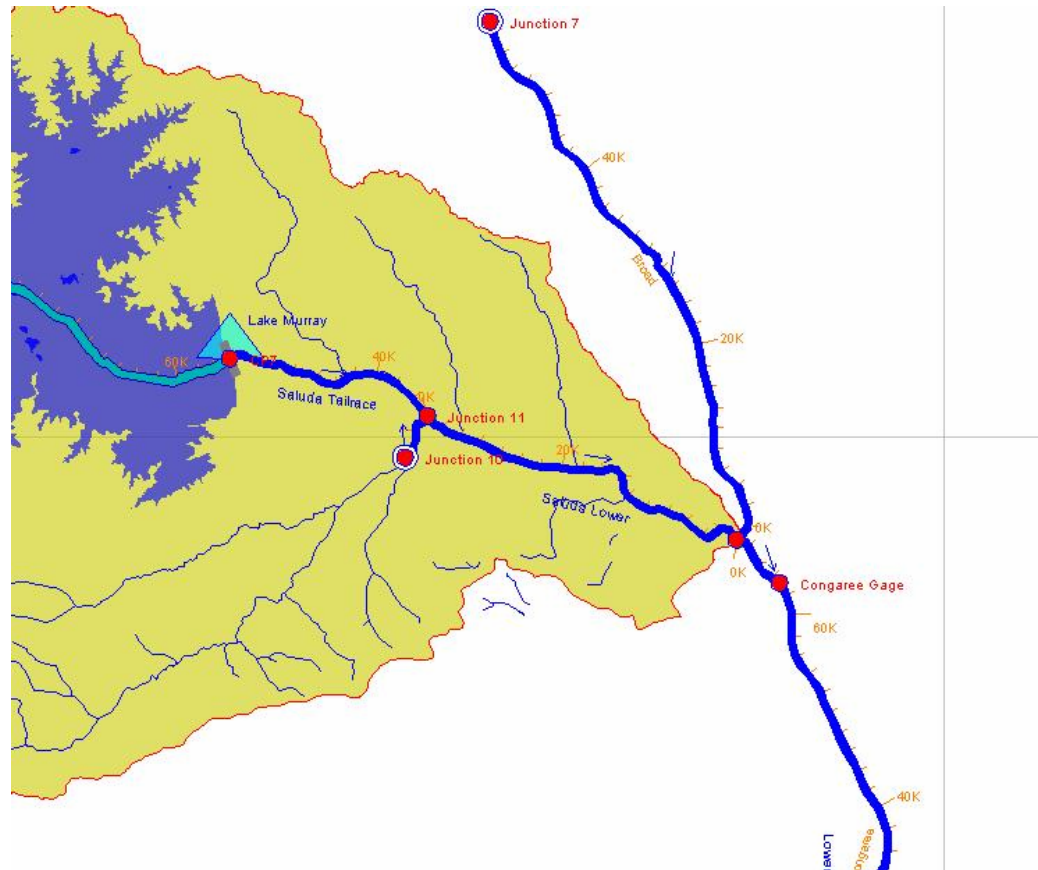
- Model Area
 - Includes *Virtual Inflow* from entire watershed
 - Inputs located directly upstream and downstream of Lake Murray
- Input data
 - Reservoir stage/storage data
 - Historic dam releases (Outflow Hydrograph)
 - Historic water levels (Stage data)

Model Development (cont)

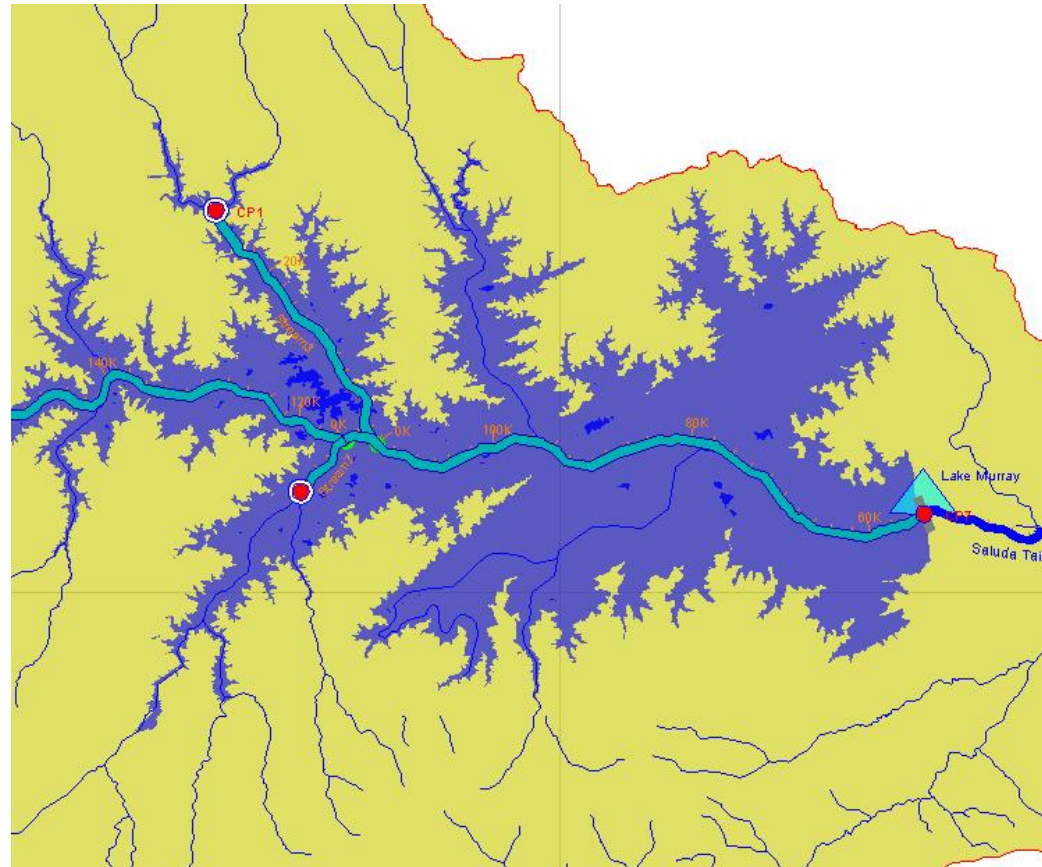
- Components
 - Upstream Inflows
 - Lake Murray
 - Downstream Gages
 - Broad & Congaree River Gages



Data Layout - Downstream



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



USGS Gage Locations





Model Process

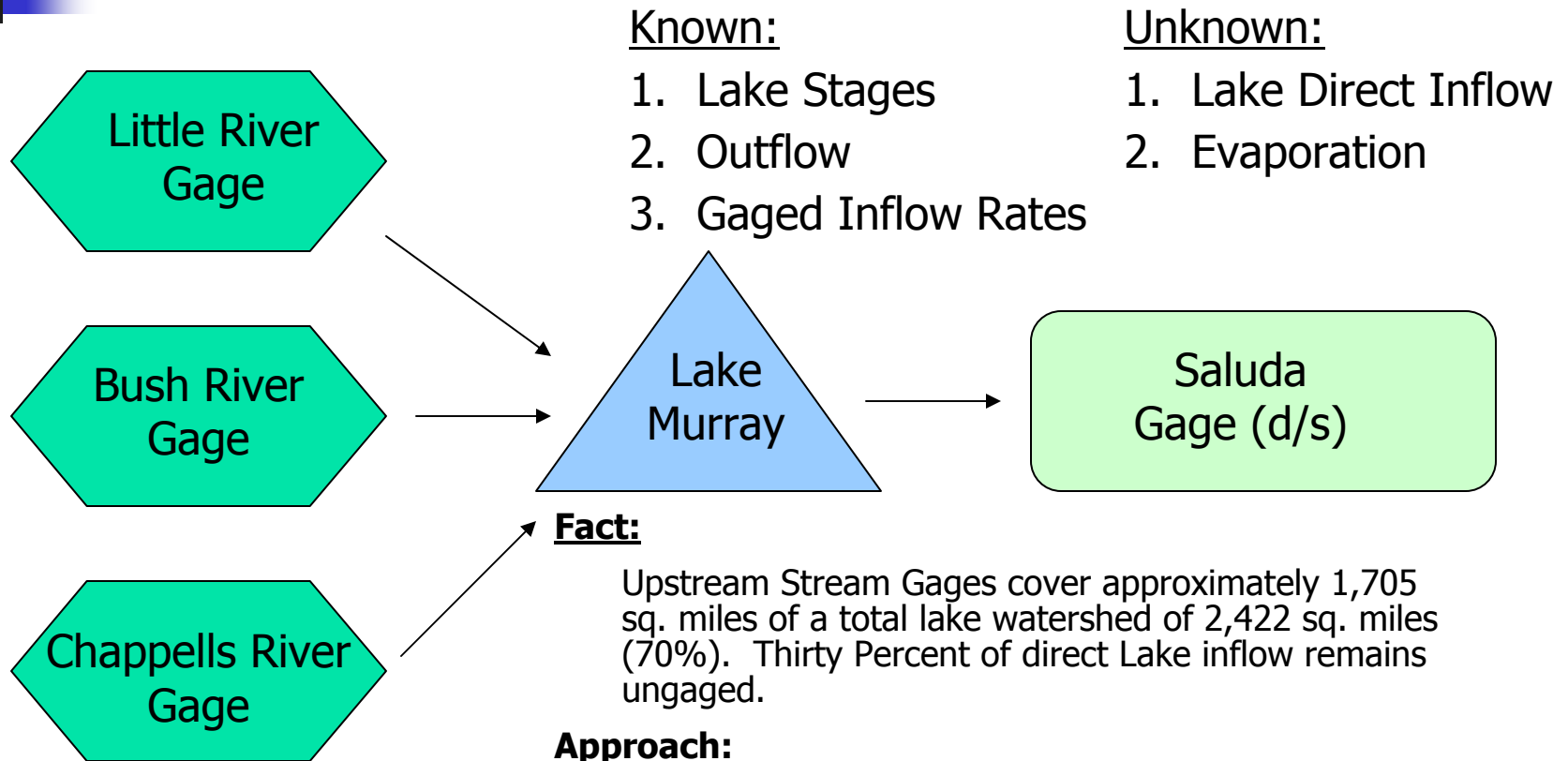
- Develop model of watershed system
- Calibrate to historical conditions
 - Historical model used to derive system inflows
- Using derived inflows, run simulations using proposed constraints to assess impacts on the Project



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

Method 1 - Gage Rating



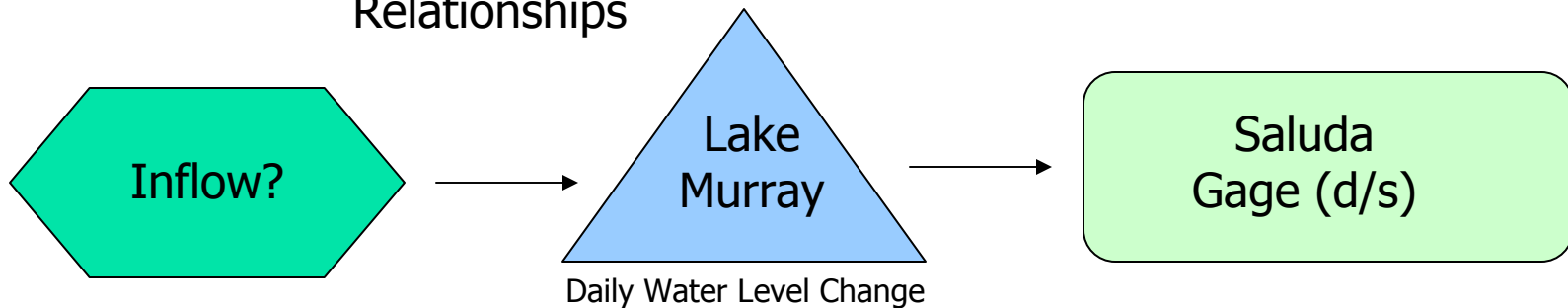
Method 2 - Mass Balance

Known:

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

Unknown:

1. Inflow



Fact:

Inflow = Change in Storage (Water Level) + Outflow

Approach:

Back calculate inflow using smoothed lake level data and gaged outflows

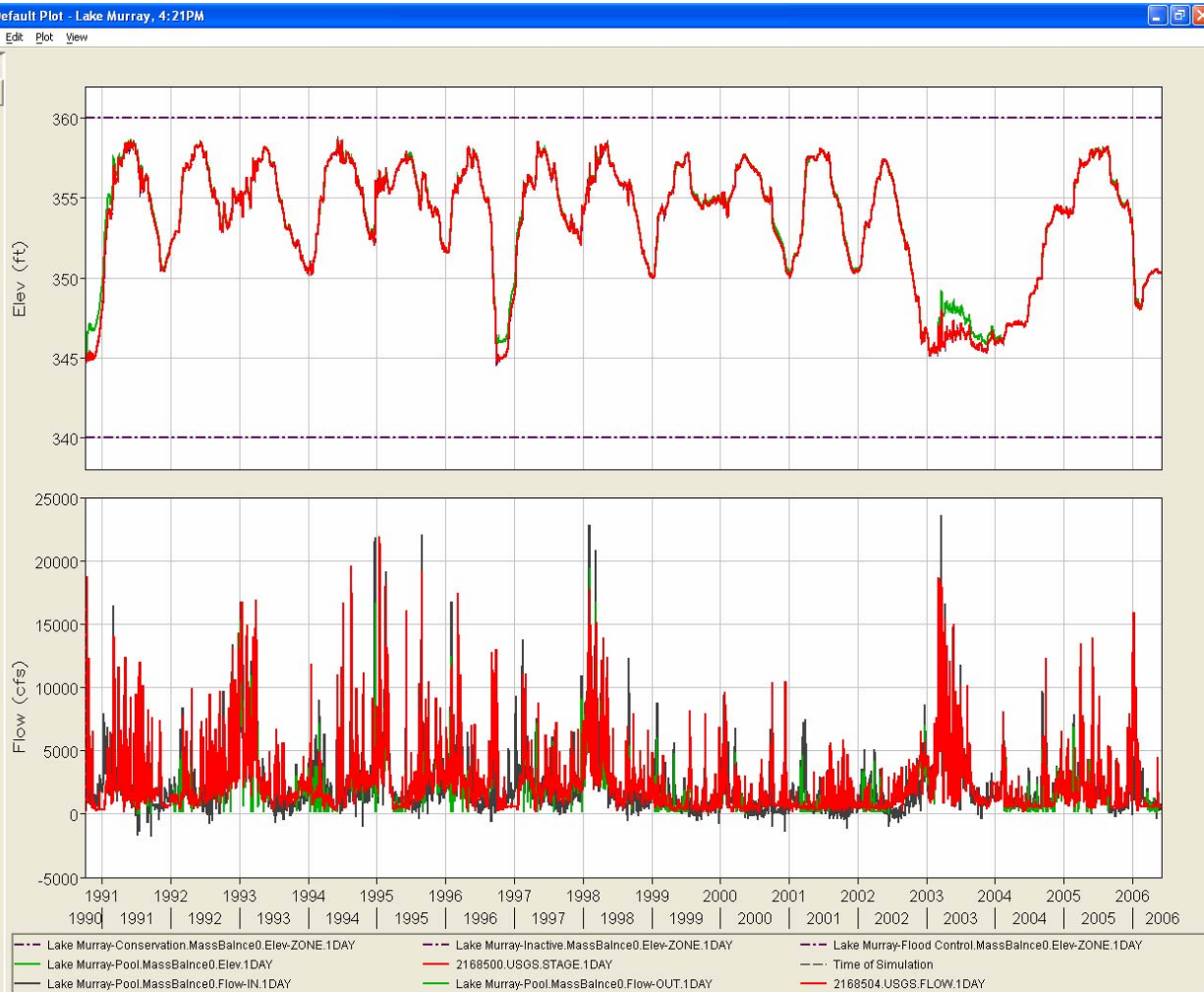


Calibration Procedure

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

Calibration Results

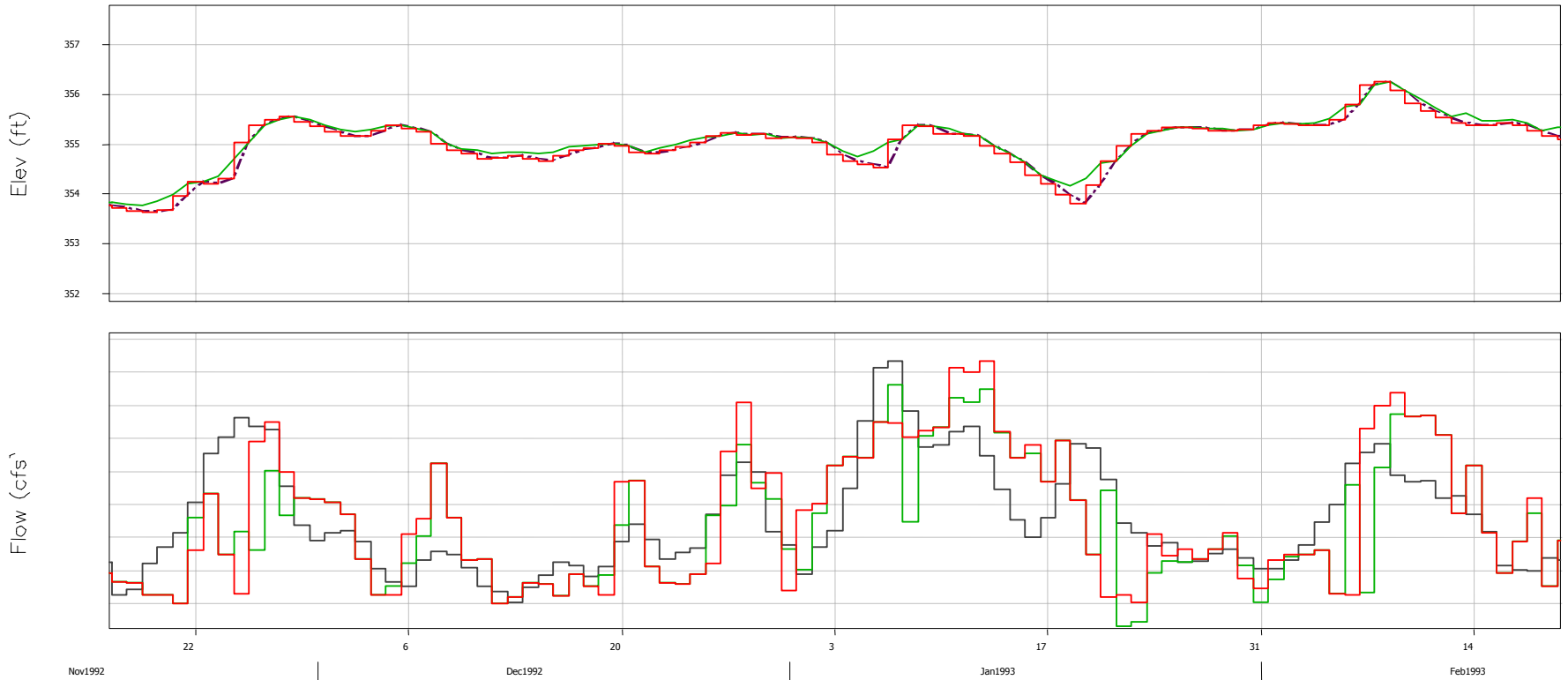
Stage



Discharge

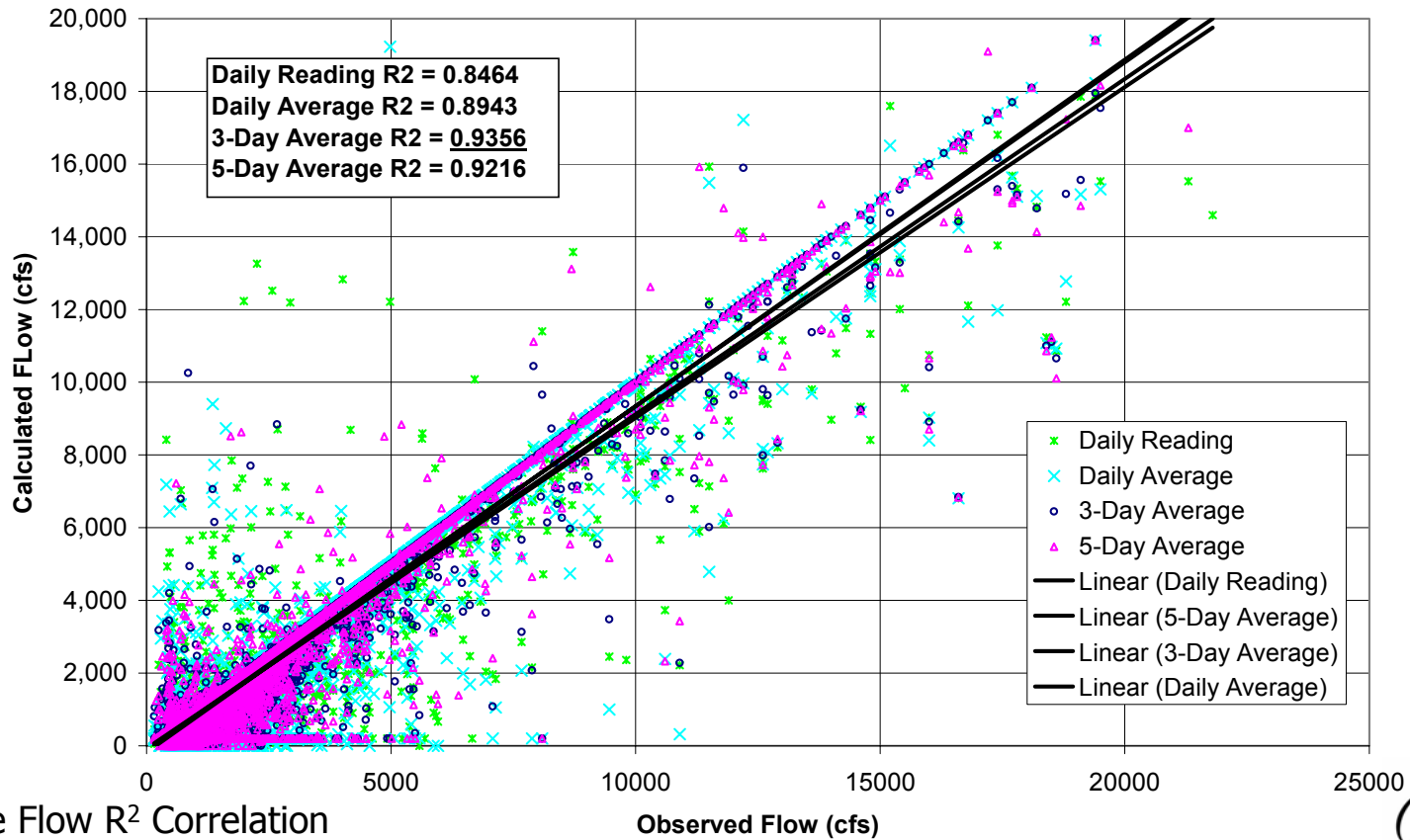
Calibration Results (cont)

Default Plot - Lake Murray, 6:16PM



Calibration Results (cont)

Comparison of Calculated to Recorded Saluda Dam Discharge Rates
(Discharge Calculated to Match Observed Stage)





Calibration Discussion

- Lake level measurements
 - 0.1 feet of variation \sim 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)



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**

Break

- 20 minutes
- Calibration Questions?





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



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



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

RES Reservoir Editor

Reservoir Edit Operations Zone Rule

Reservoir: Lake Murray Description: 1 of 1

Physical Operations Observed Data

Operation Set: Extreme Whitewater Description: Sample Extreme Whitewater Releases

Controlled Release Location: Lake Murray-Controlled Outlet

Rule Name: Seasonal Releases Description:

Function of: Date Define...

Limit Type: Minimum Interp.: Step

Date	Release (cfs)
01Jan	0.0
01May	0.0
01Jun	30000.0
01Aug	30000.0
01Sep	0.0

Release (cfs)

Jan Mar May Jul Sep Nov

Hour of Day Multiplier Edit...

Day of Week Multiplier Edit...

Rising/Falling Condition Edit...

Seasonal Variation Edit...

OK Apply Cancel

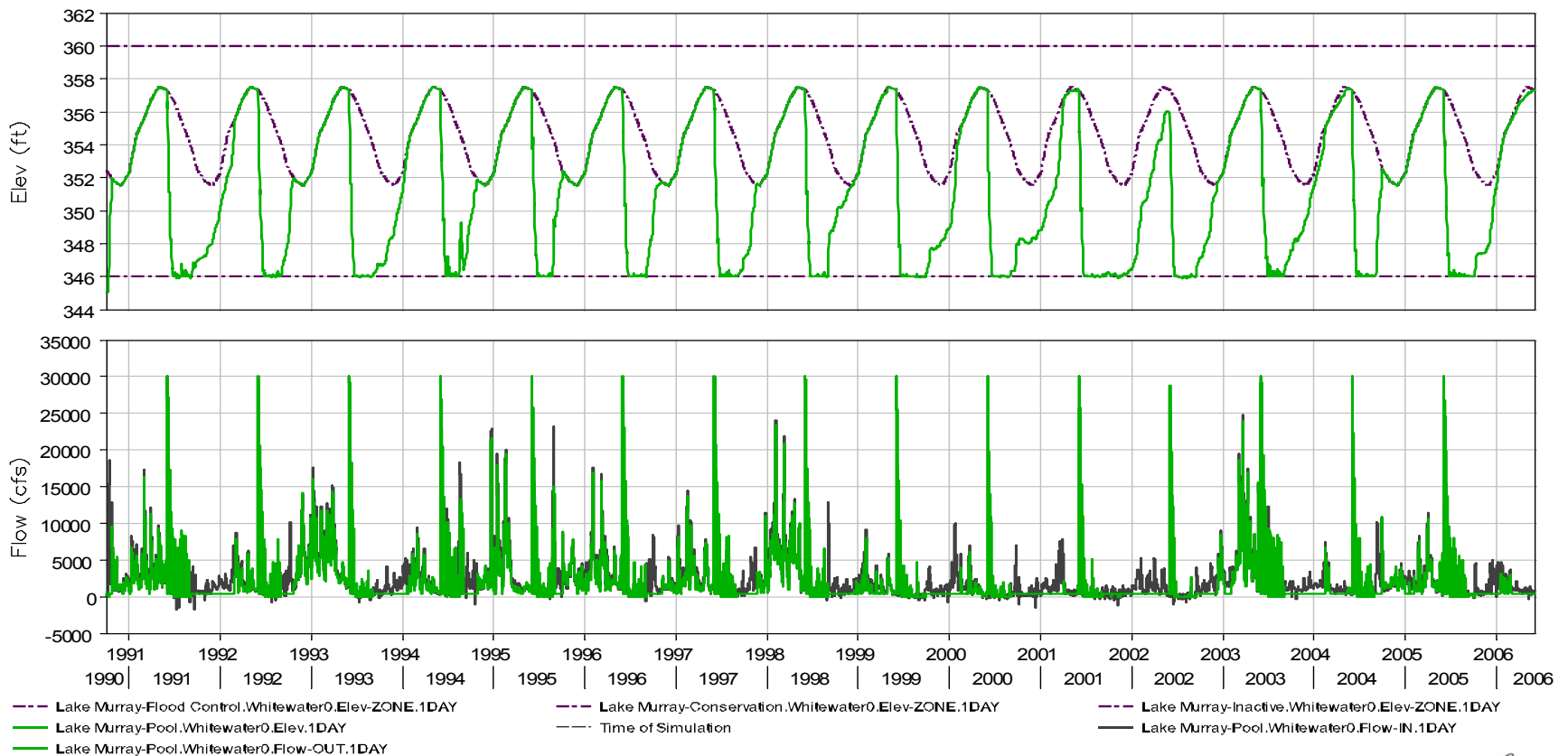
Day of Week Multiplier

Day	Multiplier
Sun	1.00
Mon	0.00
Tues	0.00
Wed	1.00
Thurs	1.00
Fri	1.00
Sat	1.00

OK Cancel

Extreme Example Output

Default Plot - Lake Murray, 11:00PM



Extreme Example Tables

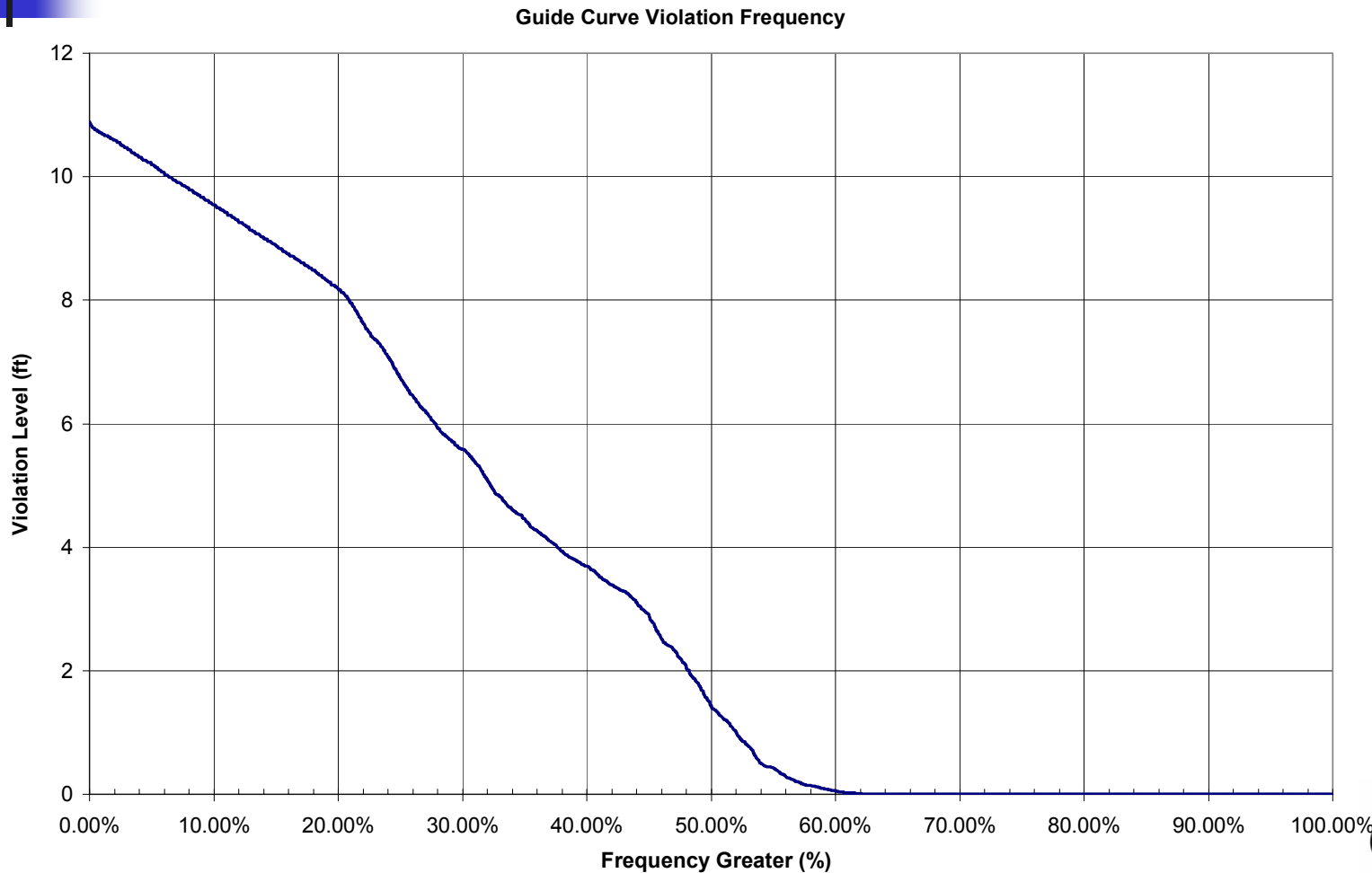
File Edit View

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

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

Example Guide Curve Violation Frequency & Magnitude





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?





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

<i>Date</i>	<i>Discussion Topics</i>
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

<i>Date</i>	<i>Discussion Topics / (Presenter)</i>
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

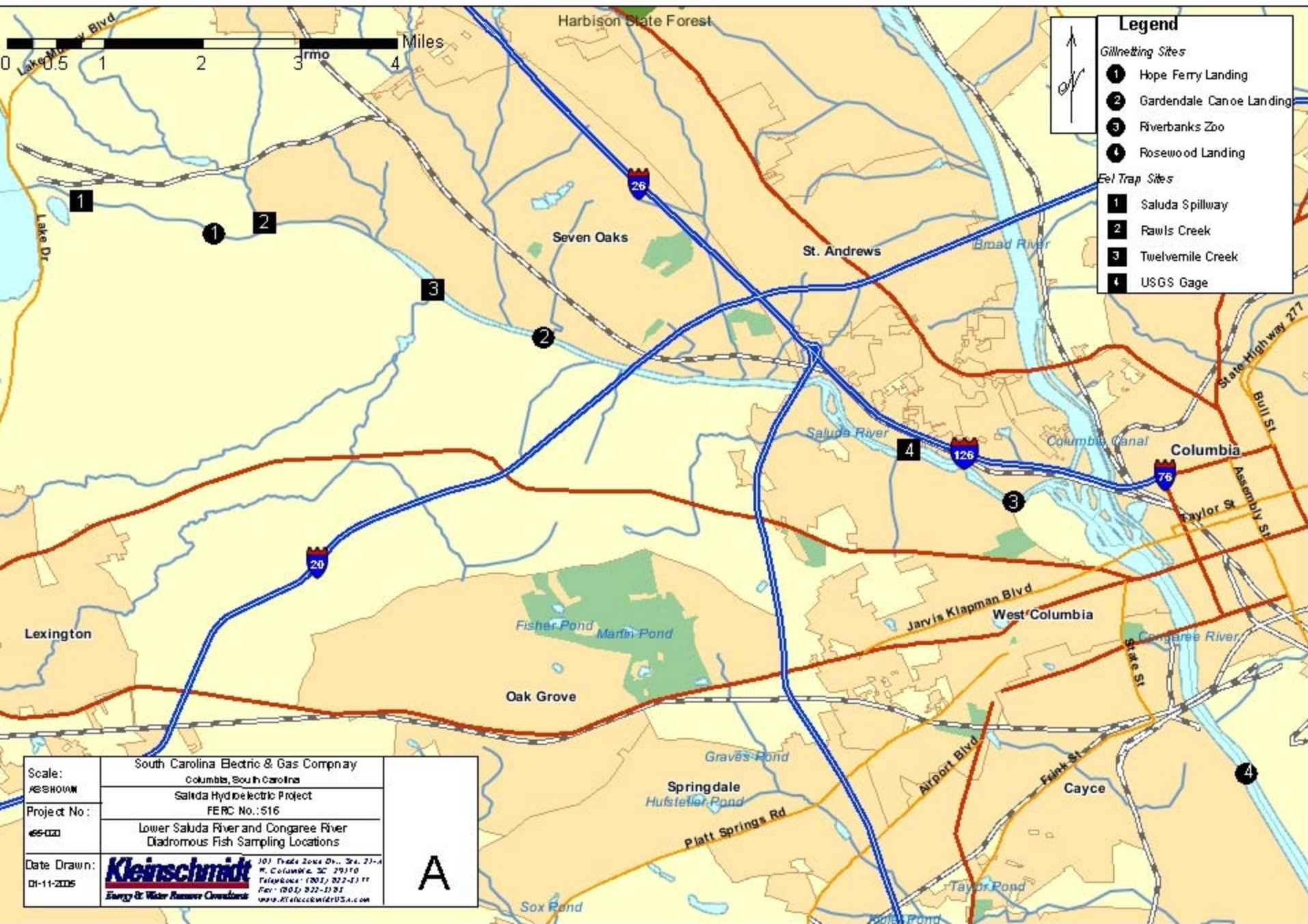
February 22, 2006

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
- Fish Trap Sites*
- ① Saluda Spillway
 - ② Fawls Creek
 - ③ Twelvemile Creek
 - ④ USGS Gage

Scale: AS SHOWN	South Carolina Electric & Gas Company Columbia, South Carolina	A
Project No.: 65-022	Saluda Hydroelectric Project FERC No.: 516	
Date Drawn: 01-11-2005	Lower Saluda River and Congaree River Diadromous Fish Sampling Locations	



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

Amanda Hill, USFWS

Ron Ahle, SCDNR

Shane Boring, Kleinschmidt

Tom Eppink, SCANA

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

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

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

Amanda Hill, USFWS

Scott Harder, SCDNR

Buddy Baker, SCDNR

Gerrit Jobsis, Am. Rivers

Ron Ahle, SCDNR

Wade Bales, SCDNR

Steve Summer, SCANA

Hal Beard, SCDNR

Prescott Brownell, NMFS

Alan Stuart, Kleinschmidt

Shane Boring, Kleinschmidt

Brandon Kulik, 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

<i>Date</i>	<i>Discussion Topics / (Presenter)</i>
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

Dan Tufford, USC

Alan Stuart, Kleinschmidt

Tom Bowles, SCE&G

Jim Ruane, REMI

Amanda Hill, USFWS

Gerrit Jobsis, Am. Rivers

Ron Ahle, SCDNR

Reed Bull, Midlands Striper Club

Andy Miller, SCDHEC

Richard Kidder, LMA

Shane Boring, Kleinschmidt

Roy Parker, LMA



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

Effects of Project Operations on Summer Habitat for Striped Bass

Potential DO and Temperature Effects on Freshwater Mussels

Downstream Impacts of Coldwater Releases

Status

W-2 Model being developed (Jim Ruane, REMI) to evaluate potential effects of Unit 5

Mussel survey was completed on July 13; report is forthcoming.

Study Plan was developed and is currently being executed; paired temperature sensors deployed at 9 locations.

Water Quality TWC: Study Requests

Request

Evaluation of Potential for TMDL Development for L. Murray

Status of Existing Downstream Water Quality Conditions

Cove Water Quality in Lake Murray

Status

SCDHEC continuing to develop TMDL strategy; does not fit into relicensing process and timeline.

Hub baffle effectiveness testing completed in Fall 2005; Report issues June 2006.

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

Flood Control

Recreational Flow Releases

Hydropower

Drought Events

Downstream Fisheries

Lake Levels



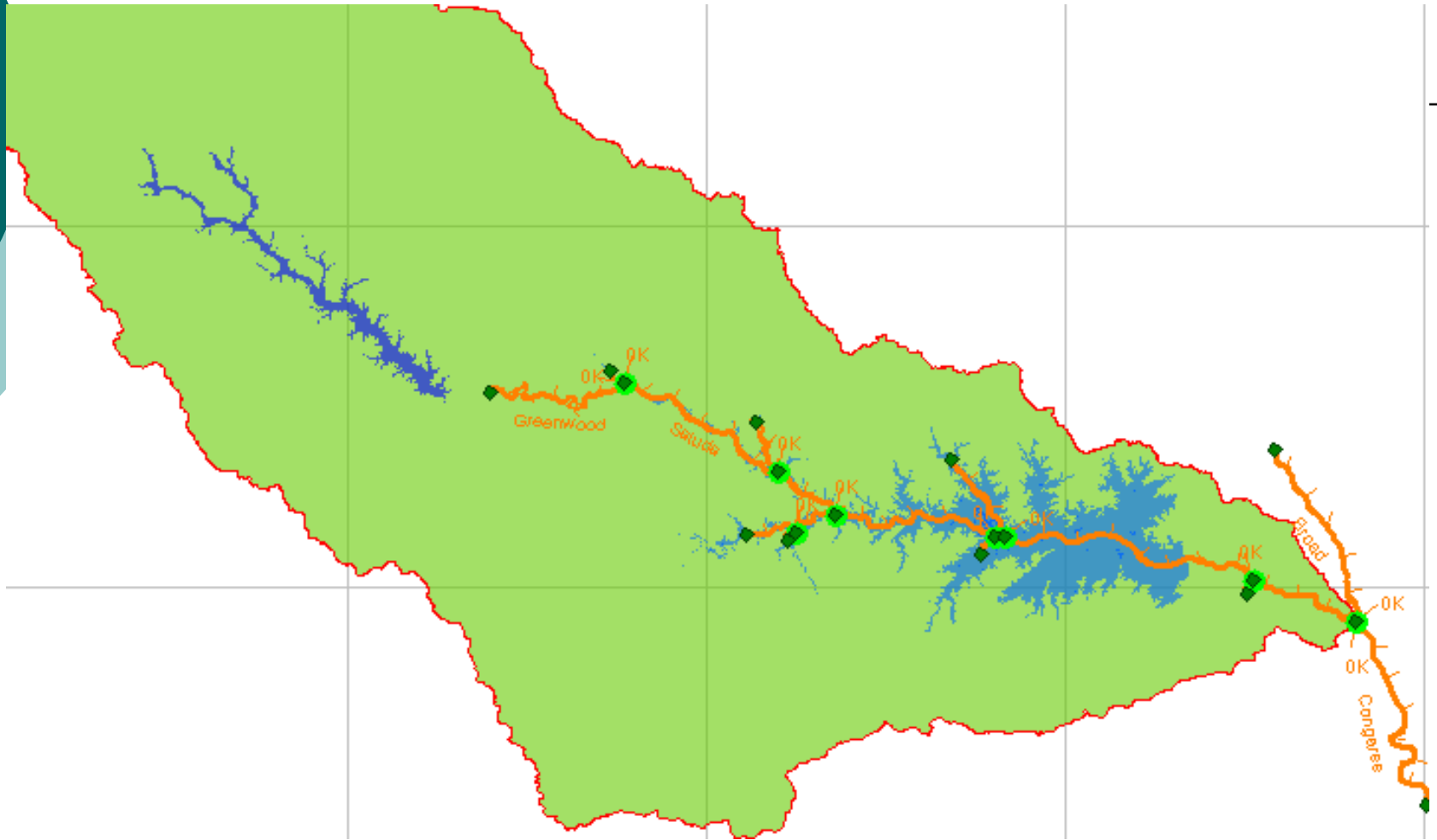
The Model: HEC Res-Sim

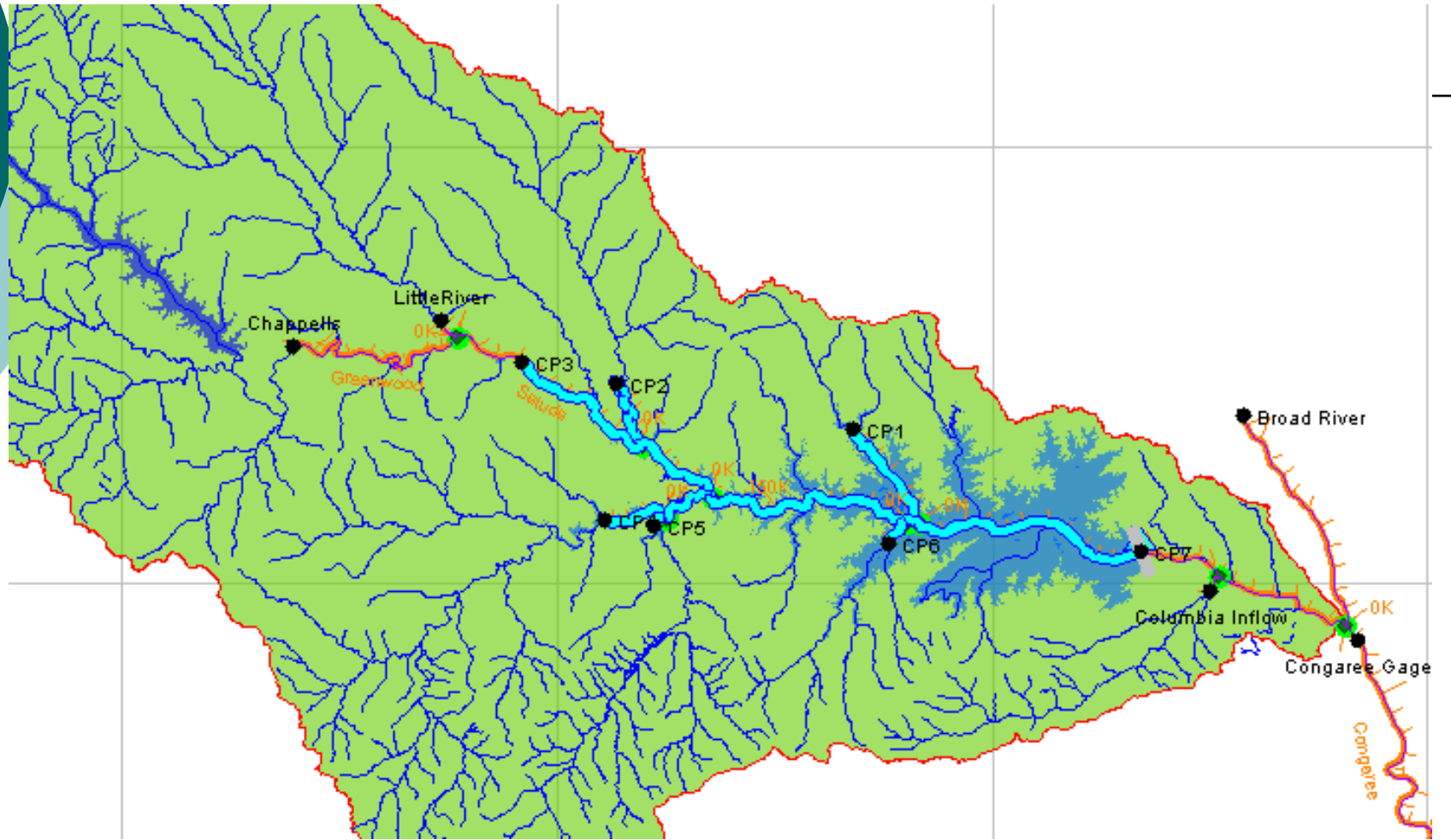
- Reservoir system simulation
- Incorporates user-defined goals with physical, hydrologic inputs
- Long term planning as well as real-time operation
- The national standard for relicensing efforts



Model Structure

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







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
H Y D R O
RELICENSING



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

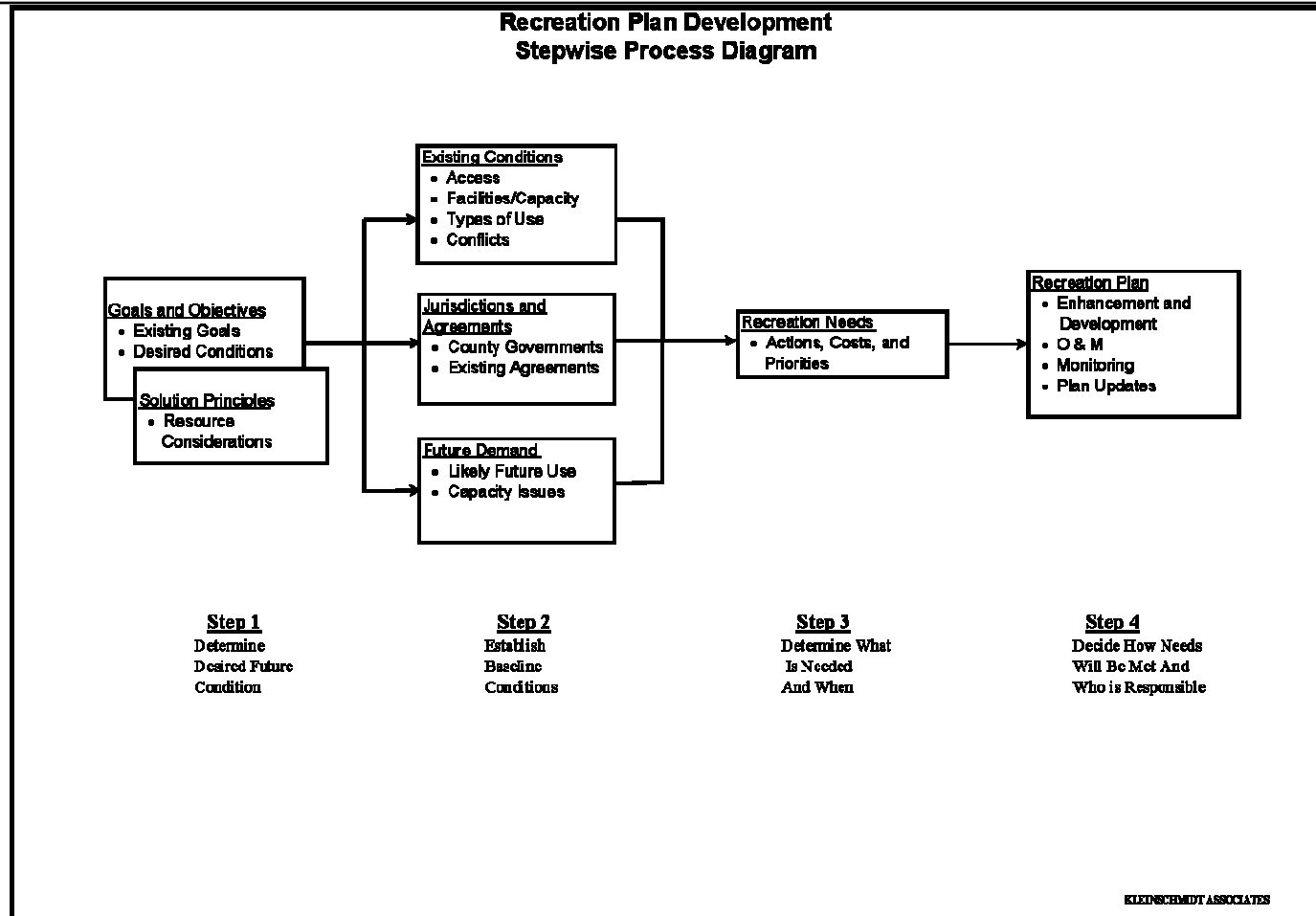
The mission of the Recreational RCG is to ensure adequate and environmentally-balanced public recreational access and opportunities related to the Saluda Hydroelectric Project for the term of the new license. The objective is to assess the recreational needs associated with the lower Saluda River and 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

Lake
Murray

September 22, 2005



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)

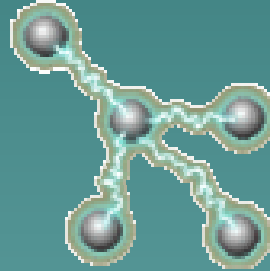
Local

- ◆ 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

