

**Virginia Smallmouth Bass Rivers
2009 Overview
DGIF Smallmouth Bass Committee**

Fisheries biologists with the Department of Game and Inland Fisheries (DGIF) spend considerable hours on Virginia's smallmouth bass rivers trying to understand more about the sport fish that live there. Knowledge about sport fish populations is partially accomplished by collecting fish with boat electrofishers in the fall at established stations. Several of our smaller rivers are difficult to access in low water, so they are sampled in the spring. Table 1 summarizes the rivers under investigation.

Table 1

River	Abbreviation	Season
Jackson River	JAC	Fall
Maury River	MAU	Fall
Upper James River	JRU	Fall
Middle James River	JRM	Fall
Clinch River	CLI	Spring
Powell River	POW	Spring
North Fork Holston River	NFH	Spring
Middle Fork Holston River	MFH	Spring
Upper New River	NRU	Spring
Lower New River	NRL	Fall
North Fork Shenandoah River	NFS	Fall
South Fork Shenandoah River	SFS	Fall
Shenandoah River	SHE	Fall
Rappahannock River	RAP	Fall
Staunton River	STA	Fall
Nottoway River	NOT	Fall

Biologists conduct these surveys with several goals in mind: age and growth relationships, spawning success, adult survival, catch rates, size ranges, and relationships between species and rivers. This report summarizes most of these attributes and attempts to qualify smallmouth bass population statistics across the Commonwealth. Keep in mind that the geological and morphological differences between these 16 rivers are significant which explains some of their differences.

Catch Rates In order to standardize the number of fish caught between rivers, it is important to distill these numbers into a comparable form. Fisheries biologists look at the number of fish caught per hour. This statistic gives the reviewer an idea of the number of fish of all sizes caught in a given river reach. Table 2 captures this information for all of the study rivers and eight major sport fish collected in 2008.

Table 2
2008 Electrofishing Catch Rates on Major Virginia Rivers

Species River	CCF	FCF	BLG	RDB	ROB	LMB	SMB	SPB
JAC	0	1	1	1	2	1	3	0
MAU	0	1	1	3	2	1	3	0
JRU	2	2	1	1	2	1	3	1
JRM	2	2	1	1	1	1	2	1
CLI	2	1	1	1	3	1	3	1
POW	1	1	1	1	0	1	2	1
NFH	1	1	1	1	2	1	3	0
MFH	1	1	2	2	2	2	2	0
NRU	2	3	1	2	2	2	3	1
NRL	1	1	1	2	3	1	3	1
NFS	1	0	2	3	1	3	3	0
SFS	1	0	1	3	1	3	3	0
SHE	2	0	2	3	1	3	3	0
RAP	1	0	1	3	0	1	2	0
STA	3	3	2	2	1	1	1	2
NOT	3	0	3	3	1	2	1	0

0 = Not found

1 = Low numbers caught

2 = Moderate nos.caught

3 = High numbers caught

Channel catfish	CCF
Flathead catfish	FCF
Bluegill	BLG
Redbreast sunfish	RDB
Rock bass	ROB
Largemouth bass	LMB
Smallmouth bass	SMB
Spotted bass	SPB

Smallmouth bass are found in all these rivers, but not in great abundance in rivers such as the Staunton and Nottoway. They are very abundant in the Shenandoah watershed. Spotted bass are encountered in the Staunton with greater frequency than most other rivers. Catfish are scarce in the Jackson (downstream of Covington) and Maury rivers, yet abundant in the Nottoway and Staunton. Pick your river and you can maximize your chances of hooking your favorite species by glancing at Table 2. Black bass (LMB, SMB, SPB) combinations are highest in the Shenandoah River system and lowest in the Rappahannock River, Middle Fork Holston River, middle James River, Staunton River, Powell River, and Nottoway River. If sunfish are your target, then it is best to avoid rivers such as the upper and middle James River, the upper New River, the Powell River, and the Staunton River.

SMB Size Ranges Once you have located 2 – 3 rivers of interest, you might wonder which ones hold the biggest fish. Using ratios developed by biologists across the country, smallmouth bass (and other species) can be analyzed by size group. Biologists look at groups of SMB as quality (>11 inches), preferred (>14 inches), memorable (>17 inches), and trophy (> 20 inches) to assess size breakdown in any given year. These four groups are scored between 0 – 100.

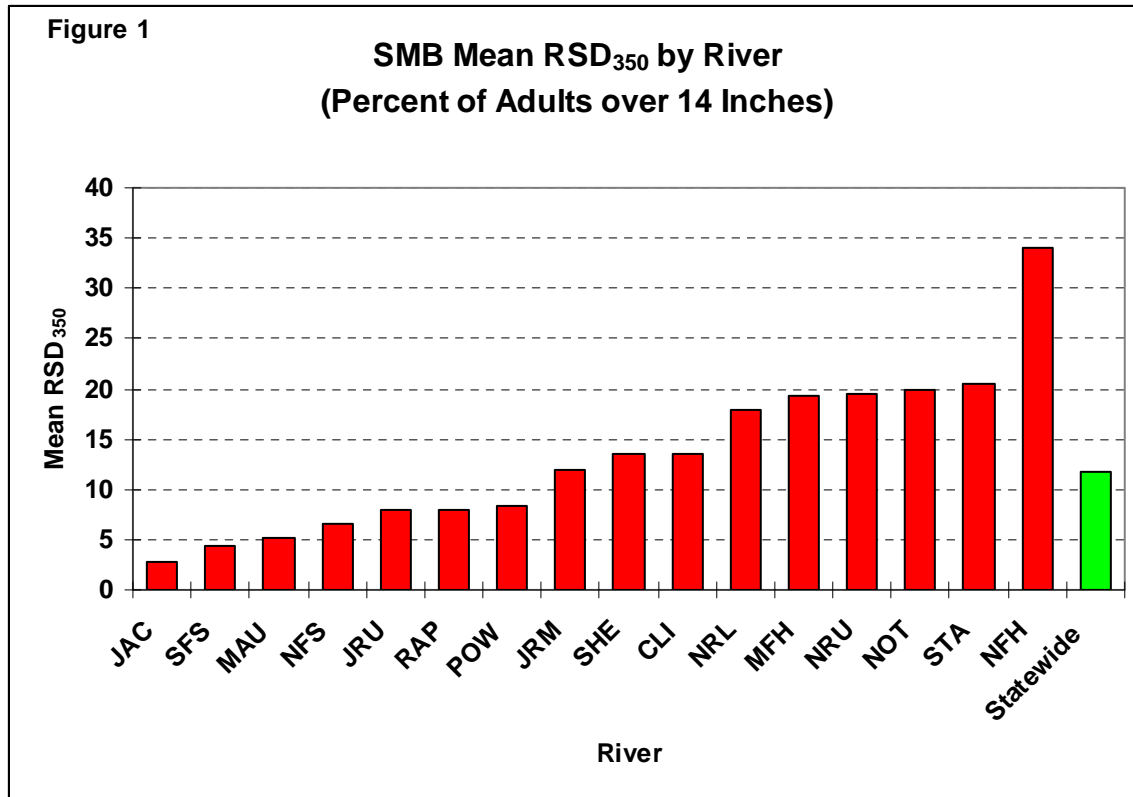
In 2008, Virginia biologists examined almost 59,000 smallmouth bass by size group. We found that quality sized bass *relative stock densities (RSD's)* ranged from 13 in the Jackson River to 57 in the North Fork Holston River. This simply means that for all smallmouth bass collected over 7 inches long, 13 % in the Jackson River were over 11 inches long. The median score for quality sized smallmouth bass in all 16 rivers in 2008 was 25. The best scores (33-40) came from the upper and lower New River, the Staunton River, the Clinch River, and the Middle Fork Holston River.

When examining the next larger size category, the Jackson River again scored low for preferred size SMB's (3), while the North Fork Holston ranked as the best at 34 (Figure 1). The median for preferred fish across the state in 2008 was 8, and the rivers that consistently ranked best for fish over 14 inches were the upper and lower New River, the Staunton River, the Clinch River, the Middle Fork Holston River, and the Nottoway River.

For smallmouth bass over 17 inches, the Jackson River does not support large smallmouth bass as indicated with an RSD of 0.1 for memorable size fish. The North Fork Holston River again tops all of the others with a score of 13. The best streams for larger smallmouth include: the upper and lower New River, the Nottoway River, and the Middle Fork Holston River.

Few SMB's over 20 inches were collected, so with the small sample number, scores are meaningless for this size group.

SMB Adult Survival Although calculating annual survival of a fish species can be highly variable, fisheries biologists have established several models to come up with this important statistic. Total annual adult SMB survival is 65% when our study rivers are averaged. Survival ranges from 57% (middle James River) to 79% (North Fork Holston River). Bass mortality is mainly due to natural causes, such as disease, predation, and competition. Anglers might think that total mortality in fish populations is heavily influenced by harvest, but in most cases, harvest is much less than 10%. In real numbers, if 1,000 young smallmouth bass are subject to a 35% natural death rate, by the time they reach 14 inches, only 116 are available to catch.



SMB Spawning Success Biologists are also interested in how a year class (those fish that hatch in any given year) will contribute to the population. We do this by electrofishing in the fall when bass that are spawned in spring are large enough to capture during routine sampling. After years of sampling and data analysis, our staff has determined that good fishing for smallmouth bass is directly linked to river flows, usually in the month of June. That is, if June flows deviate significantly from average, chances are that newly spawned bass will suffer a high degree of mortality. By examining recruitment and growth data, we can estimate how good fishing will be for smallies several years after their birth.

Table 3 lends some insight on spawning success of smallmouth bass in each of our fall sampled rivers over a ten-year period. It is obvious that there is a great deal of variability between rivers in any given year. Summer rainfall and resulting river flows can be extremely localized, so it is often difficult to compare survival of young bass in any given watershed. In some years, such as 2004, 2005, and 2007, catch rates of young bass were consistent across Virginia, boding well for top-notch fishing within a few years. Large numbers of trophy SMB's should be available in 2012, 2013, and 2015. In some rivers, like the Jackson and mainstem Shenandoah, smallmouth bass recruitment is almost always low. The smallie fisheries in these rivers are apparently supported by immigration of young fish from tributaries. Recruitment estimates for the Nottoway and upper New River were not included due to small sample sizes.

Table 3

		Smallmouth Bass Recruitment History for Fall Electrofishing Rivers									
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
River											
JAC	1	1	1	2	1	1	1	2	1	3	
MAU	3	1	2	1	1	2	3	3	2	2	
JRU	1	2	2		1	3	2	1	3	1	
JRM	2	2	1		0	3	3	1	1	1	
NRL	2	1	2		1	3	3	1	3	2	
NFS	1	1		1	1	3	3	2		3	
SFS		1	2	1	0	3	2	3	3	1	
SHE		1	1	1	1	1	1	1	3	1	
RAP	2	2	2		1	3	3	1		1	
STA	1	1	2	3	1		3		3	1	
	Below	Below	Average	Below	Below	Strong	Strong	Average	Strong	Average	

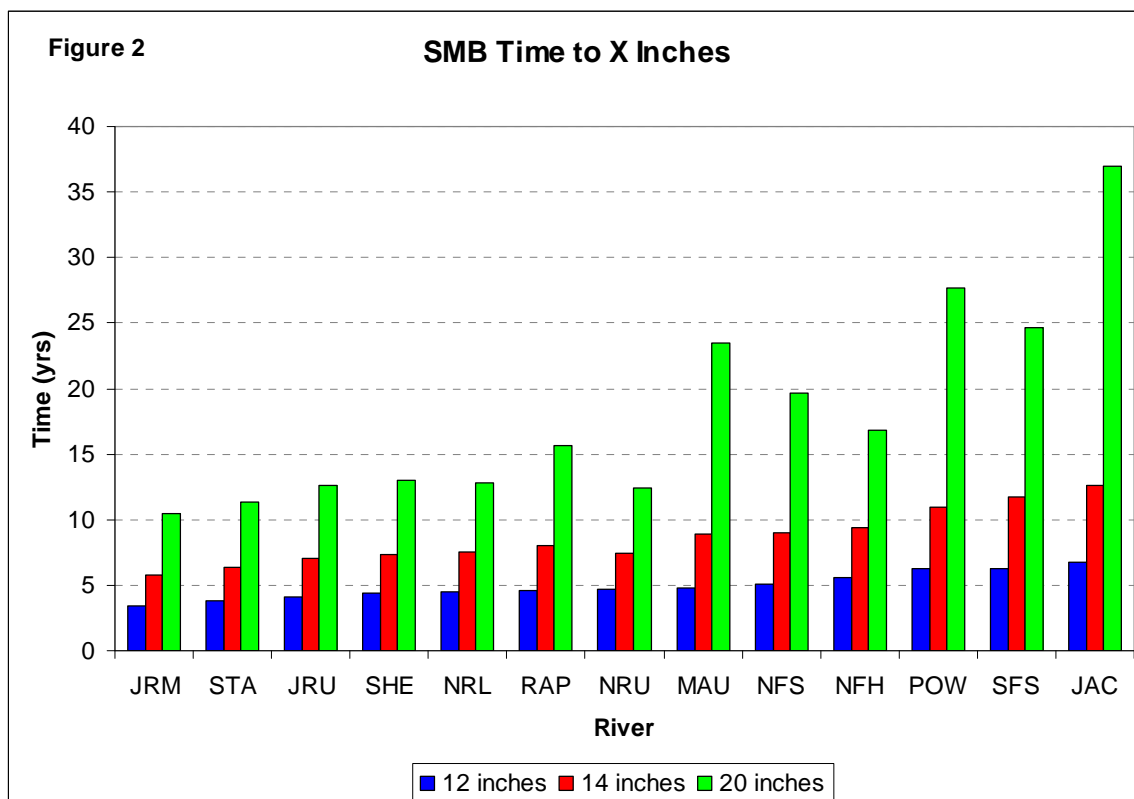
0 = year class failure
 1 = below average
 2 = average
 3 = above average

Species Interaction How do different sport fish interact with each other in our river systems? One way to examine this is to model catch rates between different species using a correlation matrix. For instance, smallmouth bass show a positive association with rock bass. In other words, where you find SMB's, rock bass are likely to be present. This might seem like common sense to avid river fishermen, but consider the following: channel catfish have a moderate negative relationship with smallmouth bass and a strong negative relationship with rock bass. However, channel catfish and flathead catfish have a strong positive relationship. Spotted bass are highly associated with both flathead and channel catfish.

Age and Growth Biologists (and anglers) are always interested in how old a fish is at a given length. This is a necessary piece of information when establishing length limits on a sport fish. Years ago, we used scales for age analysis. Because scales act as fish "armor", they become damaged or regenerated over time. This can create error in the lab, so DGIF has switched to using otoliths, or ear stones, to accomplish the same purpose. In the past 10 years, we have aged almost 10,000 smallmouth bass from Age 0 (young-of-year) to Age 17. Table 4 gives a breakdown of average length of a smallmouth bass from Virginia rivers at a given age. Growth rates vary considerably among our rivers. When you closely examine Table 4, several things should be apparent. First, river

Table 4																	
Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Length (in.)	4	7	9	10	12	13	14	15	16	16.5	17	17.5	19	19	19.5	20	18.5

smallmouth bass grow very slowly. On average, it takes at least five years to attain 12 inches and 16 years to reach 20 inches. Fish length really slows after nine years, and after that they begin to put on more weight. If you think about the smallmouth bass survival and couple it with age information, there are really just a “handful” of trophy size smallmouth bass swimming in a river at any given time. That’s another reason why recruitment is very critical from year to year. The Age 17 bass did not shrink, however our sample size for old SMB’s is limited and does not necessary reflect at state average in this instance. Finally, Figure 2 nicely displays our model on how long it takes for a smallmouth bass to reach 12, 14, or 20 inches by river. Fast growing smallmouth bass are found in the rivers displayed on the left side of this figure. At the same time, it is unrealistic to think that a smallmouth bass will ever live over 35 years in the Jackson River. Remember, these are average growth rates, so some fish will grow faster and others will grow more slowly. While anglers have reported 20 inch smallmouth bass caught in the Jackson River, their ages will remain a mystery.



Summary Valuable fisheries information is collected annually from Virginia rivers by DGIF biologists. Each piece of information they collect assists these researchers in making important management decisions, such as: How rapidly do these fish grow? How long do they live? How large are they at a given age? What regulations do we impose (or not) to sustain their populations and provide maximum recreation? It is difficult to compare each of these 16 rivers with one another, because variables such as gradient, elevation, water chemistry, land use, substrate, food, and habitat play an important role in

the welfare of river fish populations. Although smallmouth bass play a central role in our research, other game fish, non-game fish, and macroinvertebrate populations are examined along the way. We will continue to rotate these rivers into our annual population estimation surveys as well as improve our understanding of fish health, reproduction, movement, recruitment, growth, and survival. Virginia is blessed with some of the best fishing rivers in the country and DGIF fisheries biologists will continue to monitor, manage, and protect these vital resources well into the future.