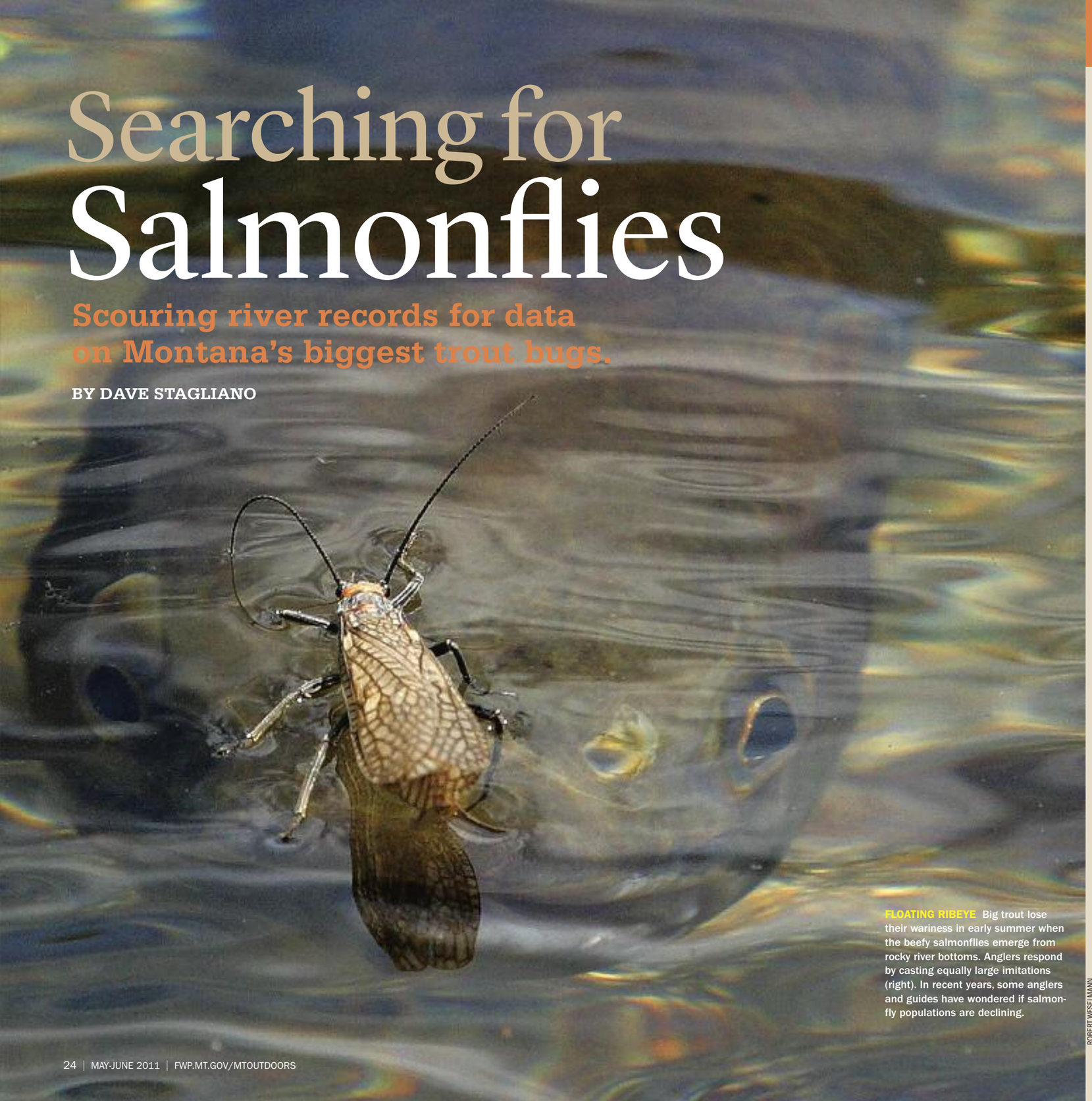
Searching for Salmonflies

Scouring river records for data on Montana's biggest trout bugs.

BY DAVE STAGLIANO



FLOATING RIBEYE Big trout lose their wariness in early summer when the beefy salmonflies emerge from rocky river bottoms. Anglers respond by casting equally large imitations (right). In recent years, some anglers and guides have wondered if salmonfly populations are declining.

ROBERT WESELMANN

Every year in late spring, like kids anticipating the last day of school, trout anglers in western Montana await the annual salmonfly hatch. These 3-inch-long members of the stonefly family are so big and protein-packed that even hyperwary large trout lose all inhibition and rush to the surface in midday to attack floating deer hair or foam imitations. For anglers used to trout snubbing their dry flies, it can be fly-fishing nirvana.

Hitting the salmonfly hatch at the right time is part experience and part luck. Arrive too early and the fish are still focused on the insect's underwater nymphal stage. Get there too late and trout have stuffed themselves on the "floating steaks," as salmonfly adults are sometimes called, and have no interest in your artificial offering. What's more, because the hatch often comes during peak runoff, rivers can be high and murky, making it hard to fish even if salmonflies are on the water.

Because the hatch is so popular, Fish, Wildlife & Parks officials were concerned by recent reports from some anglers and guides that salmonfly numbers appeared to be declining. "Especially on the Madison, Big Hole, and Yellowstone, the salmonfly hatch is a big deal," says Travis Horton, FWP regional fisheries manager in Bozeman. "If they are in decline, we want to know, and to understand why. Like fish, salmonflies are a good indicator of aquatic health."

In 2010 the department hired me to review existing information on salmonflies in Montana. As a longtime trout angler and aquatic ecologist, I knew that salmonfly numbers naturally fluctuate from year to year, based on a wide range of factors often related to water flow. During years of low flow, salmonflies have less habitat because more river bottom along shorelines is exposed to air. Also, water temperatures increase when flows are low, stressing salmonflies. And without flushing flows, silt clogs underwater cobbles where salmonflies live. But I also knew that aquatic insect populations can decline from human-caused factors, such as dissolved heavy metals or severe dewatering that dries up some river stretches.

MINING THE DATA

Montana contains three salmonfly species:

JEREMIE HOLLMAN

the most commonly encountered giant salmonfly (*Pteronarcys californica*), the lesser-known American salmonfly (*Pteronarcys dorsata*), and their smaller cousin the least salmonfly (*Pteronarcella badia*). (The least salmonfly coexists with the other two species in some rivers. It can also survive in warmer water where trout are not found, so the species is less important to trout anglers.) The salmonfly's common name refers to its orange (salmon flesh–colored) abdomen, leg joints, and several thorax joints.

Salmonflies generally live in large, well-oxygenated rivers containing swift, bouldery or riffly stretches and narrow canyon reaches, such as in the Big Hole, Madison, Gallatin, Yellowstone, Clark Fork, and Smith Rivers. Classic salmonfly waters include Yankee Jim Canyon of the Yellowstone, Alberton Gorge of the Clark Fork, and Big Hole River Canyon between Glen and Wise River. Flat, low-gradient tailwater fisheries such as the Missouri below Holter Dam and the Bighorn below Yellowtail Dam lack the bouldery rapids and river bottom cobbles where salmonfly nymphs live, as well as the large leafy material that the aquatic insects eat.

My search required compiling available sampling data on aquatic macroinvertebrate (underwater insect) populations throughout western Montana. Most monitoring data have been collected by the state Department of Environmental Quality (DEQ). Other data collection and studies have been done by me (through the Montana Natural Heritage Program), FWP biologists, Montana State University, the University of Montana, and the hydropower dam owner and operator PPL-Montana (formerly Montana Power). Much of this information was already in the Montana Natural Heritage Program database, but in many cases I had to dig through old technical reports and masters' theses to find it.

My next step was to isolate the most valuable data. Ideally, scientists monitor salmonflies year after year, at the same sampling sites. They can then devise an index showing whether the population trend is decreasing, increasing, or staying the same. Unfortunately, I discovered that little long-term monitoring has been done even on Montana's top salmonfly rivers. Data sets on some river stretches covered only a single year. Others spanned decades but contained huge gaps. The best continuous data set came from the Clark Fork River, where Smurfit-Stone Container Company conducted yearly monitoring at many sampling sites dating back to the mid-1950s.

While I scoured the data for relevant information, I also conducted a survey of 35 anglers, guides, and fisheries biologists who had expertise on Montana's main salmonfly waters. I wanted to learn what respondents were noticing and how their responses correlated with existing scientific data. Though this anecdotal evidence lacked scientific validity—for instance, it relied heavily on respondents' memories of salmonfly hatches from years or even decades ago—it provided some sense of public opinion regarding salmonfly hatch occurrence.

The main questions I asked: Do you think salmonfly numbers on the Montana rivers you fish have decreased, increased, or stayed the same? What other changes in insect or fish populations have you noticed on these rivers since you first began fishing there? What factors do you think most contribute to these changes?

FINDINGS

Overall: The anglers, guides, and fisheries biologists surveyed had spent an average of 21 years fishing Montana's rivers; these were definitely people with experience. Overall, 45 percent believed salmonfly numbers had remained the same on their rivers over the years, while 17 percent thought numbers had decreased. The remaining 38 percent said they didn't have enough information to form an opinion. No one thought salmonfly numbers had increased, except on the Big Hole in 2010. Respondents were split about 50:50 as to whether "epic" salmonfly hatches existed on the Yellowstone, Big Hole, and Madison 15 to 20 years ago.

All surveyed guides and fisheries biologists (and 50 percent of anglers) said they had noticed an increase in bottom sediment on their salmonfly rivers. They attributed this to the drought of the 2000s, during which spring runoff wasn't heavy enough to flush silt from river bottoms. Half the anglers and 20 percent of the guides and biologists said they'd also seen changes in fish and insect species composition. In some waters, they had seen more brown trout and an increase in hatches of small mayflies, such as *Baetis* and *Tricos*, and caddis flies, while noticing fewer cutthroat trout and a decline in salmonfly and larger mayfly hatches. They attributed this also to the drought, which raised water temperatures and increased siltation, both of which can be tolerated more by browns and smaller mayfly species.

Big Hole: The salmonfly hatch on the Big Hole is the state's most well known and the one most closely watched by anglers and guides. Traditionally the hatch moves upstream from the river's confluence with the Beaverhead starting in mid-June and then carries on roughly 4 to 5 miles per day to Wisdom. The highest densities are in the canyon reach from Glen to Wise River.

Anglers and guides reported smaller hatches during the drought years of the early 2000s than they'd seen in previous years. Also, one survey respondent who has been keeping a close eye on the Big Hole for many years had seen a decline in the salmonfly hatch "in sections where sediment deposition has occurred and [spaces between gravel] are now filled, Melrose to Brown's Bridge in particular." He added that the hatch seems fairly stable from year to year "in river sections where habitat is ideal and stable, with the canyon section being the best."

However, the lack of monitoring data made it impossible to conclude whether overall salmonfly numbers throughout the Big Hole were declining.

Also worth noting is that anglers and guides reported the 2010 salmonfly hatch as one of the strongest and longest in years. Those flies came from eggs laid in 2007. Though conditions for reproduction were

Dave Stagliano is an aquatic ecologist with the Montana Natural Heritage Program.

ANGIE KIMMEL

HIGH WATER GOOD When early summer runoff is strong and rivers run high, heavy flows wash silt from bottom cobbles where salmonflies live. High water also inundates shorelines, creating additional rocky habitat for salmonfly nymphs, and it keeps water from becoming too warm.

WILL JORDAN

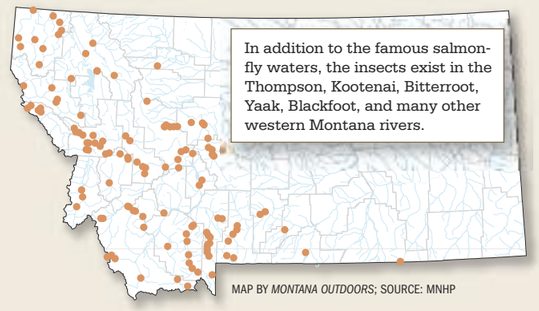
LOW WATER BAD When water levels drop because of drought and dewatering, salmonfly populations are in trouble. Rocky habitat is exposed to air, water temperatures get dangerously high, and silt builds up in bottom substrate.

USGS

COUNTING INSECTS U.S. Geological Survey biologists use a net to capture salmonflies and other aquatic insects. Standardized sampling procedures like this ensure that monitoring data is reliable. When conducted over many consecutive years, such monitoring can allow scientists to determine population trends.

Salmonfly occurrence in Montana

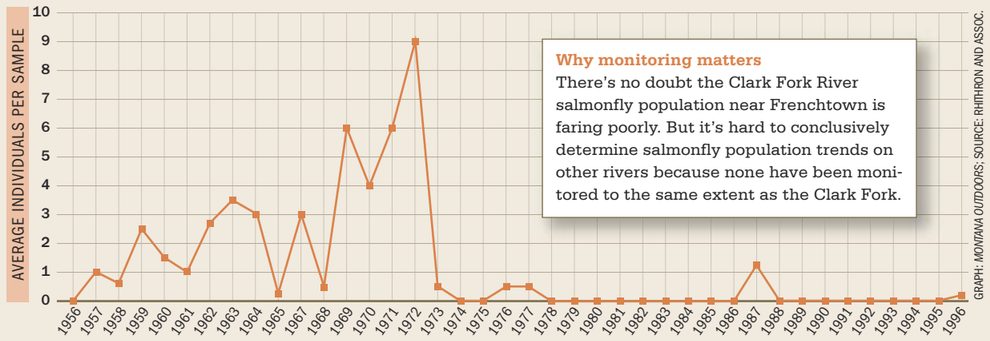
Rivers where nymphs have been collected at least once over the past few decades as part of scientific sampling.



MAP BY *MONTANA OUTDOORS*; SOURCE: MNHP

Salmonfly densities on the Clark Fork River near Frenchtown, 1956–1996

The most complete salmonfly monitoring data in Montana was conducted on the Clark Fork River. As seen here, salmonfly numbers a few miles downstream from Missoula steadily rose in the 1960s and early '70s, then plummeted—for reasons unknown.



GRAPH: *MONTANA OUTDOORS*; SOURCE: RHITHRON AND ASSOC.

not especially strong during that drought year, high flows in 2008 and 2009 likely improved survival of the larval stage of the 2007 "cohort" (or generation of salmonflies), resulting in high numbers of adults in 2010.

Clark Fork: The Clark Fork had the longest uninterrupted set of monitoring data, which yielded some surprising results. Throughout the first half of the 20th century, this river was nearly devoid of all aquatic life because of heavy metals leaching from old tailing piles upstream in the Butte and Anaconda mining area. Starting in the mid-1950s, salmonfly numbers downstream from the confluence of Rock Creek began to increase and build (see graph page 27). Then, in the mid-1970s, the population crashed and has remained low or nonexistent since. No one knows why. If not for the decades of data, we wouldn't be able to see that salmonfly numbers were once rebounding. Instead, we'd assume the Clark Fork had been devoid of the insects for more than a century.

It appears the drought from 2000 to 2007 hurt salmonfly production on some river stretches.

One exception to the disappearance of salmonflies on the Clark Fork is in Alberton Gorge, where the population remains strong, based on DEQ monitoring data.

MIKE EBINGER

BIGGEST OF THE BUNCH Montana is home to three salmonfly species. Shown here is the largest and most commonly encountered, the giant salmonfly *(Pteronarcys californica).*

Madison: The Madison's salmonfly hatch is popular and attracts anglers from throughout the United States. Salmonflies begin emerging around July 1 in the channels just above Ennis, and the hatch moves upstream several miles per day over the next three weeks.

Several anglers, guides, and biologists said the river below Beartrap Canyon also used to have a decent salmonfly hatch but that salmonflies there are now almost nonexistent. Information from PPL-Montana monitoring supports these observations. One reason may be increased silt and riverbed vegetation. Anglers and guides said that until recently they hadn't seen much silt or vegetation below Norris, and PPL-Montana's scientific studies of the lower river in 1978 and 1991 make no mention of silt or vegetation.

PPL-Montana data on salmonfly populations upstream from Ennis don't fluctuate outside normal variability. In other words, there are good years and bad years based on natural factors (such as an early summer snowstorm that can whack a year's hatch before it has a chance to mate). A PPL-Montana consultant told me the salmonfly population between Ennis and Hebgen Lake appears healthier in recent years because of high river flows.

Yellowstone: As in so many other waters, not enough continuous aquatic insect monitoring has been done on the river section from Yellowstone National Park to Livingston to conclude whether salmonfly populations are fluctuating more than would occur naturally.

But sampling data farther downstream show that salmonflies occupy roughly 30 miles less of the Yellowstone below Livingston than they did in the 1970s. It appears that the transitional area between the Yellowstone's coldwater and coolwater fisheries has been progressively proceeding upstream toward Big Timber, and salmonfly occurrence reflects this movement. That's likely because during the drought years the river was warmer and lacked flows to flush sediment.

Smith: This is another famous trout river with a traditionally strong salmonfly hatch, which now may be in decline. Anglers and guides report decreased hatches over the past decade. Since 1991, a former fishing guide has been quantitatively sampling salmonfly larvae populations roughly 10 miles upstream from Camp Baker (the put-in for the popular multi-day float). He has found that numbers have declined at this site since they peaked in 1993 and have been almost nonexistent since 1997. My anecdotal observations of the river's increased silt and water temperatures support his findings. Though no long-term data exist for the popular fishing and floating water downstream from Camp Baker, this stretch is at times severely dewatered. FWP biologists have measured late summer water temperatures there as high as 80 degrees, which can be deadly to salmonflies.

CONCLUSION

Based on the combination of survey results and data records, it appears the drought from 2000 to 2007 hurt salmonfly production on some river stretches. The drought created below-average spring snowpack, which in turn resulted in low flows, a buildup of river bottom silt, and warmer water temperatures—all tough on salmonflies.

Will Montana's climate hamper salmonfly production in the future? No one knows. Big Hole anglers say last year's salmonfly hatch was the best they can remember, and April 2011 snowpack was above average, which bodes well for this summer's flushing flows as well as salmonfly populations a few years from now (see cohort strength sidebar, page 28). Yet Montana climate experts say the state's average annual temperature has increased 2 degrees over the past 50 years and predict average temperatures will climb another 3 degrees by 2050. If they are right, both trout and trout anglers might have to learn to live with fewer of the big bugs.

Perhaps the most important conclusion I drew from the study is that Montana sorely lacks data on salmonflies. With the exception of the Clark Fork, no river has enough long-term monitoring information to make scientific conclusions about population trends. Salmonfly populations may be declining in some rivers and river stretches. Or, as on the Clark Fork during the 1960s and early '70s, they may be increasing. But without regular, scientific monitoring of aquatic invertebrate populations, there's no way to know for certain.

Read the entire Montana salmonfly report at http://mtnhp.org/reports/MT_Salmonfly.pdf.

"Cohort strength" helps predict adult salmonfly numbers

Each generation of newly hatched salmonfly nymphs is known as that year's "cohort," similar to a year class of fish. A strong salmonfly cohort is a generation with higher than average numbers, while a weak cohort has numbers lower than average. Cohort strength is determined by the conditions of the river when the adults lay their eggs and during the time it takes nymphs to mature into adults. Generally years with high river flows produce strong salmonfly cohorts, while years of low water produce weak cohorts. High water creates more habitat along submerged shorelines and keeps temperatures from getting too warm for the insects. Also, heavy flows clean silt out of river bottom rubble. Silt can fill spaces between cobbles where nymphs live and also smother leafy material the insects eat.

Because it takes an average of three years for a salmonfly to mature and reach its flying adult stage, the 2011 cohort—nymphs from eggs laid by adults this year—will not show up as adults any time soon. They will remain in their nymph stage until finally emerging—with luck on the same day you choose to fish the Big Hole, Madison, or Yellowstone—in early summer 2014.

JOSHUA BERGAN

WIGGLE ROOM Salmonflies exist in a nymphal stage for three years before crawling up on shore and emerging from their husks as adults.

FISHING THE SALMONFLY HATCH

Hitting Montana's salmonfly hatch can be fly-fishing heaven. Trout race to smack thumb-sized dry flies with names like Sofa Pillow, MacSalmon, and Stimulator. These fish are often the big trout that ordinarily lurk in deep slots and pools feeding on minnows and crayfish, never bothering to look at the size 14 Parachute Adams you usually try. But being on a salmonfly river and catching trout on salmonfly imitations are two separate things. Some tips:

When to fish: The hatch runs from mid-May to early July, depending on the river and stretch. Generally it starts downstream and moves up several miles each day, based on day length and water temperature. Brian McGeehan, owner of Montana Angler Fly Fishing in Bozeman, has his best luck a week or so after the hatch peaks. "I prefer to fish at least four days behind the hatch to give trout time to get hungry again," he says. "They seem to remember the salmonfly for about ten days after the hatch and are still looking for big bugs."

Where to fish: Cast near shore, where adult salmonflies fall from bushes, tree branches, and other streamside vegetation. Target water a few yards downstream or downwind of overhanging branches.

Times to fish: Theories abound. Some anglers fish at dawn, when adult salmonflies are lethargic from the early morning cold and clumsily fall off their vegetation perches. Others wait until the sun hits the insects, warms them up, and gets them moving. Still others delay fishing until late afternoon when rising winds knock more salmonflies into the water. And some wait until sundown, knowing that brown trout are more aggressive after dark.

What to fish: In the days before the hatch, crawl a size 4 black or brown stonefly nymph across the bottom. During the hatch, try whatever adult imitations fly shops are touting. Tippets should be short and heavy—3X or 2X—because the trout aren't skittish and you'll need to yank a few flies from errant casts into shrubbery.

What to expect: You could have your best or most frustrating day of fishing ever. Even when the big bugs abound, the fish may be stuffed on the real thing and ignore your artificial offering. "Trout get full on salmonflies in a hurry," says McGeehan. "That's why I recommend either getting ahead of the hatch and fishing nymphs or getting far below and waiting until their hunger has returned."

—Tom Dickson

RYAN BRENNECKE