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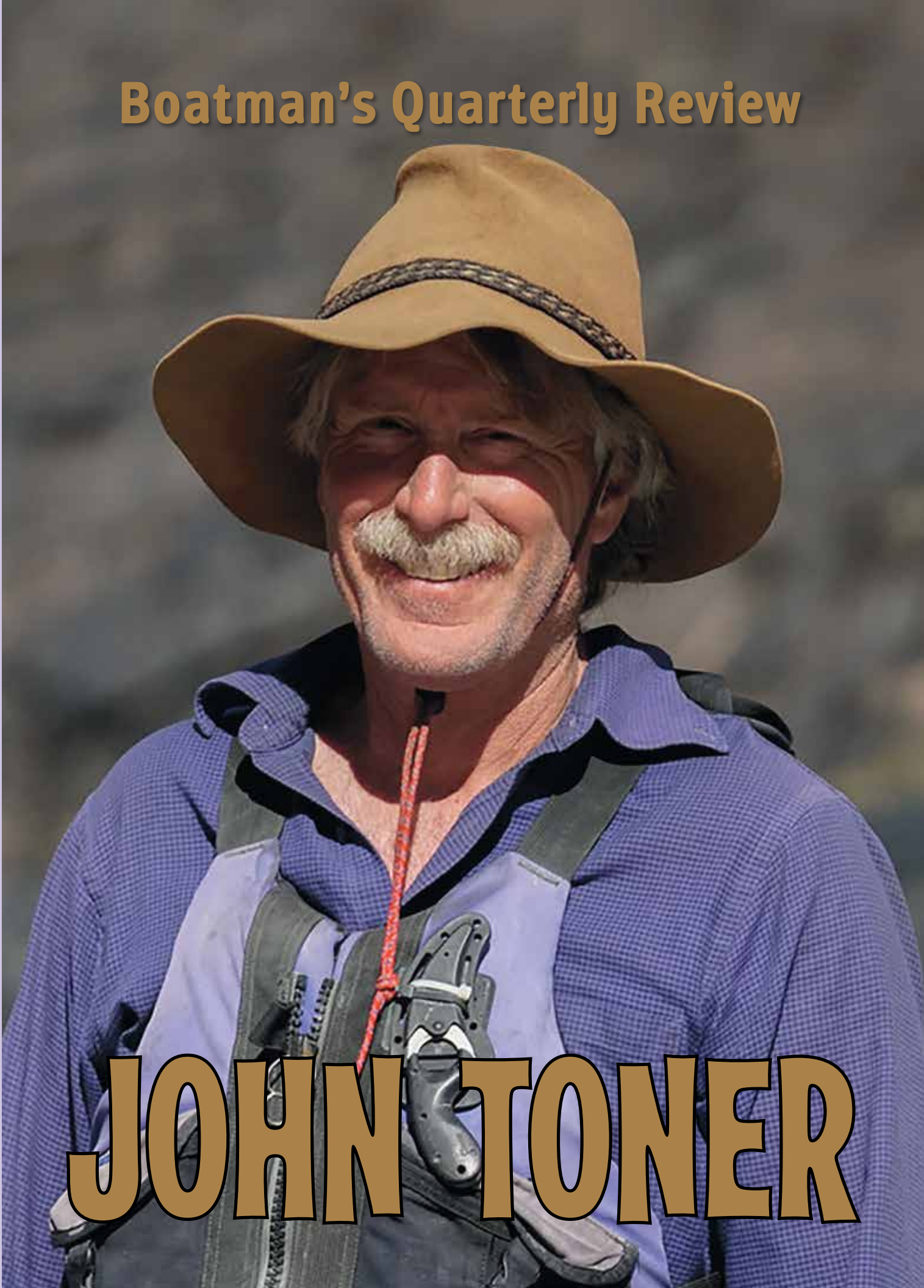
Boatman's Quarterly Review



JOHN TONER

boatman's quarterly review

Published quarterly by and for
GRAND CANYON RIVER GUIDES.

GRAND CANYON RIVER GUIDES
is a nonprofit organization dedicated to:

Protecting Grand Canyon
Setting the highest standards for the river profession
Celebrating the unique spirit of the river community
Providing the best possible river experience

General Meetings are held each Spring and Fall. Our Board of Directors Meetings are generally held the first Wednesday of each month. All innocent bystanders are urged to attend. Call for details.

Our editorial policy, such as it is: provide an open forum. We need articles, poetry, stories, drawings, photos, opinions, suggestions, gripes, comics, etc. Opinions expressed are not necessarily those of Grand Canyon River Guides, Inc.

Written submissions should be less than 1500 words and, if possible, emailed to GCRG. Include postpaid return envelope if you want your submission returned.

Deadlines for submissions are the 1st of February, May, August and November. Thanks!

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IN THIS ISSUE

GET PAID TO COLLECT BUGS!

Grand Canyon Monitoring and Research Center is seeking commercial river guides to **collect bug samples and monitor bats for less than an hour each night.** If you are interested in participating or would like more information, send an email to citizen_science@usgs.gov. Thank you!

Cover photo: John Toner by Greg Trawinski

Prez Blurb

Greetings to all from the coast of Northern California. I hope this finds you all happy and in good health. I have recently had the opportunity to revisit another beloved coastline, along the Sea of Cortez in Baja. Being from a temperate rainforest climate I love the stark contrast of the desert. My first adventure to Baja was on a fifth grade class trip to San Felipe, where about a dozen of us kids ran wild on the beach for a week, camping out of a caravan of vehicles driven by our teachers and parent chaperones. I remember most vividly the huge tidal swings. The ocean would recede for what seemed like miles, uncovering millions of sand dollars, vast flat sandy beaches, and then suddenly be right back in front of camp again.

On this most recent trip I flew to Cabo San Lucas where I joined my two traveling companions, a fellow river guide friend and her dog. Our ten day road trip back to Arizona became much like a river trip of sorts. First, find a good camp spot with a great view of the ocean. Next, take a long hike and look for interesting sea shells and rocks, flotsam and jetsam in the woodpiles, avoid cactus and other pokey objects. Unwind with a beverage at sunset, watch the pelicans dive for fish (my new heroes and the original surfer!), admire the desert cliffs and many islands off the coast turn beautiful shades of reds, pinks, and purples until the light gives way to starry skies. Get up at sunrise, make coffee, take a dip in the ocean, read our maps and plan the day's adventure, hit the road and make miles, find another camp (hope we have enough time for a layover day somewhere)… and repeat, or something like that. Oh, did I mention it's windy in Baja?

Of the many trips I have spent traveling in this most awesome landscape that is Baja, it really sank in during this one just how many parallels can be drawn with a Grand Canyon adventure. I have begun to view the Baja Peninsula as an extension of the Grand Canyon. Maybe this is why I feel such a connection to the place. Traveling north up the coast, a common remark began to occur when looking

out over the Sea of Cortez, "Oh my gosh! The Grand Canyon is in there!" Kind of a heady thought. The Colorado River drainage is a truly fantastic natural wonder and sentient being, from its origin in the Wind River Range and Rocky Mountains to its termination into the Sea of Cortez where it once nourished a thriving ocean ecosystem. I have no doubt it will again someday…

Cool things are happening here at GCRG. We feel really grateful to have had the opportunity this winter to virtually meet with Superintendent Ed Keable and his awesome staff. They have many huge tasks in front of them, from park infrastructure projects like the waterline replacement (picture the newest spring in the Grand Canyon visible on river left just below Pipe Creek rapid), weighing in on water releases from Glen Canyon Dam, and building a new Grand Canyon river operations program to monitor and patrol the river corridor. The NPS presence has been lacking for several years in the river corridor and I think we are feeling the effects of that through issues like overcrowding at put-in, congestion at exchange points, and vegetation encroachment in camps. Together our board compiled a great list of congestion points, camps that are in danger of being lost to unchecked vegetation growth, and recommended places for total camp rehabilitation in these congestion zones. I feel confident in saying that the Park recognizes what a valuable asset that river guides are in the Grand Canyon and we are looking forward to working with them for the betterment of the river experience.

I am happy to report that upon writing this, there have been seven Indigenous WFR scholarship recipients since this program was implemented a year ago. We have also helped award three NRS gear stipends in varying dollar amounts. In the works, and possibly ready to go by the time you are reading this, we are excited by the possibility of offering a new Indigenous Swiftwater Rescue Scholarship as well. Having just done all my recerts and such this year, I am thankful these were not hurdles I had when I was starting out

as a river guide. I had the luxury of being well established in the game when these work prerequisites were implemented. They are of course extremely valuable in our line of work! We hope that these contributions help towards making the guiding community a more diverse and inclusive place to work by alleviating some of the monetary leaps and bounds. Please help us spread the word that these programs are available. They don't have to be Grand Canyon-centric either, we recognize that guides start out on other rivers such as the San Juan, or working dailies on the Animas.

Another notable, GCRG is in the process of updating our website and making it mobile-friendly, courtesy of GCRG director, Rachel Unger! I was recently browsing issues of past BQR's on our current website and I have to recommend a trip down the rabbit hole if you have the time. There is such an incredible collection of stories, science, art and history in these pages. I am personally excited to read John Toner's interview in this issue. Although I don't know John beyond a few quick introductions over the years, he has always struck me as a super cool person. The guides on my crews that knew him well always had such great things to say after they had departed from a visit with him. And it goes without saying Lynn, Mary, and Kat are incredible as the backbone of this organization and publication!

With the 2022 river season fast approaching, I find this part of the year gets really busy and stressful as I try to wrap up the winter's loose ends and goals (my neat bow usually looks more like a poorly tied knot). It looks to be a low water season ahead. Water! Or lack of...this really is the elephant in the room and it's going to get dicey to say the least in the not far off future. Through my reading endeavors over the winter, which ranged from the rise and fall of the dinosaurs to how the Colorado River water is allocated and used up before it can flow into the Sea of Cortez, it is hard to feel like we can do anything to slow down the trajectory of climate change. I feel grateful to be in our line of work and will try in my small way to make a positive difference whereever I can. Getting to disappear into the folds of the Grand Canyon, leaving behind the "talking heads" on TV and in media outlets, and living simply for short stints of time is a lifeline to sanity. Wishing everyone a great river season ahead and I look forward to seeing and meeting many of you along the way. Maybe we'll be on a passenger exchange hike at Havasupai Gardens! Cheers!

Billie Prosser

Photo credit Margeaux Bestard

BACK OF THE BOAT— THE WHALE FOUNDATION NEWS BULLETIN

I hope you're well and looking forward to a great summer season! 2021 was a rough year for a lot of folks and for our community as a whole. I want to *thank you* for hanging in there and for your continued support. The Whale Foundation was able to keep offering services through it all. Fifty people talked with our counselors, for a total of more than 280 sessions. Those are almost exactly the same numbers as what we saw in 2020, which was our biggest year ever.

I also want to thank everyone who made the decision to call our helpline, talked to an expert, and did the hard work to make their life better. It's not easy. It's also not just about you. It matters to the people who care about you, and to the community you're a part of.

Two key Whale Foundation programs are open now until *May 15:*

- The **Kenton Grua Memorial Scholarship** is a chance for guides who are pursuing their educational goals to receive a bit of financial support. If you're working to make your life better, we want to help. To learn more, look under "Scholarships" on the Whale Foundation website.
- Our **Health Insurance Assistance Program**, created in honor of Tim Whitney, is there to encourage guides to sign up for health insurance. If you pay for your own insurance, we can offset the cost a little bit. Check it out on our website. If you qualify, it's easy to apply and well worth your time.

Both of these programs are available because of the generous support of the Grand Canyon river community.

Thank you all for being there and for all you do to make the world a better place! Have fun out there, on the water and off.

Sam Jansen

Dear Eddy

In reference to *Lake Powell Calculations and Conversion* by Gary Ladd, BQR Volume 34, Number 3, Fall 2021.

The lower Colorado basin water use last water year was more than double the available natural stream flow. This ratio is independent of the units one uses to measure things (we could measure Powell elevation in light years instead of feet and water usage in pints per week instead of acre-feet per year for example and the result would be the same).

Last water year (October 2020 to September 2021) seven million acre feet of natural streamflow would have entered Lake Powell. However, upper basin use reduced that number to an actual inflow of 3.5 million acre feet. To that add 0.5 million acre feet of natural flow between Lees Ferry and Lake Mead to reach four million acre-feet of natural streamflow available to the lower basin. The lower basin demand is 7.5 million acre feet plus 1.5 million acre feet to Mexico and over a million acre feet lost to evaporation leading to a total demand of over ten million acre-feet. Last year the demand was more than twice the supply from the river. That last number is a ratio and as such has no units.

It seems to me that there is no relevance of modern cosmology to erosion and formation of the Grand Canyon. The expansion of the universe was not discovered by Edwin Hubble but by Georges Lemaitre in 1927. What astronomers measure is not a velocity, but the redshift of spectral lines. The article implies that the earth is at the center of some sort of explosion that flung galaxies away from earth. This is a common misconception. The Andromeda Galaxy, used to illustrate this interpretation of the velocity of galaxies, is in fact moving towards the Milky Way not away from it. This was established by Vesto Slipher at Lowell Observatory in 1913.

The "expanding universe" theory applies on very large scales where the matter density does not vary appreciably throughout space. These solutions to Einstein's equations do not apply on earth; I think we can agree that entirely different physical processes explain the erosion in the Grand Canyon.

George Rhee

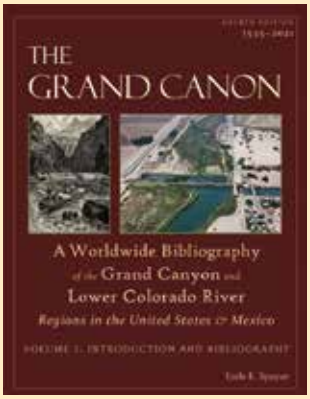
Note: George Rhee has given astronomy talks to tourists on Grand Canyon commercial river trips over the past quarter century as well as rowing boats, and playing guitar. He has also been paid to follow his scientific curiosity in astronomy for a living over the past forty years.

The Grand Canon Bibliography

Raven's Perch Media has just revamped its Grand Canyon and Lower Colorado River bibliography website with three new volumes of *The Grand Canon* series. Everything is free and can be downloaded right from the home page, www://ravensperch.org. The website tabs delve more deeply.

Volume 1 is "Introduction and Bibliography" (13,700 pages—not a typo). Volume 2 is a greatly revised "Cartobibliography" (1,200 pages). Volume 3 is "Grand Canyon: Colossal Mirror," (all the Grand Canyons in the world, and then some, plus… analogies and metaphors enough to fill the Grand Canyon! Light reading, comparatively).

Earle E. (Early) Spamer has now been collecting citations for the Grand Canyon and Lower Colorado



River (Glen Canyon Dam to Mexico) into a fifth decade. It has always been an indispensable research resource for myself and innumerable others. This fourth edition of *The Grand Canon* is comprised of over 100,000 citations, that is a grand's worth in thousands. Of particular interest to boaters of the Grand Canyon of the Colorado River should be "Part 10. Colorado River Guides: Informational guides to the Colorado River between Glen Canyon Dam, Arizona, and Mexico" (pp. 4745–4775). That citation is one I should have included in my current BQR article "Lava Falls as a Big Drop" (this issue, pp. 10-15). No other National Park Service entity, nor any other entity in the world, has anything remotely close to this monumental compilation of bibliographic sources. At a guess, it is probably a double magnitude more than any others. Highly recommended! Rates a "10" on the Grand Canyon scale.

It's all free for eager beavers and insomniacs alike—and spread the word! Cheers!

Early C. Corax & C. V. Abyssus

Farewell

Kim Crumbo—August, 1974–missing since September 20, 2021.

This tribute to Kim Crumbo was written and read by his son, Daniel, at Kim's memorial service.

No one will ever know for certain what happened up there, but I have a theory. My case rests on two key missing pieces—my dad and his camera—and one unexpectedly found piece. On the first day of the search, a pilot reported a solitary wolf swimming across the lake. Wolves occasionally swim across lakes, but not often. My contention is this wolf was swimming back.

The campsite was largely laid out. Pop's books and notes were stationed next to his chair, as if the day's scheduled canoeing was completed.

I see Uncle Mark looking up, possibly from a camp stove, squinting toward a ripple on the horizon. He calls to Pop, who scuffles for his camera and hurries to the shoreline. A good shot, to be sure—but not a great one. Without time for the usual punctilios, the two shove off, each with a paddle, and one with a camera: A once-in-a-lifetime image beckoning just a bit too far for his telephoto lens to properly capture.

My father was a literary man, a lover of romances and epics. I don't know how much he saw himself in Aragorn or Achilles, but to his son, the idea of him as an Odysseus who ultimately succumbed to a beckoning siren seems about right, and that the siren was a wolf—one of his most beloved endangered species—a fitting end to his hero's journey.

Pops was, of course, a person. That person is whom I miss, for whom I grieve. But he was also a legend, and that legend also means much to me. While he was out rowing between his Charybdises and Scyllas, his Penelope and two toddling Telemachuses busied themselves with the mundanity of family life. Dad was gone a lot, so I spent my formative years with the idea of Kim Crumbo, the legend.

Even his legend had a real presence. He would sporadically emerge from his adventures, sun-dried, with his piercing eyes nestled behind a great black shag of hair and beard, with stories of raging hippopotamuses, landslides, flash floods, covert operations, muddy firefights, and harrowing helicopter crashes.

And these stories would find their way to my childhood friends and adversaries, and they would be impressed. Whatever the outcome of our own playground scuffles, all grimly knew what would really happen if our dads got into a fight. I probably shouldn't admit it to polite company, but I was proud of my father, and not always for the right reasons—and I still am.

I once asked him if he was Hayduke in Edward Abbey's *The Monkey Wrench Gang*. Without breaking focus on the epoxy he was carefully applying to the oar he was repairing, he replied "No. Of course not. Hayduke never killed anyone." The implication, of course, was that he had, thereby dismissing the hyperbolically masculinized literary caricature, who may or may not have been partially based on the author's acquaintance, as an also-ran wannabe. He distanced himself from this sort of thing later, and he'd be mad at me for telling you here, but it was a badass thing to say, and he said it, and it was true.

Brothers Kim Crumbo and Mark O'Neill, 2014.

Becky, Daniel and Kim Crumbo in Grand Canyon, 1980s.
Courtesy of the Crumbo family.

I also remember a Grand trip when I was seven, standing with my mother on the rock bar at Crystal in the 100,000 cfs water year, watching giant motor-rig after giant motor-rig get absolutely trashed—not to mention the diminutive oar boats faring even less well. And finally my dad, in his bright yellow, comically overloaded (not self-bailing) Domar, calmly dipping an oar here, and oar there, effortlessly pirouetting around bus-sized watery mountains that had catapulted other boatmen deep into the yawning foam, the tip of his raft nudging jagged rocks as if with the mildly moist nose of a curious puppy, and finally standing for two or three strikingly violent pulls, his body ripping into huge muscular contortions that skipped his burgeoning boat upstream and around the gnarliest of snarling exploding froth. At last, he spun into the shore below, to collect us portaged civilians, bitching about a chance wave wetting his shirt and knocking his visor askew.

To this child that was me, this water was Pure Chaos, darkly swirling liquid nightmare, and he had mastered it. And to be with him meant that you had also mastered it, because if he was close, there was nothing, no six-foot-seven drunk driver, no mountain lion, no storm, no fall, no cliff, no anything else, that could get to you. And I knew I was right to feel it, as I had heard exactly how he had conquered chaos, and I had I seen it, again and again.

I was proud of my dad. I wanted to be like my dad, so I wanted to be a SEAL. He talked me out of it. The important thing he took from the SEAL teams, he told me, didn't require guns or covert missions or combat per se; rather, it was about cultivating a readiness, a deep appreciation of life's potential perils, and a cheerful indifference to the visceral fear of them. SEALs, he would explain, are not reckless and crazy—but they can do things that look reckless and crazy because they are properly prepared, deeply informed, and confident in their fellows. After surviving several apparently impossibly dire catastrophes, he did not become fearless, but his relationship with what is frightening fundamentally changed. It was hard, but you could learn it, and you didn't necessarily have to go into the teams to figure it out.

So you could never really convince him that all was lost. That anything was truly hopeless. That there was no reason to keep going. You may not see it, you may never see it, you may lose people along the way, and people may lose you, but that doesn't mean there isn't a way. As he developed this notion, he began to call it informed optimism, and it colored his whole approach to life, and especially to his approach to conservation.

When I heard, some fifteen years ago, that an elk had attacked him, I was not so surprised that he had found himself in a fistfight with a bull elk, but that he had lost. I knew his foibles, and I watched his superhuman strength wane, but nothing ever shook the bone-deep belief that this man was beyond death.

Even so, it seems the swirling icy chaos finally caught him, as it does to legends more legendary than Kim Crumbo. Thanks to him, however, I know we'll find a way through—even though it will take more than we think that we have, more than we think we can do.

Whatever its validity, in the story I will tell my grandchildren, his was a hero's life, and his was a hero's death. Like all legends of his ilk, he came upon his calling reluctantly. He never wanted to be a SEAL. He enlisted in underwater demolition training in part because they cleared landing points for amphibious assaults, and there were no amphibious assaults in Vietnam. He didn't even know what SEALs were. But he was at the top of his class, and when they asked him to serve, he did.

He saw an extraordinary amount of shit in his first tour, even by SEAL standards, so the Navy gave him an out. He didn't take it. Instead, for his second combat tour, he traded his powerful Stoner 63A for a camera, and thereby commenced his true odyssey, a lifelong pursuit of images of landscapes and life, which was really a quest to save actual life, for anyone who cared enough to seek it out, and especially for itself.

My last image of him is in a gently rocking boat, an evening mist gathering against a backdrop of pristine forest, just to the fore of his fellow semi-deity brother, his preferred "weapon" at the ready," advancing upon a lone wolf, afore a slowly spreading wake slipping silently into the ominously rising chop of an icy lake.

I miss him so much. I know he had more life to give. But there are worse ways to go.

Daniel Crumbo

Pat Diamond
January 21, 2022

The river running community lost another influential member, Pat Diamond on January 21. Pat and her husband Bill Diamond were Grand Canyon pioneers who helped start Sanderson Bros. Expeditions and later bought out Harris Trips and split the combined companies into Sanderson and Diamond Expeditions, respectively. Look for a memorial in the next issue of the BQR. But in the meantime, you can read Pat's Oral History in BQR Volume 33, Number 2, Spring 2020.

Recent Grand Canyon Geese Invasion: Another Request For Help!

Last year we published a note in BQR (Vol. 34, No. 2 Summer 2021) reporting that Canada geese (*Branta canadensis*), historically only winter visitors to Grand Canyon, had begun regularly nesting along the river corridor. In that article, we requested help from guides, researchers, and NPS biologists to assist us in the documentation of this unusual colonization. We asked for photographs of family groups, the date and river mile of sightings, and estimates of gosling ages. We want to thank B. Dierker, S. Haas. T. Rowley, B. Short, and D. Trimble for responding to that request. Their willingness to share their observations improved the accuracy of our annual counts and is greatly appreciated.

To recap what we reported last summer, we began tracking geese after spotting a single pair in 2018 between Diamond Creek and Columbine Falls that nested and raised seven goslings to full adult plumage. In that same year, a river trip passenger reported seeing a pair of geese with four goslings in the upper Canyon between Saddle Canyon and Nankoweap. Then in 2019, at least three pair raised young in the lower Canyon and another pair nested in the upper Canyon, again between Saddle and Nankoweap. Based on the data from 2018 and 2019, and the fact that adults and young generally return each year to the area where they previously nested and hatched (a behavior called "philopatry"), we predicted that nesting geese were here to stay and would annually return in growing numbers. Unfortunately, our goose surveys were seriously interrupted in 2020 due to the pandemic and limited permitting. We were able, however, to access the lower end in 2020 by motoring upstream from Pearce Ferry to Separation Rapid in May and found a single pair with goslings at Surprise Canyon. Also, in July 2020, one of us (SWC) was lucky enough to get on a Grand Canyon Whitewater trip as a work-along (thanks to T.J. and B. Gloeckler). Sure enough, when we got to the Saddle-Nankoweap area we encountered a pair with six goslings.

Last year was a banner year. In 2021, nesting geese and goslings showed up in numbers we found simply astonishing. Between our field observations and data coming in from guides and other river runners, we documented at least eight nesting pairs in the lower Canyon and four in the upper Canyon (see Figure 1). Note that Figure 1 includes a June 2016 observation by river guide Scott Jernigan of Canada geese with goslings somewhere along the river in the area between Marble Canyon damsite (RM 39) and Saddle Canyon (RM 47). We include that observation here because those returning adults and young are the

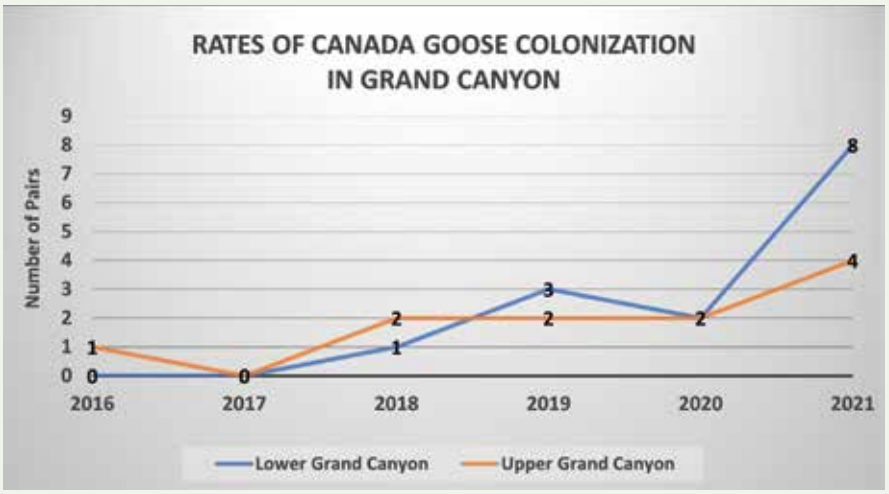


Figure 1. Numbers of individual pairs of nesting Canada geese observed in Grand Canyon, 2016–2021. Note that data for 2020 are incomplete because of pandemic-related restrictions on river trip permitting.

Figure 2. Canada goose nest with addled egg in lower Grand Canyon.

likely source of the nesting geese found in the Canyon today (at least those in the upper Canyon).

Overall, from that one pair in 2016, nesting geese observed in Grand Canyon have increased to twelve pair in just five years. Interestingly, in the lower Canyon, all eight pairs in 2021 were found within the same 34-mile corridor (RM 243–277) where the nesting birds were documented between 2018 and 2020. In the upper Canyon, two pairs of geese nested in 2021 in the Saddle-Nankoweap area just as we expected, but another two pair nested and raised young between RM 70 and 72. We suspect those pair found the large river island between Cardenas and Unkar to be an excellent nest site. While we did not actually find nests on the island, we know from the literature that island habitats are preferred by geese for nest sites, and we did confirm nesting on a different island. Figure 2 portrays a goose nest on a small island with a single addled (i.e., non-viable) egg we found in the vicinity of RM 260–266. The day we discovered the nest and egg we also encountered a family group with four-week- to two-week-aged goslings less than 200 yards downstream of the nest.

We have learned much about goose biology since we spotted that first family group in 2018 and realized that a significant change in the Canyon's avifauna may be underway. Today we better understand some curiosities in their nesting habits that you may find interesting. For one thing, they are extremely social and will nest in reasonable proximity to other pairs. Once hatching is complete, the adults and goslings will band into a single flock often with mixed-age youngsters. We assume this is primarily for predator protection and efficiency in resource utilization. In addition, the family groups can be extremely secretive—it is amazing how quickly a family can seem to disappear, or never be seen in the first place.

So, here we are again asking for guides and other river enthusiasts to help us in 2022. We would really appreciate it if you would report to us any geese you see with goslings and get photographs if you can. Just please be careful not to disturb family groups to get photographs, and please don't approach active nests. If you can't provide photographs, it would be a big help to us if you could make the best estimate you can for gosling age based on the five stages of gosling plumage development described below. Goslings in stages I–III of development are illustrated in Figures 3–5, respectively.

• Stage I—Downy young stage (1–15 days). In the first week, post-hatching the goslings are tiny balls of lemon-colored fluff that begins to darken to gray in the second week.

• Stage II—Gawky pre-teen or "tween stage" (16–33 days). After the second week, for the next two weeks the youngsters are gawky, clumsy, and in possession of feet and legs seemingly way too big for the body; almost all lemon color is gone, the birds are gray overall, and while some down is still apparent, the first feathers are just becoming obvious.

• Stage III—Adolescent stage (33–48 days). Almost half to mostly feathered, black neck beginning to show, but down still on neck and back and the white cheek patch beginning to show.

• Stage IV—Sub adult stage (60+ days). Fully feathered, white cheek patch obvious, youngsters are still slightly smaller than adults, some limited and short practice flights, birds are barely able to get off the water.

• Stage V—Goslings largely undistinguishable from adults, and by 60–65 days the goslings are capable of sustained flight.

Figure 3. Goslings at plumage development Stage I.

Figure 4. Goslings at plumage development Stage II.
Photo credit: Mark Nenadov.

Figure 5. Goslings at plumage development Stage III.
Photo credit: Diego Delsa.

In 2022 we hope to be able to band some of the adults and young as well as capture adults that already have bands. Since we began this effort we have encountered two adults with butt end bands that will contain data on their previous location when first banded. We would like to know where these adult birds originated. Our suspicion is that some of our nesting geese could have originated as a result of the annual goose roundup in Reno, where Canada geese have become noxious pests. The captured birds from Reno are regularly translocated into Wildlife Management Areas on the Virgin and Muddy Rivers to the north of Lake Mead. From there, it is a short hop to Grand Canyon. Exploding populations of Canada geese have become unwelcome guests in urban areas like Reno and in grain fields all across the country. Their effect on natural areas is less obvious. If ever larger numbers of these big birds come to nest and raise their young along the river in Grand Canyon, how will that effect the existing ecosystem? Nobody knows the answer to that question, but there is no doubt that the Canada goose is another example of a "new" naturalized citizen of the breeding riparian wildlife in Grand Canyon.

Steven W. Carothers and Tanner S. Carothers

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2022: THE YEAR OF A PERMANENT GRAND CANYON MINING BAN?

Reprinted with permission from the Grand Canyon Trust blog at grandcanyontrust.org on February 3, 2022

Is 2022 the year of banning new uranium mines around the Grand Canyon forever? We sure hope so.

As the country heads into the second year of the 117th Congress and the Biden administration with the Grand Canyon Protection Act yet to become law, we're reflecting on how far we've come and what still needs to happen in 2022 for a permanent mining ban to finally become reality.

We've come a long way

The work to protect the Grand Canyon region and its precious waters from uranium mining has taken a variety of forms over the years as tribes, congressional allies, nongovernmental organizations like the Grand Canyon Trust, and community members and leaders have adapted to the ebb and flow of political circumstances, opportunities, and threats.

Today, the bill to protect the Grand Canyon is called the Grand Canyon Protection Act. It would permanently ban new uranium mines on about a million acres of federal land around the Grand Canyon.

A complex groundwater system connects these lands to the Grand Canyon. In a landscape of fractured rock, how far and how fast water flows, and the paths it follows before emerging into the Grand Canyon as seeps or springs, are still not well understood.

The substance of what is now the Grand Canyon Protection Act was first introduced in the 110th Congress in 2008 by Arizona Congressman Raúl Grijalva and originally called the Grand Canyon Watersheds Protection Act. Between 2008 and 2013, the Grand Canyon Watersheds Protection Act was introduced four times and had as many hearings, but died each time before even getting a vote in the House, let alone seeing daylight in the Senate.

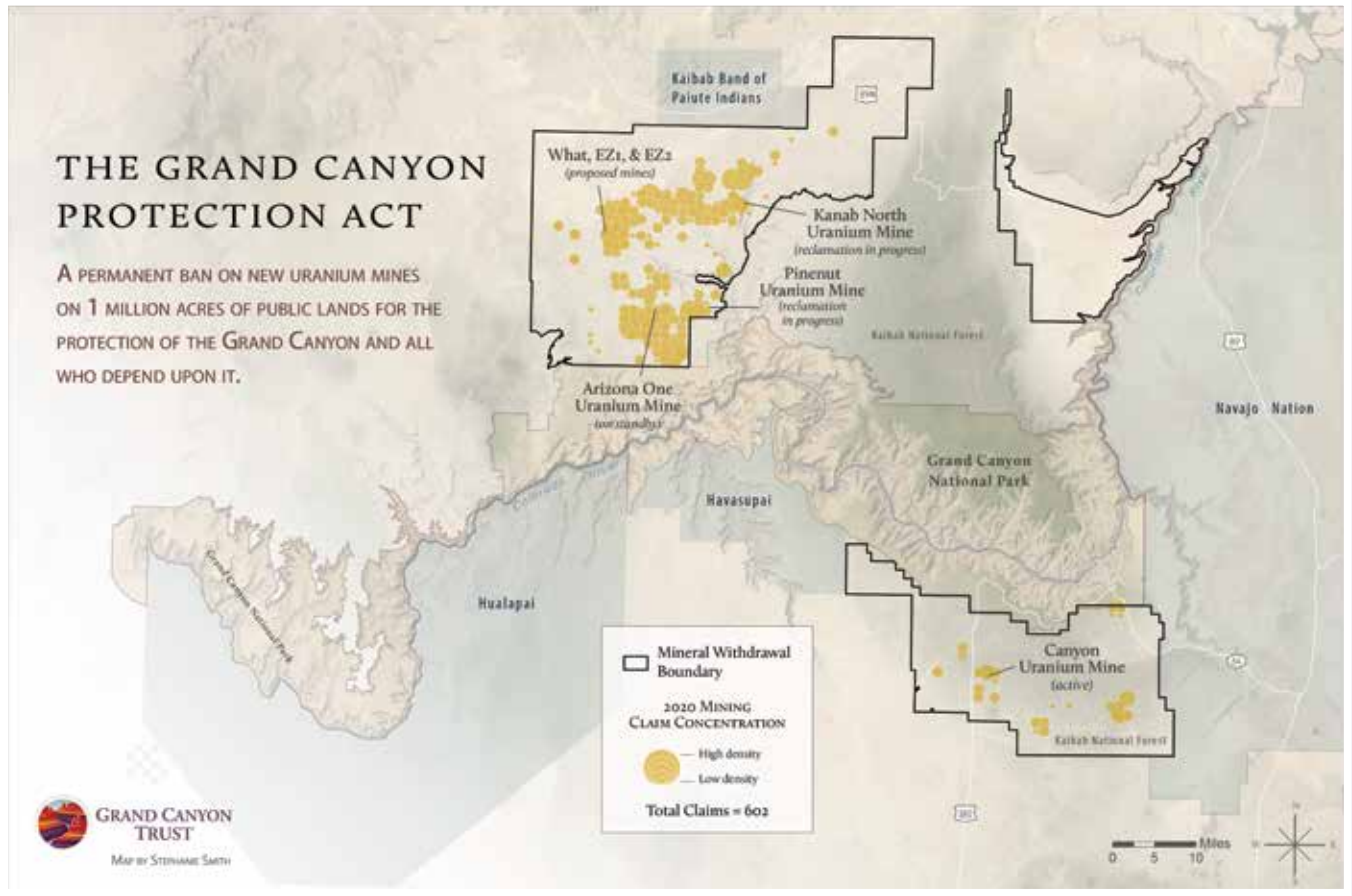
A temporary mining ban

In 2012, after much work by tribes, Rep. Grijalva, community leaders, the Trust, and our partners, the Secretary of the Interior declared a temporary administrative mining ban on the same area near the Grand Canyon. But in 2016, President Obama ultimately declined to use his executive authority under the Antiquities Act to establish a national monument in the region, which would have included a permanent mining ban.

Bill revived in Congress

In February 2019, at the start of the 116th Congress, Rep. Grijalva introduced the legislative permanent mining ban again, this time called the Grand Canyon Centennial Protection Act, in honor of Grand Canyon National Park's centennial that year. The bill passed the House, and was introduced in the Senate by Arizona Sen. Kyrsten Sinema. But there it stalled and died before it could face a vote on the Senate floor.

Remember, a bill must pass both chambers of Congress and be signed by the president in order to become law. If one chamber fails to vote, or votes "no," the bill dies.



Another revival

In February 2021, at the start of the 117th Congress, Rep. Grijalva reintroduced the current bill to permanently protect the Grand Canyon from mining—the Grand Canyon Protection Act. Arizona senators Kyrsten Sinema and Mark Kelly weren't far behind, introducing their version of the bill in the Senate a week later. The House quickly passed the bill as part of a larger public lands package. But, like the previous year, things slowed way down in the Senate.

Stalled in the Senate, again

At one point, the bill was added as an amendment to the House version of a defense spending bill called the National Defense Authorization Act and it passed the House for a second time in 2021. Unfortunately, the Senate didn't include the Grand Canyon Protection Act in its version of the defense spending building. Although senators Sinema and Kelly requested that the Grand Canyon bill be included as an amendment to the Senate version of the spending package, it was ultimately not included in the version that reached President Biden's desk.

Anyone following Congress over the past year knows that things are complicated. Other important priorities like the bipartisan infrastructure bill and voter rights legislation have occupied center stage. But we also know that the effort to protect the Grand Canyon from new uranium mines has come a long way since 2008 and one way or another, together, we will win permanent protection for this region.

What needs to happen this year?

2022 is the last year of the 117th Congress. If the bill doesn't pass the Senate, the Grand Canyon Protection Act will die yet again. In order to have another chance at becoming law, the process of House and Senate bill introductions, committee hearings, and floor votes would have to start all over again in 2023.

In 2022, we need the Grand Canyon Protection Act to be scheduled for a hearing before, and to pass out of, the Senate Energy and Natural Resources Committee, of which the bill's co-sponsor, Sen. Kelly, is a member. We then need senators Sinema and Kelly to seize any and every opportunity to pass the Grand Canyon Protection Act out of the Senate so that it may finally, after more than a decade of work, be signed into law by President Biden.

Please take a moment to thank senators Sinema and Kelly for their work thus far, and urge them to keep pushing. If you live outside Arizona, please urge your senators to support permanent protection for the Grand Canyon.

Amber Reimondo
Energy Director,
Grand Canyon Trust

LAVA FALLS AS A BIG DROP

"A ROSE BY ANY OTHER NAME WOULD SMELL AS SWEET"[1]

In many cultures, winter is a time for stories. It might seem logical that shorter days and colder weather are more conducive to staying inside and sharing stories. As river runners, we do so whenever there is someone (regardless of how many) to share with, and any time, place, or situation. In winter, maybe more so than other seasons, we are thinking of river trips past and those yet to be experienced. A good book of river stories to read any time is *The Big Drops: Ten Legendary Rapids* by Robert O. Collins and Roderick Nash or the revised edition by Nash, *The Big Drops: Ten Legendary Rapids of the American West*.[2]

According to Collins and Nash, "Big Drops are big rapids, whitewater, places where rivers go wild…Defining a Big Drop is almost as difficult as running one…In choosing the Big Drops, we tried to look beyond our own experience to the historical record…There was a temptation to overemphasize the Grand Canyon of the Colorado River…The decision to go beyond the Grand Canyon only increased the problem of choice… We wanted rapids that could be run more or less regularly by experts in standard river boats…The present treatment is limited by design to the American West…We also hoped to dramatize the fact that Big Drops, for all their might, are highly vulnerable. Dam builders characteristically eye whitewater with as much enthusiasm as boatmen…Big Drops, and the wild rivers that create them, are in fact the rarest outdoor recreational resource, and already dams have been seriously proposed that would inundate every Big Drop discussed in the following pages. They deserve instead our best preservation efforts. Without them wilderness whitewater boating will exist only as history."[3] In an "Epilogue: Honor Roll," Collins and Nash stated, "The following rapids, all of them Big Drops, have given their lives in the service of a civilization that, some feel, has yet to prove fully worthy of their sacrifice."[4] Of eleven Big Drops, the first two in the list are Lava Cliff and Separation Rapids in Grand Canyon. Of the chosen ten in both editions are numbers nine and ten, Crystal and Lava Falls.

At no time do Collins and Nash define a Big Drop as having anything to do with total drop in a rapid. In fact, they don't note the total drop for every rapid under discussion. Often, they'll mention the total drop of the river within the canyon or stretch for that river run, but there can be no comparison amongst the chosen ten. But recent readings of publications in the last few years brought me back to a topic I've been interested in for well over thirty years, the drop in Lava Falls Rapid. "Few rapids in the world grip the mind that way; few have the ability to condense a year, a lifetime on moving water into forty-five pounding seconds. Lava does. It is the *undisputed* Big Drop. Season after season, high water and low, kayaks to pontoons, Lava has a strong claim to being the most difficult stretch of runnable whitewater in the West, maybe in the world. The climax of every trip in the Grand Canyon is Lava Falls. A veteran boatman says, 'There is only one rapid on that river,' and no one who has run the

Colorado through Grand Canyon asks 'Which one?' The length and rhythm of the Grand Canyon river trip only reinforces this perception…It is the last major rapid, a final showdown with the river."[5] It has even inspired rapid naming around the world: "Lava South, Bio Bio River (Chile)"; "Lava North, Alsek River (Canada)"; and "Lava East, Coruh River (Turkey)."[6]

However, Collins and Nash do state the fall in the rapid at Prospect Canyon: "At Lava Falls the Colorado drops thirty-seven vertical feet; twenty feet of this occurs in an astonishing hundred yards at the top of the rapid—a rate of descent that Robert B. Stanton, with his engineer's eye, extrapolated at 352 feet per mile on his 1890 Colorado River survey."[7] As we shall see, this is not the first reference to 37 feet. But is this where several recent readings of a similar number come from? "In about a hundred yards the river drops thirty-seven vertical feet." "The river made a dizzying, nearly 40-foot drop here." "Lava Falls, with a vertical drop of almost forty feet."[8]

The first guess at a number was on August 25, 1869, by "Free Trapper" John Colton "Jack" Sumner, with trip leader John Wesley Powell: "We came to a fall, or the nearest approach to it of any on the river; about five miles above the fall the cañon has been completely filled up with lava when it was as deep as it is now, and has all been cut out the second time except at the falls, where there is a large lot of basalt still in the river making a fall of about 15 feet in 40 yds." Secret diarist George Young Bradley made no specific mention of the rapid, though wrote about a near accident while lining one of the heavy boats. In his geology notes, Powell referenced "See journal for Description of Lava," meaning the occurrence of the igneous deposits. In his daily journal referring to those deposits, Powell inadvertently named the rapid without capitalizing it, "Came to lava monument in middle of river, then to **lava falls** [emphasis added]. These falls must have been very great at one time."[9] We should all know by now that Lava Falls Rapid is not formed from the remnants of lava flows, but because of rocks from Prospect Canyon debris flows. Drops can change because of debris flows and river flows. Lava Falls has been called the most unstable rapid in Grand Canyon because of more frequently occurring debris flows.[10]

Surveying for a river-level railroad, in his 1890 field notes Robert Brewster Stanton noted (1890, published 1987), "The fall of this cataract No. 364 is about 15–18 feet in 200 [feet]" (equivalent to 22.5–27 feet in 300 feet).[11] Collins and Nash quote him from an earlier published version of his voluminous manuscript (1906–1909, published 1965):[12] "The Lava Falls had a drop of eighteen to twenty feet, and a length to the main rapid of some three hundred feet [equivalent to 12–13.3 feet in 200 feet]…This Lava Falls, for three hundred feet, had a steeper grade than any like distance on the whole river. It is at the rate of three hundred and fifty-two feet per mile."[13] The later manuscript edit was published first, prior to the field notes. Nash did not update Stanton's estimate that he and Collins quoted, not citing the second published, though preliminary, source. Stanton's two distances are estimations only, as his trip did not measure Lava Falls, as they only "decided to make instrumental surveys at all difficult points and take complete notes and a continuous photographic panorama of the whole route, for the preliminary report."[14]

Among other publications of early river runners' personal experiences, rarely did the voyagers venture a guess as to the drop in Lava Falls.[15] George F. Flavell, in 1896 with passenger Ramon Montez (spellings vary), ran the third complete traverse of Grand Canyon (August 17 to October 30), and had the first acknowledged run of Lava Falls.

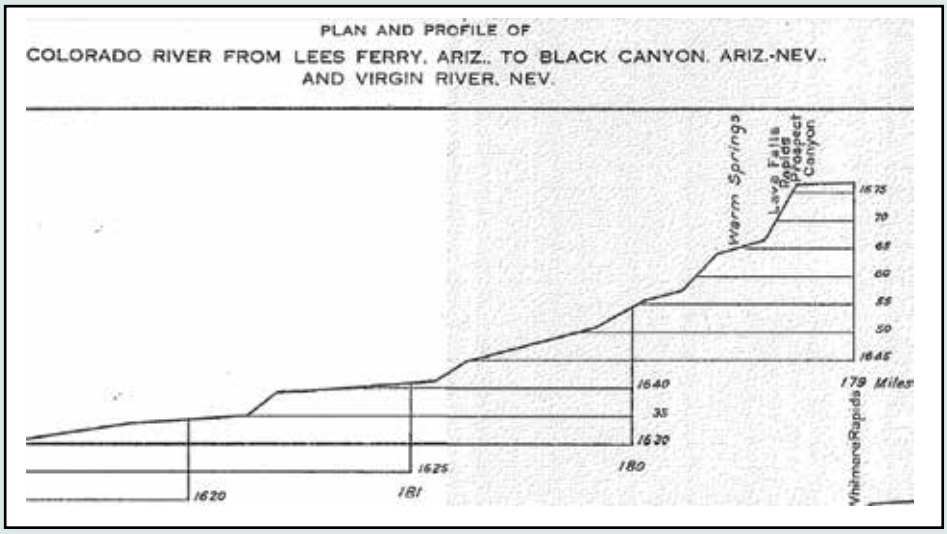


Figure 1. Plan and Profile, Sheet R, showing Lava Falls profile, river miles 179-182. Birdseye and Burchard, USGS, 1924.

Flavell wrote, "A bad rapid was run which put about eight inches of water in the boat." He summarized the trip and run through Grand Canyon, "I can say that there is no place where the river has a fall of over 15 feet to 100 yards, or a place where it has over 50 feet of fall to any one mile. I don't think there is any single rapid that has over a 35 foot fall—still that is pretty steep."[16]

None of these early accounts, including drops in Lava Falls or not, had been readily accessible until much later publications.[17] This was to change in 1923 with an expedition

surveying potential dam sites led by Col. Claude Hale Birdseye of the U.S. Geological Survey (USGS).[18] Previously, the USGS had surveyed many sections of the Green and Colorado River system, resulting in a series of "plan and profile" maps. The "plan" is a top-down view of the course of the stream, similar to a topographical map, and the "profile" is a horizontal view showing the change in elevation along the stream, such as drops through rapids. In 1924, under Birdseye's name, the USGS issued 21 sheets, 14 plan (map) and seven profile (elevation), for *Plan and Profile of the Colorado River from Lees Ferry, Arizona, to Black Canyon, Arizona-Nevada, and Virgin River, Nevada*, with topography by Roland Whitman Burchard. Birdseye noted, "we came to Lava Falls which we consider the worst rapid so far in the Marble and Grand Canyon series. It has a fall of only 10 feet in medium low water stage but this fall is very steep and rocky." This was upon first encountering the rapid on September 18, before the flow went from 9,380 cfs (cubic feet per second) to 42,800 cfs (Grand Canyon gage, about 90 miles upstream, so there is a lag in flow timing) as a flood delayed their progress for several days. That same day, boatman Leigh Brinton Lint confirmed Birdseye, "Lava Falls has a fall of 10 feet," and boatman Henry Elwyn Blake wrote, "Lava Falls, which has a steep fall for about two hundred feet." We now have three opinions for Lava Falls in 1923, without yet having been formally surveyed.[19]

As the flood flow peaked, Chief Topographic Assistant Herman Stabler wrote, "The character of the falls has completely changed. Instead of a short sharp cataract we now have a rapid a mile long." Birdseye added, "At 8 am the river had risen 16 feet and continued to rise all day, reaching the peak of a 20-foot rise about 6 pm." The next day with a lower flow, Birdseye wrote, "The river seemed to have receded a foot or so but there was no apparent change during the day…Our instrument station was still several feet under water and the river too rough for navigation." Boatman and publicist Lewis Ransome Freeman stated, "The river has fallen six feet during the night, but is still ten or twelve feet above the stage of the day of our arrival." Birdseye continued, "…resumed our voyage at 9:30 am with the river still about 7 feet above normal low water stage." Lint added, "This morning the water level was 13 feet below what it was at the peak of the flood and it went down about 1.4 feet during the day." Birdseye noted, "River fell 1.4 ft. during the night. Still 3.2 feet above normal low water stage."[20] He did not explain the relationship between "normal" and "instrument station" locations. Some geologists have speculated that "this abrupt rise led to one of the myths about Lava Falls that has been attributed to the 1923 USGS expedition. Some printed river guides portray Lava Falls as having a 37-foot drop…This is in fact the drop from the top of the rapid to the bottom of the fifth secondary rapid one and one-half miles downstream."[21]

The 1924 "Birdseye" maps then became standard for most river runners, and continued even with the more recent global positioning system (GPS) use with satellite navigation.[22] Around 1962, boatman Leslie Allen Jones reproduced the "Plan and Profile" ("P&P") in a continuous roll for easier on-river use. On his "Les Jones Scroll," he extrapolated a twelve-foot drop from the Birdseye profile.[23] A 1969 guide focused on geology rather than the river: W. Kenneth Hamblin and J. Keith Rigby produced three books in a series, with the second covering Lava Falls, *Guidebook to the Colorado River, Part 2: Phantom Ranch in Grand Canyon National Park to Lake Mead, Arizona-Nevada*. At "Mile 179.2, Lava Falls, **Thirty-Seven Foot Drop** [emphasis added]," the first time I have found that number in print. They also listed this drop in an earlier table giving ratings and drops, "Modified from Jones 1962."[24] Figure 1 is the "P&P" profile for Lava Falls Rapid and downstream for three miles encompassing the 37-foot overall drop. I leave it to readers to evaluate and interpret the drop in Lava Falls Rapid for themselves.

The editors of Flavell's 1896 diary have added some comments that should be addressed. Without stating a reference, they noted, "Lava Falls Rapid has a total fall of about 37

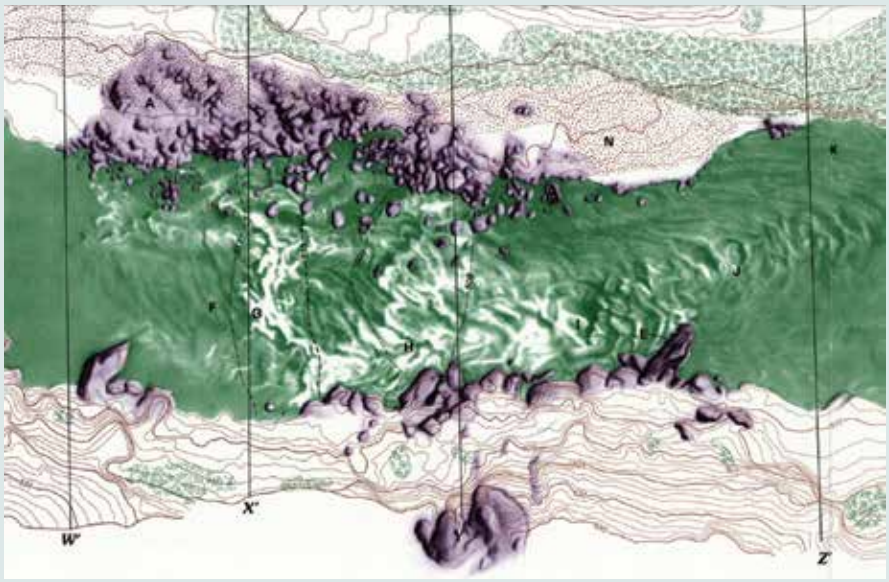


Figure 2. "Figure 5 – Water Surface Contours at Discharge of 5,000 Cubic Feet Per Second." Susan Werner Kieffer, Map I-1897-J, 1988.

YEAR	NAME	SOURCE	SOURCE DATE	DROP	DISTANCE	NOTE	REFERENCE
1869	Sumner	Sumner, 121	1947	15'	in 40 yds (120')	UHQ V. 15	
1890	Stanton (1890 field notes)	Smith/Crampton, 226	1987	15'-18'	in 200' [22.5'-27' in 300']		
1890	Stanton (1906-1909 ms)	Smith, 202-203	1965	18'-20'	in 300' [12'-13.3' in 200']		
1896	Flavell	Carmony/Brown, 69	1987	n/a			
1912	Kolb, E. L.	Suran, 138	2003	12' or 14'		very rough	ELK journal, not 1914 book
1923	Birdseye	Boyer/Webb, 185	2005	10'			
1923	Lint	Boyer/Webb, 186	2005	10'			
1923	Blake	Boyer/Webb, 186	2005		in 200'		
1923	Birdseye/Burchard	Birdseye/Burchard	1924	[~12']		orig Plan & Profile	Sheet R (profile)
1923	Birdseye/Moore	Birdseye/Moore, 192	1924 Apr.	10'		The Geologic Review	
1927		Jaeger, 167	1932	10-15'			Birdseye
1940		Goldwater, 93, 168	1940/1970	12' or 15'		Journey; Delightful	Stanton (Smith 1965)
		Jones	1962	12'			Plan and Profile
		Simmons/Gaskill, 101	1969				[Stanton (Smith 1965)]
		Hamblin/Rigby (pt. 2), 28, 77	1969 Apr. 5	37'		river log (geology)	[John Cross II ?]; modified Jones '62
		Belknap	1969-1988				Plan and Profile
		[GCNHA], 5	[ca 1969+]	37'			[Hamblin/Rigby]
		Braun/Nash, 143	1970	10'			
		Kingsley/Currey (West. Riv. Ex.), 21	1972	37'		map (geology)	Hamblin/Rigby Pt. 2
		Hansen (Tour West)	[1973]	12'			Plan and Profile
		Abbey/Playboy, 174	1977 Aug.	37'			Wally Rist quote
		Abbey/Blaustein, 107	1978	37'	in 200 yards (600')		Wally Rist quote
		Collins/Nash, 186	1978	37'	20' in 100 yards (300')		Hamblin/Rigby Pt. 2
		Crumbo, 48	1981				[P&P; Goldwater 1970]
		Stevens, [90]	1983-1995	37'			Hamblin/Rigby Pt. 2
		Lindemann	1984				
		Calvin, 424	1986	[30-40']		"three stories, almost four"	Collins/Nash
.	.	Smith/Crampton, 226	1987	37'	20' in 100 yards (300')		Collins/Nash
		Carmony/Brown, 69	1987	37'			Stevens
		Kieffer, Map J	1988	4m [13']	[~600', ~200 yds, fr CVA]	map (geology)	
		Billingsley/Elston (IGC), 30	1989	13'		Elston/Billingsley/Young	[H/R Pt.1]; Kieffer J
		Belknap/Evans	1989-now	13'			Plan and Profile
		Nash, 179	1989	37'	20' in 100 yards (300')		Hamblin/Rigby Pt. 2
		Lindemann, 119	1990-now	14.4'			H/R 1969; Stevens 1983
		Carothers/Brown, 34	1991	15'	in 200 yards (600')		
		Ghiglieri, 243	1992	13'			H/R 1969; Stevens 1983
		Brian, 117, 153	1992, 2015	13'			still deserves "10" rating
		Baars, 145	1994	37'			Stevens
		Stevens	1996-now				
		Webb (GC Century), 153	1996a	12'	main part		Kieffer Map J
		Webb et al 1 (Great Cat), 2	1996b	4m [13']			Kieffer Map J
		Fletcher, 295	1997	34' vert			
		Webb et al 2 (Lava Falls), 33	1999	4m [13']			Webb et al 1
		Whitis/Vinson, Map 32	2001	13'			
		Martin/Whitis, Map 32	2003-now	13'			
		Murphy/Staveley (Canyoneers), 123	2006	13'			H/R 1973; Stevens 1990
		Boyer/Webb, 190	2007	~14'			Webb et al 2
		Fedarko, 133	2013	almost 30' vert			H/R 1969; Stevens 1983
		Fedarko, 133	2014	almost 15' vert			H/R 1969; Stevens 1983

Figure 3. Many of the stated drops in Lava Falls Rapid, from a selection of commonly available published sources.

feet." Their "Selected Bibliography" does not include Collins and Nash. They do have Stanton *Down the Colorado*, of which we already have numbers that are not 37 feet. And they list Larry Stevens' popular *The Colorado River in Grand Canyon: A Comprehensive Guide to Its Natural and Human History*. It had Lava Falls as 37 feet from 1983 through 1995, but by 1996 it dropped all rapid drops, including Lava Falls, which remains the case today. Checking Stevens various reference lists, there is no Collins and Nash citation, but there is a Hamblin and Rigby Part 2. In 1979, I ran two Grand Canyon River trips with John Cross II. He was a boatman for his father John's company, Cross Tours, and transported Hamblin and Rigby down river for their field work. He told me about mentioning to them that the metal boat we know as the *Ross Wheeler* was called *Old Ironsides*. In 1994, we were both on the USGS Old Timers river trip, and I asked him if he had any clue that he might have something to do regarding Hamblin and Rigby and a 37-foot drop in Lava Falls. He didn't, but did venture that since he ran river trips for Hatch River Expeditions before his father started Cross Tours (in 1967), if he did tell them, then perhaps he acquired that number from someone at Hatch.

In 1988, the USGS published hydraulic maps of ten Grand Canyon rapids by Susan Werner Kieffer. Part of her "Figure 5" in *Hydraulic Map of Lava Falls Rapids, Grand Canyon, Arizona*, Map I-1897-J, is shown as Figure 2. It shows the overall length of the rapid at 5,000 cfs. Kieffer does not state the length of the rapid, but distances may be scaled from her cross-sections. The distance between W-W' and Z-Z' is about 200 yards. The length from the top of the first drop into the rapid at X-X' to just below the big black rock E is about 120 yards. In her "Discussion," Kieffer states: "At the discharge of 5,000 cubic feet per second, the water surface through the rapid drops **4m [meters]** (from 512m to 508m in elevation; Figure 5)," or **13 feet** [emphasis added].

As John Wesley Powell may have written, Ah, well! we may conjecture the following things:

In 1924, the USGS published their "Plan and Profile" of the Colorado River in Grand Canyon, with a profile of Lava Falls Rapid of approximately 12 feet. The rising flood waters during their stay at Lava Falls appears to not have affected their profile of the rapid, and does not seem to imply the conclusion of a 37-foot drop.

In 1962, Les Jones reproduced the P&P on a scroll map and assigned Lava Falls the same 12-foot drop.

In 1969, Hamblin and Rigby,

"modifying Jones 1962," assigned Lava Falls a 37-foot drop, the first time I have seen this in print. Did boatman John Cross II relay that information to them?

In 1978, Collins and Nash stated 37-foot, from Hamblin and Rigby.

In 1983, Stevens produced his river guide, which became very popular, using the 37-foot figure from Hamblin and Rigby, until removing all rapid drops in 1996, including that of Lava Falls.

In 1988, Kieffer gave Lava Falls a four-meter drop, or 13 feet.

To this day, the drop in Lava Falls Rapid often continues to be stated as 37 feet. Please peruse Figure 3, a chart showing many of the various statements as to drop, and their derivation.

Lava Falls: A drop by any other height would be as big.

C. V. Abyssus

Note: Comments, corrections, or additions to C.V.A. may be addressed to richard.quartaroli@nau.edu.

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2. *The Big Drops: Ten Legendary Rapids* by Robert O. Collins and Roderick Nash (Sierra Club Books, 1978, with color photos by John Blaustein); revised edition by Roderick Nash, *The Big Drops: Ten Legendary Rapids of the American West* (Johnson Books, 1989).
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5. Ibid., 180.
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14. Stanton, Down, 112; 1987, 118.
15. Frederick Samuel Dellenbaugh and John Karl Hillers, with Powell in 1872, hiked down to view Lava Falls and offered no drop estimate. Ellsworth L. Kolb (1912), indicated "12 or 14 ft.' very rough" in his journal but not his book; *The Brave Ones*: *The Journals and Letters of the 1911-1912 Expedition Down the Green and Colorado Rivers by Ellsworth L. Kolb and Emery C. Kolb, including the journal of Hubert R. Lauzon* (Fretwater Press, 2003), 138, transcribed and edited by William C. Suran; Ellsworth L. Kolb, *Through the Grand Canyon from Wyoming to Mexico* (The Macmillan Company, 1914), 254-5.
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17. See Fig. 3 for publishing dates.
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19. Ibid., 185-196. See also, Robert H. Webb, Theodore S. Melis, Thomas W. Wise, and John G. Elliott, *"The Great Cataract": Effects of Late Holocene Debris Flows on Lava Falls Rapid, Grand Canyon National Park, Arizona*, (USGS, 1996) U.S. Geological Survey Open-File Report 96—460, 35, https://pubs.usgs.gov/of/1996/ofr96-460/; "During the expedition, the water-surface fall of the Colorado River was measured and 'adjusted' in an undescribed manner to a uniform discharge of 280 m3/s. Upon arrival at Lava Falls, they photographed the rapid at a discharge of 260 m3/s but the surveying crew did not measure its fall," Birdseye, unpublished diary, 1923. In 1938, C. H. Birdseye wrote that "The measured fall in the highest rapid—Hance Rapid—was 28 feet in a few hundred yards"; "Exploration in the Grand Canyon," *The Reclamation Era* 28(August 1938):171.
20. Boyer and Webb, 185, 186, 190, 191, 192, 194, 195.
21. Quote is: Ibid., 190 fn 35. Similar statements are by Webb or Webb et al: Robert H. Webb, *Grand Canyon, a Century of Change: Rephotography of the 1889-1890 Stanton Expedition* (The University of Arizona Press, 1996), 153, 264 en 50 and 51; Webb, et al, *"The Great Cataract"*, 2, 35; Robert H. Webb, Theodore S. Melis, Peter G. Griffiths, John G. Elliott, Thure E. Cerling, Robert J. Poreda, Thomas W. Wise, and James E. Pizzuto, *Lava Falls Rapid in Grand Canyon: Effects of Late Holocene Debris Flows on the Colorado River*, (USGS, 1999) U.S. Geological Survey Professional Paper 1591, 33, 60, https://pubs.usgs.gov/publications/pp1591. Thus, it appears to me, Webb et al may be the sources of the attribution.
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25. The original is in the Grand Canyon Museum Collection, "Journal of the Panthon," part of GRCA 22495.
26. Carmony and Brown, 99, en 16.
27. Larry Stevens, *The Colorado River in Grand Canyon: A Comprehensive Guide to Its Natural and Human History* (Red Lake Books, 1983), 90.
28. Hamblin and Rigby, Part 2, Fig. 21, p. 38, "Old Ironsides. The boat was constructed and used by William Wallace Bass...." In fact, Bert Loper and George Meiss built the *Ross Wheeler*; Brad Dimock, *The Very Hard Way: Bert Loper and the Colorado River* (Fretwater Press, 2007), 200.
29. See Richard D. Quartaroli, "The Begats: Grand Canyon River Outfitter Genealogy," *Boatman's Quarterly Review*, 26(4)(Winter 2013-2014):[10], in "Arizona River Runners" section.
30. Susan Werner Kieffer, *Hydraulic Map of Lava Falls Rapids, Grand Canyon, Arizona*, Map I-1897-J (USGS, 1988), https://pubs.er.usgs.gov/publication/i1897J. The other nine rapids evaluated by Kieffer may be accessed at https://pubs.er.usgs.gov/search?q=&contributor=Kieffer&year=1988.
31. Distances are inferred by C. V. Abyssus. Four meters converts to 13.1234', or 13' 1 ½". Perhaps the USGS can pick up where Webb et al and Kieffer left off, and take some stage discharge and distance measurements at Lava Falls during High Flow Experiments and constant 8,000 cfs photography flows to update the data.

Photos: John Blaustein

WHAT DROUGHT MEANS FOR SOUTHWESTERN LANDSCAPES

Introduction

Each year, more than 20,000 people raft the Grand Canyon, many of whom will experience this iconic landscape for the first and only time. Visitors to our region for their once-in-a-lifetime Grand Canyon experience might be surprised to see forests and wetlands in addition to deserts. While locals are seeing changes to the Colorado Plateau woodlands, many visitors may not be able to distinguish between our normal desert landscapes (we have cactus!) and the increasingly dry and hot conditions we have experienced in recent decades. Helping visitors see these drought impacts could help communicate that climate change is not a problem for future generations but something affecting us now.

The southwestern US ("Southwest") is one of many dry regions around the world located within about thirty degrees of the equator. As global temperatures rise, these dry zones are getting drier and are likely expanding[1]. Dryland expansion and aridification alters water availability, which touches our lives and ecosystem health in the Southwest. This essay focuses on drought impacts on ecosystems across the Four-Corners region and Grand Canyon, with particular attention to the forests and woodlands that contribute, in part, to Colorado River flows.

Drought

In September 2021, the National Oceanic and Atmospheric Administration (NOAA) Drought Task Force released a report about the ongoing Southwest drought, which is predicted to last (at least) through 2022[2]. From January 2020 through September 2021, precipitation across the Southwest (New Mexico, Colorado, Utah, Arizona, Nevada, and California) was the lowest since measurements began in 1895 and temperature was the third highest.

Drought severity can be assessed through "drought indices" that merge precipitation and temperature information. The Palmer Drought Severity Index[3] (PDSI; Figure 1) is one such index, and NOAA often uses PDSI to quantify drought severity and map the affected area. PDSI is not a perfect measure of drought, but it is useful for understanding longer-term (twelve months or longer) drought conditions.

Since the start of the 21st century, the Southwest has experienced unusually dry and hot conditions[4], and average monthly PDSI has been firmly in the "Extreme Drought" category (PDSI <= -4). PDSI has reached "Extreme Drought" conditions many times since formal weather measurements started in 1895 (Figure 1). For example, from 1900 to 1922 when the Colorado River Compact went into effect, just four percent of the months were classified as "Extreme Drought." From 1946 to 1966 (22 years before Glen Canyon Dam operations started), six percent of the months fell into this PDSI category. In contrast, more than thirty percent of the months since January 2000 fall into this PDSI category, making the extreme drought of the start of the 21st century unprecedented in the instrumental record (Figure 1). Impacts on Colorado River flows are clear, and persistent drought conditions over the past two decades have contributed to the first-ever shortfall of water in the system since the Colorado River Compact went into effect in 1922[2].

What about conditions that directly affect flows through the Grand Canyon? Conditions in the Upper Colorado River Basin, especially Rocky Mountain snowpack, control the amount of water entering Lake Powell and then Grand Canyon[5]. While the Upper Colorado River Basin is projected to have above historical average precipitation through the end of the 21st Century, higher temperatures (1 to 4°C above historic average[6]) will likely accompany increased precipitation. Air temperature controls evaporation of water from the land surface and vegetation. More water can evaporate under warmer conditions, so higher temperatures decrease groundwater infiltration in the Upper Colorado River Basin and flows into Lake Powell. Computer models indicate that flows through the Grand Canyon will decrease by about eight percent per 1°C (1.8°F) increase in temperature in the Upper Colorado River Basin[7]. In other words, a temperature increase of 1°C increase will likely decrease flows into Lake Powell by approximately eight percent, while a 2°C temperature increase will decrease flows by 16-17 percent even if precipitation in the Rocky Mountains is normal or high[7].

Ecosystem Impacts

Droughts adversely affect river flows and have major impacts on regional ecosystems. Away from

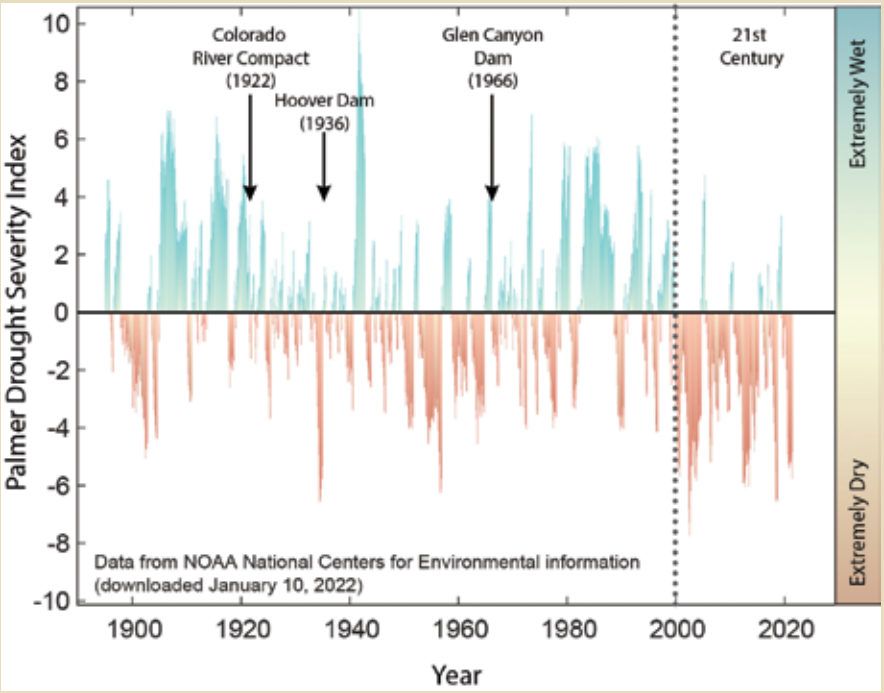

Figure 1. Palmer Drought Severity Index (PDSI), a common drought index, for the Southwest calculated based on the instrumental record (1895-present). Since the start of the 21st century, the Southwest has experienced frequent extreme drought conditions (PDSI < -4), undermining the ability of ecosystems to recover from one drought before the next extreme drought strikes.

Figure 2. A lone living piñon emerging from a sea of dead junipers off of Highway 89 north of Flagstaff, AZ (May 1, 2021). This area experienced a massive piñon die-off in 2002-03, but the remaining piñons were likely more deeply rooted than the surrounding junipers, allowing them to access more stable water sources (G. Koch, personal communication).
Photo Credit: Kimberly Samuels-Crow.

river corridors, most Southwest ecosystems are water-limited with plants that are relatively well adapted to dry conditions. However, even drought-adapted ecosystems are sensitive to increasingly frequent hot droughts. Rugged topography in the Southwest puts vastly different ecosystems near each other due to differences in elevation, aspect, and geology. For example, driving north from Flagstaff to Lees Ferry, we leave the world's largest contiguous ponderosa pine forest and pass through piñon-juniper woodlands, juniper savannahs, shrublands, and grasslands. Each ecosystem is shaped by the temperature and precipitation conditions that it historically experienced. Grasslands tend to dominate lower elevations that experience relatively low precipitation and high temperatures, while ponderosa forests emerge at elevations where mean annual temperatures are lower and precipitation is higher. Higher temperatures and increasing aridity across the region will ultimately change how ecosystems interact with water resources.

Sustained drought accompanied by increased temperatures have had an impact on even the most drought-tolerant ecosystems. Since the start of the 21st century, there have been dramatic changes to piñon-juniper woodlands that dominate elevations between around 5,000 and 7,000 feet. In 2002–2003, drought conditions spurred a massive mortality event that killed off vast numbers of piñon trees across the Southwest. In this case, bark beetles ultimately caused death, but drought conditions and high temperatures led to a large beetle population and decreased the trees' ability to fight off beetles[8].

Piñons are relatively less drought-tolerant than junipers[9]. However, sustained drought conditions across the Southwest have put even highly drought-tolerant junipers at risk. Severe drought led to juniper mortality in the Bears Ears region (Utah) in 2018, particularly at low elevations[10]. In 2021, the Forest Service documented a die off of more than 100,000 acres of junipers in northern Arizona[11]. Juniper mortality is evident on the drive from Flagstaff to Grand Canyon—whether you're headed north on Highway 180 toward the South Rim or on Highway 89 toward Lees Ferry (Figure 2).

Drought also has direct impacts on ecosystems dependent on river flows (riparian ecosystems), but those impacts vary by river. Riparian plants along the Colorado River through the Grand Canyon have been buffered from drought so far, due to the constant, comparatively high-water releases from the dam[12]. In fact, riparian plants have expanded in this stretch of river since dam operations began (Figure 3).

The story is different on the Bill Williams River below Alamo Dam. Between 2014 and 2017, extensive cottonwood mortality occurred despite regulated flows. Regional drought contributed to low reservoir levels, so less water than usual was released from Alamo Dam. This decreased water release contributed to lower water availability for cottonwoods[13]. Dam operations have the potential to buffer riparian plants from drought only as long as typical release volumes can be sustained.

Flood timing and magnitude in Colorado Plateau rivers and streams is predicted to change, decreasing water availability as climate changes[14]. Some perennial streams are at risk of becoming intermittent, and some intermittent streams are at risk of becoming dry[15]. The combined influences of river flow change and increased temperature will likely mean more cottonwood and willow loss and increases in more drought-tolerant riparian plants[14].

Figure 3. Riparian plants along the Colorado River in the Grand Canyon have so far been buffered from drought due to regulated flows from Glen Canyon Dam. This has allowed riparian plants to increase over the last six decades.
Photo credit: Emily Palmquist.

It rained!
Does that turn things around?

Longer term precipitation patterns shape ecosystems and regional water availability more than individual rain or snow events. The recent juniper die off on the Rim (Figure 2) is likely the result of many years of below average precipitation and above average temperatures, and a single season of above average precipitation can do little to bring ponderosa, piñon, and juniper trees back from the brink of mortality. Woody plants in the Southwest generally rely more on winter precipitation than summer precipitation, so more snow can greatly benefit Colorado Plateau trees[16]. Although future snowpack trends remain unclear[2], the start of the 21st century hasn't been promising—the amount of snow in the Upper Colorado River Basin on May 1 has been below long-term median values in twelve of the last 22 winters[17].

The region also receives precipitation during the summer when the North American Monsoon is active. Summer rainstorms and higher humidity alleviate some stress on trees. Piñon and juniper tend to respond quickly to changes in air temperature and humidity[18], so they are sensitive to these day-to-day changes during the monsoon. However, monsoon rains rarely soak deeply into the soil, because summer temperatures enhance evaporation from the surface soil, and high intensity thunderstorms can lead to increased runoff (and sometimes flash floods). This makes rain that falls in the summer less useful than snow for Colorado Plateau trees, but it is still important for decreasing fire risks and supporting other, crucial parts of the ecosystem, and the overall contributions of the monsoon to tree health are an area of active research[19].

Ongoing research using tree-rings and other data is finding that drought events can have long-lasting impacts of "drought legacies," and it can take Southwest conifer trees up to four years to recover from a severe drought[19]. For example, if a drought is interrupted by a wet year, the trees and local ecosystems often cannot take advantage of the increased water availability the additional precipitation provides. That's because sustained drought likely caused damage to their tissues, cells, or metabolic processes, impeding the trees' ability to quickly recover when conditions improve.

Drought legacies are alarming because droughts in the Southwest are becoming more frequent and more severe[20], so droughts are hitting trees and ecosystems before they can fully recover from the previous drought[19]. This begs the questions: how will increasing drought severity and frequency impact our beloved ecosystems? What will our ecosystems look like in 25, 50, 100 years from now? Will they be composed of the iconic plant species that currently define the region, or will piñon, juniper, and ponderosa become rare specimens on the landscape? How might dramatic changes in the occurrence and distribution of these dominant tree species impact the water cycle and stream flow? We do not have definitive answers to these questions, but they drive current research by scientists studying drought impacts in the Southwest.

Climate Change is Happening Now

We do not know exactly what the future holds for the Southwest, but data and computer models, which rely on the best estimates of the physics and dynamics of the climate system, make it clear that temperatures are rising globally and that drylands are becoming increasingly arid[21]. Precipitation varies from year to year and season

to season, but rising temperatures increase evaporation, reducing the amount of water soaking into the soil and flowing into rivers. Changes to water availability in the Southwest will certainly change our landscapes, our outdoor experiences, and visitor experiences. Guides are in a unique position to communicate these regional impacts of global change to people who may not be able to witness the changes for themselves.

Kimberly Samuels-Crow[1], *Kiona Ogle*[1], and *Emily Palmquist*[2]

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Dont' Forget to Register...

Don't forget to register for the V-GTS (March 26-27, 2022)—listen and learn from our tribal partners, NPS staff, and special guest speakers discussing the impacts of climate change on the Colorado River! Anyone can join in by Zoom, and it's FREE, but you must register to receive the Zoom links!! GCRG and the Whale Foundation will also be co-sponsoring an important Point Positive workshop dedicated to promoting safety, inclusion, and respect within our river community. And or course, these great events are followed by yet another phenomenal learning opportunity—the Guides Training Seminar River trip (April 1–7, upper, and April 7–16 lower). So much incredible knowledge to be shared! Check out the GCRG website for details (look under Guide Resources), or watch out for Boatman's Beta emails for the latest info. Not on our Boatman's Beta email list? Go to our website to sign up, or email Lynn at info@gcrg.org. Boatman's Beta is an easy way to get dialed in with everything you need to know!

V-GTS

guide profile

Rio Hibarger

Where were you born where did you grow up? Fort Smith, Arkansas. I'm working on the growing up part. I lived in the Ozark National Forest in central Arkansas until I was 12 and in Weston, MO during high school.

Who do you work for currently (and in the past)? Currently in Grand Canyon I row for OARS and I guide for Bio Bio Expeditions on the Futaleufu. During college I worked for Echo River Trips on the Middle Fork of the Salmon and Main Salmon, but I trained and started guiding for Bill Dvoraks Kayak and Rafting Expeditions and since worked for several river companies in eleven countries.

How long have you been guiding? My dad knew I wanted to river guide so he sent my sister, Mariah, and I to attend a month long, whitewater skills camp with Bill Dvoraks Kayak and Rafting Expeditions based in Nathrop Colorado. It was really high water that year. I was 16 turning 17, and Mariah was 14. After the camp ended, I asked Bill for room and board work for the rest if the summer. He said yeah, and helped me get my swift water rescue certification. I ended up working four more full seasons for him fixing gear, running shuttles, rowing gear boats, later guiding, teaching kayaking, and canoeing on the nine different rivers Dvoraks had permits to run. We had lots of international guides there so once I was 18, I had river guides from many countries inviting me to visit and they'd help me arrange river work during northern hemisphere off seasons. I put off college until I was 24. I haven't had a winter for the last twelve years and most of my years since 1997 have been year round summers.

What kind of boat(s) do you run? Oar and paddle Rafts, Dories, Kayaks, Sweep rigs, Drift Boats, Canoes, Safety Cats, and Death Stars (dories and baggage rafts lashed together and steered with a motor) in the lower reaches of Western Grand Canyon…

What other rivers have you worked on? Green, Dolores, San Juan, San Miguel, Rio Chama, North Platte, Arkansas, Gunnison, New, Gauley, Main and Middle Salmon, Snake, Selway, Owyhee, Lochsa, Tuolumne, Rogue, White Salmon, Toutle, Green (WA), Snoqualmie, Kaituna, Rangitaiki, Wairoa, Mohaka, Rangitata, Mendoza, Rio Diamante, Futaleufu, Azul, Apurimac, Cotahuasi, Urubamba, Trisuli, Sehti, Sun Kosi, Bhotekoshi, Karnali, White Nile, and Zambezi.

What are your hobbies/passions/dreams? Kayaking, kitesurfing, I bike most everyday I'm off the water. There is a moratorium on any type of ski or snowboard talk in my life cause I ain't been finding no winters! I don't mind working on cars, trucks, and machinery.

I'm passionate about having milk in my coffee and how and what I load on my rig or in my gear before heading out to whatever river season.

A return to Peru and the Marañon with continued travel to Colombia.

Married/family/pets? Does it work when folks as young and me do that?

My parents are still able to run chainsaws, fight the Missouri and Arkansas weeds, and they plant native species in what used to be overgrazed land. I have a brother and two sisters who are comfortable with horses and water.

I'm petless, but I sure have had some good dogs show up. Its tough to travel with dogs lately, so I've been telling 'em "get" even if they are quick looking, tricolored hounds.

School/area of study/degrees? Evergreen State College, Olympia Washington, History and Social Movements. I haven't seen a convincing argument to apply to graduate for my bachelor's degree in anarchy, but they still assure me that those credits won't loose their validity.

What made you start guiding? When I was thirteen I came home from school and my mom told me she'd sold our milk cow, who was too old to calf or produce milk. I's like "What? Who'da bought that old cow," and she said, "It was these two guys that were building a farm that kids from Kansas City could visit to see what a real farm

looked like." I thought well, they must be real suckers and figured maybe I can line up some more work that'll pay so I can get out of the town when the time comes. Well, that job was a great job for a kid to have and that cow lived to be the oldest cow in Missouri with all the kids petting her. One day, early on, I heard one of the owners talking about river guiding in his college days. I thought, "Wow!" is that really a thing? It was about nine A.M., about to get real hot, not sure what all I was gonna be doing that day, but I thought, OK, new plan.

The winter after high school I was working on one of the best concrete crews the planet ever knew. It was a solid gig and a hard one to leave, but I finally turned 18. I could start carrying passengers legally, so come May it was time. I bought donuts for the crew my last morning at the site. That afternoon when we had the forms set for the next day's pour I headed to Colorado. I knew I'd miss the old timers there, they said hilarious things, I was just about to qualify for all the benefits, and they had a lot more to teach me. For a number of years, I'd come back and work a month or two with them in-between seasons. I worked making bird feeders at the farm when I broke my legs and was in a wheel chair. I quit needing that work a long time ago, now I just visit.

What brought you here? The desire to work as long of river trips as possible and to row dories in Grand Canyon.

Who have been your mentors and/or role models? My great grandparents, my grandparents, my parents, my aunts and uncles, my cousins, a couple of my mom and dad's friends, my bosses, hitchhikers I've picked up, people who've picked me up hitchhiking, this college professor and another one I had, people leading the conversations I've overheard while riding on trains, some of those good folks who paid to run the river with us, Willie Nelson, this boss I have who happens to be the Guide of Guides, my high school's maintenance engineer, and this person who lives downstream and don't have no flaws.

What do you do in the winter? I am base linja for Bio Bio Expeditions in Chilean Patagonia where I guide the Futaleufu in stern mount paddle rafts, safety kayak, and safety cat. I run horse trips, and repair and develop anything I'm able to do on our five star base. If the water is too high to guide we paddle our kayaks more.

Is this your primary way of earning a living or do you combine it with something else? Yes it is. Everything else I do is what folks who know call a liability.

What's the most memorable moment in your guiding career? There have been a few eddies I was real happy to catch, a few canyons I was happy to make it through, or even happier we called it off and stayed out of. I think guiding those high volume, free flowing, multi-day rivers in Nepal stand out as my best memories of working rivers so far.

What's the craziest question you've ever been asked about the canyon/river? A participant on one expedition asked me if I thought I'd ever commit to anything? I thought, "What do you think I've been doing ever since I was 13 when I decided what I was gonna do with the rest if my life?"

What do you think your future holds? They told me I get to safety kayak next week. Woo hoo!

What keeps you here? My phone gets ten gigs of data a month. I wouldn't want to risk going over by staying in town. They really make it hurt if you go over.

call for volunteers! adopt-a-beach needs you!

Our Adopt-a-Beach long-term monitoring program will need volunteers for the 2022 river season! Whether you'd like to adopt/photograph the same beach that you've had in the past (which is helpful for consistency) or whether you're volunteering for the first time, it's easy and we provide you with everything you need! The Colorado River is experiencing unprecedented and rapidly changing conditions due to long term drought. This important citizen science program documents changes to the camping beaches we all depend upon and is supported through a cooperative agreement with the U.S. Geological Survey. Send an email to Lynn at info@gcrg.org or call the GCRG office at (928) 773-1075. Thanks very much for your help!

Colorado River Tides[1], Part 2

Discharge Wave Evolution

This is the second installment of Colorado River Tides. Colorado River Tides, Part I—including a revised tide table—appeared in last BQR Volume 34, Number 2, Fall 2021.

On most days, the Glen Canyon Dam, 15.5 miles upriver from Lees Ferry[2], begins to increase its discharge in the early morning hours. The first sign of this rising flow passes Lees Ferry between 6:45 and 7:00 A.M. The flow then may follow one of many variations on a common pattern represented in Chart 1.

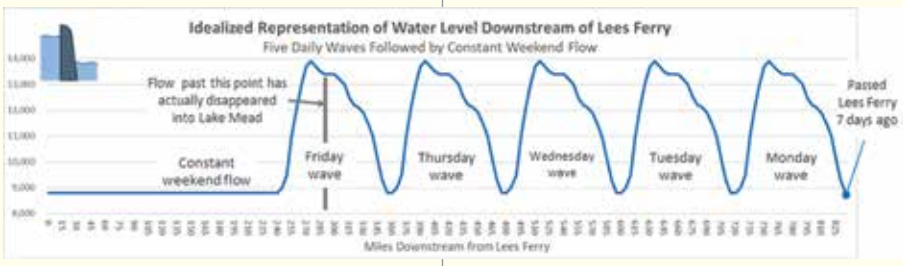

Chart 1

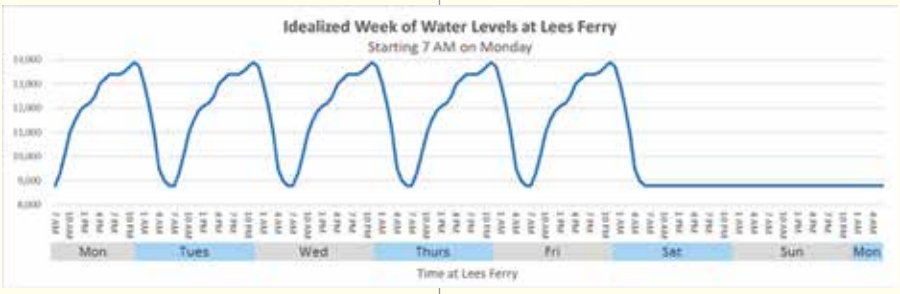

Chart 2

If you imagine starting with low flow from the dam, then increasing for a number of hours, then stabilizing at a high level for a while before dropping back to low flow, you can picture a "discharge wave" informally referred to as a "bubble" starting at the dam and stretching about 120 miles downstream. Often there will be five successive waves emitted by the dam between Monday and Friday followed by about 240 miles of relatively constant low water representing "weekend flow." Here is what an idealized series of five waves might look like. Think of this as a snapshot of seven days of flow at one moment in time as if water could flow freely 900 miles past Lees Ferry:

Chart 1 is one picture of flow for which there are many daily and weekly variations. (Note that the Tuesday wave in this depiction accurately represents the flow at Lees Ferry on Tuesday, April 26, 2016. It is the only accurate wave in this stylized representation. The days varied somewhat and there were tides on the weekend.)

If instead of taking a snapshot of all seven days of flow at once, you graph the changing flow at a single point such as Lees Ferry, you get exactly the same pattern—except reversed. The flow on the far right of Chart 1 above was the first part to pass Lees Ferry at about 7 A.M. seven days ago and everything to the left of it followed. Chart 2 is a depiction of the water level at Lees Ferry over the same seven days. Note the x-axis now represents time of day instead of miles from Lees Ferry, and Chart 2 is a horizontally reversed version of Chart 1.

In other words, graphing the river level at Lees Ferry over a period of a day or more depicts a discharge wave with its leading face on the left and its tail on the right of the curve. You can still get a view of the shape of five successive waves if you picture the left side of Chart 2 as the leading edge and the right side (weekend flow) as trailing edge of the snapshot. It's important to understand this non-intuitive reversal to follow the rest of the description.

Chart 3 represents a typical day at Lees Ferry. Flow increases steadily until about 10 A.M. and then continues a slow ramp up until early evening. Flow rises very slowly for a few hours, peaking at 11 P.M., and then begins a sharp drop off before midnight, approaching low flow in the early morning hours. It stays low for 45 to 90 minutes and then begins to rise. This is a common pattern, but there are many variations on this theme.

In Charts 1 and 2, I simplified the

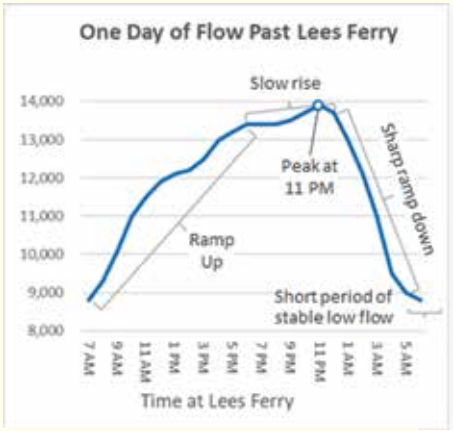

Chart 3

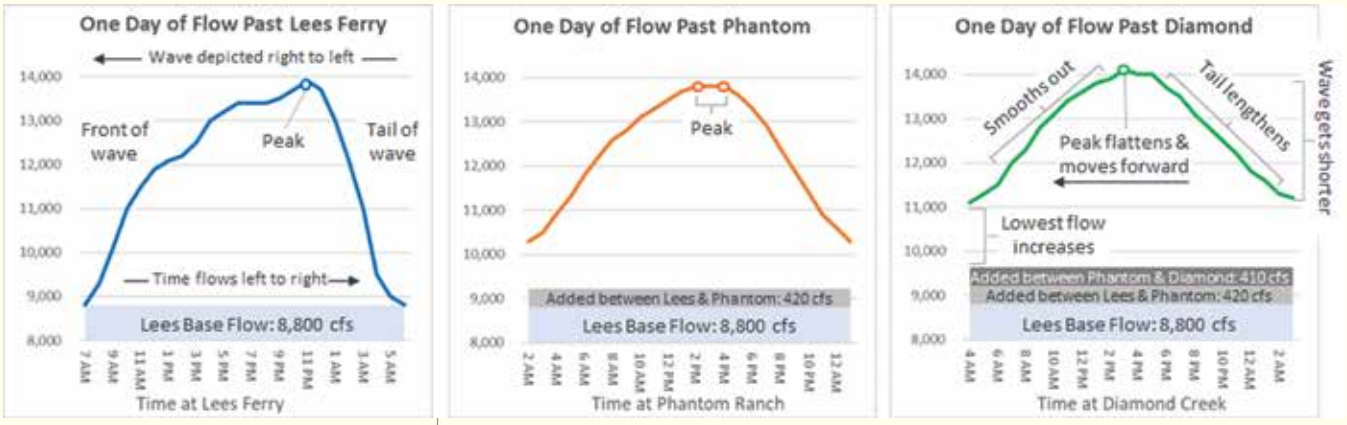

Chart 4

multiday discharge waves a great deal. As waves move downriver, they evolve in predictable ways. Using the example wave we have been working with, let's take a look at various aspects of that evolution. Chart 4 shows three views of the wave that started at Lees Ferry at 6:30 A.M. on the 26th of April 2016:

The most notable changes in the shape of any significant wave between Lees Ferry and Diamond Creek are:

- Jagged places smooth out.
- The base spreads and comingles with the preceding and following days' flows (Lazenby, 1987, page 1).
- The tail lengthens substantially.
- Peak flow moves faster than lower flow and progresses forward—to the left—on the wave (Lazenby, 1987, page 5).
- Often, the peak flattens as the wave moves downriver, increasing the uncertainty of the time the wave starts to fall.
- Variation between minimum and maximum flow decreases.

Charts 5 and 6 reveal the details of the collapsing wave as minimum flow rises and the peak falls. The difference between high and low flows diminishes from 5,100 to 3,500 to 2,950 cfs. Note that the maximum flow at all three gauge stations remains pretty close to the same value because the shortening of wave height is counterbalanced by inflows and the rising of the lowest

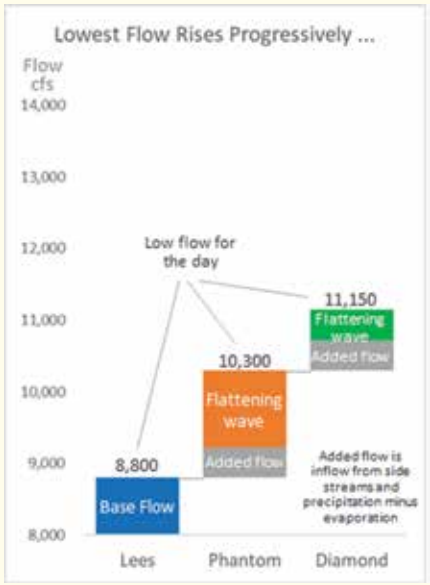

Chart 5

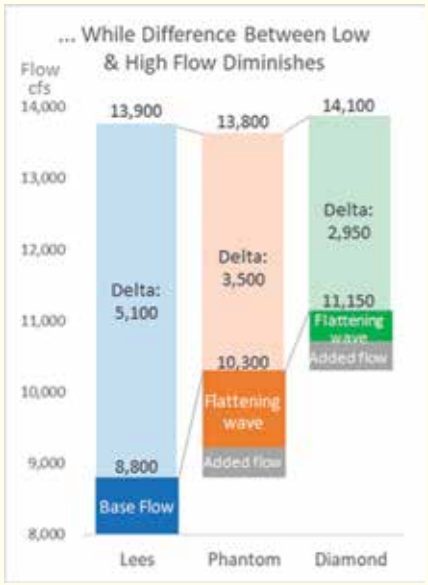

Chart 6

point of the wave due to flattening (as high points drop, low points rise).

START TIME OF RISING TIDE AT LEES FERRY

All of the varying estimates I have seen of the start of the rising tide at Lees Ferry are at odds with data logged at the Lees Ferry gauge station. On days with significant tides (at least 2,000 cfs difference between low and high tide), over 87 percent of the time the tide starts to rise within an hour of the common 6:45 to 7:00 A.M. window.[3] See Chart 7.

For years the Bureau of Reclamation has advised boatmen that the river at Lees Ferry starts to come up about 10 A.M. (see sidebar below). While highly inaccurate, 10 A.M. is still a good rule of thumb for planning a launch because much of the prior drop off below the 10 A.M. level will have occurred in the early morning and by 10 A.M. flow is increasing rapidly. The problem is that 10 A.M.

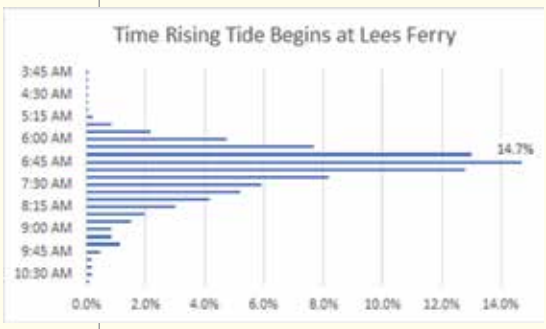

Chart 7

is a terrible baseline for projecting flow downstream leading to huge errors in estimating high and low tides and in wave speed.

DISCHARGE WAVE SPEED & TIDE VARIATION

Note that "wave speed" is quite different than the speed of the water. The average downriver speed of the water molecules themselves is a leisurely 2.3 miles per hour when the river is running 15,000 cfs and four miles per hour at a torrential 45,000 cfs.[4] The water molecules linger along the way as they swirl in eddies and engage with various obstructions (Graf, 1997, page 2). The discharge wave propagates through water at a much higher speed than the water itself just as sound speeds through the medium of relatively stationary air molecules.

Most sources I have come across claim the wave flows between 4.0 and 4.5 miles per hour. Some sources claim the wave flows as fast at 5.0 miles per hour at very high levels. In fact, at common levels, the wave travels between 4.15 and 5.85 miles per hour.

Speed of Discharge Wave Above and Below Phantom Ranch

Few sources attempt to distinguish speeds above and below Phantom Ranch. Another interesting finding from my analysis is that the river flows about 0.85 miles per hour faster below Phantom Ranch than it does above. We can use this distinction to improve the accuracy of tide tables for locations throughout the river corridor. Chart 8 summarizes these findings.

This chart ties out nicely with results of the only other study I could find of discharge wave speed. The 1987 paper—using data collected in 1985—determined the speed from Lees to Phantom is 4.8 miles per hour and phantom to diamond 5.3 miles per hour (Lazenby, 1987, page 8). The paper did not distinguish between different water levels.

A Canyon Noir Mystery

On April 20, 2021 I spoke with a staff member at the Bureau of Reclamation that I'll call Flo. I asked Flo for help understanding why water so often starts to rise at Lees Ferry before 7am implying an implausibly early 4am ramping up at the dam. (It takes 3 hours for the discharge wave to travel from the dam to Lees ferry - Lazenby, 1987, page 8)

Flo explained that a 4am start makes sense because regulations limit how much the dam can increase its release per hour so if they start to ramp up about 4am they can be at high water by mid-morning.

In a bizarre twist, next morning Flo emailed to say that Lees Ferry actually comes up at 10am. When I confronted her with public data showing the water at Lees Ferry beginning to rise at 6:45am that very morning, Flo said the Bureau was formally retracting all previous comments.

Simple mistake or nefarious plot tied to the seamy underworld of western water politics? Jake Gittes is on the case.

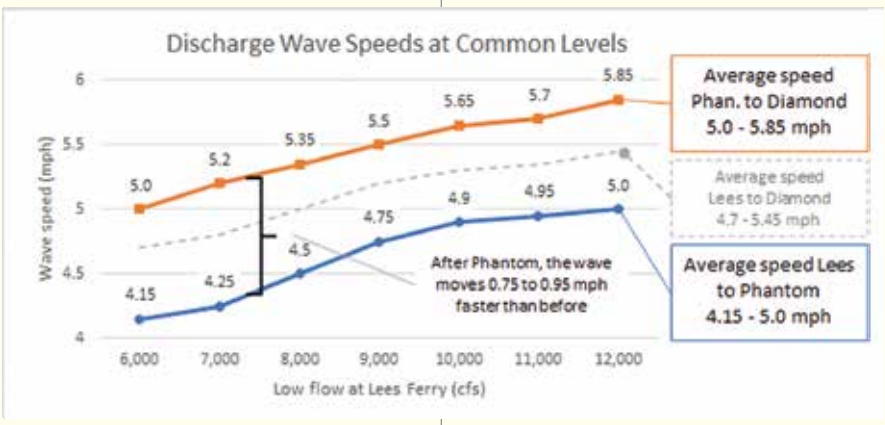

Chart 8

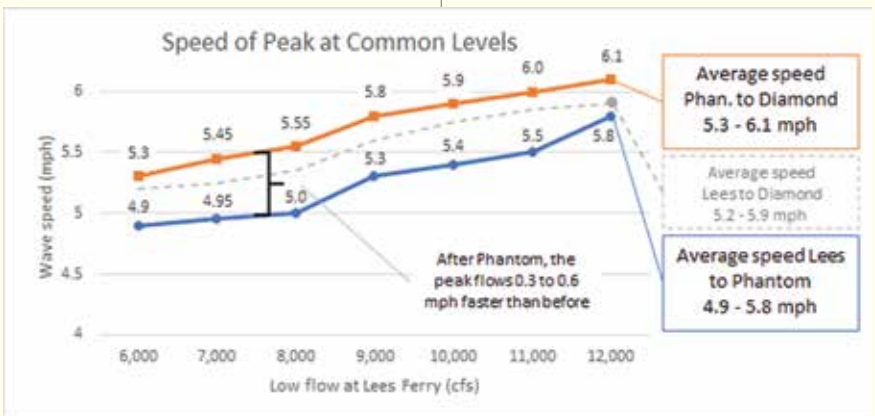

Chart 9

Speed of Peak at Common Levels

The timing of peak flow carries a fair bit of uncertainty. Indeed, the "peak" of a wave at Lees Ferry is often fairly flat, more akin to a mesa than a peak. And the wave tends to flatten as it progresses downriver, further complicating the assessment.

A small variation in measurement could advance or delay the time the peak appears to pass a given point by 60 to 90 minutes—up to a three-hour window where a peak might appear in the data for a given wave.

While the discharge wave flows considerably faster than most sources claim, peak flow is faster still. In other words, the peak of the wave travels forward on the wave as it progresses downriver. This peak migration is another reason for higher

uncertainty about the time the tide begins to ebb. Chart 9 shows the speed of peak flow before and after Phantom Ranch.

Faster Peak Flow Migrates Forward on the Discharge Wave

On average the peak flow moves 0.55 miles per hour faster than the overall wave before Phantom Ranch and 0.25 miles per hour faster after Phantom. When low flow at Lees Ferry is 9,000 cfs, peak flow on average travels:

- Ten miles more than the front of the wave by the time it reaches Phantom Ranch,
- An additional four miles more than the front of the wave by the time it reaches Diamond Creek.

It may seem counterintuitive that the peak accomplishes more than two-thirds of its movement in the first 88 miles of travel. Keep in mind that by the time the discharge wave reaches Phantom Ranch, the peak has used up much of its available runway atop the wave.

While the peak migrates toward the front of the wave, this movement may be counterbalanced by the wave lengthening. Lengthening, however, is usually inhibited by the front of today's wave running into the tail of yesterday's wave and the tail of today's wave colliding with the front of tomorrow's wave. As a result, each daily wave is about 24 hours in duration for the full length of the Canyon. It is about 102 miles long at the top of the river and 125 miles long in the faster water at the bottom.

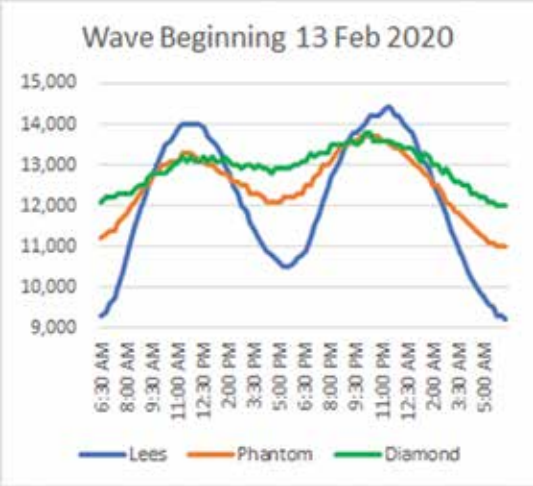

Chart 10

VARIATIONS IN TIDES

About two-thirds of the days during the sample period (2009 to 2020) adhered strongly to the common tide pattern at Lees Ferry: begin rise in the early morning, continue to rise throughout the day and into the evening, then initiate a sharp drop before midnight.

Weekend Flow

In recent years, most Saturdays and Sundays from May through August have had "weekend flow." During this period there is no discharge wave on Saturday and Sunday and the river remains at low flow from early Saturday morning until Monday morning. U.S. national holidays—notably Memorial Day and Independence Day—also have weekend flow.

Between 2018 and 2020 the U.S. Department of the Interior experimented with what they called "bug flow." This was an attempt to better understand how to improve egg-laying conditions for aquatic insects. On spring and summer weekends during this period, rather than just running the dam at a constant low, the Bureau experimented with a variety of flows. Don't count on summer weekend low flows.

Winter Double-Peaks

About 8.5 percent of the days in the sample have double peaks. Double peaks typically occur between January and March.

Ramp up starts as usual at about 6:45 A.M. and continues until mid-morning when flow experiences a sharp drop off. This is followed by another rise starting in the early evening. The dip in the middle of the discharge wave smooths considerably or even disappears completely as the wave proceeds downriver (see chart 10).

2011 High Water Testing

Between late February and December 2011, the USGS conducted flow testing in hopes of finding a way to stem erosion of Grand Canyon beaches (Wright and Grams, 2010). For most of this period the river ran at constant daily flows between 15,000 and 25,000 cfs.

Other Experimental Flows

The U.S. Department of the Interior periodically runs experimental flows. Be sure to find out before you launch if you should expect any significant deviations from typical flows during your trip. Most recently, in November 2018, the dam increased from a daily flow between 6,000 and 9,000 cfs to a sustained flow of 38,100 for three days (National Park Service, 2018). The increase from low to high was about 4,000 cfs per hour over about eight hours. You definitely want to avoid being surprised by a spike like this.

CONCLUSION

I hope that, armed with an improved tide table, boatmen will be better able to understand river flow, avoid surprise overnight beaching of their flotilla and better time their running of challenging rapids. I wish you good floating and hope to see you on the river in the future.

Phil Gormley

Note: Email Phil at P@HairyBoatman.com if you would like a copy of the tide table or the Excel model on which this article is based.

Endnotes:

1. Of course, rivers don't actually have tides. The word tide is a useful and concise shorthand to describe the daily rising and falling of river flow caused by varying levels of the discharge wave.
2. There is a surprising amount of disagreement about how far Lees Ferry is

below Glen Canyon Dam. Wright and Grams state the distance is 15.5 miles (page 2). Kurt Schonauer of the U.S. Geological Survey confirmed the distance is about sixteen miles. A 1985 study found the discharge wave takes about three hours to travel from the dam to Lees Ferry (Lazenby, 1987, page 8).

3. Here is a 24-hour picture of the time rising tide begins. The late afternoon/evening cluster most commonly occurs on days between January and March as the first step of a second wave for the day. This second cluster was omitted from analysis to focus attention on the much more common morning cluster:

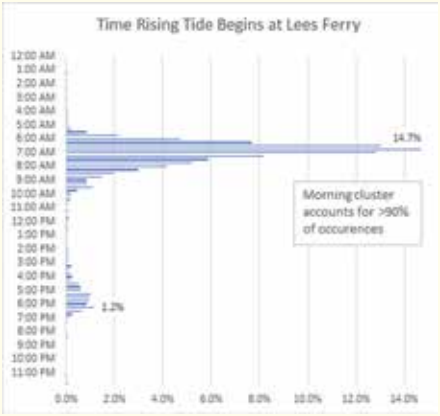

Chart 11

4. During special flows in 1991 and 1996, the U.S. Geological Survey released florescent dye at the dam and at Lees Ferry and used it to determine river speed—i.e. speed of the water molecules, not the wave—to various locations.

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2. Lazenby, Jerold F. "Unsteady Flow Modeling of the Releases from Glen Canyon Dam at Selected Locations in the Grand Canyon" (1987). *Elusive Documents*. Paper 24.
3. U.S. National Park Service. "November 2018 High-Flow Experiment" (November 2018).
4. Schonauer, Kurt (Hydrologist, USGS Arizona Water Science Center, Flagstaff, AZ). April 2021. E-mail.
5. Stone, Bryan (Grand Canyon River Permits Office, U.S. National Park Service, Grand Canyon, AZ). April 2021. Phone and e-mail.
6. Wiele, S. M., and Smith, J. D. "A Reach-Averaged Model of Diurnal Discharge Wave Propagation Down the Colorado River Through the Grand Canyon." *Water Resources Research*, (32)5, pages 1375–1386, 1 May 1996. A significant fee may be assessed to access this document.
7. Wright, S.A., and Grams, P.E. "Evaluation of Water Year 2011 Glen Canyon Dam Flow Release Scenarios on Downstream Sand Storage Along the Colorado River in Arizona." U.S. Geological Survey Open-File Report 2010–1133. 2010.

The Inner Canyon
(Stone Creek Camp, Grand Canyon)

Demigods of cloud and shadow,
wind and time, devoured
these mountains a mile deep.
How those monumental giants
must chew the towering loaves—
the buttes and buttresses
atop the River's walls.
They gnash their teeth
on golden sandstone breads
and round shale muffin-tops.
They sink their ravenous lips
into the limestone pastry layers.

Is that how River
discovers its labyrinthine path?
Do epic spirits consume their way
toward an unseen ocean,
River sluicing behind their appetite?

Yet desert deities can take many forms.
I admire the tenacity of those giants,
yet dearer I hold the spirits'
more minute incarnations—
a dragonfly whose trembling wings
split a moment of incandescent air,
or a riffle whispering more silently
than the intelligence of speech,
or even the few fragile tears
spilled onto a riverside boulder,
turning one stone
into a baptismal font.

—Mark Meierding

JOHN TONER

John Toner has been a staple in the Grand Canyon guiding community for nearly four decades now. His sense of humor has become infamous, keeping boatmen on their toes—you never know what you're going to see when you open your motor box next! His style of leadership is a model for seamless river trips, his patience for people impressive. What many people don't know about Toner is his love for birding (you can't mark a bird off your identification list until you've seen it poop!), and his ability to state the Latin name of any plant—shows the depth of knowledge he possesses. I caught up to him in Salt Lake City at the end of the 2021 river season, and right before the start of the brine shrimp season out on the Great Salt Lake.

Ben Reeder

Reeder: Alright! Here we are with John Toner for our interview. It's great to be here with you.

Toner: Great to be here with you, too, Ben Reeder.

Reeder: I wanted to start out about your upbringing. You had a really fascinating upbringing: born in Ethiopia, correct?

Toner: Yup, born in Ethiopia. And the reason I was born in Ethiopia was because my dad was in the army, and he was attached to the embassy over in Addis Ababa, Ethiopia.

Reeder: And that's where you were born?

Toner: Yeah. And I wasn't there long, probably just for about a year. My dad loved being outside and camping. When he was attached to the embassy there, he was an aide to a general, and the general loved to get out and go on safari. And they would literally just get in their vehicles, and they didn't call them roads, they called them tracks, because they were all dirt. But they would go out on these tracks into the outback. We have some incredible pictures of all this wildlife. They pretty much toured the country in these two Land Rovers. So here he and my mom are doing this in Africa in 1960, it was quite an adventure for them.

Where we lived in Addis Ababa, I'm not sure where we got them, but we had some animals around the house. We had a monkey, and we had these two big tortoises. They'd eat the grass. They probably weighed seventy pounds apiece. They were huge. We have pictures of me on the tortoise, riding the tortoise. And then we had these small deer, they only weighed about twenty pounds. They'd come up and lick my face. I was pretty much a salt lick to these deer. So from an early age I was around animals a lot. I grew up in an outdoor family.

Reeder: You had siblings?

Toner: Yeah, I have one younger brother, Chris, by about three years. And we did a lot together when we were younger. Our family vacations were centered around camping or fishing or hunting. So I got outside just from an early age.

Reeder: Where else was your dad stationed?

Toner: You know, we moved around a lot. We were back east, we were out west. We were stationed in Kansas, Georgia, Virginia, Utah, Colorado, and actually all of those twice. So we moved around a lot. Lucky for me, though, every place that we were stationed and where we lived, I was lucky enough to be able to walk really just a few blocks and get into some woods. Maybe the woods weren't that big, but back east, even when we were in Virginia near Washington, D.C., we were close to some woods.

Reeder: You had free rein?

Toner: Yeah, I was pretty much a free-range kid. You could step out the door at eight o'clock in the morning and tell your mom, "Oh, I'm going to the woods," and you didn't have to come back until five o'clock. And you were with your friends and all that. They were the same way too. I guess it was a different time. We'd all just get together with our friends, go out into the woods. These woods had creeks

John at three months old with duiker antelope, Ethiopia.

in 'em. We'd make rope swings across the creek and be able to swing on the rope and fall in the creek and get out and do it again. I was pretty lucky to be able to have woods about everywhere I lived.

Reeder: Sounds like a pretty wonderful childhood.

Toner: Yeah, it was pretty good, pretty good.

Reeder: Did you stick around long after high school?

Toner: Let's see, high school, I was in Kansas at that point. My dad had retired from the military and had a job in Topeka, Kansas. And of course Kansas is flat, and I could look out my backyard and then drive a hundred or even two hundred miles to the north, and it would look the same as my backyard—the Great Plains. So that didn't suit me too well. I did manage to stick around for two years of college in Topeka, but was hitting a wall, it was time to get out of there. And I knew I wanted to come back to Utah, because we'd spent some time in Price, Utah. My mom is from Price, Utah. And not only had I lived there for a while, we'd always go back to Price, Utah, for these big family reunions. My mom came from a big Greek family; they had thirteen kids. And of course the reunions were pretty fun—you know, Greek food and dancing. They'd go up into the mountains and slaughter a lamb and bring it back down, and we'd roast it over a spit in the back yard. And we'd also go fishing up in the mountains above Price. And of course traveling across the desert just to get to Price, I just fell in love with the whole area, and I knew I wanted to be in Utah from an early age. In fact, I'd look at the map and...See, the eastern half of Utah, there were no towns or anything. And I could see that river, the Green River, and Desolation Canyon. I didn't know it was Desolation at the time, or even what was there. I just imagined there was nothing there and I wanted to go down that river.

Young John Toner and his pet raccoon.

I remember the first time I went down Deso it was pretty much a dream come true. I had always looked at that river on a map and wanted to go down there.

Reeder: How old were you?

Toner: Oh, I bet I was twelve years old when I was looking at those maps.

Reeder: And when you first went down Deso?

Toner: Oh, when I first went down Deso I was probably 21 years old. Yeah. So I was back in Kansas and then after two years of college, I packed up my Jeep and drove out to Utah, and I stopped in at Moab, Utah. That's where I was doing my laundry, at the Moab Laundromat, and I saw a Help Wanted sign for a boatman trainee—Help Wanted sign on the corkboard there. And of course I didn't have a job, didn't have much money, so I called them up. That was with Outlaw River Expeditions. And yeah, they hired me.

Reeder: What year was that?

Toner: That was 1983.

Reeder: In 1983. Wow.

Toner: So 1983 was the first time I went down Deso. I started for them real early. I started in April and did the warehouse stuff and everything.

Reeder: And who ran that outfit?

Toner: That was Joe Greeno. He had bought the permit from A.C. Ecker. Joe Greeno also had run for Canyoneers down in Grand Canyon. So he wanted to be an outfitter, and he got the permit to run on Cataract and Desolation and Westwater. Again, he bought it from A.C. Ecker who had Outlaw Trails.

Reeder: Your first year, guiding with the biggest year we've seen since...We haven't seen those water levels since.

Toner: (laughs) Yeah, 1983 and 1984, just *huge* water.

Reeder: So in April you weren't seeing those flows yet, but tell me about that first season, and how that water came down, what you were doing.

Toner: Well, I really didn't...You know, that was my first year. But of course, being around the other guides, they were just freaking out. They were wondering about the huge amount of water, and of course when we were going down Cataract Canyon that water was just so big and huge and had so much energy in it. You could tell when you were on it, it was just pushing your boat all around, and of course there's huge cottonwood trees coming down the river. And it did feel dangerous. But, of course that first year I didn't run a boat. They had all these experienced guides come in and run these boats, and I was just swamping. You could tell by their faces how serious this was. I just remember being on those boats, and we're going down the river, and just these huge waves

would spring up all around you. There was just so much energy in the water. There wasn't, like…It didn't have a lot of order to it.

Reeder: Total chaos?

Toner: Yeah. The eddy fences were huge and powerful. You'd see snout rigs that would go into an eddy, and tip right up on their side. I could see the whole bottom of the boat. You know, they'd just tip sideways up and ride that eddy fence for, I don't know, ten feet, and (slaps hands together) flap back down on the water again. And then a lot of times when you got in that eddy, it was extremely difficult to cross over the eddy line and get in the current. You would try and break out of the eddy and into the current but you'd end up at the bottom of the eddy and the current would shove you up against the rocks on shore.

Reeder: Wow.

Toner: You know, at Lower Spanish Bottom, that camp, you have the big cottonwood tree right up there. Well, you'd just pull your boat right into that tree and step off your boat right onto the bank. That's how high it was.

Reeder: Wow, all the way up there?

Toner: Yeah. Saw a couple of snout rigs flip, and we'd pull over, get them over, get the people back in our boats and help flip the snout rigs over.

Reeder: Imagine being a swimmer in that water. That'd be a lot of stress.

Toner: Yeah. I didn't have as much stress as, of course, as the boatmen. They had the responsibility of piloting those boats down there.

Reeder: Good year to be a swamper! (laughter)

Toner: Yeah, good year to be a swamper, right! All those guys were terrified of what was going on down there—and rightly so. Then of course the next year I did get a boat, and then I was terrified about—you know, 1984 was still big. You had your game face on, you really wanted to be extremely careful, because you saw the consequence of screwing up and having even a snout rig flip, and people in the water. So yeah, it was pretty frightening in a lot of ways.

Reeder: But you came back for a third year.

Toner: Yeah, came back for a *third* year, and during that third year I started working for Dave Mackay, Colorado River and Trail Expeditions. So that was '85. And that's when Joe Greeno couldn't make his payments on that permit, so A.C. Ecker took the permit back. The high water scared a lot of people and Joe didn't have any money coming in. And that's when I started working for Dave Mackay. And that's when Mary and I started working for Dave Mackay.

Reeder: Mary Allen?

Toner: Mary Allen. Because I had met her when I was working with Joe Greeno in 1984. So then we were pretty much a couple in 1985. So that's when Mary and I started working for Dave Mackay.

Reeder: So you start working for Dave Mackay in 1985. You and Mary had come over from Outlaw. So what was the crew you were running with there? What was that scene like?

Toner: Let's see…Well, Bill Trevithick was there, and he was a *very* important mentor to me—Bill Trevithick. Then there was Mark Tygeson and Tim Begay, and the Joneses were there. Nathan Jones, Sam Jones, Sarah Jones—I think they were there at that time too, or maybe just the next year some of them came in. But I think out of all those guys, I ran with Bill Trevithick was the one who mentored me on a lot of these things on river running, especially in Grand Canyon.

Reeder: Did you start out on Green River, or did you get down to Grand Canyon pretty quick?

Toner: No, I was in Green River. I got a Grand Canyon trip a year, but most of the time we were in Green River, and usually we'd go down Grand Canyon once, maybe twice, during the summer. But we were doing Deso and Cataract and Westwater. Those early days, you look back at it when you're young, all the work you do—you know, derigging the boats all the time, and just some of the funny things. Like, we didn't have stoves to cook on; we'd always cook on fires. We didn't have drop bags and our overflow canned goods would go in a military duffel bag. And so down Desolation, or even in Cataract Canyon we'd gather wood, get out the fire pan, and you'd make dinner and breakfast on the fire. So you'd get your bed of coals going, you'd get your hot water going for the coffee, get the bacon going. I think you became pretty good at learning which wood gave you a good bed of coals so you could cook your pancakes and your eggs. At that time, Dave also had…You know, down in the Grand Canyon they were cooking on propane stoves—you know, the Partner propane stoves. And when the guides in Grand Canyon would come up to do a trip, they'd bring their propane stove, because they're not going to cook on wood! We were thinking, "Well, why can't *we* have propane stoves?!" Dave's like, "You know, you need to learn how to cook on wood in case your propane stove breaks."

Reeder: They probably weren't as reliable as they are now.

Toner: Yeah. But it was funny, I just remember… Especially in Cataract Canyon, if you didn't have the right camp, the sun pops up at six in the morning, and it's hot, and here we are cooking over a fire. Most companies probably did it that way too, cooking over fire. It's just so nice now to turn on a stove and not be sweating over a fire, cooking eggs and bacon and all that. So that's just one thing that I look back on now. You know, some of the equipment was probably the best for its time, but it still broke a lot. You'd pull the pull cord on the Mercury motors, and you'd probably break a pull cord a trip. Or they were famous in the big water for the engine dying when a wave washed over them. We'd tape 'em all up with duck tape, because you'd go in and get a big wave right over the motor, and they'd just die.

Enjoying a damn fine cup of coffee.

Reeder: Just when you need it the most!

Toner: Yeah, just when you need it the most, it'd swamp. So we'd figure out, trying to tape all the seams with duct tape, and try to get it so no water got in. That was normal. We figured that's just how it is. But it's kind of funny to look back on it now, and how the motors now are just so nice, and they run with hardly any complications and we have boats that are good, tough and hold air. And we get to cook on stoves!

Reeder: Trailers.

Toner: Yeah, and trailers. And so it was fun to just get in...I just got in on the tail end of cooking on fires, and having cotton boats to run—just a couple years, and then we started getting really good equipment. I appreciate having a taste of what Bill Trevithick had to deal with for the decade before me, or two decades before me, and all those old-timers.

Reeder: Yeah. You were raised up in a little bit of the old school for sure.

Toner: Yeah, just a little bit. Nothing like Bill Trevithick or Stuart Reeder. But it was fun to be able to just get in on that a little bit.

Reeder: So before too long, you and Mary, your relationship developed and you guys got more serious.

Toner: Uh-huh. Yeah. So we got married in '87, and then continued to work for Dave. We just kept coming back every season. Mary rowed boats in Grand and in Cataract high water, and also she learned how to run the motorboats. So we were running two motorboat trips together after a while up in Cataract and down in Grand Canyon. That environment, when we started running, the water was still high in Grand Canyon. We were running on 60,000 [cfs], then it dropped down to 30,000 [cfs]. And it kept going lower and then we started running on 5,000 CFS. And of course we had no experience with low water, and I remember this one trip when I was going to run a steady 5,000. I'm on the bus, and I'm doing a single-boat trip, and I'm on the bus riding to Lees Ferry, and Bill Trevithick is next to me and he's sketching out these diagrams on a notepad about how to run some of these rapids; how to run Hance; what I should do in Dubendorf, because here I'm going to go down the river on 5,000 and it's a single-boat trip, and I'd never seen it at a steady 5,000.

Reeder: What did some of those descriptions on the notepad sound like?

Toner: Well, his descriptions were really good, but I'm the one who got the descriptions wrong. (laughter) You know, these two rocks that he described as the duck pond rocks.

Reeder: In Hance?

Toner: In Hance, yeah. The duck pond rocks. He told

me to come in and do a turn around run then drop your boat between these two rocks then start ferrying to the left. His description was great on how I should run it, but when I was scouting Hance I got his descriptions of the rocks all wrong. So for awhile there I was entering Hance just full cobb and I'd come screaming into the duck pond itself. I'd just eddy out right in the duck pond, right *above* the two duck pond rocks. Now of course Bill meant for me to go to the right of the two duck pond rocks, but I thought those two rocks were what he thought I needed to drop in between, so for about four or five trips, I'd come screaming in with my big motorboat, into the duck pond, do a turnaround, and I would eddy out above those duck pond rocks, and then I would just drop in between those duck pond rocks. And I kept my motor in, because he told me, "Oh yeah, you can keep your motor in, if you're between those two rocks." And then I did a trip with him, and I told him what I was doing, and he was looking at me, going, "You were doing *that*?! I didn't know you could fit a boat between there!" I said, "Well, I stick sometimes." (laughter) And I did, I'd kind of come in, and my two side tubes would stick sometimes on those two rocks. We'd just jump up and down and slide off. And he was like, "No, no, no, go to the right of those as you're coming in." So even now I'm looking at it, wondering if I could do that again—come in and go between the two duck pond rocks with a motor-rig. Probably our frames are a little fatter now, I don't know. When I was doing that, we had the old wooden frames, and they were a little narrow. So I'd probably get really stuck now if I tried it with our new frames.

Reeder: The Mercury might not have been hanging down quite as low. (laughs)

Toner: Yeah. So anyway, the water got low. Mary and I were down there. Of course we broke motors—learning through suffering. We'd also team up with other boatmen down there. We knew Mike Denoyer and Marc Smith. Sometimes they were on our schedules, so we'd say, "Okay, we're going to wait until they get here so we can see how *they're* running it," and we'd watch them run it. So they actually helped us a lot too, because they'd seen low water, and we never had. And so…

Reeder: You were able to help each other out?

Toner: Yeah, we were able to help each other out. Pretty interesting down there at low water.

Reeder: When did you start doing trips in Alaska?

Toner: Oh, Alaska, I think I did my first Alaska trip in probably the early-nineties, maybe '92, '93.

Reeder: And so Dave had gotten a permit up there?

Toner: Yeah, Dave had always had a permit up there. He got up there pretty early. Bart Henderson told Dave about the Tatshenshini and Dave went up there and ran it and just started doing trips up there. I'm not sure when *his* first trip was, but he'd had a permit up there before I got onto the company.

Rowing on Alsek Lake.

Gathering ice near the Walker Glacier, Tatshenshini River.

Reeder: Uh-huh. You've been running up there for over thirty years now?

Toner: Yeah.

Reeder: What was it like in the early years? Tons of wildlife you'd see? How has that changed over time? I guess glacial ice has been melting.

Toner: Yeah. The big change is that the glaciers have been melting back. Some of them we used to walk on and now you can't. Now you can't even do that. There's no ice shelf by the river. It's just melting back, all the way to the mountain—huge change.

I was just going to say that Dave Mackay got up there and ran the Tatshenshini, and that Dave did a lot of other rivers. He was up in Alaska. He went down into Mexico and ran some rivers. And of course when he was running with Jack Currey, he ran the Selway. So…where am I going with this? I think it's just great. If he hadn't done all this stuff, I wouldn't have been able to do all these rivers you know, with his company. He really did a lot of rivers where there wasn't a lot of information about them, no guide books. And to his credit, going up to Alaska, shoving off on a river and wondering what's down there, with no guide book, no sat phone.

Reeder: No safety net.

Toner: Yeah, no real big safety net.

Reeder: What was it like running with Dave?

Toner: Well, it was pretty fun. He was a good teacher on the river. He'd just kind of sit there and be looking at the scenery and everything, but if you were getting a little bit close to the bank, he'd look back at you. And when he looked back at you, you knew something was wrong, so you had to…He'd kind of say, "Oh, pull away from that bank now. Get your angle better." He was a good teacher. He'd say, "Get your angle a little bit more so you're 45 degrees away from the current," so when you did pull, you were moving away from what you didn't want to hit.

So it was fun working for Dave, and of course he was a solid guy in camp. He'd be right in there in the kitchen and everything. And you could tell he really liked—well, he didn't really like it, he loved river running and loved being outside. He was in his element on the river.

Reeder: So then back down Grand Canyon, you spent a long, long time doing science trips. Tell us about how… You were planning to go back to school, you were going to study biology?

Toner: Yeah, I was going to get a degree in biology.

Reeder: So what happened?

Toner: Well, let's see, what happened is I'd just finished a late fall trip with Moki Mac River Expeditions, and it was a Cataract trip with Bob Quist. And then I went back home, and I'm like, alright it's time, let's go back to school, get a degree. So I went up to Cedar City in Utah and I talked to the counselor there. I think they changed the name. It was Southern Utah University.

Reeder: Yeah, I think it still is.

Toner: So I went in there and was talking to the counselors, "Alright, what do I need to do to get a biology degree?" And I got back home, and it was kind of funny, the phone was ringing, I picked it up, it was Mike Walker from OARS and he said, "Hey, I was just talking to Bob Quist. I was looking for boatmen, and he said you might want to do some river trips in the winter." And I said, "Well, what do you mean?" And he explained that he could keep me busy for all winter, all through six months. These trips would be anywhere from twelve to 25 days long.

Reeder: And these were the science trips. They had the contract?

Toner: Yeah, OARS had the contract.

Reeder: What year was this?

Toner: I think it was '90. I have it written down, but I believe it's '90. This was when I did my first science trip.

Reeder: So what science trips were you running?

Toner: Well, I was just going to say, after talking to him for about fifteen minutes, I said, "Oh yeah, let's put my college degree on hold, and yeah, I'll do these trips." So I did. I did a whole variety of trips. I did a lot of fish trips, and beach survey trips, did some sediment trips, did some archaeology trips, birding and botany trips. Did some trips where they were going down and taking photos from the vantage point of the old photos, like the 1923 Birdseye expeditions. You know, they'd get their camera and tripod right where the 1923 photos were taken, and take *those* photos. Pretty fascinating, because they would then match the rocks and also the plants. Had a botanist on board, and she was like, "Look, those plants and that prickly pear is in the same spot it was in the 1923 expedition, and it hasn't changed that much." So it was pretty cool to be on *that* trip. And of course then here I am doing these science trips with all these other boatmen, and I was still pretty wet behind the ears, and trying to figure out still how to run the Grand Canyon and run these rapids in different types of water level without wrecking a boat or breaking my motor. So here now I'm running with these people that have had *all* this experience. I was running with Mike Yard, Brian Dierker, Dave Edwards, Liz Hymans [*phonetic*], Connie Tibbets. So I'm just around, to me, all these incredibly great people that I've looked up to all my life, and I'm in the midst of them, watching them, absorbing how they're running the rapids—and Whale, you know, watching how Whale would run the rapids. Some of them agreed on some runs, some of them didn't, but it was just fun to be there, because my main mentor was Bill Trevithick, but to be able to expand this huge base of knowledge, with all these other people going, "Yeah, well, maybe if you just stick your ass end of your rowboat on that rock, it'll stick a little. Then you can swing over to the right, and clear sailing from there." And so it was just amazing to me to be with all these guys with all this experience and see how they did things. And of course just to be around all those characters. Just what a privilege, and what fun it was. Really a lot of fun. And then that kept going for about ten years. So that kept me busy in the wintertime.

Reeder: And then at some point you and Mary split up?

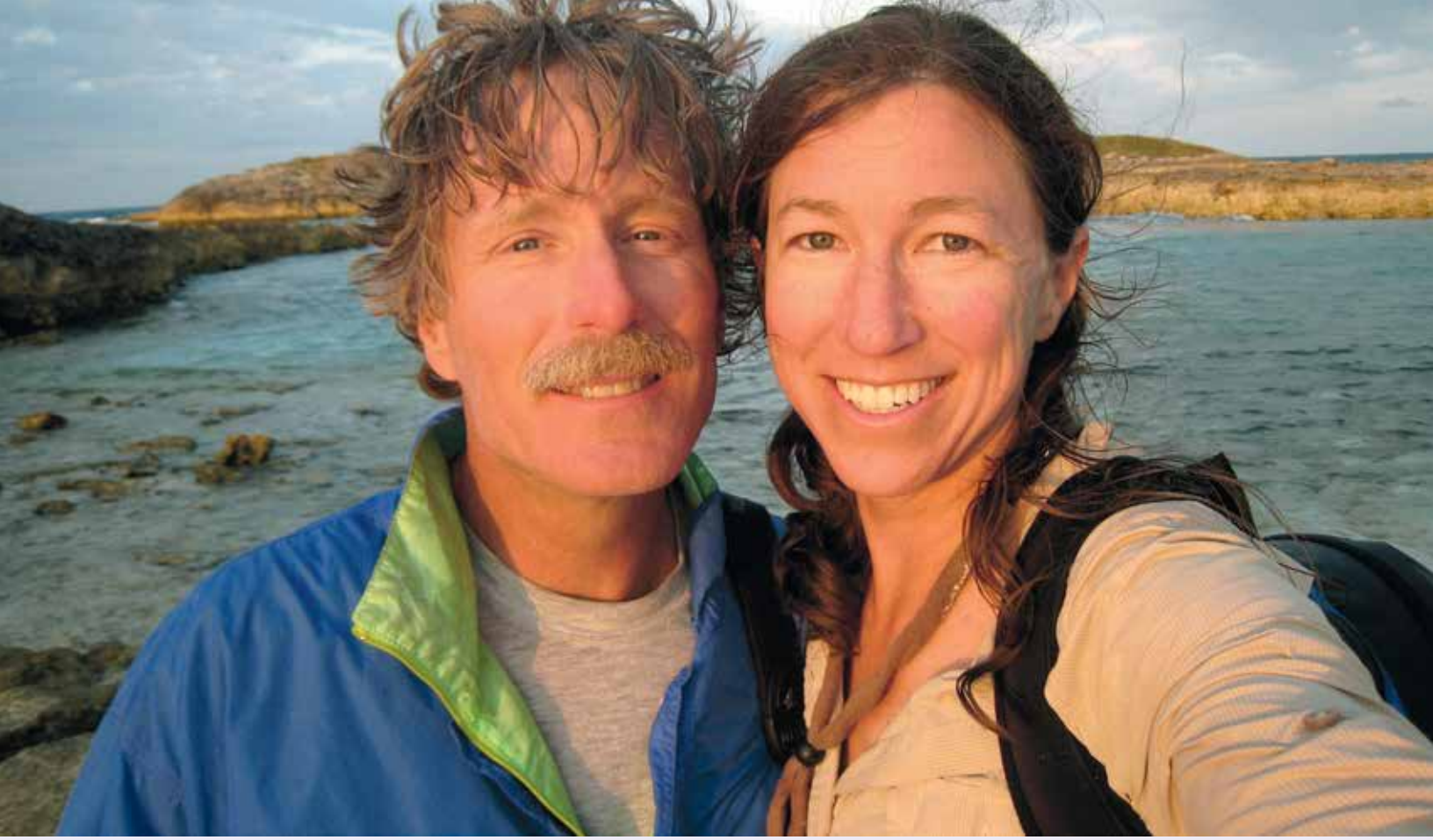
Toner: Yeah, we split up. We tried pretty hard. It was fourteen years, and at the end it was…Pretty much we knew we were going down different paths. It was just time to go our own way. At least the marriage part of that relationship ended. But, you know, it was good while it happened, and she was an incredible boatman, and it was a good eye-opener for me to see that when I was running with her, she was a great motorboatman, but there was often a double standard applied to her on the river because she was a woman. You know, I could go in and have a terrible run in Deubendorff, hit the shore, bounce off, and come out the end, and people would cheer, "Whoa! He made it!" And then if Mary did that, had a bad run, they would say, "Wow, she doesn't know how to drive." And there was a double standard, and it was hard on her, for sure, because I think every trip she had to fight that.

Reeder: She's one of the pioneers of these badass women river guides, opening doors for people.

Toner: Yeah. And that's what she was, she was a badass woman river guide. She was competent, smart, she knew how to run a motorboat real well. I remember running trips with her and there were a number of times where guys at the end of the trip would come up and say, "You know, I didn't think I'd ever get on a boat that a woman was running, and I was wrong. I'm pretty much a fool."

Reeder: I've seen you work to break down that double standard in so many ways, and I think that's so important. Our industry today, you see the boatmen down there—man or woman, it doesn't matter, we're all down there working together. It's my impression that you've done a lot of work to try to bridge the gap and treat everybody equally.

Toner: Yeah. Well, I try. (chuckles)



John & Kristen.

Reeder: Going back to the science trips and running down there, I wonder if you could have possibly learned as much about biology studying in school as what you learned down there in the Grand Canyon.

Toner: Well, what I learned, too, on those science trips, was that I didn't want to be a biologist. Of course they're doing invaluable work, but I was sitting on that boat watching the scientists, especially the fishing biologists. You know, they're scooping up all these fish, weighing them, sexing them, and it's pretty tedious work. It's hard work, it's important work, but I was thinking, "You know, I don't really think I want to do that." And then of course they're getting all this data, and they're giving it to a guy who's *not* on the river, he's up in an office, and he's got to get all of that data and make sense of that.

Reeder: You decided the river was the place for you?

Toner: Yeah. I decided I didn't want to be that type of biologist or, of course, be up in the office. One thing I *did* learn after doing fish studies, bird studies, bat studies, that if you're going to be a biologist, be a botanist, because a botanist would get up in the morning, have a cup of coffee, and then we'd go out and look for plants. They seemed pretty happy. They work in the daytime, and they're smiling, "Yeah, we don't have to chase our subjects around. We have to *find* them, but we don't have to get up real early or stay up until late a night." That's when I started getting into plants a little bit more than I had been, so it was fun being with the botanists and learning all the Latin names. So I guess if I did go back to school, I'd be a botanist, I'd go that route—which I'm not going back to school. Yeah, I decided at that point that I just liked being a boatman. So when the science started petering out, that's when…Well, two things happened. Number one, I met Kristen Sorensen, who's now my wife. She started working for Dave and Vicki in the office, and then she came down the river with me as a swamper. That was '98? And, you know, it was one of those things, "Hey, we need some help on this motor trip." Dave sent Kristen down to help, also she's working in the office, and he's like, "Well, get her down, and that will help her with all the questions she gets over the phone." So I think it was 1998, I believe, that she got down and swamped for me. It wasn't the first time I met her, but for simplicity's sake, that's when we started to get to know each other. And then a couple years later…I was talking to Dave on the phone. It was December. He said, "Oh yeah, well, you know, Kristen isn't dating so-and-so anymore." I thought, "Really?" And I pretty much immediately asked her out on a date. Yeah, real quick. I think it was that day, too.

Reeder: What was your first date like? You told me the story. Maybe it was the second date?

Toner: Well, you know, we'd gone out to dinner a couple of times. We always consider our first *big* date was when we went down to southern Arizona and ended up in

Mexico—it was wintertime, it might have been February or something, a little chilly up here. So we went down to Southern Arizona and did a road trip down there. Of course there was this little place in Mexico called Alamos, a little town. It's probably, I'm guessing maybe somewhat like a hundred miles south of the border. I've always been a birdwatcher, so I said, "Well, let's go across the border and go down there and watch some birds." I think we were supposed to be gone about ten days. Anyway after ten days I called Dave up and said, "We need a little more time down here," and he said, "I figured that was what was going to happen." So he gave us another week to hang out down there, and we came up through Organ Pipe National Monument. Just had a great trip.

Reeder: That's when you really hit it off?

Toner: Yeah, that's when we really hit it off. That was in 2001. We got married six years after our first date. I was like, alright, let's have four years, you can see what the river guiding life is all about. After four years I asked her to marry me, and she said yes, but then it took two more years to actually do it. We've been together since 2001. Of course she's great and wonderful, we've had all sorts of good adventures. She grew up in a family very similar to my family where the parents would pack the kids up in the truck and go to the mountains and go fishing and hiking—it was like that—backpacking.

Reeder: And you've traveled all over the world together.

Toner: Yeah.

Reeder: Some incredible adventures.

Toner: Yeah, we've done some good trips out there, and I think they've been focused mainly on getting out to the wild parts of other countries and looking at animals, watching animals. We'll go to the parks in other countries, go camp out, backpack, and make a concerted effort really to find animals. I'm pretty much hunting animals, except without a gun.

Reeder: What have you seen?

Toner: Oh boy. Well, I've seen…well, some of these animals, Kristen hasn't been with me, but I've seen jaguars. There was a time there I was getting down to Central America a lot. There's this guy, Michael Kay, who owns Costa Rica Expeditions—he came on a CRATE trip and he said, "Come on down to Costa Rica and check it out." So I came on down there, and I never worked for him, but I ran some rivers with him and started backpacking all around Honduras, Costa Rica, Guatemala. God, that's a whole other story. I have this collapsible sea kayak that I would bring down there sometimes. I'd sea kayak along the coast of Honduras and Belize and did the Corcovado Peninsula around…No, I think it's the Osa Peninsula around Corcovado National Park. So anyway, all these adventures, I run into jaguars…

Reeder: What was that like?

Toner: Well, the jaguar was scary because I was on the beach in Corcovado National Park down in Costa Rica. I was sea kayaking around the Osa Peninsula there, and at my camp I'd noticed there was this coatimundi playing around the edge of the forest near my camp. He was coming out, looking around. And so coatimundis are diurnal, they like to be out during the day. Then it got dark, it was nighttime, and I was just curious if he was over there at night. So I had my little flashlight, so I walked over there, and I saw these two eyes, and I thought, "Well, that's funny, they're only supposed to be out during the day, but maybe that's him." So I started walking towards these two eyes, and I got pretty close to those eyes—you know, just a small flashlight; maybe it threw out a beam maybe thirty feet—and these two eyes were looking at me. Then all of a sudden I heard this big "woof!" and this big jaguar turned sideways toward me. You know, I was looking at him head on, and I couldn't really make out any body. But then when he woofed and he turned sideways, I could see his whole body. Then he stopped and looked at me again and woofed.

Reeder: Like a dog?!

Toner: Yeah. "Woof, woof!" Of course I stopped real quick, and [I'm] going, "Oh, God, what have I gotten myself into?" And then he turned back around and he paced about ten feet to the left in front of me. Then he just… and this all happened within twenty seconds. And then he disappeared into the brush, into the jungle back there. I backed up real semi-slowly and got back to the camp

Friendly beetle in Ecuador.

which was maybe fifty yards away, and I just got in my tent and stayed there. That peninsula, that Corcovado National Park is just a wild area. That camp I was camped at, I had thousands of these crabs all over the place. And just literally you couldn't—you had to be careful where you stepped, because all these crabs, I don't know, maybe they were mating or something, but literally the whole forest floor was covered with all these crabs, thousands of crabs.

Reeder: Just moving around?

Toner: Just moving around, moving around, and they were getting underneath my tent. And I'm in the tent, and I don't want to get out of the tent because of that jaguar. So I brush my teeth, and I try to spit out of the tent. A little bit of that spittle got on my tent. The next morning, I woke up, I probably had about twenty crabs *in* the tent, and they had eaten my tent where that spearmint spittle had fallen. They made a hole, and then they all came in, and I thought…well, I just went to sleep at night, I was pretty tired and exhausted. But I thought they were underneath the tent, but they were underneath the tent, in the tent, on me. But that tropical rainforest is just an amazing place down there.

Yeah, so Kristen and I get out camping, backpacking.

Reeder: Yeah, your eye for birds has always been impressive, and bighorn, and just…you know, it seems like your upbringing, with all the animals you were exposed to, and seeing all these amazing creatures in their environment has really inspired you. What about wildlife encounters in Grand Canyon?

Toner: Oh I think as guides we've all had our encounters with rattlesnakes. I don't know how much of them were near misses, but there were times when they got a little too close. One time tying up my bow line, I just happened to look up just before reaching and sticking my head into the bushes and here's this rattlesnake hanging right on the limb, two feet above the ground, where I was going to put my head. Luckily the day before I had a stick flip back and it cut me pretty bad across the bridge of my nose and it was pretty sore. The only reason I looked up when I was tying that line was because of that cut on my nose. I would have stuck my face right into that snake.

Reeder: Yeah. I have this picture with you, and you've got, I think it's a whiptail snake. You're holding it, and it's wrapped around…Is it through your legs, or around you, and then it bit you on the side and wouldn't let go?

Toner: Yeah, he kind of got between my legs and whipped around and bit me on my side. He was unhappy about being picked up which is understandable…

When we were young, my brother and I would bring *all* sorts of animals back to the house. We'd go out to the woods and, oh, we'd bring snakes. I think we had maybe twenty snakes in a terrarium once in our house. And of course at one point the lid got off, and twenty snakes were loose in the house. And we'd bring back—I remember one time we dragged a possum back to the house. The possum was playing dead. We brought him back and showed our mom and dad, and they were like, "Oh, what are you guys doing?! Take that guy back to the woods!" I remember one time we dragged a snapping turtle back to the house—*huge* snapping turtle. I think the thing weighed about thirty pounds. Chris and I were both dragging him back, and of course the snapping turtle is digging his claws into the ground, but we managed to get him into the house and put him into the bathtub. We were pretty young. Chris was probably eight years old, and I was maybe eleven. My parents were not happy about that. They heard us laughing and giggling up in the bathroom together, and here we were poking, putting our fingers down by that snapping turtle, and that snapping turtle would just…Thank God he was just slow enough that he didn't grab our hands. We were poking at it, and my dad was like, "Ohhhh xxxx!" Both my mom and dad were, you know, thankful we didn't lose any fingers on that. We really got in trouble for that. Yeah, we were always outside in the woods, playing around. Yeah, it was just natural to…I always wanted a job outside. Pretty much that's how I got into guiding.

Reeder: From your love of the outdoors?

Toner: Yeah. So I came out to Utah and got a job with Outlaw River Expeditions in '83 and '84. But when I was let go at the end of the season in '83, I was like, "Well, I need to find another job." So I went up to Price, Utah, and I was staying with family for a little bit so I could figure out what I was going to do. I was driving down Main Street, and I saw just a ragtag bunch of guys out on the corner by this building on the main street of Price, and I thought, "What are *they* doing?" I mean, they had backpacks on, and day packs. So I pulled in and just kind of walked up to them. They were right by this office, and I walked in and there was this secretary there. I asked her what was going on. Actually they had a Need Help sign on the office window, and she said, "Well, we're a seismograph company, and what we do is we go out and map what's underneath the earth so we can try to find oil or natural gas. If you want this job, what you have to do is pick up these fifty pound one hundred yard cables and lay them out. Then you pick up the next cable and do it again. You do that all day. So I did work for the petroleum industry for a while. I said, "Yeah, I'll try it." That was a pretty fun job, because after a while, after laying out cable for two months the bosses figured out I knew how to use a map and a compass pretty good, so they put me on this job where they would fly me in a helicopter and drop me off, and I would take these bearings that they would give me, and the distance, and I'd walk these bearings, and I'd put some red flagging about every 500 yards on this compass line that would stretch for miles. So I was pretty much paid to hike. At the end of the day they would come in with the helicopter, land it, I'd jump in the helicopter, and they'd take me back to the base. So I did that for six months, and that was pretty fun until the next river season came along.

Reeder: How did you meet Dave Mackay? How did you get tied in with them?

A little R&R in a small boat.

Toner: Well, Joe Greeno, who owned Outlaw River Expeditions knew Dave Mackay, so when I was working for Outlaw River Expeditions…I think the first time I ever met Dave Mackay was when I was with Joe Greeno, and Dave Mackay was in Moab, going to a city council meeting. He was trying to get some land zoned, I believe, where he could put a warehouse. So I think it was either '83 or '84 when I met Dave. And then of course '85 is when Mary and I jumped over to Dave. I think Joe called him up and a few other people called him up and said, "These guys need some work." Dave's like, "Yeah, well, we'll try them out."

Reeder: So we're skipping around a little bit, and that's fine.

Toner: That's how it goes…

Reeder: Yeah, totally. So over the years I've heard some incredible stories about Lava Falls. It seems like Lava Falls—I wouldn't say it was your arch-nemesis, because… Tell me about some of these runs in Lava Falls that you've had some good luck in.

Toner: Well, let's see. I think some of the most exciting runs that I've had is because I like to jump on the baggage boats and go with these guides on their first run through Lava Falls. You know, like when we're training people, and then someone has a boat, and it's like, "Alright, it's my first run through Lava Falls." I'll say, "I'll go with you." So I kind of like doing that. It's just been fun, and it's fun to be with the young guides that are going into Lava, they're amped up, and just to be with them, and go on their first run through Lava Falls with them is pretty cool. Of course it has made for exciting rides where I haven't stayed in the boat all the time, and neither have they.

Reeder: What was that one with Casey running the boat?

Toner: Oh yeah, Casey, I was sitting in back. She had a great entry. But, you know, the V-wave hit, just a powerful hit, and she got tossed out. So I jump up and grab ahold of her ready to pull her in and she's like, "Wait! Wait!" And we're heading toward the black rock. In retrospect, I should have just, pulled her in, but she said, "Wait! Wait! My pants are around my ankles!" Of course by that time we hit the two big waves down there by the black rock and luckily just wash through and then she pulls her pants up, and then I get her in. What's interesting, since then

Training run, Lava Falls. Photo by Sybrena Smith

I've heard a *number* of stories of people getting tossed out of Lava Falls and losing their shorts in Lava—a lot of stories. "Oh, yeah, I got tossed out, and my shorts were around my ankles." (laughter) Now whoever is rowing through Lava I say, "Make sure your belt's tight on your shorts. We're going to get you in."

And one time Dave Stinson and I, we were on a single-boat. Dave he was swamping, training, and I was running the boat, a 37-foot motorboat. So we scout Lava and get back in the boat and pull off the shore. We were heading into Lava, and we get about—you know, we're below those little black rocks that are on the right-hand shore. You know, if you counted twenty seconds, we'd probably be in Lava, or maybe ten or fifteen. But we're out, ready to motor to the entry of Lava, and my motor dies! He looks at me, I look at him, I jumped down and I looked to see if the gas line's pinched. By that time, the boat has turned sideways and we're just floating right in, sideways, and we're going to go over the shelf if something doesn't happen. I'm pulling on the motor, pumping the fuel bulb, the fuel bulb is hard. I'm pulling on the motor and nothing is happening. And it wasn't a windy day, but the wind came up right then and it was such a powerful wind it pushed the whole boat upriver. So I'm sure it must have been a little bit of low water, because if it had been high water, I think that current just would have pushed us down. But it actually pushed our boat back upstream, to the right-hand shore, and we saw this was happening, and I said, "Dave , get the bow line and jump on that little black rock that's right by the shore!" But that wind came up and pushed our boat upstream probably about twenty yards, thirty yards, and to the right-hand shore enough that Dave jumped off the boat with the bow line, and landed on that rock. That rock's real slippery, and he kind of slipped on it, but he held the line and held onto the rock, and then we swung into the shore, and I grabbed another line, tied it on the boat, jumped off to the shore, and tied up.

Reeder: Oh man!

Toner: Yeah, and it wasn't a windy day at all, but it was really strange. We were both looking at each other and crossing our hearts, going, "Oh my God!" [*Yep, that's who gets the credit for that wind.*] It almost felt like we were going to die. We couldn't get that motor to start. Of course back at the warehouse it started right up. But we changed the motor and went on through. But about five years after that happened, I talked to Stinny again—Dave Stinson—and I said, "Did this really happen?" I told him my version, and he said, "That's exactly what happened. Motor quit, floating sideways into the ledge hole, then a big wind came up and pushed us back upstream twenty to thirty yards, and pushed us into shore pretty much." And it hadn't been windy. Isn't that weird? I'm not kidding!

And there was the time with the line stuck in the motor. So it was a two-boat trip, and we pulled in to scout Lava. The other boat was going to go through first, and we were going to take photos, which we did, and then I came back down to *my* boat. What had happened—and I didn't know it at the time—we had a stern line going, and the other boatman had thrown the line to *my* boat, but it fell into the water. I didn't realize that was what had happened. We just undid the bow line and proceeded to run Lava Falls. So going into Lava, and just as we were going into the tongue, my motor binds up. I could tell by the way it stopped it was a line in the prop. So I figured it was the bow line. I always carry a knife on the spare motor, right in front of me. So I grabbed that. We're entering Lava, and I grabbed the knife off the spare motor and I jumped up and I managed to jump up on the front deck.

Reeder: Probably thirty feet forward.

Toner: Yeah. So I scrambled up there, and just before we hit the "V" wave, I jump on the deck, and of course all the people are looking at me. I'm on the deck with a knife in my hand. I grab on and just hold on. We pop out of the "V" wave, I look up, and I see the bow line's all tied up. And then I instantly realize it's not the bow line, it's that side line that's probably got us, that I hadn't seen. So then I look at all the passengers, they're looking at me with a knife in my hand, and I leap over everybody, run back to the back, and by the time I cut the line out and get the motor started, we're past the black rock, and we had a great, great run. Well the boat had a great run.

Reeder: Perfect run!

Toner: Perfect run! And of course the next time I ran Lava Falls I thought, "Oh, I've got this figured out. You don't throttle up at all, you just go in there and just have a mellow run." So I came in, I'm like, "I'm not going to throttle up." And of course that "V" wave hit me, it kicked me way to the right, and then I was throttling up real hard to get to the left, and we went up on the black rock a little, had a pretty exciting run. And I thought, "Well, I guess it all depends on the circumstances."

Reeder: And then there was the time at Tequila Beach. How many people ended up there after Lava?

Toner: Oh yeah. There were probably at least six trips there. I think there was a science trip; and then I was running a motor-rig on a GCE Dory trip. And then Pete Weiss was there with a Sleight trip. Mark Jenson was there on a private trip. Dennis Harris had a trip there. Anyway, there was over a hundred people at Tequila Beach, and it was in the afternoon about lunchtime, and we'd all run Lava Falls, and some of us would eddy out, and we're running back up the trail, jumping on another boat, going down with that boat, then pulling in on the right, below Lava, running back up. I think I ran Lava Falls about three times that day, jumping on other companies' boats. It was just a real fun time, jumping on a paddleboat, going through. And we all ended up at Tequila Beach. We had about four or five tables going for lunch. I remember Pete Weiss came in. He had a kayak support trip, and he just threw bread out to his kayakers and said, "Go forage." I was on that GCE trip with Abel Nelson, Connie Tibbets, Mike Denoyer and his wife Roxanne. Connie and Abel were running rowboats for GCE. And that might have been the first time Grand Canyon Expeditions got their dories down. Mike Denoyer was running a dory. Anyway, we end up at Tequila Beach, there were all these people there, and there was this photographer by the name of C.C. Lockwood. Real good photographer. He's worked for *National Geographic*, he has a few books out on the Grand Canyon. He lives down in Louisiana. A friend of Mike and Roxanne Denoyer. Anyway, incredible professional photographer. I noticed that he was up on the rocks, taking pictures of everybody on the beach, and I went over to Connie Tibbets and I said, "Hey, Connie, let's get everybody to line up and moon C.C. up there." Of course she's like, "Yeah! Let's do it!" So Connie and I went around, we got everybody together, "Hey, we're going to line up here. That guy's up there, he's going to take our photo, and we're going to moon him!" So we all lined up. He didn't know what was going on, but finally he got the drift when we all dropped our pants. He got the shot, but he didn't have a wide-angle lens, and I think about thirty people, at least, are left out of the picture.

Reeder: Did that picture get published?

Toner: Yeah, it was in his book on the Grand Canyon. [*Also made the BQR but I don't remember what issue.*] I can't remember the title of the book, but C.C. Lockwood's book on the Grand Canyon, photographs of the Grand Canyon. I can't remember if he titled it "Moon Beach" or "Butt Beach."

Reeder: "Full Moon Beach"?

Toner: Yeah, "Full Moon Beach." And then of course Connie Tibbets, I did a number of science trips with *her*. She's always fun. Yeah, she has a lot of knowledge of the river and how to run rapids. Learned a lot from her.

Reeder: Yeah, she was running big rigs in the high water in '83.

Toner: Yup, high water, low water. I remember running low water with her, and we were like, "Boy!" I think we were all tense and sore because we were lifting our motors a lot. I think just the worry of low water and hitting rocks, we were just all tense. Like, "You sore too?" "Yeah, I'm a little sore too." (laughs) Our bodies go through a lot down there. Oh boy.

Reeder: Yeah, I think to be a guide down there you're going to deal with some stressful situations and have to react. I've seen you react to some pretty stressful situations that I've been in down there. I think one thing that always impressed me was your ability to stay cool, keep calm, and react in absolutely the best way possible. How did you develop that, where did that ability to stay calm come from?

Toner: Well, I think it's just because it's almost normal (chuckles) to have those situations. And after a while, I think maybe just having a lot of experience with those situations…It's like, "Well, this isn't the first time this has happened." So a lot of practice. Yeah, I think it's just coming from having…You know shit is going to go wrong, that's normal, that's going to happen down there. You know, when I'm running with Sybrena Smith and things go wrong we joke around, "Is this normal?" And we look at each other and say "Yeah, this is normal." (laughter) It's like okay, it's normal, no big deal. And I think that's what happens in these situations. Accidents happen. Let's make things better. I've had my share of excitement, adventure, and accidents, and Dave Mackay always says, "Oh yeah, alright. Well, let's just move on. You learned from that, right?" I'm like, "Oh yea." Yeah, I think it's just that things go wrong down there.

Don't you think that a lot of things happen down there, it's almost like not *every* trip, and there's some accidents worse than others, but boats flip, people get sticks through their feet.

Reeder: I think your demeanor in these situations is just something to learn from.

Toner: Yeah, I don't know. I mean, it's…Maybe there's some things, too, you don't have any control of, you might as well not panic. Kind of like when we were up on the Alsek and Walker MacKay and Sybrena Smith and myself went on a walk. We call it Bear Knoll now, but Walker and Sybrena and I wanted to explore a little, "Let's get out of camp, let's go for a little walk. We'll just go up to that little knoll." So we hike through the woods to get on this knoll, we're about thirty feet from the top of this bald piece of rock. We looked down, and Walker says, "Hey, there's a bear there." So Sybrena and I and Walker look over at this bear, and then this bear notices us and stands up on its hind legs. And then he drops down and comes directly at us, just full gallop, boom, boom, boom, boom.

Reeder: Charging.

Toner: Just charging at us. And we're looking at each other, going, "Oh, this isn't good." So we kind of back up a little bit, and then that bear gets about, I don't know, sixty feet from us and pops up in the brush again and looks at us, stands up on his legs. And we kind of spread out, at

arms length, we're yelling, hollering, waving our coats and everything. And then the bear drops down again on all fours and we're like, "Alright, well, let's at least get up on the knoll," which was about twenty steps behind us. We managed to get twenty steps behind us, and we're looking for the bear. Then the bear appears to the right of us, and stands up. We're hollering at him and everything. But there is not much you can really do to control that bear. We're making noise, we're being big. I didn't really feel threatened at that point or I should say panicked because he didn't seem like he was mad and aggressive. His ears weren't down, he wasn't popping his jaws. But he was checking us out. And I think he might have been checking us out to see if he could eat us—here we were, three little things. But I didn't really feel panicked at that time. But that bear could have easily run right into the midst of us, grabbed one of us, turned around and headed into the woods to eat one of us. But I was just thinking. One of my thoughts was as Sybrena and Walker were yelling and hollering was, "Here I am with Walker and Sybrena, we've been running rivers together for twenty-plus years, and we're still getting into trouble together and having these adventures.

* * *

Reeder: Yeah, it's a wild place.

Toner: Wild place up there…

Reeder: You have had these incredible adventures all over the world. Have you ever done any first decents?

Toner: No not really. There was the Kaibab.

Reeder: The Kaibab?

Toner: Yeah CRATE had a late March trip. It was a single boat trip. And it was snowing at the warehouse in Fredonia just a little. Walker MacKay was the one driving me over and we both thought we could drive over the Kaibab. We didn't think the snow would be that bad. But we get past Jacob Lake, and the snow is not plowed or anything, it gets deeper and deeper and we decide to go back but we got the truck stuck, kind of jackknifed on the side of the road. So we are wondering what we're gonna do. I have to get down to the ferry. But I thought about it and I thought, "hell I think we can just kick the boat off the trailer and I could probably make it off the mountain". I mean it's all downhill from here. And Walker Mackay thought we should at least try it so we slid the boat off the trailer and had to tie it up because the boat actually did start sliding down hill a little bit. We put the side tubes on then he looked at me said, "You ready?" I said yep and he cut the line and off I went. I went flying down that road. I was surprised and thankful at how much control I had. It was pretty much just like being on the river. When I got to some of the uphill I did give it full cobb…I didn't want to stall out…I would have been screwed. But going down the switchbacks on the east side of the Kaibab didn't present me with any problems. They were pretty fun.

Reeder: Wow! Those turns do have a nice bank to them.

Toner: Right! So the plan was for Claire Quist to meet me at the bottom of the Kaibab, where it all flattens out, down by House Rock Valley, and sure enough he was there waiting with his truck and flatbed trailer. The funny thing was, was when I went over that cattle guard down there I hit my motor and chewed up my prop. Claire said "Didn't you see that cattle guard? How come you didn't pull your motor?" You know, I just didn't think at all about pulling my motor. I just said to him "Well, you're right. I should have pulled." And then I had to ask him if I could borrow a prop. That was a little hard. But he was pretty nice about it and we loaded the boat and got down to the ferry.

Reeder: That's incredible! Never heard that story…Well folks, we are hearing about this first right here!…

* * *

The Fun Factor is always high when running with John Toner. Better not take a nap on the run out, or your toe nails might be painted. After a meal with beans, Toner often hides a remote controlled fart machine in a central place—just to help folks feel more comfortable about the way they might be feeling. When the days get long, on a difficult trip, you can hear Toner say, "Look at where you are!" It's a tough job, and John has mastered the art of making the low-times seem fun. His theory is that if the crew is having a great time, that energy is infectious—it's impossible for anyone not to be having fun. Toner has a separate box on his boat, where he keeps his surprises. It might be a gigantic rubber toad that he hides along the trail to the groover—or a random clothespin you find hanging off the back of your shirt. And next to the pranks he keeps an oversized geographic map of Grand Canyon that he pulls out to break down the history of rock that we have traveled through. He has the ability to break down complex scientific theory and have people laughing at the end of the conversation. Toner is a dynamic guide- who makes every trip a unique adventure.

* * *

Reeder: So in the wintertime these days you've been doing brine shrimping out on the Great Salt Lake.

Toner: Yeah. So it was kind of when the science trips were dying out a *little* bit—you know, I wasn't getting as much work in the winter. Kristen and I got together, and she's in Salt Lake. Dave Mackay had started brine shrimping on the Great Salt Lake and some of the other guides were working for him. I kind of resisted doing it, because I enjoyed my work doing science trips, and being in Southern Utah—you know, wanted to stay down there. But then the science trips started drying up for me a little bit. And then I met Kristen, who's in Salt Lake, so it was like, well, I guess I'd better come to Salt Lake and be with Kristen. Dave had always offered, "If you ever want to

Kaibab descent.

come up and brine shrimp, you've got a job." So I asked Dave if I could get on brine shrimping, and he said, "Sure, come on out."

Reeder: What is that process like? You're out on the Great Salt Lake, you're on boats, you're collecting egg, is that right?

Toner: Yeah. So what we're doing is we're not collecting brine shrimp, we're collecting eggs of the brine shrimp. And these eggs float to the surface. The brine shrimp lay their eggs, the eggs float to the surface of the Great Salt Lake, and we go out on boats, we lay out this oil boom, which is like a curtain that floats in the water. We position it so that the wind or the current will push this egg into the back of our oil boom. And then we gently close down that oil boom, so the egg doesn't flush out underneath, doesn't come out from underneath the oil boom. And we get it tight enough that we can pump/vacuum up the egg and put it on the boat. So we put it in these sacks that usually can hold about 2,500 pounds, sometimes a little more. So we're collecting this egg then this egg is processed and a lot of it is sealed in a can. Just like a coffee can. The egg or cyst is very tough. The egg is shipped to these shrimp farms, fish farms where they'll hatch the brine shrimp egg and feed it to the young shrimp and fish.

So when I got out there, I was thinking, "Well, this sounds like a fun job. I'm going to get on a boat, I'm going to work on the Great Salt Lake, and that sounds pretty fun and interesting." I never really thought about the money. Of course, you know, river running you never really thought about the money too. I've always just done something that sounded interesting and sounded like fun.

So I get up on the Lake wondering what the job has in store for me. Pretty much the training I got to go out and participate in all this was, "Here, get on the boat and get out there and we'll tell you what to do once you get out there." You know, I get out there and get on the radio

John Toner and Dewey Moffat harvesting egg.

and they would say, “Okay, go to these coordinates.” I’m thinking, “How do I get to those coordinates, I’m not sure.” So they’d say drive to the boats with the flashing lights.” Or, “Drive toward the big peak.” The other brine shrimpers out there are great people, but a lot of them at that point in time were extremely protective of the egg they were getting, and it was pretty much the wild and wooly West. I think the third day I was out there, I saw boats pushing other boats around, they’d ram each other, they’re yelling at each other. I saw one guy get out of his boat and throw a Number 10 can of corn at another boat, shattered the windshield. I saw one boat ram another boat; saw another boat go over and hit this little ten-foot skiff and just tip the skiff completely over in the water. There wasn’t anybody in it, but they tipped the skiff over. So I’m going, “What have I gotten myself into, and what *is* all this?” People are yelling at each other, cussing at each other, ramming each other with boats.

Reeder: Competitive.

Toner: Oh my God. So what is going on out here? Yeah, especially back then when I first started, it was really competitive.

Reeder: What’s changed since then?

Toner: What’s changed is that most of the companies are now in a co-op, so we’re all working together. There’s no reason to be fighting each other or anything. It’s all going into same pot. There’s one company that hasn’t joined the co-op, and we’re still pretty aggressive with them as they are with us. But we’re just following the rules, and mostly they do the same with us. So it’s settled down quite a bit. You used to have, I think, twenty plus companies out there.

Reeder: Twenty plus companies?!

Toner: Yeah, at one point in time. It was pretty aggressive. When you have that many boats on the water, there’s bound to be some fights.

Icy brine shrimp boats.

Working on the Great Salt Lake in bad weather, listening to Jimmy Buffet, staying warm and having a good time.
Photo by Dewey Moffat

Sunrise on the Great Salt Lake.

Reeder: What's it like to be on the Great Salt Lake in the winter? You know, short days, the sun goes down, what's it like to be out there?

Toner: I think in every description of the Great Salt Lake the words strange and weird pop up. And it *is* a weird place. It's just a strange, surreal place, with the lighting out there, and being on the water with the sunsets out there. It's real incredible. Sunsets are beautiful, sunrises are beautiful. It's a challenging environment too. You've got fog out there. Some parts of the lake actually get freshwater lenses and it'll freeze over with ice. And of course the nature of the job is, a lot of times when we're really fishing hard, we're on the lake at 4:00, 4:30 in the morning, and a lot of times we don't quit work until maybe ten at night. And when there is a lot of egg you get up and do it again and again and again. So pretty challenging work. You try to get enough sleep, because if you don't get enough sleep, after a while you get punch drunk. If you get four or five hours of sleep night after night it just feels like you're a little drunk. You're not moving as fast or thinking as clearly.

You know, it is a pretty fun, cool job. A lot of times when I'm walking down to the boat in the morning and it's dark and cold and I'm walking down the dock, getting on the boat I'm thinking, "How many people in Utah are walking down a dock and getting on their boat to go out and do their job in Utah, especially in the winter time. I joke with the other brine shrimpers that we have the best job on the Wasatch front. And they say thank God it only lasts four months. It's a cool job. And it's fun most of the time, and you're on a boat.

Reeder: Year-round boating.

Toner: Yeah.

Reeder: With that, and with science, and going back to the Grand Canyon, always going back to it. Closing in on forty years now.

Toner: Yeah.

Reeder: So what is it that keeps bringing you back to the Grand Canyon year after year after year?

Toner: Well, it's a great place to be, it's always challenging—everything from running the river to dealing with people, to even dealing with logistics, and even just packing all the food, with all the dietary restrictions. So the work is challenging. Of course you've got the Grand Canyon, which is one of the best places in the world to be. You can disappear down there in a magical place. You're in one of the prettiest places in the world. I'm always in awe of it, *all* the time. Running trips down there you get tired, but I don't think you ever get tired of the Grand Canyon. You do get tired. But yeah, it's just a magical, magical place down there, and I feel privileged to be able to get down there. I think I've just had a great life, being able to make my living in Grand Canyon National Park, Canyonlands National Park, up on the Tatshenshini and Alsek.

I feel just very, *very* fortunate to be able to be in these *special* places—to be in these special places my whole life. Yeah, real lucky and fortunate. And I'm just lucky to have all these good people I've known throughout my life, and be around them, and meet all these really talented, crazy special individuals, these boatmen. They really grasp life by the horns, huh? They really live it to its fullest, and it's fun to be around people like that. You know Nels [*Niemi*], eighty-something years old, still running rivers. It's just good to be around people like that—always, huh? Yeah. I'm not a big-city guy. We have a place in Fredonia, and I'm happy for it. Never thought I'd be in Fredonia for that long, but that's where our CRATE warehouse is. And Fredonia is pretty much the town that doesn't change *at all*. Maps change, but not Fredonia. So nice to live in a place where you can see the stars. I have good neighbors. Some of those neighbors are cows and horses that wander into the yard, or the neighbors' chickens that come into the yard. So it's just really nice and *tranquillo* there. Yeah, I feel pretty fortunate.

Reeder: It's always a privilege to be on the river with you, John Thunder.

Toner: (laughs) You too, Ben Reeder! A lot of history there.

Picture Repairing a Hole. Circa 1975

I've confused a star for a planet before,
I've confused waiting for wondering,
I've confused answers for options.
The past, wide and watchful, looks
at it all and has no use
for our hungry, stale questions.
It knows what it knows.
Leaves the rest to our restless,
violet ways.

Your dad and my dad
stopped on the right
to repair the boat.
My dad's hair Tapeats gold,
your dad's red bandanna crouched stiff
beneath his neck,
and the sun cradled whatever conversation
they had, and your dad held twine of some
kind,
and mine placed a sneakered right foot
up on the tube, tucked his folded hands
under his knee.
Their shoulders crisp and ready,
they were shining: this one afternoon below
the horns,
repairing a hole, young friends you call them,
circa 1975, your mom says, they had everyone
walk around, my dad tells me, and
what was to come didn't matter. It just sang,
unconfused
in the background:
This river, this boat, these words between
walls.

—Erin Agee

I wrote the poem inspired by the photo of former Hatch guides John Kramer and Russell Agee who are seen repairing a hole below Horn Creek in the mid-1970s. Family legend has it that Russell and John walked their passengers around Horn Creek that day due to the steep drop. Whose boat needed repair after the rapid, Mr. Agee's or Mr. Kramer's, remains disputed, although Mr. Agee admits his memory is not what it once was.

I am Russell Agee's daughter and I recently had the pleasure of meeting my dad's guiding friend, John Kramer, his wife, Renee, and their son, Russell. After spending a weekend together, Renee sent the photo to me over text, saying, "Your father and John Kramer below Horn Creek on the Right after Russell's interaction with almost perfect run. Not quite. Picture repairing a hole. Circa 1975." Taking that last line from her text as the title, I wrote the poem as though addressing John and Renee's son, Russell Kramer. Russell Kramer guided in the Canyon and I have several commercial and private trips down there as well. The stories continue.

Erin Agee

Back of shirt.

Summer Doss is a fine artist who works primarily in oils. Her work explores the dichotomy between modern civilization and the natural world, trying to navigate a balance between the two extremes. Summer seeks to confront the human illusion of control and wants to facilitate inner dialogues surrounding our innate connection to nature, fear, ego, and mortality.

Summer is currently based out of Flagstaff, Arizona and her work can be found at the Art Loft Collective, @summerdossart on Instagram, and at summerdossart.com.

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GRAND CANYON RIVER GUIDES

boatman's quarterly review

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Thanks to all you poets, photographers, writers, artists, and to all of you who send us stuff. Don't ever stop. Special thanks to the Catena Foundation, the Adopt-a-Boatman sponsors, "Circle of Friends" contributors, and innumerable GCRG members for their generous and much appreciated support of this publication.

Little Colorado River — Betsy Menand / BetsyMenand.com