

boatman's quarterly review

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Steve Carothers

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Humpback Chub • GCY • Moth Mystery • Respectful Recreation
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...is published more or less 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.

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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, be sent on a CD or emailed to GCRG. Microsoft Word files are best but we can translate most programs. Include postpaid return envelope if you want your disk or submission returned.

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

HELLO AND HAPPY fall season to all! As I write this, golden leaves are falling around me while I sit on my writing perch on the deck. My hands are still cracked from the de-rig two days ago and the last traces of "tolio" have almost been resolved. I have always appreciated fall as a time to reflect on the passing of another grand season in the Canyon. I find myself filled with gratitude for two reasons among many: one—that I have what I consider one of the greatest professions—guiding, educating and playing with folks in Grand Canyon—and two—my newest role as GCRG president. I cannot tell you how honored I am to be in the position to invest my time and energy advocating for and learning from one of the greatest places on Earth and one of the most phenomenally diverse, talented and original community of characters! I find myself feeling similarly to those moments right above a rapid—there's a lot going on in that rapid and I'm never sure how things will turn out, but I feel prepared, enthusiastic and open to what lies ahead.

It took me awhile to get here, and at times I thought it wasn't going to be possible. I grew up on a farm in rural Virginia. When I was twelve, my grandma took me to see a film documenting what must have been an early '80s commercial river trip in Grand Canyon. I can still clearly see the frame that stole my heart: a great wave splashing the camera, laughing in the background and Canyon walls larger than comprehension in the background. What was this place and could I ever do that? Twenty-two years later, I find myself living the dream. It took me awhile to figure things out. My only skills were my farm-based knowledge of how to work hard, honor the land, and enjoy the company of the people you're with. I am ever grateful to the guides who likely shaved years off their lives by riding with me my first time rowing and to those who encouraged and supported me unconditionally. Grand Canyon Youth provided me my first row-boat (was I supposed to bring straps?) and GCY trips still ranks among my top favorite trips ever. AZRA has become a second family to me and I am proud to row, paddle and motor their boats through Grand Canyon. Ceiba Adventures is a ridiculously fun community of people I admire and they often keep me busy through winters in Flagstaff. In the off-season I try to maintain a nice balance of travel, social work and massage therapy. But my career as river guide is my foundation. Grand Canyon feels like home and the river pulses through me wherever I seem to be.

There are a great many issues looming on Grand

Canyon's horizon. At this moment, there are developers at meetings attempting to persuade the Navajo Nation to approve a 420-acre development called Grand Canyon Escalade at the Confluence of the Little Colorado River and the Colorado River. Our Native neighbors have been passionately working to prevent this development as we heard at this year's GTS when Jason Nez, Renae Yellowhorse and Delores Aguirre with *Save the Confluence* gave their presentations. It's not just the Navajo Nation that will be greatly affected by this development but also the other ten affiliated tribes who often voice their concern for the well-being of Grand Canyon. Nikki Cooley, GCRG's first Navajo president, implored the guiding community in 2012 to, "Keep abreast of these issues, know the facts, so you can share these with your passengers and fellow guides."

On January 30, the draft of the Long Term Experimental and Management Plan EIS will be made available for suggestions and critique. This is the first time the EIS will be revised since the opening of the dam. It is *the* guideline for best management practices in the Canyon, covering everything from daily flows, high flow experiments and attempting to measure how individuals value Grand Canyon. Adaptive Management Work Group (AMWG) representatives, Sam Jansen and Jerry Cox, have been working hard to keep the board abreast of the developments in this intricate and involved process.

The Backcountry Management Plan is set to come out soon and GCRG will need to be prepared to comment on issues that affect river running such as pack rafting and the Deer Creek Narrows closure. GCRG is looking forward to meeting with Superintendent Uberuaga to discuss these issues and a number of others.

One last challenge to note is that as I am writing this, federal investigators are at Grand Canyon National Park looking into allegations of sexual harassment by Park employees. This can be seen as an opportunity for all of us to sincerely and mindfully consider the way we work together as men and women. We must respectfully uphold the integrity of our chosen profession and the relationships we create with other professionals who live and work in Grand Canyon.

Now, we find ourselves setting up in the glassy tongue. Checking out those waves in front of us I am confident that the GCRG team and members of this phenomenal community are ready to take on what lies ahead. Like previous GCRG president Sam Jansen said, "We don't determine the way the river flows, we just steer as best we can." It is an honor to work with an organization that, since its inception in 1988, has worked to protect Grand Canyon and set the highest standards for the river profession. Those goals are every bit as

important and relevant today as they were back then. I look forward to meeting you. Let's jump in the boat and look forward to what's around the next couple of bends.

Katie Proctor

WFR Recert

NEEDED TO RE-CERTIFY your Wilderness First Responder in 2015? Consider the "Canyon and River Medicine" WFR recert sponsored by GCRG and Desert Medicine Institute. Dr. Tom Myers and Marc Yeston (WEMT) will be teaching the class, and their wealth of first-hand knowledge about critical situations in Grand Canyon can't be beat. You'll be getting *real world* knowledge that can help you diagnose and treat in the challenging Grand Canyon environment. The class details are as follows:

WFR RECERT, INCLUDES CPR (SPONSORED BY GCRG/DMI)

DATES: February 20–22, 2015 (same weekend as the Whale Foundation Wing Ding so you can get certified and have fun in the same weekend!)

TIME: 8:00 A.M. to 5 P.M. on the first two days, and 8:00 A.M. to 3:00 P.M. on the last day. CPR portion will be the morning of the first day.

LOCATION: Arizona Raft Adventures warehouse in Flagstaff

COST: \$225 (note: a \$50 deposit will hold your spot)

PAYMENT OPTIONS: you can pay either the deposit or in full on the GCRG website: www.gcrg.org/guide_resources_firstaid.php, or you can mail a check made out to GCRG (PO Box 1934, Flagstaff, AZ 86002)

MAX CLASS SIZE: 22 people

And if that class doesn't work for your schedule or you need a full WFR instead, you can check out lots of other local class options (both full WFR and WFR Recert) on that same web page, or scroll down to the list of Wilderness First Aid providers and do a little investigating yourself to find a class in your area.

Sign up soon while there are still spots available! Beats scrambling at the last minute.

Lynn Hamilton

EXECUTIVE DIRECTOR GCRG

Farewells

ART GALLENSON—NOVEMBER 10, 1942 – SEPTEMBER 9, 2014

ARTHUR S. GALLENSON PASSED AWAY on September 9TH, 2014 at age 71. Art “followed his heart,” and “never gave up,” these two mottos influenced him throughout his life. Art was diagnosed with Parkinson’s Syndrome twenty years ago and gradually the disease robbed him of many abilities; nonetheless he had the wherewithal to stay fascinated with life and continued to be positive and present in the lives of his friends and family.

Art grew up in Salt Lake City and worked for his father, uncles, and grandfather at Gallenson’s Grand Jewelry and Loan. At the family store he developed a lifelong passion for cameras, firearms, and people and their stories. Art joined the Army ROTC while attending East High School and continued with the ROTC program while in college at the University of Utah (U of U). As sophomores at East; Art, Art Fenstermaker, and Ron Smith caught the attention of substitute teacher and river runner Ken Sleight.

That summer all three ran a semi-commercial river trip through Glen Canyon led by Sleight. Later on in 1962, Art paid his own way to run Grand Canyon with Georgie White, thus becoming an official “River Rat.” Following these formative trips, muddy Colorado River water coursed through Art’s soul for the rest of his life. Art started with Western River Expeditions in the early ’60s becoming one of the company’s original guides, and ran rivers for Western into the mid-’60s in Idaho, Utah, and Arizona, as well as served as support for trips in Mexico.

During his twenties and thirties, Art became involved in causes that he was passionate about. He often used great insight and perseverance to fight within a system in an attempt to reach many lofty goals. He was at the forefront of opposition to building Glen Canyon Dam, where he learned at an early age the lesson of getting to be known and respected by people on both sides of an issue. He became a dear friend of John Flannery, a vice president of the Sierra Club, and W.L. “Bud” Rusho, the Bureau of Reclamation spokesperson during the construction of Glen Canyon Dam. In Rusho’s memoirs he mentions a self-assertive young man, Art Gallenson, walking straight into his office and laying out a plan to build a pipeline to funnel Colorado River sediments from the upper reaches of what would become Lake Powell to a site below Glen Canyon Dam, thus prevent-

ing the silting in of the reservoir. Rusho also noted in retrospect that “Art had a brilliant idea.” Later on, in efforts to champion the preservation of rights of the commercial river running industry, Art used his scientific knowledge and lobbying skills to add input to the subsequent rules that govern commercial river operations. In many of the battles Art fought, the results left him the chance to say, “I told you so,” but that was not in his nature.

Art earned a degree in geology from the U of U and continued his military duties after graduation. His experiences included Officers Candidate School (OCS), a security detail in Washington D.C., and an Ordinance Disposal Command at Navajo Army Depot, Arizona, where he felt he received a lucky break to be posted on active-duty at a place near Grand Canyon. While

stationed at the depot, Art renewed his friendship with Earl Leseberg, pilot and owner of Lake Mead Air in Boulder City, Nevada. Earl began to teach Art to fly airplanes, which like the river, became a defining component of his life.

Art started guiding with Grand Canyon Expeditions (GCE) in the later sixties. His childhood friend and classmate Ron Smith, whom he had grown up with on the east side of Salt Lake City, had recently founded the company with his wife Sheila.

The commercial river industry in Grand Canyon during this time was beginning to prosper, and GCE had established itself as an innovative river company. Art’s energy, resourcefulness, and intellect complemented the young business. He was willing to give whatever time was necessary to complete a project, and always eager to explore ways of improving any systematic challenges. Never someone who was “just doing a job,” Art was constantly looking for ways to improve the operation for everyone. And more times than not, he brought out the best in others, by helping them buy into a better way. Art left GCE after a few years to explore a future in the military and honor the commitments that he made, and returned to the company a few years later to pursue a future in the river business. With valuable new experience, and a fresh new perspective of how much Grand Canyon and river running meant to him, Art settled in Kanab as the GCE headquarters and operations had moved there from Salt Lake City during the time he was away. The company had grown considerably, and the timing was opportune for GCE to welcome back Art’s loyal and resolute personality. He continued to guide



Art Gallenson circa 1978.

occasionally, however his primary focus became the office, warehouse, and ensuring that the guides were given the support they needed. It was during this period that Ron purchased a Piper Comanche (and within a year or two a Helio Courier), which Art used to shuttle crew from the Grand Wash Cliffs back to Kanab.

Art's most memorable opportunity began in 1979, when Earl Leseberg phoned him stating; "I need someone to help me run this S.O.B." Art accepted the offer of an ownership stake in Lake Mead Air and filled a much needed role, that of manager and director of everything from office staff operations, to aircraft maintenance scheduling, to pilot training, and much more. Art worked tirelessly with the FAA to ensure that the special use airspace, now in-place above Grand Canyon, is available to all users. He has been credited with authoring much of the language and rules adopted by the FAA that now govern this airspace. Fueled by Art's dedication and focus to making the Grand Canyon available to the public, Lake Mead Air thrived as it matured. Under Art's direction, flights were multi-dimensional, servicing a wide range of users from sightseeing, to river runners and outfitters, to U.S. Forest Service Fire Patrol, to Air Ambulance flights. This made the Lake Powell, Marble Canyon, Grand Canyon, Lake Mead, and Death Valley airspaces available to those who desired to view the spectacular vistas from near the ground to high above. Art, being a partner in the company, gave his all to molding it into an incredibly efficient and respected entity. His leadership assisted the company in enjoying the best safety record achievable and this legacy has become the hallmark and model for which Lake Mead Air became known. In 2003, when Lake Mead Air, Inc. ceased operations, it had become one of the largest fixed-wing scenic air touring companies in the United States.

For those of us who had the pleasure of knowing Art, perhaps his greatest asset was his insatiable desire to be a friend. Once a relationship was built, one could expect years of kind consideration and goodwill. When Art settled in Kanab, the Colorado Plateau became his backyard as he graciously moved among his many friends, including Emery Kolb, Dock Marston, and John Riffey, while also leading younger generations into the future. He was the same way in Boulder City where he gained the respect and adoration of the town, and of the aviation business as a whole. Throughout his life, his circle of trusted and loved friends and associates was truly remarkable. Art's devotion to people—and to his cats and other pets—defined the core of his character. Art helped out many souls in both small and life-changing ways, and he did it because he felt it was the right way to live.

Like time and the river flowing, Art will be in our thoughts forever. Clear skies, dear friend.

Latimer Smith

NOTE: This farewell was adapted from two earlier farewells and simultaneously added to for submission to the BQR. The first farewell was written for newspaper and online publication by Steve Gallenson, Marcia Thompson, and Mark Leseberg; and the second is a heartfelt tribute written by Paul Thevenin.

A celebration of life is scheduled to take place at Lees Ferry on March 14, 2015. For those wishing to attend, a block of rooms will be set aside at Marble Canyon Lodge (www.marblecanyoncompany.com or 928-355-2225. Please contact Steve Gallenson (galico@comcast.net or 801-244-8468) for further information.

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BOB RIGG—DECEMBER 1, 1930–AUGUST 23, 2014

JIM AND BOB RIGG set speed record in 1951, rowing a Nevills cataract boat through the canyon in 2½ days," stated the caption in the Belknap *Grand Canyon River Guide*. Since 1969, thousands of Grand Canyon river runners with a Belknap guide have read those words, and the record of slightly less than 53 hours, running on approximately 43,000–39,000 CFS, stood for almost thirty years. Older brother Jim had two previous Grand Canyon river trips, one in 1949 with Norm Nevills and one in 1950 with his own Mexican Hat Expeditions (MHE), Bob only one in 1950 with MHE (becoming #116 through Grand Canyon on Dock Marston's list). They continued to row cataract boats but also switched to powerboats, running Chris-Craft hard hulls beginning in 1952, with brother Jack accompanying them on several trips (see BQR Spring 2004, 17(1):6 for a "Farewell" to Jack). According to Gaylord Staveley, through 1957, Jim completed nine trips, Bob eight, and Jack three. Bob also did an MHE cataract trip in 1965 with Gaylord, and then rowed another cataract boat with Brad Dimock in 1994 on the "Old Timers" trip (with Bob's only flip ever, in Sockdolager), a trip that Brad said "was, and I'm not kidding, the coolest trip I've ever been on" (see BQR Fall 1994, 7(4):10-11).

Lew Steiger interviewed Bob on that "Old Timers" trip, and Bob commented about after he and Jim had passed Nevills' record of seven Grand Canyon trips (Jim's eighth was 1953 and Bob's in 1955): "And I said it's very humbling... Jim came up and he said, 'Well, you know what this trip is to you, don't you?' And I said, 'Yeah.' And he said, 'Well, congratulations, we passed Norm Nevills.'... You just didn't talk about it. But people



"Tad Nichols and Bob in the Bonnie Anne on the Old Timers trip," 1994, NAU.PH.94.37.84, USGS Old-Timers Collection.



"Bob and Jim below the Grand Wash Cliffs at the end of their speed run," June 11, 1951, NAU.PH.96.4.117.1, Bill Belknap Collection.

thought we were crazy anyway for running the rivers." The audio and transcript to Bob's interview may be found on the Northern Arizona University Cline Library website: <http://archive.library.nau.edu/cdm/singleitem/collection/cpa/id/63459/rec/4>. Following are some excerpts from the transcript.

"Jim went to medical school, as did I. I think that's one thing we probably had [in the mid-'50s] to divert from running rivers. And with the dam's coming, why, we ended up going into medicine. But I don't consider myself a physician, I consider myself a river runner—consider myself a river rat yet."

"When [we] ran later on in '51 [after the speed run], it was one of the first times that anybody had ever made two trips down the Grand Canyon [in one year]. And certainly the record time was the first time that all the rapids had ever been run virtually wide open [without stopping to scout], except for the one at Lava Falls—we stopped there. You can talk about a lot of different records. I don't look at it as a record—I look at it as a fun experience and a great time."

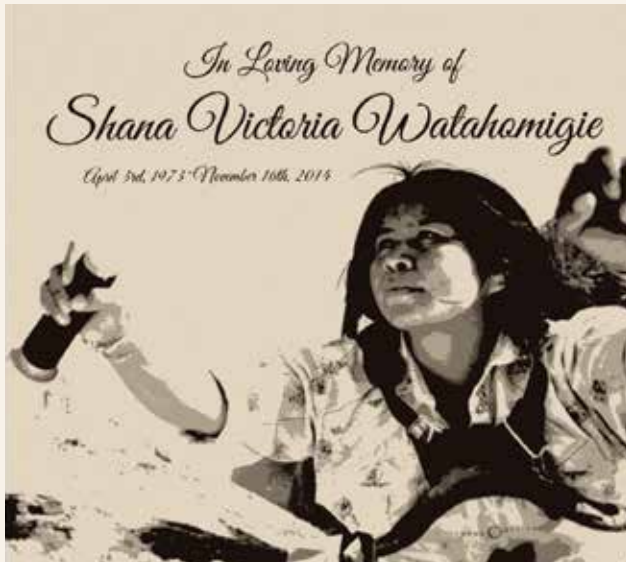
"I really liked the cataract boats because I felt I had more control of an oar than I did of a stupid machine that stops every now and then, or you could lose your rudder, or prop, or something. We had no problem with the powerboats, but it's a mechanical thing, that you really got a little less intimate with, as far as the river and the water and the rocks are concerned."

"With the high water coming up next year, I know where there's a Chris-Craft cabin cruiser that's well-preserved. [Laughter] Keep me in mind. We'll resurrect it if you'd think you'd like to take it down sometime. All in favor? [Aye!] Opposed? [No response.] Carried! We'll go, we'll do it!"

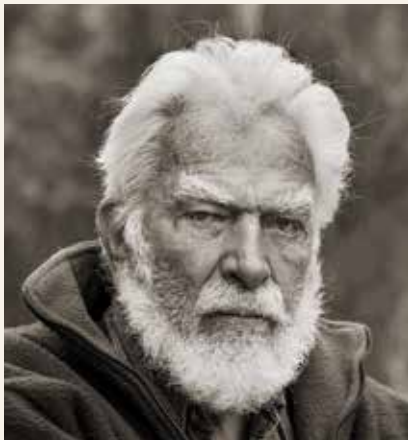
"Sure, you can say, 'Was the speed run the greatest? or the *Esmeralda* [rescue] the most high point?' But it's really the people—I hadn't thought of that before. Not to take away from the Grand Canyon—I don't mean that. But what made the trips were the good people. And of course the beauty, the solitude, the quietness. Being in the Grand Canyon is the high point, too, but anyone can do that, if they want to. We had some harrowing experiences, but wonderful fun."

At the 1989 GTS in the Flagstaff City Hall, Bob showed and narrated some Grand Canyon river running films to great acclaim; it was the first time I met Bob. He would often show at subsequent GTS's, including the 1995 Old Timers trip reunion, and one a year or so ago, most often wearing his pith helmet which made him easy to spot in the crowd. Bob loved gathering with other river runners, swapping stories, always with a big smile on his face. My favorite memory of Bob, though, was way off the river, in the Phoenix airport, of all places. My family was waiting to change flights and I saw Bob and his family waiting to board. I went over to greet him, exchange handshakes and hugs. We only had a few minutes before his line moved to board. As I walked away, I turned to look back at the same time Bob did. With a big grin, he waved to me and shouted, "Say hello to all the river runners in Flagstaff." On August 23, 2014, doctor of ophthalmology Robert Williams Rigg, Sr., ran his last rapid at the age of 83 (and to me he never looked, or acted, his age). Our condolences to Bob's lovely wife of forty years, Karen, and to all of the many of his offspring and descendants. I was fortunate, indeed, to have boated with such a great guy!

Richard Quartaroli



SHANA WATAHOMIGIE PASSED away November 16TH. We will publish a worthy tribute in the next issue of the BQR.



John Blaustein

MARTIN LITTON PASSED away on November 30TH. There will be space dedicated to this Grand Canyon hero in the next issue of the BQR.

Fall Rendezvous

THE FINAL NOTES OF Native American flute music cut through the darkness, leaving us in the audience, seated outside at picnic tables at “Into the Grand,” a venue in Page, in utter silence. Lestin Fuller, Diné, let the last tones hang in the air and then fade away, before announcing he would perform the Native American Hoop Dance, a dynamic form of storytelling where the dancer uses hoops as props to form different types of images. Prior to that, Paul Altosie, also Diné, introduced himself and explained the meaning behind his regalia—which was handmade by his mother, and consisted of porcupine quills, beadwork and detailed fringe—before vaulting into the sweeping, fast-paced movements of the Grass Dance. The performances were quite the way to wrap up a perfect evening.

The Grand Canyon River Guides 2014 Fall Rendezvous was a resounding success, with companies ranging from OARS, to Canyoneers, CRATE, Wilderness, Western, Grand Canyon Expeditions, AZRA, Hatch, and CanX participating. Some private boaters and general members were also present. Perhaps GCRG Executive Director Lynn Hamilton summarized the experience best when she said: “Gosh, that was a lot of fun. And what a great mix of people.”

The weekend started bright and early Saturday, October 11, with a guided tour of Glen Canyon Dam and its inner workings. Duane Berrier, a hilarious and seasoned interpreter (and an engineer at the dam for many years, now retired), led our tour. Because the dam is a federally owned facility, we underwent strict security measures before entering, including giving up any knives or lighters in our possession, and passing through a full-blown metal detector. Lynn’s husband Rick set off the detector with some hardware recently installed in his knee following a surgery, requiring a pat-down by a solemn-faced security guard, which everybody found pretty funny.

Following an informative description of how and why Glen Canyon Dam was built, how the dam operates, where the power goes, and how managers are considering increasingly lower lake levels, we shuttled ourselves to the other side of town for a raft trip with Colorado River Discovery—otherwise known as CRD, or “The Blue Boats.” The ones that do the dam-down trips to Lees Ferry. What a fun and wonderful experience!

We started by meeting in their office, a large and welcoming building located at 130 6TH AVENUE in Page, behind the Safeway, and signed our name on a liability release before examining the shiny new outdoor gear on display on shelves and racks throughout the entry.



For some, the smell of sandwiches and coffee from The River's End Café, located in the far corner of the building, proved too good to resist, and the yummy scents lured us to the register to make a purchase. Our retail therapy was interrupted only when a friendly CRD representative took us outside to discuss how things would progress: we would board a bus (be sure to use the restroom before loading said bus) that would take us to the base of the dam; once at the dam, we would grab a hardhat (yes, a hardhat), and walk down a ramp to the dock; upon reaching the dock, we would give back our hardhats (this walk was like, twenty feet); and finally, we would meet our guides. Oh, and not to forget, the two-mile-long ride through a tunnel at eight-percent grade to reach the bottom. That was one of the best aspects of the voyage!

Once at the water, we were introduced to the Colo-

rado River below Glen Canyon Dam by two CRD boat handlers who provided us with a top-notch half-day river trip on motorized pontoon boats. Kris, the captain of the boat I was riding, provided thoughtful and thorough interpretation throughout the approximately twelve-mile round-trip voyage, including a stop at a wall displaying rock writings, some of which predate many we are familiar with in the lower reaches of Grand Canyon. It was pretty phenomenal, cruising down that cold, crisp, clear river, with the Navajo Sandstone walls towering high above us, casting a reddish glow on the water's surface. Fishermen (and women) and other recreationists abounded. It was nice to see so many folks out enjoying the weekend. I think we all left the experience with a better appreciation of who CRD is and what kinds of trips they offer. It's nice to see a company filling the niche for day trips above Lees Ferry.

By the end of the day, we were shuttled back to CRD's office, and promptly invited to explore "Into the Grand"—run by owner/operators Hoss Sanderson and Karen Steele—which is a venue displaying all sorts of Grand Canyon boats, pictures, gear, movies, and other artifacts. The thoughtful duo were kind enough to let us make ourselves at home at their place—playing horseshoes, listening to music, exploring the property, and socializing in general—before preparing a yummy meal of chili and cornbread with lots of fixings. Overall, the night was a complete success.

Once night fell, we were treated to Gary Ladd's fascinating slide show on the creation of Glen Canyon Dam and the damage from the 1983 high water, bringing the conversation of the day full circle; this following the timeless, forward-looking performances of our new friends and Native American Indian neighbors, who are in the process of raising funds to participate in national competitions. I don't know about everybody else, but I, for one, am already looking forward to what Lynn has in store for next year's Fall Rendezvous adventures!

Chelsea DeWeese

Chelsea DeWeese is a guide with Hatch River Expeditions and serves on the Grand Canyon River Guides Board of Directors.

Thousand Pockets—Fall Rendezvous Adventure

IT'S WAY OFF THE BEATEN TRACK—so far off that you probably wouldn't find Thousand Pockets outside of Page, Arizona unless someone showed you. I know, I've tried! So, I was all the more excited when Alan Neill from Wilderness River Adventures agreed to lead our group on a hike out to the Thousand Pockets area as part of our Fall Rendezvous weekend. We made it down the dirt road that turned rocky, then whooshed through ever deepening sand with only one vehicle getting stuck (which begs the question: How many river guides does it take to get a van unstuck? **ANSWER:** *All of them.* And another question: How many conflicting opinions were offered on what to do? **ANSWER:** *Waaaaay too many.*)

At any rate, the three to four hour hike itself was phenomenal. It offered a bit of everything, from hiking up a sandy wash and shimmying through a slot canyon, to rock scrambling, and of course, exploring a whole landscape of "pockets" of all sizes, some of which still had water in them, while checking out the unique critters called triops living in the pools. What are triops? These tadpole shrimps are an ancient genus of fresh-water crustaceans that closely resemble a miniature horseshoe crab. Some consider them to be living fossils with a fossil record that goes back hundreds of millions of years. In fact, triops are considered to be one of the oldest animal species still in existence.

The Thousand Pockets area inspired our imaginations with land forms that seemed otherworldly and fantastical. We called one butte riddled with deep pockets on top "The Cottonballs," and another outcropping looked like a giant sand worm or Jabba the Hut. Still other areas were undulating in waves of rock. You know that when you find yourself in a constant state of wonder, it's an experience you wouldn't have missed for the world. Of course, could I tell you how to get out there? Nope, I'd need to show you...

Lynn Hamilton



Back of the Boat— The Whale Foundation News Bulletin

THE WHALE FOUNDATION 20TH ANNIVERSARY CELEBRATION AT THE WING DING

THE WHALE FOUNDATION will be celebrating its 20TH anniversary at the upcoming Wing Ding. This year will be a great time to haul out those dusty Whale stories and put a new shine on them. The board is working on ways to commemorate this occasion so check back on our website for more information as we get closer to February. The Wing Ding is our primary fundraiser but more importantly it is an opportunity to catch up with old friends and just have a great time. The Wing Ding is on Saturday, February 21ST, 2015 from 6–11P.M. at the Coconino Center for the Arts (2300 N. Fort Valley Road) in Flagstaff. There will be dinner and music, a kid's corner, a huge silent auction with lots of beautiful art, books, services, and getaways donated by the river community.

See you there!



THE 2015 WHALE FOUNDATION CALENDAR

The calendar this year is filled with amazing shots of wildlife, up-close. It is teeming with beautiful photographs documenting the diversity of species in Grand Canyon. Our old friend Raven graces the cover; this particular individual posed for Joe Bennion. Check out our Facebook page and our website to see some more incredible images you will find inside the calendar: www.facebook.com/WhaleFoundation. Calendars are \$12/each and \$3/each shipping. Order now by calling our business line at 928-774-9440. You can also just send us a check for \$15 to; P.O. Box 855 Flagstaff, AZ 86002 and we will send you one. There are a handful of retail stores in Flagstaff that carry it too, you can find a list of these stores on our Facebook page. If you

order ten or more, the price drops down to \$10/each (no shipping costs).

TIM WHITNEY WELLNESS INITIATIVE SPONSORS THE HEALTH INSURANCE ASSISTANCE PROGRAM

The Whale Foundation will once again offer the Health Insurance Assistance Program in 2015. You are eligible if you have worked as a guide on the Colorado River in Grand Canyon for at least one full season and you have health insurance. Applicants do not need to be currently working as a guide and past recipients are eligible to apply. The deadline for applications will be May 1ST, 2015. See our website for more information and application forms.

Lost and Found

LOST

Grey waterproof stuff bag with numbers 122 (I think) in black at Legends Campground on Thursday, September 11. Contents: blue mat, blanket with horses on it, black north face jacket, black toiletry bag towel, misc. shirt and shorts, two fly boxes. Important items: are Rx for a medical condition and custom teeth retainer. Contact: Peter Debellis, peter@siennasolutions.com, 949-599-8940.

LOST

Red Pentax camera (rectangular shape, waterproof) left at Diamond Creek on Wednesday, October 15TH after a CanX takeout. The owner would gladly trade the SD card for the rest of the camera peripherals (charger, manual, etc). At this point the camera is secondary and the card is primary. Contact Lora Cox at lora.cox@comcast.net.

The Secret Life of the Humpback Chub— Revealing the Ecology of a Cryptic Colorado Fish Through Chemical Signals

IT WAS A CLEAR MORNING in late May. We were in Andy Hutchinson's dory *Cottonwood*, with its light green gunnels riding above a red keel. The Colorado was flat as we rowed past Olo Canyon near river mile 146. Suddenly a fish broke the limpid green surface, leaping about two feet up, arcing its body sideways, before gravity exerted its pull. As with bird-watching, I only caught a few details: that this fish was about eight inches

It was known to spawn in the Little Colorado River, the Colorado's largest tributary and one which is only moderately disturbed. Tagging and tracking fish had revealed aspects of the chub's population ecology, but little was known about their life when young. My colleague Bill Pine from the University of Florida was anxious to study this life stage. He invited me into his project because of my arcane knowledge about otoliths,

the tiny ear-stones in fishes' inner ears. Each fish has three pairs of otoliths, which function like parts of a gyroscope, maintaining balance and aiding in hearing. These are not true bone, but are instead composed of calcium carbonate that precipitates on a gossamer-thin sheath of protein. The amazing thing is that this process occurs each and every day, and when fish are young, daily growth rings are formed, much like the annual rings in a tree. Indeed, older fish are aged to the year by this method, much as foresters determine the age of trees. Only because these are so small, fitting under the braincase, microscopes are needed to see the rings.



An adult humpback chub on a measuring board. Photo by Bill Pine.

long, its tail section was thinly tapered, and the tail itself flared out into a wide fork. Having already seen the bluehead and flannelmouth suckers, rainbow trout, and carp with their golden scales, by process of elimination I realized this was the fish I'd been studying for over four years, but had never seen alive: the humpback chub, *Gila cypha*.

This desert river fish, native to the Colorado River drainage basin, was only declared a separate species in 1946. It is one of a handful of endemic (native) species, and one of only four that survive today in Grand Canyon. The alterations of the river's natural regimes to electrify and water the West eliminated habitat and connectivity of fish and other aquatic life. The humpback chub, a pinkish, nearly scale-less minnow adapted to the sediment-laden pre-Glen Canyon Dam river, was an original member of the federal Endangered Species List in 1967.

Fast forward to 2009. By this time, many agencies and academic scientists had studied this rare fish.



Photograph of the three kinds of otoliths from a humpback chub. Top: lapillus otoliths; middle: a single sagittal otolith; bottom: the asteriscus otoliths.



Examples of otoliths viewed under the microscope. Left: a lapillus otolith from a 29-day-old juvenile. Right: a lapillus otolith from a 28-year-old adult chub. The scale bar represents 100 micrometers (about 0.004 inches).

late this tracer with easier to measure proxies. Not only did the chemistry show us when fish moved between rivers, but because the Colorado River is so cold—a near constant 50° Fahrenheit—the temperature differential caused the chubs’ daily

Even more amazing, the chemical composition of the otoliths reveals much about how the fish spent their lives. Water dissolves ions from rock and soil, and depending on local conditions, may bear a specific “fingerprint” of different trace elements and isotopes¹ that can be measured with sensitive instruments. Since the otoliths keep growing throughout life, if a fish moves from a water body with “fingerprint x” to one with “fingerprint y,” this is recorded in the growth rings—a chemo-chronology not unlike a Rosetta Stone.

Starting out, we didn’t know which mix of chemical tracers would be useful, so we began by surveying the waters of Grand Canyon—the main stem of the Colorado as well as its major tributaries—for many trace elements and isotopes. Quickly we learned that the main stem of the river, which is dominated by what comes out of Lake Powell upstream, is chemically the same from top to bottom of the Canyon, at least to Diamond Creek where our surveys ended. We also found some differences in several of the tributaries, notably the Little Colorado. And, in what amounted to an afterthought, we conducted an analysis that produced a whopper of a tracer, one that clearly differentiated Daddy Colorado from Little Colorado. The difference in that tracer was caused by the deep groundwater bubbling up out of Blue Spring, some ten miles up the Little Colorado. This source water is highly carbonated, and as it emerges from the depths it de-gasses, precipitating minerals and creating the milky blue water and travertine dams that the Little Colorado is famous for. That de-gassing also produces a chemical marker that distinguishes the chubs’ natal stream from the big river.

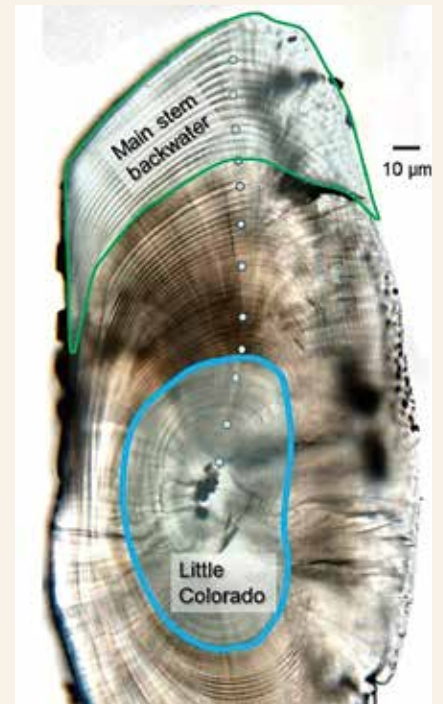
The trouble with the tracer was that it was tough to measure in tiny otoliths. My post-doctoral research associate, Todd Hayden, had to travel to one of only three labs in the country that had the appropriate instrumentation, a secondary ion beam mass spectrometer, and then he only had a week of “beam time.” Nevertheless, he confirmed our suspicions, and we were able to corre-

growth rings to contract when they migrated from their warmer “Little Colorado nursery” into the main stem.

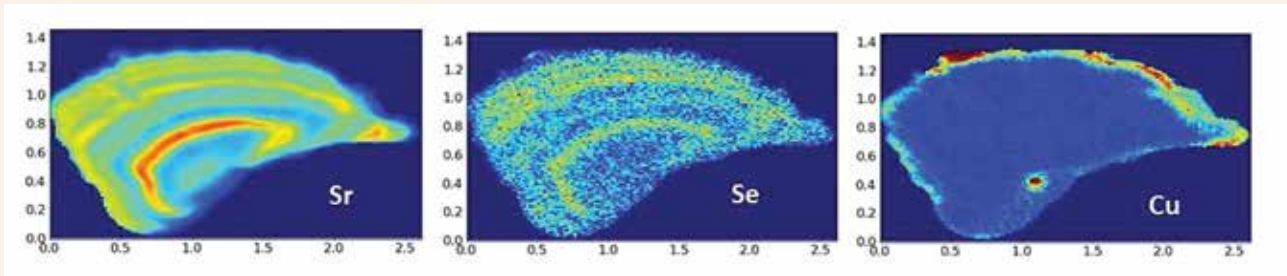
By careful combination of ring-counting and chemistry, we could pin-point just when the baby chubs moved out to the main stem Colorado. We could tell how old they were—to the day!—and how large they were. And we could do this not only in young fishes, but also in adult fish. In a sense, we asked each fish, “How old were you, and how big were you, when you ventured out into the cold, clear waters of the Colorado?”

We learned that humpback chubs make multiple visits back and forth between the main stem and the home waters. In many cases, it was as if a chub had a summer home and a winter home. Although seasonality is tough to determine in this system, given that the main stem river is warmer in winter than the Little C., we think that at least some individuals use the big river in winter.

What we ultimately learned—and wanted to know—was that the chances of surviving out in the main



Our discovery of a chemical marker for the Little Colorado allowed us to be able to distinguish use of different habitats during a fish’s life. The dots represent sampling points.



These trace elemental maps of strontium, selenium, and copper in an otolith of a 5-year-old chub were made with a technique using a synchrotron at Cornell University. The banding shows how this fish made annual migrations back and forth between the Little Colorado (blue-green shades) and the main stem of the Colorado (yellowish-red shades). The copper in the core (right panel, dark spot) was likely deposited in the developing egg by its mother.

stem were greatly improved, the longer the young chubs stayed in their nursery grounds. This was consistent with much of what’s been learned about other fish species in many parts of the world. But now we had proof—the chubs had revealed their secrets. This resolved an open question about how important the Little Colorado is to the population (*answer: very!*), and also provides insights into what other tributaries, with similar chemical properties, could also be managed to restore humpback chub populations. One of the most important of these is Havasu Creek, on river left just downstream of mile 157. Havasu is also a “travertine stream,” and indeed, experimental stocking of chubs yielded successful spawning earlier this year.

Otoliths shed a great deal of light on the ecology of this mysterious fish. The information we learned is helping those who care about humpback chub to understand their ecology better, and along with other studies, improve their management.

Karin E. Limburg

Department of Environmental and Forest Biology,
State University of New York College of Environmental
Science and Forestry

FURTHER READING:

LIMBURG, K.E., T.A. HAYDEN, W.E. PINE III, M. YARD, R. KOZDON, AND J. VALLEY. 2013. Of travertine and time: otolith chemistry and microstructure detect provenance and demography of endangered humpback chub in Grand Canyon (USA). *PLoS ONE* 8(12): e84235. DOI: 10.1371/journal.pone.0084235. (Open Access)

FOOTNOTES:

1. Trace elements are defined as those whose concentrations are trace: less than 100 parts per million. Isotopes are like “flavors” of an element, differing only in the number of neutrons, which affects the atomic mass. Measuring ratios of heavy to lighter isotopes provides insight into many physical, chemical, and biological processes.



John Owen

Grand Canyon Youth Update

ARTISTS HAVE LONG BEEN an important stakeholder in the stewardship of National Parks (think Ansel Adams). Grand Canyon Youth (GCY) through our partnership with Grand Canyon National Park, and this year outfitted through Hatch River Expeditions, has built on this foundation by engaging young artists in a twelve-day education program (eight-day river; four-day rim) called Grand Inspiration, or GRIN for short. GRIN combines the talents of an artist-in-residence, a NPS Interpretive Ranger, GCY staff, and fifteen youth from diverse backgrounds. Youth have an opportunity to share their voices and vision of the importance of Grand Canyon with Park visitors at an open air exhibit in front of the Park Visitor Center. In this spirit, I'd like to share Emma Landsiedel's story about her recent experience. Emma attends University of Arizona, is majoring in Optical Sciences and Engineering with minors in Mathematics and Mechanical Engineering. She currently works at Shane Knight Gallery as a sales representative, and framer (from a connection she made as part of this program).

Emma Wharton
GCY EXECUTIVE DIRECTOR

.....
FROM EMMA LANDSIEDEL:

*I wake up dimly, unsure
Of what surrounds me, where I am.
The cool sand is soft underfoot,
Yet untouched by the burning
Hand of the sun.
Cicadas hum in the brush,
Rusty, jagged cliffs pierce the cerulean atmosphere
Nature's skyscrapers.
Water whispers by, a muddled current of life
And I stand alone, at peace in this existence
And remember where I am: home.*

A month ago, I wasn't a poet. Yet, these lines of poetry come from my journal, written just a few weeks ago on an experience of a lifetime on the Colorado River. I was inspired by the glory of the canyon and though I had never been a poet before, I became one in that moment. I didn't limit myself with labels, with what I'd been able to do before. What I felt simply unfolded in front of me, effortlessly.

The feeling of effortlessness and ease with my art



encompassed my state of mind while on the river. Before going on my trip, I was certain I was a specific kind of artist, one who used colored pencil, charcoal, acrylics. But that all changed, thanks to some amazing inspiration

from the artists in residence, fellow youth on the trip, river guides and other adults, and especially the powerful Colorado River and wondrous Grand Canyon.

They freed me from those years of thinking I couldn't paint with watercolors, couldn't photograph, couldn't write poetry, couldn't sculpt. I could do (and I did) whatever I felt. My expression became uninhibited, raw, and easy. Before the GRIN trip, I had not known ease in my art, it had always come through hard,

meticulous work. But this trip freed me.

The vastness of the canyon reminded me of my own insignificance, but also gave me an opportunity to attempt to capture something so much greater than myself in my art. And I felt I needed to do that in every way I could, every medium, every style. I have so many more styles, more techniques to try, and already the River is calling me back to experience and express even more.

Emma Landsiedel
(age 19)



Moth Mystery Hour

THANKS TO THE EFFORTS of all the citizen scientists that have participated in Grand Canyon Monitoring and Research Center's light trapping project, we now have thousands of samples and millions of individual insects to study and learn from. As you might recall from previous updates in the BOR and at GTS, these data are beginning to shed light on important river management issues such as how river flows affect the abundance of adult midges and blackflies, both of which are key prey items for native fish. However, telling a straightforward story about midges and blackflies is proving to be a challenge, because the abundance of these adult aquatic insects is also affected by environmental variables including tributary floods and water temperatures. But not all the ecological stories that we're finding in these light trap samples are so complicated. We thought we'd use this Flyco update to tell you an interesting story that has emerged from these data. We love this story, because it centers around a beautiful terrestrial insect that you've probably seen on your river trips, and because it's a freebie that we didn't expect to come out of this project.

Like a loaded drag bag in an eddy, angel lichen moths (*Cisthene angelus*) are a conspicuous sight in Grand Canyon. During the months of April–May and

September–October, thousands of these tiny jewels appear in light trap samples. When we first noticed this pattern (lots of moths in spring and fall, but absolutely none in the summer) it immediately caught our attention, because it means there are two distinct generations of angel lichen moths each year.

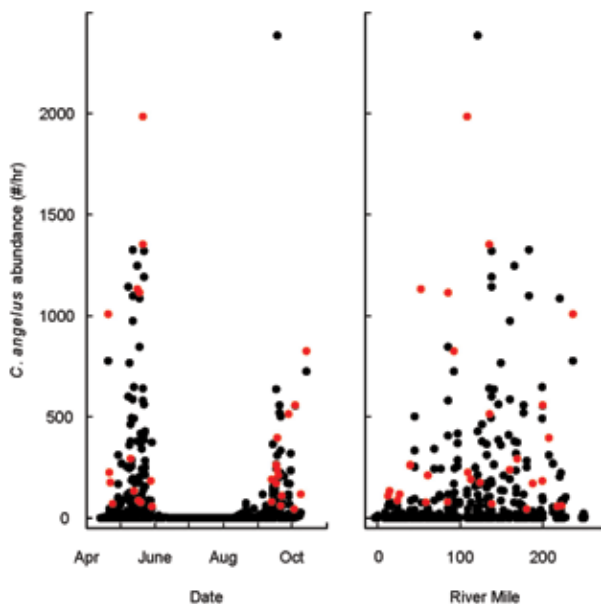
Scientists refer to this as bivoltinism, and pulling off a bivoltine life cycle is no small feat, because the timing of each generation has to be just right. If the timing of these generations is off, then the spring moths might find themselves trying to find mates in the blast furnace of summer, and the fall moths might emerge when it is freezing cold.

The length of the growing season is the primary factor that influences the number of generations a given species of moth has each year. In general, moths close to the equator tend to produce many generations each year while populations far from the equator are often univoltine (one generation per year). Species that are widely distributed often exhibit variation in voltinism based on their locality, with populations closer to the poles being univoltine and then transitioning to bivoltinism or multivoltinism closer to the equator where the growing season is longer.

Because of the confines of the Southwest's growing season, the two annual generations of angel lichen moths have unequal periods of time to complete their metamorphosis from egg to adult. The moths that are flying in fall had only a couple of summer months to develop, while the moths that are flying in spring had almost a year to develop.

Intrigued by this bivoltine pattern, we decided to dig into the archived samples and see what else we could learn about angel lichen moths in Grand Canyon. We dusted off the 2012 collection and pulled 28 samples: 14 from the spring and 14 from the fall. We identified the genders and measured the wing length of the first 100 moths from each sample (2640 moths in total!; not all samples had 100 moths).

We found that the aforementioned disparity in development time between the two generations is actually affecting sexual selection in this species. What is sexual selection, you ask? Sexual selection is one type of natural selection, and it occurs when some individuals out-

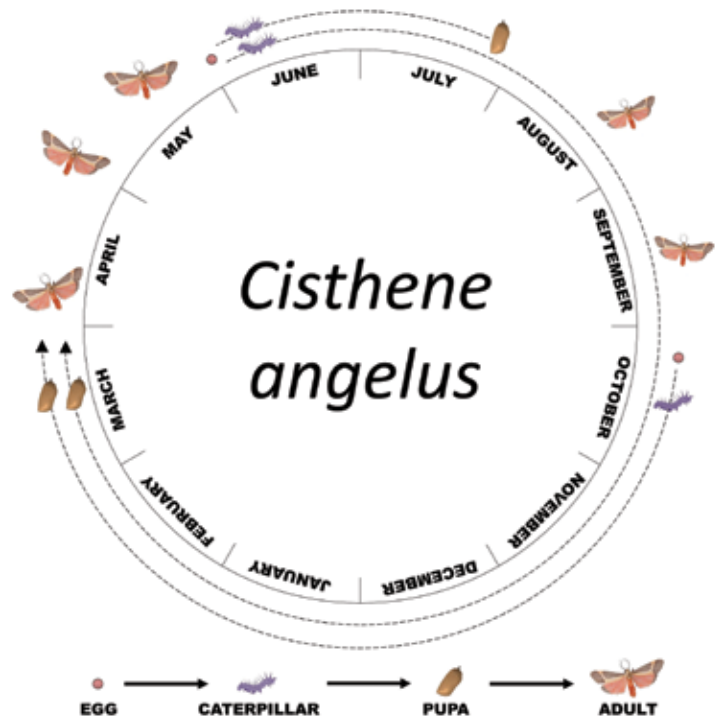


Light trap catch of angel lichen moths during 2012 in Grand Canyon by time (left) and river mile (right). Red dots indicate subsamples from which specimens were sexed and measured for this study. One data point from May 2012 (4216 moths) is excluded from this graph.

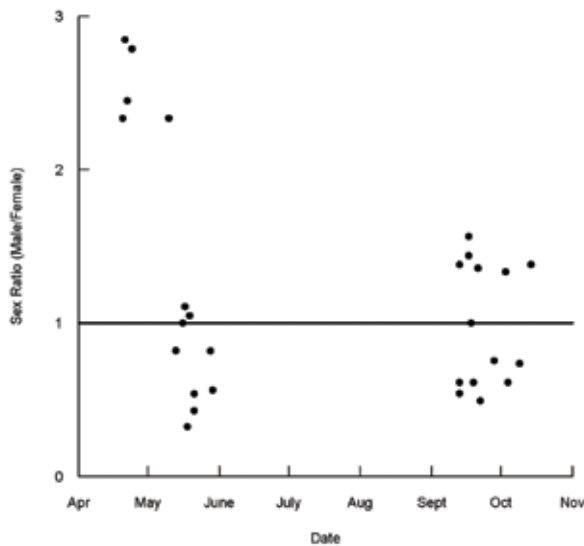
reproduce others in a population because they have an advantage when it comes to securing mates. Sexual selection is responsible for the outlandishly ornate plumage on male peacocks and the huge antlers on elk. With moths and butterflies, this sexual dimorphism (physical differences between the sexes) is less obvious.

In the case of angel lichen moths, we found that the males of the spring generation (the ones with a long growing season) were able to achieve a greater degree of sexual dimorphism than the males of fall. In spring, the wing length of males averaged 10.6 millimeters while females averaged 10.0 millimeters, a difference of six percent. In the fall, males and females had similar wing lengths (10.0 mm versus 9.9 mm).

We also found evidence that male moths are maturing and emerging before females. Early in spring, when angel lichen moths first started showing up in light traps, males outnumbered females by a factor of two to three. Later in spring, and throughout fall, the ratio of males to females varied across samples, but it never exhibited the strong male bias that was evident early in the spring. This pattern of males emerging before females is termed protandry, and it is another common outcome of sexual selection in moths. It is an especially clever sexual strat-



Life cycle of the bivoltine angel lichen moth in Grand Canyon. The two annual generations of angel lichen moths do not have equal development times. The eggs and caterpillars laid by the spring generation can either mature quickly and fly in the fall of the same year, or they can spend up to 10 months developing before finally emerging in the following spring. Both generations spend the majority of their developmental stage as a caterpillar feeding on algae and lichen.



Sex ratio of angel lichen moths by time. The male dominated sex ratio in early spring is an indicator of protandry. Males emerge before females to maximize their chances of producing offspring.

egy for males that belong to species where females are monogamous and only mate once. By being the “first guys at the party,” males are ready and waiting when virgin females begin to arrive on the scene. Since males can mate multiple times, being protandrous increases their chances at fathering offspring.

Although this project has shed a great deal of light on the conspicuous adult life stage of angel lichen moths in Grand Canyon, the other life stages (eggs, caterpillars, and pupae) remain a complete mystery because they are cryptic and have proven difficult to locate. In fact, as of this writing, an angel lichen moth caterpillar has never been seen, much less collected, from Grand Canyon (L. Stevens, personal communication). The caterpillars are presumed to feed on lichen and algae, so next time you’re out hiking and spot a patch of lichen, consider poking around and seeing if you can find a tiny little caterpillar about half the size of a grain of rice!

Anya Metcalfe, Ted Kennedy, and Carol (“Fritz”) Fritzinger

GRAND CANYON MONITORING & RESEARCH CENTER

Respectful Recreation in the Grand Canyon— An Anthropologist's Perspective

IN THE VIEWS OF MANY Native Americans, and other indigenous people around the world, every animal, plant, rock, and place is a living being, because everything is in the flow of life. Special locations like springs, creeks, and waterfalls are experienced as having especially concentrated life and significance. Everything recognizes respect and disrespect, and everything responds accordingly. Given this viewpoint, the behaviors of visitors to the Grand Canyon affect—either positively or negatively—the natural and spiritual world (which are not separate, but the same).

Accordingly, in a metaphysical sense, what a visitor does at a place can affect the spirit of the place—and the spirit of those who have been to the place because they are still in that place. Ancestors are not just people who lived and died a long time ago. They are still present in the places they lived. Place is more important than time, and place is not separate from time. Time and people and actions accumulate in places. We see our actions as affecting the present (and perhaps the future), but in the cultures of people who call the Grand Canyon their homeland, our actions are seen as impacting the present, the future, *and* the past (and those in the past).

So, how can we recreate in the Grand Canyon in a way that respects these relationships? Traditionals approach any special place quietly and respectfully. In this way, you and the Place (and the past people in it) get to know each other by watching, listening, and feeling. You acknowledge mutual respect by quietly, even silently, asking permission to visit, and by observing what's already there. Partying, yelling, and jumping right into the watery home of myriads of small creatures disrupts the quiet contemplation of those already there and those to come in the future. For many Native Americans, the Grand Canyon is the place of original emergence into this world and is therefore the embodiment of the Earth's womb and of their own identities as people. This way of understanding and experiencing the world is fundamentally different than the way most non-Natives experience the Canyon, at least initially. But we, too, can develop a close, respectful, and rewarding relationship by approaching places like the Little Colorado River, Elves' Chasm, and Deer Creek slowly, taking in the beauty—giving time to acknowledge the specialness and connect our spirits with the spirits of the place—before getting in the waters.



photo: Greg Woodall

The Grand Canyon is a National Park, a World Heritage site, and homeland to other cultures; so showing a little respect as we visit is only appropriate.

Kelley Hays-Gilpin
(NORTHERN ARIZONA UNIVERSITY)
and Greg Woodall

Court Upholds Grand Canyon Uranium Mining Ban— Havasupai Tribe, conservation coalition celebrate key win for protecting water, wildlife, and sacred lands, but fight continues

ON SEPTEMBER 30, 2014, Grand Canyon's watershed got some much-needed protection when federal Judge David Campbell upheld the U.S. Department of the Interior's twenty-year ban on new uranium mining development across one million acres of public lands adjacent to Grand Canyon. Judge Campbell summarized his ruling dismissing the uranium industry's arguments by stating that the Secretary of the Interior had the authority to "err on the side of caution in protecting a national treasure—Grand Canyon National Park." At stake is protecting the aquifers and streams that feed the Colorado River and Grand Canyon from toxic uranium mining waste.

The Havasupai Tribe, Grand Canyon Trust, Sierra Club, Center for Biological Diversity and National Parks Conservation Association had intervened in the lawsuit filed by mining and uranium-industry trade associations and uranium prospector Gregory Yount in U.S. District Court in Arizona. The mining industry lawsuit asserted that the Interior Department's exhaustive, 700-page evaluation of environmental impacts was inadequate. The tribe and groups helped to defend Interior's decision to protect Grand Canyon's springs and creeks, wildlife and vistas from new toxic uranium-mining pollution. The groups and tribe were represented by public-interest law firms Earthjustice and Western Mining Action Project.

One of the great symbols of the American West, Grand Canyon was first protected as a national monument by Theodore Roosevelt in 1908, and is surrounded by millions of acres of iconic public lands that include wilderness areas, two national monuments, lands designated to protect endangered species and cultural resources, and old-growth ponderosa pine forests. The canyon area is also home to the Havasupai, Kaibab Band of Paiutes, Hualapai, Hopi and Navajo tribes and has been designated a "World Heritage" site. The Grand Canyon region annually attracts about five million tourists and generates nearly a billion dollars in regional revenues.

Interior's study of the mining ban concluded that without it, 26 new uranium mines and 700 uranium exploration projects would be developed, resulting in more than 1,300 acres of surface disturbance and the consumption of 316 million gallons of water. Under the ban, existing mine operations are projected to have about one-tenth of the surface impacts and one-third the water usage over a twenty-year period. If new

uranium mining were allowed, uranium levels in some springs could rise to twice the level of Environmental Protection Agency (EPA) drinking water standards and aquifers could be severely depleted, endangering public health and wildlife, and compromising the values of native people who consider the springs sacred.

Uranium pollution already plagues Grand Canyon and surrounding areas. The Navajo Nation is dealing with more than 500 abandoned and contaminated mine sites on its lands alone. In the last few years, the National Park Service finally initiated clean-up of the abandoned Orphan Mine—a mine that pollutes Horn Creek inside Grand Canyon National Park. Its clean-up costs to taxpayers have already reached \$15 million for the initial phase of surface contamination clean-up.

Hualapai, Havasupai, and Navajo have banned uranium mining on their lands due to the past impacts. Proposals for new mining on national forests and Bureau of Land Management lands have prompted protests, litigation, and proposed legislation. Because dozens of new mines threaten to industrialize iconic and sacred natural areas, destroy wildlife habitat, and pollute or deplete aquifers, scientists, tribal and local governments, and businesses have all voiced support for the protections enacted by Interior. However, industry and the government assert that several pre-existing mines are not covered by the mining ban.

Havasupai leaders have long fought uranium mining around Grand Canyon and the tribe, along with conservation groups, is currently challenging Canyon Mine in federal court. It is a uranium mine that was permitted in the 1980s by the Kaibab National Forest near Red Butte, a designated Traditional Cultural Property that is sacred to Havasupai, Zuni, and other native people. Located six miles from Grand Canyon's south entrance, the agency has failed to update the mine's 1986 Environmental Impact Statement and known threats to water, wildlife, recreation, cultural, and economic values of the region.

Canyon Mine, like the three other "zombie" mines in the withdrawal area, returned from the dead in recent years following decades of inactivity due to slumping uranium prices. After recently resuming operations, it has again gone on "standby" in response to again-plummeting prices and a stipulated agreement with plaintiffs challenging its reopening. The mine could be resurrected at any time under existing agency practices that are being challenged in court.



Red Butte. photo: Sandy Bahr



Canyon Mine. photo: Sandy Bahr

“The Havasupai support the withdrawal of the lands from mining for the protection of our homes and our water. The ruling by Judge Campbell recognizes the unique and important resources on the lands south of Grand Canyon that are our aboriginal homelands and within the watershed that feeds our springs and flows into our canyon home,” said Havasupai Chairman Rex Tilousi.

Conservation groups are also trying to get the Arizona Department of Environmental Quality and the Bureau of Land Management to halt operations on Pinenut Mine, a mine that is located north of Grand Canyon on Bureau of Land Management lands. In 2013 the National Park Service said that the “regional aquifer groundwater wells at the Canyon, Pinenut, and Hermit mines as well as the sumps at the base of Pigeon and Hermit mines have all exhibited dissolved uranium concentrations in excess of drinking water standards (thirty micrograms per liter)...”

When Pinenut was reopened in 2009, miners discovered that more than three-million gallons had flooded its shaft. That radiation-contaminated water continues to be pumped into a nearby retention pond. Conservationists asked ADEQ to deny a groundwater protection permit for this mine, citing concerns about groundwater contamination. In a one-page letter, ADEQ said that the mine had complied with all of the permit requirements. The agency did nothing to address concerns about the water in the shaft and the potential for groundwater contamination. Conservation groups are evaluating possible additional action on this mine.

In addition to supporting the mineral withdrawal and efforts to stop mines such as Canyon and Pinenut, there is growing support for permanent protection for public land surrounding Grand Canyon. The

Grand Canyon Watershed National Monument would include the Kaibab Plateau and watersheds that flow into the Grand Canyon and provide water for millions of people in Arizona, Nevada, and California, and further downstream in Mexico. The area is home to 22 sensitive plants and animals, some of which are found nowhere else in the world, including the Kaibab squirrel. In addition, it provides critical wildlife corridors for iconic wildlife such as mountain lions and mule deer, and important habitat for imperiled species such as the California condor. South of Grand Canyon, the monument would encompass the Coconino Plateau, which contains deep groundwater that supplies life-giving seeps and springs.

The recent court decision may be appealed, and the twenty-year ban on new mines will eventually expire. Or, worse, an unfriendly administration could undo it before that. That is why Grand Canyon, an American icon and one of the seven natural wonders of the world, and its watershed deserve permanent protection through a monument designation. It’s up to President Obama whether or not it gets that protection—and he won’t act unless he hears from all of us. You can send President Obama a letter urging him to do so from any of our websites—Grand Canyon Trust, Sierra Club or Center for Biological Diversity.

Sandy Bahr, Roger Clark, and Taylor McKinnon

Left: Canyon Mine. photo: Sandy Bahr

Kayaking Blind

All photos courtesy of James Q Martin

SIX YEARS AGO, I was introduced to Erik Weihenmayer on a Leading the Way blind kids trip that was organized through Global Explorers. It was on that trip, while blowing a whistle and kayaking through the rapids, as Erik paddled an inflatable kayak following the sounds, that the idea was spawned; to kayak the entire Grand Canyon in a hard-shell kayak.

Fast forward and here we are, successfully accomplished in our goal and full of 21-days of memories, stories, and footage from a truly once in a lifetime experience.

Although this project really began six years ago, floating side by side dreaming of the possibilities, the actual planning and logistics started in 2012 when I got a call from Erik's assistant asking me the feasibility of putting something like this together. I immediately jumped on board not only because of the incredible journey it would be kayaking with Erik but also because it is my passion and has become my career to organize and execute adventure film projects through my company, 4 Corner Film Logistics. To pull off a multi-faceted trip like this is in and of itself a seemingly insurmountable task, however, with dedication, focus, and the right team it is possible to execute a full scale film production, while leading two blind kayakers through the 277 miles of river, all the while, fulfilling all the media requirements that make a project like this financially feasible.

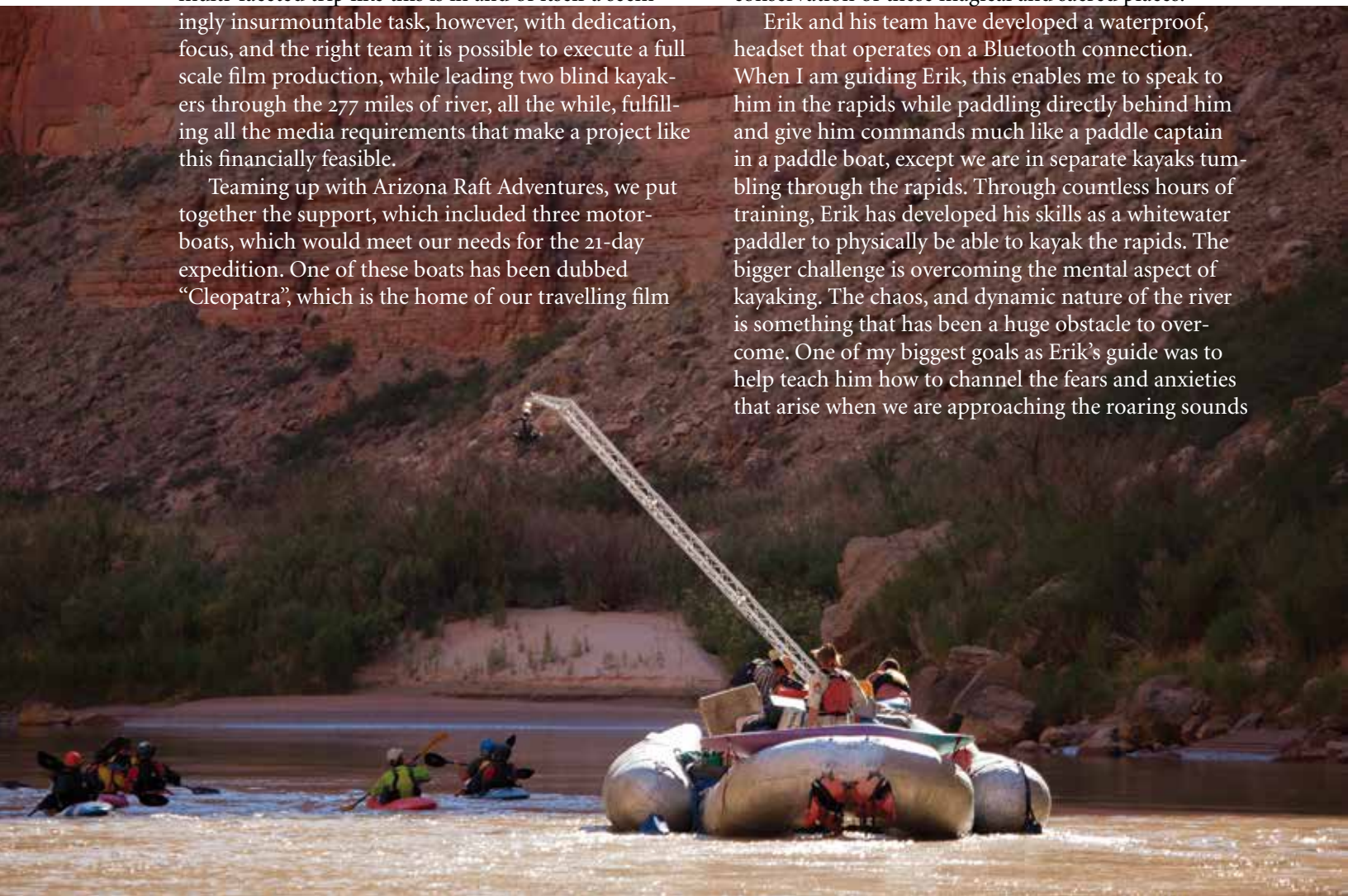
Teaming up with Arizona Raft Adventures, we put together the support, which included three motorboats, which would meet our needs for the 21-day expedition. One of these boats has been dubbed "Cleopatra", which is the home of our travelling film

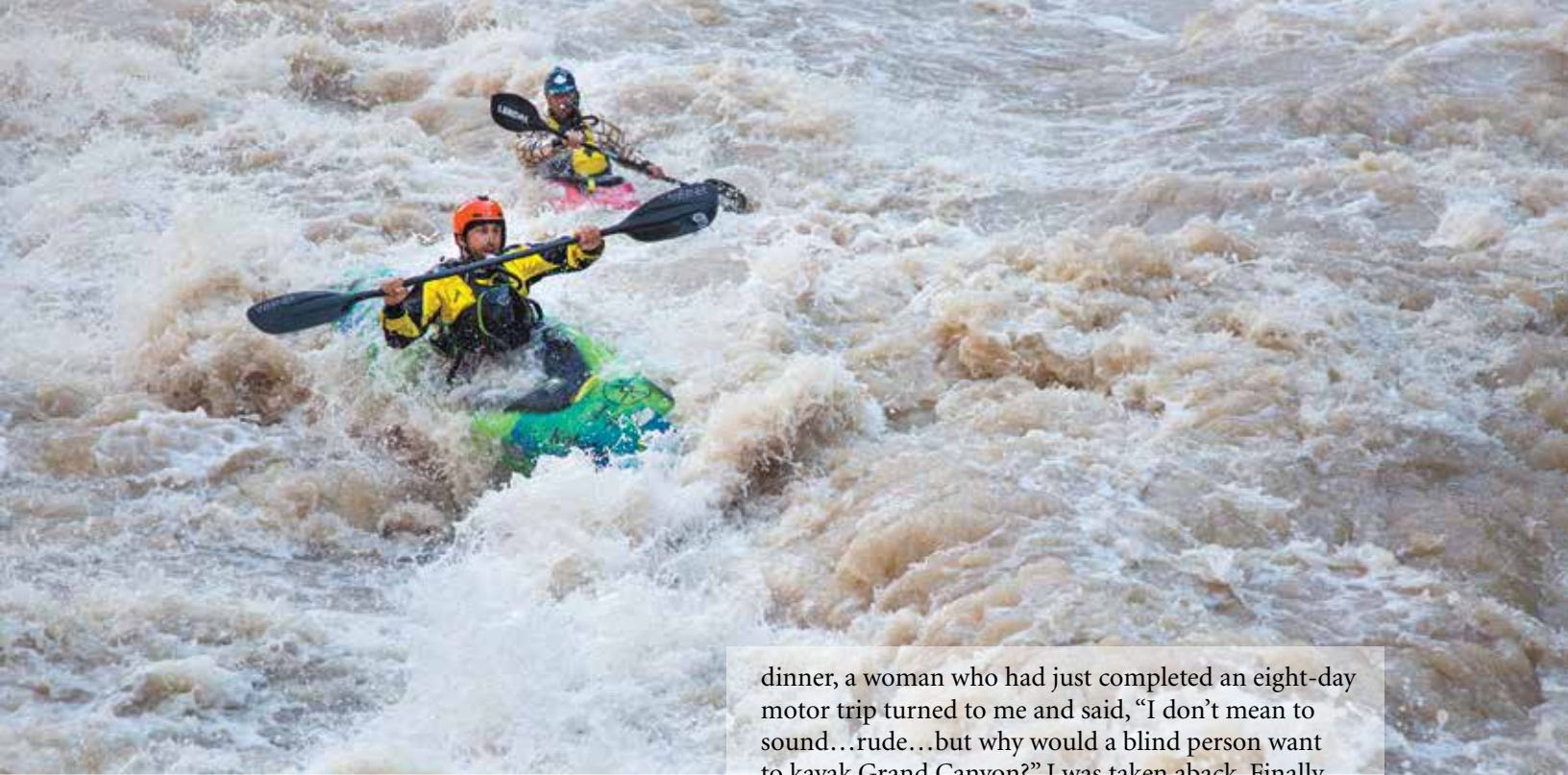
production. In order to overcome the power requirements to run a full scale film production, 4 Corner Film Logistics has developed a floating solar generating station, fully equipped with an array of twelve full size solar panels on elevated canopies, a 14,400 watt battery bank, inverters, and charge controllers. Through harnessing the Arizona sun, we have revolutionized how we can document expeditions like this in remote wilderness areas, in order to completely satiate all the power hungry electronics.

In addition, we have spent many hours building custom equipment such as a 17-foot crane, which mounts onto the raft. We can remotely operate the steady-cams to acquire some of the most state-of-the-art cinematography that has emerged from the Grand Canyon.

When I conduct film productions in the Grand Canyon or any wild place in nature, the goal I have and which I share with the talented production crew, is to capture through the lens, imagery that will not only bring the viewer to that special place, but also allow them to fall in love with it. Even though they may have never actually been there, I believe, that we can generate an audience that will see the importance of conservation of these magical and sacred places.

Erik and his team have developed a waterproof, headset that operates on a Bluetooth connection. When I am guiding Erik, this enables me to speak to him in the rapids while paddling directly behind him and give him commands much like a paddle captain in a paddle boat, except we are in separate kayaks tumbling through the rapids. Through countless hours of training, Erik has developed his skills as a whitewater paddler to physically be able to kayak the rapids. The bigger challenge is overcoming the mental aspect of kayaking. The chaos, and dynamic nature of the river is something that has been a huge obstacle to overcome. One of my biggest goals as Erik's guide was to help teach him how to channel the fears and anxieties that arise when we are approaching the roaring sounds





of the rapids. Being able to harness that energy and turn it into clear focus, has allowed us to work as a team and be almost synchronized in our movements. I have to not only deal with and react to what is instantaneously happening to me in the rapid but also tell Erik stroke by stroke what he is about to encounter. He is completely dependent on hearing my voice to know where he is and understand what is about to happen to him.

Throughout this trip, I feel we reached a bond and trust in one another that is rarely experienced in everyday life. Surrendering to one another and trusting one another during intense moments like that was, I believe to be, a large reason for our success.

Harlan Taney

IN DWINDLING LIGHT of afternoon I watched as Erik Weihenmayer and Lonnie Bedwell sat with their teams at the scout above Lava Falls rapid. The pounding of Lava could be heard in the background and even though the boats were tied to shore, the river could be felt surging towards the drop. The air was cool as the light dwindled and the film producers were frantically calling the kayakers to run before the light dissipated altogether. I could see Erik and Lonnie focused, prepared, poised at the brink. All of us were anxious. All of us here have our sight, except Erik and Lonnie. They ran all the rapids of Grand Canyon. Blind.

Even before participating in the trip, I would tell guests about the project, Kayaking Blind. At a trip

dinner, a woman who had just completed an eight-day motor trip turned to me and said, "I don't mean to sound...rude...but why would a blind person want to kayak Grand Canyon?" I was taken aback. Finally, I asked her why she had chosen to come to the river. She gave me a litany of responses explaining how she wanted to see Grand Canyon and thought a river trip was the best way to do it. The bottom line was that the trip was on her "bucket list." It seems many guests in Grand Canyon come because it is on their "bucket list" which doesn't seem like a bad thing as long as Grand Canyon is not just a bullet point on a list looking to be checked off then forgotten.

Erik and Lonnie came for many of the same reasons as the woman. They too wanted to experience Grand Canyon from a boat. I watched as Erik stood in the middle of Redwall Cavern with Lonnie, making clicking sounds and clapping to discover the depth of the space. I saw Erik jump off the trickling falls at Elves into the green, cool pool below, noticing the difference in the weight and softness of thousand-year-old spring water to the heavy silt in the muddy Colorado. I observed Lonnie sitting on the precipice of the Redwall on the Eminence hike. He'd made the hike without one misstep, a feat many of us sighted people can only aspire to. Lonnie told me that as weird as it sounded, he actually appreciated going blind thirteen years ago. He said he learned things and gained a new, more solid perspective on life. He took nothing for granted any more and appreciated experiences more deeply. Watching Erik and Lonnie I witnessed the depth of their experience in Grand Canyon and it humbled me. It seems feeling is believing.

I'd like to sit with my guest again and tell her what I've seen. I've seen two men make a powerful and authentic statement about achieving things initially thought beyond their reach. That statement will create



Previous page: Erik Weihenmaier (in front) and Harlan Tanney paddling through Lava Falls Rapid.
Left: Erik jumping into the Elves Chasm pool.
Above: No caption necessary.

a ripple effect that travels far and wide, encouraging not only those with disabilities but all of us to break down the barriers in front of us. Erik and Lonnie are intent on doing something with what they learned from their trip—to let the memory of this experience shape their futures. Now, I encourage myself and my guests to do something with each incredible experience. When you have truly experienced Grand Canyon, you realize it deserves more than just a check mark.

Katie Proctor

River for children that have lost a parent to war. As one student said, “[It] was the perfect opportunity to get away from everyday life and spend a mind-opening week on the river surrounded by nothing but quality friends and nature.”

“Lonnie and I fully intended the story of our descent to be a universal one. It’s not just about two blind people kayaking. It’s about you and what’s possible for all of us when we choose a No Barriers Life.”

—Erik Weihenmayer

VISION IS MORE THAN just seeing with the eyes. That’s why Erik and Lonnie are intent on bringing their message of hope and resilience to others. Erik is one of the early founders of No Barriers USA, an organization that helps people embark on a quest to contribute their absolute best to the world. Today No Barriers serves wounded veterans, youth and people of all abilities through transformative experiences, tools and inspiration. Many of these experiences happen on the river, including programs in Grand Canyon for students with visual and hearing impairments. No Barriers also launched a program this year on the San Juan

No Barriers believes that “What’s Within You is Stronger than What’s in Your Way” and jumped at the opportunity to spread its message as the expedition sponsor. Erik and Lonnie’s journey is proof that anyone can live a life of purpose and inspiration. With the right combination of innovation, grit and resilience we can shatter expectations of what is possible for each of us. The addition of Lonnie Bedwell to the expedition team only reinforces this message. As Erik put it, “One blind kayaker paddling the mighty



Above: Lonnie Bedwell and Erik Weihenmayer.

Below: It takes a village.

Colorado River could be seen as an anomaly, but two becomes a powerful statement that a No Barriers Life is possible for all of us.” Everyone has challenges of one form or another. What sets Erik and Lonnie apart is their choice to embrace them; a choice that we can all make.

Now that the expedition is over, many people have asked Erik and Lonnie, “What’s next?” There will always be more adventures. But Erik and Lonnie have taken it upon themselves to help others discover their potential through the work of No Barriers. They invite people of all backgrounds to join them on their

relentless quest to grow, become and contribute their absolute best to the world. Get started by taking the No Barriers Pledge (<http://www.nobarriersusa.org/take-the-pledge/>). It is your personal commitment to live the No Barriers Life. By doing so, you’ll join a community of individuals who will support and inspire each other on their journey. You can also start a fundraiser, participate in an event or volunteer your time with No Barriers. Opportunities are available at <http://www.nobarriersusa.org/get-involved/>.

Rob Panos



Thanks and Farewell

Jack Schmidt, Chief at Grand Canyon Monitoring and Research Center (GCMRC) is retiring from his post to return to teaching. He made the remarks below at the Glen Canyon Dam Adaptive Management Work Group meeting on August 28, 2014.

I REALLY WANT TO THANK Anne, Lori, and Bob Snow, absolutely wonderful people that are supportive at the highest level. Dave Lytle, my boss, who has made it possible for me to be me and still keep my job. I want to thank all the stakeholders who I've gotten to work with. And I really mostly want to thank the staff that I work with, because all I've been is the shill, or spokesman, for the hard-working staff of GCMRC.

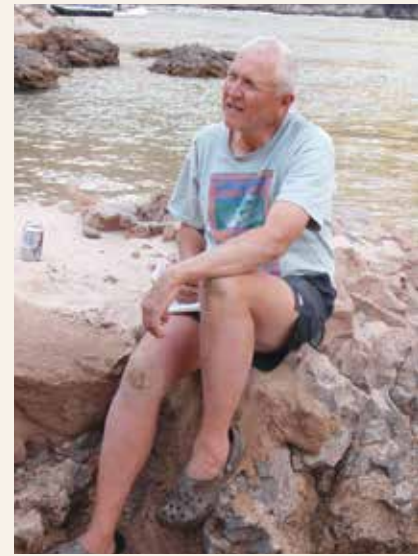
I've been part of this river for 35 years. The only person in this room who has worked longer on the Colorado River is Larry Stevens, and I'm honored to be on the same page with Larry. We've come such a long way. I've been part of so many things. Whatever you think of him, this program wouldn't be where it is without Dave Wegner, and what he started way back then. The whole cast of scientists who didn't really know what they were doing back in the 1980s, who did their science and also sat around on sandbars and beaches and said "well, this could be a better place than it is." The program's evolution has partly been due to good scientific work and partly taking the time to sit with river guides and other folks concerned about the river.

A bunch of us sat around the campfire during one trip and wrote the first draft of what we called the Beach Bill that ended up being an early draft of the Grand Canyon Protection Act. Others of us came up with the idea that we ought to have floods in Grand Canyon, and then we worked on that issue for many years before the first flood was implemented. I've had wonderful students to work with. And it's one of my greatest satisfactions that some of those folks are now on the staff at GCMRC and others work throughout the basin or on other rivers.

The reality is that the Colorado River has given me much more than I've given it. It gave me a career. It gave me a passion. It gave me an entire professional life. I'm now returning to life as a university professor, because I think that's a good place for me to be. I've gotten so much from the River. What I've learned from all of you in these three years is the depth of dedicated service provided by government civil servants, government appointees, and stakeholders who represent agencies. I didn't realize just how much work goes on behind the scenes, how much selfless behavior and

actions occur to make the world a better place, that you are all part of. Maybe I was a little cynical about that once, but I have learned so much and I appreciate what all of you have done.

You all know that Larry, I, and others wrote in a paper in the late '90s in *Bioscience* where we said that, "America could have whatever kind of Colorado River it wanted. It just needed to figure out what it wanted." We said that in an unambiguous way, and we published that a long time ago. I still believe that statement, and I have tried to work hard to get GCMRC to contribute the basic information so that you, the stakeholders and policy people, could decide. Sure, I have my own personal opinions on these things. Some of you know what my values are, but the bottom line is that GCMRC must give you the best information we can, and we must ask the most insightful scientific questions so that we as a society can all make the best decision. I have a great belief in the fact that we have the best river science in the world right here in the United States, and I believe that we have a wonderful democratic republic in which transparent and open decisions can be made. I celebrate diverse opinions, and it's been a great honor to be part of this program. Thanks an awful lot.



Jack Schmidt

Jack Schmidt



A 1984 USGS sediment sampling trip. From left to right: Tim Whitney, Jon Stoner, ?, Julie Graf, Richard Wilson, ?, Jack Schmidt (sitting).

Are You Ready for the New Plan?

THE LATEST WORD IS it will be out for public comment in January 2015: the new plan for operations of Glen Canyon Dam, officially known as the LTEMP EIS.

The report will present about six possible alternatives, ranging from a step back in time (higher daily fluctuations) to steady flows. One will be labeled “Preferred Alternative.”

We don’t know exactly what this Hybrid Alternative will look like, but clues have been provided during the last few months. It’s a combination of the two best-performing alternatives. It’s built on the best science available. It’s got a strong focus on beach building and protecting the Humpback Chub. It seems to be a step forward for stewardship of the Grand Canyon and the river that runs through it.

Strange to say it, but we might be pretty happy with this Preferred Alternative.

Does this mean that when the EIS comes out we won’t have much to say about it? Definitely not.

Folks at the Bureau of Reclamation (BOR), National Park Service, and Argonne National Labs have been working hard on this EIS for years. They’ll need to know what we think, positive and negative.

The decision makers at the Department of the Interior will want to hear from us, too. Nobody knows the Grand Canyon the way we do, and nobody cares about the place the way we do. Our voices matter, and we should make them heard.

Maybe most important of all, not everybody will be happy about the direction of this EIS. There are people, agencies and organizations that want the focus to shift more toward power generation and the money generation that goes with it. There are some individuals out there who feel strongly that Glen Canyon Dam should be freed from environmental restrictions and be used to its highest capacity. These folks will be writing comments when the EIS comes out. There will be lots of them, and they’ll be loud. We need to make sure they’re not the only ones with something to say.

At the last Adaptive Management Work Group meeting, I saw a preview of what one target will be: The High Flow Protocols. We’re three years into a twenty-year experiment to see if it’s possible to use Paria and Little Colorado River sand to rebuild and keep beaches in the Grand Canyon. Three years and three high flows; the Paria has given us generously muddy water each September.

Some agencies, and perhaps some of the basin states, are thinking maybe this is happening too much.

Forget about the science plan. Each high flow costs about a million dollars in lost power revenue. The Basin Fund may be at risk!

You can bet there will be extensive comments detailing the price tag of high flows to the dime, expansive graphs of carbon emissions created when coal plants offset the loss of power generation, and who knows what other dire accountings of the costs of caring for the Grand Canyon.

Truly, it’s important to acknowledge the costs involved. But we need just as clear a picture of the benefits, and it will be our job to paint it.

When the comment period hits, it will go by as fast as the right run at Crystal. Be ready to jump in! You can subscribe to the LTEMP email list at <http://ltempeis.anl.gov/>.

You’ll be hearing more from us when the report arrives. Until then, thank you for your support. Keep on swinging for a better world, and have fun out there!

Sam Jansen

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Steve Carothers

I WAS BORN AND RAISED in Prescott. Born in 1943, December. When I was three years old, my mom and dad took me on a leash down the Bright Angel Trail into Grand Canyon. (My mom and I just came back from her high school reunion three or four days ago. She graduated in 1942, and I graduated in 1961, so we were nineteen years apart, but same high school: St. Joseph's Academy.) I can vaguely remember, I think, these fleeting images from when I was three years old, of seeing the Grand Canyon. And then again I went there on a school project when I was in the eighth grade. Went down the Kaibab Trail that time for a little ways. Then I had an opportunity when I was in college at NAU—through a work study deal at the Museum of Northern Arizona—to go into the Grand Canyon with Vern Taylor as an undergraduate...it must have been 1965, '66, '67, right in there. I was a grunt, helping to backpack all Vern's research gear up and down the Little Colorado River from Blue Springs to the confluence. We helped him gather sediment samples...His question was, "Why does the Little Colorado River turn blue? And what's all this white sediment in it?" That was his dissertation, that's how he got his Ph.D. Vern Taylor was a geologist from Prescott College. And the boating story starts here for me, because I, in the process of covering that country, that thirteen miles from Blue Springs down to the confluence—we were in there for two weeks at a time with helicopter sup-

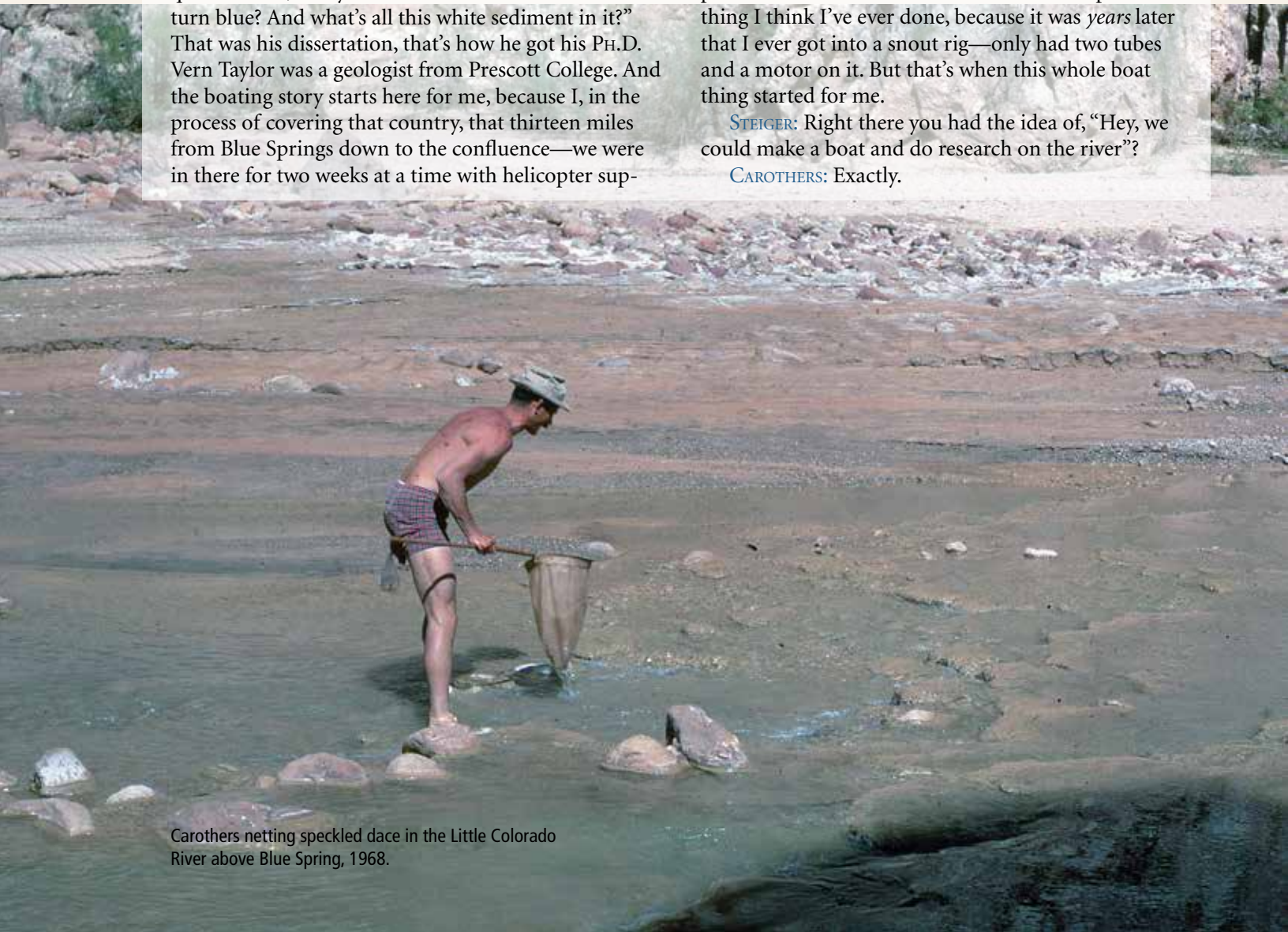
port, *barely*. Everybody constipated because we were drinkin' that Little Colorado River water.

STEIGER: So the helicopter support, those were those little plexi-glass bubble jobs?

CAROTHERS: It was Wayne Lern in a Bell, in a bubble. We called 'em "Tinkerbelles." But somehow, during one of those expeditions—and I think there were three or four—sometimes we'd hike down the Salt Trail, sometimes we'd hike down Blue Springs Trail. Blue Springs Trail is a sketchy nightmare with a full pack on. I have pictures of George Ruffner and me inching around ledges...Wayne would land that Bell and dump off a bunch of gear at a prearranged site and us grunts, George Ruffner, Joe Sharber and Larry Marshall and I would schlep it in relays to our camps. Anyway at some point I got down to the confluence and I saw this big boat come in. I'm just sitting there, and here comes a commercial river trip, and it's in the mid-sixties. A baloney boat. I looked at that thing, and I have in my notes—I drew a frame between three pontoons and a motor well. It was the most prescient thing I think I've ever done, because it was *years* later that I ever got into a snout rig—only had two tubes and a motor on it. But that's when this whole boat thing started for me.

STEIGER: Right there you had the idea of, "Hey, we could make a boat and do research on the river"?

CAROTHERS: Exactly.



Carothers netting speckled dace in the Little Colorado River above Blue Spring, 1968.

STEIGER: In other words, “Screw this hiking!”

CAROTHERS: Yeah! “This hiking is not really...

Wouldn't that be cool to just go down the river?” So at that point in time, then I started looking into what was known about the natural history of the river: what was going on with the rodents, the plants, the birds, the lizards and snakes. When they were building Glen Canyon Dam, Dr. Amos Woodbury and all those guys from the University of Utah were paid to study dam impacts, or what was going to be inundated by Glen Canyon Dam, but nobody was really concerned about what was going to happen below the dam. And to tell the truth, nobody had the *huevos*, really, to go downriver, below the dam site, down where all those rapids were and see what was going on. The last time any biologist had been down there was when Clover and Jotter [*botanists Elzada Clover and Lois Jotter, who were also the first women to run the river, in 1938*] went with Norman Nevills. I should have showed you the reprint up in my office, Emery Kolb has an inscription on a reprint of a publication in 1944 by Clover and Jotter on the vegetation communities on the river, twenty years before the dam started really f---ing up the downstream environment. Yeah. I've got that publication prominently displayed in my office. You should see it. Roy Johnson sent it to me, and Art Gallenson gave it to him. But the bottom line was that, beyond Clover and Jotter, nobody had really studied anything down below the dam.

* * *

Dr. Steven W. Carothers did a little stint as a boatman for Wilderness World and for ARTA in the glory days of the 1970s; and quite a few trips below Diamond Creek for Steve Glass too. But his work here as a scientist over the years has affected us all, and the canyon we love, to a degree that is almost incalculable.

It's safe to say that he has been in on the lion's share of pretty much all the significant Grand Canyon science of the last half-century, not to mention some serious action based on that research.

He's really smart, and his grasp of the “big picture” has been impressive, to say the least. As of 2014 his firm, SWCA, Inc. [formerly Steven W. Carothers Associates] employs 800 people, in 26 offices from Chicago to Hawaii. His grown kids are doing quite well for themselves and he's aging pretty gracefully too, considering all that mileage.

This interview, funded by a generous grant from Dan and Alida Dierker, was conducted over multiple sessions in 2006 and 2007.

* * *

Somehow or another, I scammed my way onto a Park Service/Arizona Academy of Science river trip with Paul Martin and John Carlson and Martin Karpisak and several other scientists. There was Dr. Dwayne Smith from Brigham Young University, he was a mammalogist. I suppose I was working as his assistant. How I wrangled my way on that trip I really can't remember. But Paul S. Martin from the geochronology lab down in Tucson, and Martin Karpisak, and a guy named Carlson, who was a fisheries biologist at the University of Arizona—he's the guy, when we were loading up at Lees Ferry—and this was just kind of an exploratory trip to look at a variety of things. It was not long after some of the boatmen had complained about too much crowding down there. If you remember from the early sixties to about 1971, river running increased from like 200 people a year to over 15,000. At that point the Park Service... there was a big hue and cry about too much crowding, and campsites being trashed with fire rings and porta-potty dump sites and what not. So this was the beginning of those studies. Well, when we loaded up at Lees Ferry, Carlson came over to the boatmen. Glade Ross, who was the main river guy at the Park Service then, he was the head boatman. We had a big old, God, it must have been a 33 with that ugly Park Service green paint all over it. Carlson asked Glade where should he put—he wanted to separate his *dynamite* from the dynamite caps! And that was the first any of us knew that there was anything *like* that. He actually had 120 sticks of dynamite and 120 caps. That was pretty damned interesting. The thing I remember the most about it—it was above Badger the first time he used it, kind of got out of earshot and out of the vision of the folks at Lees Ferry, and he started pitching dynamite into these eddies. I remember clearly—and I have the photographs of this—that what came up... you know, one or two sticks of dynamite—he would wrap sometimes two sticks together—one was really sufficient—but what would float up—and we would go catch and then lay out on the beach, were native fishes: humpback chub, blue-head suckers, and flannel-mouth suckers. And I really, in the early seventies like that, I remember very few trout. Okay, very, *very* few trout in that upper section. Now we didn't go up above Lees Ferry, because we knew the trout fishery had begun stocking up above Lees Ferry, aggressively, with brook trout and cutthroat trout and rainbow trout. And that fishery had yet to really evolve or grow into that blue-ribbon trout fishery. So as we went downstream, the other thing that we would get would be carp, and every now and then a channel catfish.

STEIGER: So he'd just throw the dynamite...?

CAROTHERS: ...into an eddy.

STEIGER: And the fish would float up dead?

CAROTHERS: The fish would float up dead, because most fish have air bladders—catfish don't. So the catfish would get... To this day, when we're tryin' to catch catfish with electrofishing, you've got to have really shallow water because they don't have the air bladder that causes them to float up to the top. So that's what would happen. But anyway, that was the first time that I was exposed to the fishes of inner Grand Canyon. I think that to this day, what I've noticed about the change in the fishery is that the humpback chub have contracted more, being closer to the Little Colorado. And by and large, the flannel-mouth suckers have remained about the same in terms of size and where I see them. But the blue-head suckers seem to have gotten smaller. We used to be pulling these fishes out of our nets, and I've been consistently looking at this for 35 years now, and I think the blue-heads are getting smaller and less common, which is not surprising to me; but the flannel-mouths seem to be really hanging in there. The carp are becoming far less common than they were in the early days of the dam.

STEIGER: So this dynamite deal, you guys went down, you set off a hundred and some sticks, and inventoried those fishes all the way down?

CAROTHERS: We inventoried all the way down. I was working for the Museum of Northern Arizona in those days. About two weeks after we got off the river, a Game and Fish guy walks in my office with a citation pad, to write me a ticket—and I was taking pictures the whole time of the fishes that we would catch, and of the people doing it. I have pictures in my collection of the dynamite going off in the water, and fish being thrown hither and yon. Two weeks after the river trip, in walks Levi Packard, the regional Game and Fish manager here in Flagstaff, with another guy. They were both carrying pistols on their hip. Levi Packard walks into my office with this pink citation book. He says, "I'm here to give you a citation for illegal fishing." And I go, "Whoa! Wait a minute, man, I'm the mammalogist!" Because Dwayne Smith and I, all the way down, at night we would set our mammal traps and in the morning we'd get up and run the traps and take the critters out and skin 'em. Those critters, still to this day, the Museum



National Park Service science collecting trip, 1971. Post-river trip photo at Diamond Creek take-out. Left to right: Larry Beasley (University of Illinois); John Carlson (University of Arizona); Martin Karpiscak, kneeling (University of Arizona); Carothers, behind post (Museum of Northern Arizona); John Haldeman (Museum of Northern Arizona); Tom Doerr (NPS boatman), kneeling (NPS); unknown, standing (unknown).

Below: Museum of Northern Arizona snout rigs, looking downstream above Blacktail Canyon January 1975 or 1976 (?). One of the first January river trips since the Kolb trip of 1912 (?).

Bottom: January launch at Lees Ferry, note 14-foot ash oars and thole pins, January 1975 or 1976.





National Park Service science collecting trip, 1971. Diamond Creek de-rig. Carothers, Larry Beasley, and John Haldeman (all three now have Ph.D.s) labeling specimens collected in Grand Canyon.

of Northern Arizona has the largest collection of small mammals for Grand Canyon species, and we found some *very* interesting things about... It was the first time anybody had really caught small mammals on the Colorado River in Grand Canyon. So we knew who they were and where they lived and there's some *really* interesting stories about the species distribution. One of the mice, *Peromyscus maniculatus*, the deer mouse, was not common to Grand Canyon, didn't belong in the river. It came in on the food boxes off the river trips. And so at the popular camps, here would be *Peromyscus maniculatus* that came out of the Hatch warehouse or the ARR warehouse someplace.

STEIGER: Naw, not the ARR! (laughs)

CAROTHERS: Okay, probably not ARR, must have been all Hatch and Sanderson and those guys! (laughter) But that was real interesting.

* * *

I spent my four years at NAU getting a bachelor's degree; stayed there and got a master's degree and started studying Grand Canyon. I went to work for the Museum of Northern Arizona in I think 1967, curator of biology. Went and got a Ph.D. at the University of Illinois in 1974, with the Museum's help, and started doing research projects in Grand Canyon, because that's where the money was. I think I've been funded in one way or another—I can count funding from Grand Canyon National Park or the Bureau of Reclamation, steady funding, and now with SWCA—from about 1972 to the present. I don't think there's been a year where we haven't had some kind of funding to do *some* kind of research in Grand Canyon.

* * *

I did a literature survey for what was known about stuff in Grand Canyon, I think in 1972. Then in '73, '74, I had small projects with the Park. Must have been 1974 we got a contract from Grand Canyon to do an evaluation of human impact on the beaches in Grand Canyon. For that, we did a bunch of river trips. We called the boats the *Museum of Northern Arizona Ecological Survey*, and I have pictures of those boats. We rowed the snouts. We would go down and we would go to beaches and we would count the charcoal piles and the porta-a-potty piles, and

we would record the presence of ants and flies and what not, and vegetation trampling. That's where we basically developed... A lot of the boatmen credit Peter Winn for most of this. Peter Winn, Scotty Imsland, guys that had been commercial boatmen, basically knew how to keep from impacting the areas. It was on those trips where we found out... I mean, all of the popular campsites were just garbage dumps: Nankoweap, Unkar, Deer Creek. And this is in the early seventies.

STEIGER: The way I remember it, when I started, the procedure—people had various methods for dealing with human waste, but there were basically two: There was the “here's the shovel, and here's your roll of toilet paper.” Or the more proactive guys in the beginning just said, “Here's a portable toilet. We'll consolidate this, everybody go in the portable toilet, and then we'll dig a hole and bury that.” And so you either had everybody—if you had thirty people on a trip, either everybody was getting a roll and going off behind a bush and trying to burn their T.P. and just buryin' their s--t; *or* you were digging one hole for the whole trip, and it was all going in there. But it didn't really matter... And we—ARR, had a flush toilet. We would prime it with blue goo and we had a twelve-volt battery that would run the flusher. I remember my first job was to go dig the hole every day. Over the course of a season, sometimes you were at a camp two or three times a year—four, five, whatever—and sometimes it would get to be hard to find a new place to dig the hole, where there wasn't another hole already.

CAROTHERS: Exactly.

STEIGER: And that was what you guys found?

CAROTHERS: Right. Every beach has its logical porta-potty site.

STEIGER: To Gaylord's credit, there were some of the guys that were startin' to scratch their heads over this as the explosion came, all of a sudden we're taking all these people a year down. "This is gettin' to be an issue. What are we gonna do?" And Gaylord Staveley of Canyoneers was really darned proactive. He was the first one that I remember really addressing it. They built a big tank on their boat, and they would poop in a porta-potty every day, and then they'd carry the porta-potty to the tank and dump the thing in the tank. That was nice, but we laughed at 'em for doin' it. It was like, "Oh my God." And then I remember there was this big discussion, "Well, what are we gonna do with the s--t?" And there were all these options that were posited. People thought, "Well, maybe we'll have toilets everywhere, at all the camps," and there'll be a boat that'll come along once a month.

CAROTHERS: Pump 'em out.

STEIGER: Yeah, pump 'em out. And that sounded like, "That might not be a bad job, to run that thing." Whatever. There were all these potential solutions that were presented. But then in the course of you doin' that study, you were the one who said, "Nah, just poop straight into a can and carry it out." And that was you that did that, wasn't it?

CAROTHERS: Canyoneers and Gaylord had already started, they were hauling it out. But we got it to where people could go straight into in an ammo can, a rocket box, and just very easily carry it all out. And it's still kind of... That was huge. It's worth talking about that port-a-potty just for a minute. I would come back to the museum after a couple of river trips, and I sent out a memo one day to the museum employees: it was called "S--t for Science." I asked people to hold off on takin' a dump until they came into the office, and come into our lab, and take their dump in there. I had these gallon containers I wanted to collect human feces in, because the issue that happened first and foremost when we started using the rocket boxes was that we weren't putting anything in there to discourage the production of methane gas, and we had more than one incident where an ammo can popped open, blew, because of the heat and the generation of gas. And so what I was looking for... I had a screw lid on top of the feces, in the jug. Actually, a prophylactic with a pipette comin' out of it to measure the... It was the best thing to use. A balloon would have worked, but prophylactics were easily available. And we measured the gas that was produced. What we finally ended up with, putting a lot of different things—alcohol, baking powder, soap—we finally just ended up with formaldehyde. If you remember, the first port-a-potties were formaldehyde, and that's how we got to that point. I think

by 1974, on our own river trips, we had developed the port-a-potty to where we were not getting the ammo can lids to pop open. And people really liked it. The thing is, the boatmen liked it the most, because you were taking... What I did is, I put a plastic garbage bag inside a rocket box, and we put the toilet lid over that. People would poo in there, and then before we closed it up for the day, we would pour some formaldehyde in there to kill the production of gas, and we would tie off the garbage bag—maybe they were double-bagged. Well these days now, the Park Service wants—instead of having the plastic...

STEIGER: You've gotta go to the waste treatment, that whole deal.

CAROTHERS: And instead of having the formaldehyde, because formaldehyde as we found out later, of course, is a carcinogen, what we use now is just baking soda.

STEIGER: Powdered bleach is what most...

CAROTHERS: Well, Clorox 2, we did that for a while, but it just starts to stink so bad, and it isn't as good as just baking soda. Baking soda sprinkled in on top of the poo just cuts it, and you don't end up getting that... With Clorox 2, you get that bleach-feces smell, that is just really not nice. But anyway, that developed in those early trips in the seventies.

STEIGER: Well, it seems so obvious now. I mean, such a simple thing, why would you even... If you didn't realize the overall journey it took to arrive at that. But having witnessed it, it was really something. There were any number of different ways of dealing with that, that weren't near as good as what we've got now.

CAROTHERS: Yeah. Well, I think by 1975, it was a Park Service rule. But I also do remember it was 1975 or '76 when Deer Creek first burned down. You remember, back in Upper Deer Creek, and that burned because of somebody lighting their toilet paper. So that high and far, that technique of takin' a shovel and a roll of toilet paper and a lighter, it caused no end of fires at Nankoweap, at 50-Mile, Deer Creek—you can name a dozen places where we've seen fires that started with toilet paper.

STEIGER: Nankoweap—this is where you gotta hand it to Kim Crumbo—what you were saying about the camps, I remember Nankoweap there were multiple camps all over the place, there were trails that went every which way.

CAROTHERS: Charcoal and dirty sand.

STEIGER: There were a gazillion trails goin' up to the ruins. The whole place was so hammered. It's so much better now. And *my* sense of what happened there physically to that place was that Crumbo took it on himself—Kim Crumbo said, "We're gonna start fixing

this multiple trailing,” and he started at Nankoweap, and then there was Saddle Canyon, and then any number of places where they just went in, and with the pure sweat off their brows, rolled up their sleeves and spent more time covering up the ones they didn’t want, picking out the good routes and all that. That was a Herculean effort right there.

CAROTHERS: It was. The other thing that was part of that at the same time was how to dump the chickie pails, what to do with the feces, and the other thing then were the fire pans. We would take...you know, we disciplined it in terms of a science study. We would take meter-square boards and have data sheets, and we would count the pieces of charcoal. But the other thing we did too is we had an instrument that read changes in color. I can’t remember what it was called now, but we actually filtered sand, and then shook the sand from the beach up against a white piece of filter paper, and then read what color it was after that. And we would get black sand sometimes, especially at Nankoweap, because of the accumulation over the years of the fires that had been built on that beach. Those fire rings just expanded out, and the beaches were just really disgusting in terms of ash and charcoal. And today, that too is gone. We got into the containerized fire pan. Early on, we would dump the charcoal into the river...Well, you know, you got rid of it that way. And then later on the Park Service came up with regulations that now you haul all your charcoal out too, and use stoves for cooking. But it depends. You can manage your fire now to where you don’t get any charcoal. You let it burn down and put that in your garbage container in the morning, if you’ve got a fire.

STEIGER: Well, that was a huge thing. We went from human waste and charcoal all over the beach, and really all kinds of garbage that had been thrown into the fire-pit but didn’t get completely burned up. There were can lids, pop-tops, cigarette butts, and you name it, strewn all about. And now it’s hard to see any of that stuff. I think the flood of ’83 actually did a lot there.

CAROTHERS: The flood of ’83 put new sand up there, and it never got dirty again. We used to talk about how the sand was filling, cat box style, full of debris from the humans. And then after the flood of ’83, we *did* get new sand.

STEIGER: It’s funny that we call it a flood, but anyway...

CAROTHERS: Yeah.

* * *

My team and I did all those early studies to figure out where the human feces was being buried and

we quantified how many flies and ants and s--t piles were on the popular camping beaches. But, what we quickly discovered was that the donkeys in Grand Canyon were really causing more impact than the people. There was people impact, big time, but the *donkeys!* Man, you get five or six donkeys in a canyon and they could eat and trample all the vegetation on a beach. And that’s what they did in spades. And so that was in ’74 or ’75. We started publishing papers on the impact of humans in the Grand Canyon, and the impact of donkeys. We had control and impact areas. I remember at 209-Mile camp at Granite Park, we had a control area (where humans never camped) on the opposite side of the river, but as it turned out, that is where all the donkeys gathered. We would set all these small mammal traps on grids and do repeat, mark and recapture studies for days at a time; we also ran hundreds of vegetation transects. We found out that where the people were camping there was virtually no change in vegetation compared to what the donkeys were doing. As I recall eighty percent of the vegetation was obliterated where the donkeys were and there were sixty percent fewer small mammals, and it was just really kind of a cool hypothesis testing study where you’d go...I mean, you could be brain dead and go measure this stuff, because you could see it with the naked eye. Where the donkeys were, it was like you were inside a corral. We published our findings in about 1975 and the Park Service was just then organizing another attempt at what they called “direct reduction” to get rid of the donkeys in Grand Canyon...I published a paper in 1976 in the *Journal of Wildlife Management*, called “Feral Asses on Public Land.” People used to make jokes about it and change the title to “*Federal Asses on Public Lands.*” In the article we discussed the habitat damage the donkeys were causing in Grand Canyon. This was all complicated by the fact that in 1971 President Nixon signed the Wild Horse and Burro Act protecting donkeys on public land. And, there was a big furor as to whether or not these burros should be taken out of Grand Canyon. Paul S. Martin from the University of Arizona, was writing all these flowery, bleeding heart stories about some prehistoric equine in the Pleistocene that he claimed was native to the Grand Canyon, and led him to believe and proselytize that letting the donkeys proliferate in Grand Canyon would be a good thing. I called “Bulls--t!!!” The burros were *trashing* the beaches. It was like they were in corrals. I told Merle Stitt one time—he was the superintendent of the Park, and he wanted us to do a study on the donkeys and what impacts they were really causing. I told him, “Merle, for thirty grand, I can kill every donkey in there, and get ’em outta there once and for

all. It'll be a million bucks to take 'em out alive. But they need to go. They *need* to f---ing go." And sure enough he gave me a contract for thirty grand, and we got started. George Ruffner and Stan Stockton, and I and a couple of other rangers went in by chopper and we started gunning down donkeys.

STEIGER: Now who was Stan Stockton?

CAROTHERS: Stan Stockton was a ranger at Grand Canyon National Park, and at first he was real reluctant to take me into his confidence, or let me in his circle. He went on a research river trip with us. He was the ranger. He was the guy who ran the mules down to Indian Gardens, to Phantom Ranch, and back up, and he was kind of coming up in the Park Service then. He was a force of nature and the iconic Grand Canyon wrangler. And for some reason or another, I ended up finding out he was a *really* good shot, and Ralph Heinz, a buddy of mine, who had gone to Vietnam straight from college, had been an Army Ranger and worked as a sniper in the LRRP's, behind the enemy line patrols and other gruesome details. So it was mostly me, Stan and Ralph, and we went in there with Merle's thirty grand to kill donkeys.

STEIGER: What does "lerp" stand for?

CAROTHERS: Long Range Reconnaissance Patrol, I think is what it was.

STEIGER: And these were guys that they would send 'em out on their own and say...?

CAROTHERS: At night, behind enemy lines. "Go kill s--t and come home."

STEIGER: But they wouldn't even come home every day, right?

CAROTHERS: No.

STEIGER: They'd stay out there.

CAROTHERS: Oh, they'd stay out.

STEIGER: For quite some time.

CAROTHERS: That's Ralph Heinz, former sniper, current artist. He's got an oil painting in my hallway here. He's still one of my closest friends, and damn that guy could shoot! He shot a .25.06; Stan Stockton shot a .270, and I shot a .243. A helicopter would take us in, and we went ahead and made a science project out of it. We were going to do diet studies. Okay? This was in part, the cover.

STEIGER: So you're shooting 'em and you were takin' their stomachs.

CAROTHERS: Oh, we were taking their tummies, we took their lenses out of their eyes, we took their lower jaws, we took pieces of their hearts, their kidneys; we took stomach samples, and we analyzed the genitalia and what kind of general condition they were in... We would take the body parts out, Lew. We had a five-gallon can or buckets—you know, pickle buckets—

that we would have full of formaldehyde and all the specimens. The Museum of Northern Arizona has this to this day: the eyes, because you can age the critter by the weight of the lens, the lower jaw, samples from the stomach, the heart, the kidney, the liver—those samples—and put 'em in formaldehyde and put 'em in the bucket, and sent 'em out for future analysis. However, a little secret I don't mind sharing today, for each donkey we would often have two buckets. On the younger donkeys I'd peel the backstraps off just like a fresh killed deer, and I'd take the hams too. Those two buckets would go out, and right on this porch—before it was built this way, it was an "A" frame—we would butcher up and wrap that meat when we got back; I'd send it down to my mom in Prescott, and she was feeding the whole family. She and I had this joke about eating green chili *burritos*. We were actually eating that fresh meat, and my mom and I never told the rest of the family, but we had *hundreds* of pounds of donkey meat from right out of the Grand Canyon.

From one trip to the next we'd know where the donkeys were. There were big concentrations in Forster Canyon and Fossil and Parashant—we would never get them all on a single trip. We'd go in early in the day—fly around and find our targets—"Okay, there are fifty donkeys there on the slopes across from Fossil." So I'd say to Dan O'Connell the pilot, "All right, set us up here. Let us out here, we'll get behind these rocks. You go back and you push the donkeys into us." He would hover and let us out, and the helicopter would go back, and we'd get all set up, and I'd radio, "Okay, we're in position, man." And he'd come herding these donkeys into us. And we'd just start dropping 'em one at a time until we had 'em all. They would drop with a neck-shot like lightning had hit them. But, I remember one time at Forster, and for years afterwards, I saw this one old guy we had missed. There was this really, really old jack. After we were all done, cleaned all those up—and we just left 'em lay, because within a few years their bones were gone. We circled around and came up and there was an old donkey who somehow had escaped...

STEIGER: Smart. He didn't go.

CAROTHERS: And we could have gone back down and nailed him, but for some reason I just left him... For years afterwards when I'd turn the corner at Forster and be coming down toward Fossil, I could see some piles of dung every now and then, or a track, and I knew that old guy was still in there, but there was nothin' else. We got them all out of that section of the Canyon and you know today there aren't any in there.

STEIGER: Yeah.

CAROTHERS: And Parashant we got them out of there too.



Steve Carothers and Rob Von Neumann determining the sex of a Grand Canyon rattlesnake, near Hilltop Ruin, Cardenas Creek, 1973.

STEIGER: Yeah. I should add...I remember seeing that little bunch there at 122, and I remember seeing— basically you would start seeing 'em almost from just below Lava, maybe not quite that high. Was it Parashant? You'd see *tons* of 'em.

CAROTHERS: Right, we got 'em all out, we took 'em all out.

STEIGER: Then there's that whole...did you ever hear the whole Cleveland Amory story, and Russell and Moldy and those guys? [*Where the Fund For Animals sponsored a live-capture/adoption effort.*]

CAROTHERS: Yeah.

STEIGER: That's a great story.

CAROTHERS: They spent a million bucks on their live capture effort. We started it, killing them, and got about 200 before we got shut down by the Fund for Animals.

STEIGER: That's a hilarious story, Dave Erickson [*the famous wild-cow catcher, who headed up the cowboy*

portion of the roundup] and all that.

CAROTHERS: Oh yeah, Dan O'Connell was their pilot too, I just saw him. I just talked to Dan O'Connell. He still goes down and sees Dave Erickson, when those guys hauled all the live donkeys out on boats. You should talk to O'Connell...It's a classic American tale. And you know what? It's a real success story because those donkeys are *gone* now from Grand Canyon.

STEIGER: They really are. And 35 years later, you can *still* see the trails they left.

CAROTHERS: Yeah, they were basically self-sustaining populations, they were increasing in numbers, and they were really, from an ecological standpoint, a non-native species hammering the native vegetation in many areas. They would concentrate around springs, just like the rest of us, looking for water. And they would knock the vegetation down, and they just really made quite a big mess. Their trails were obvious from the rim, you could see where donkeys were common. They would actually knock down the ocotillo plants and beat 'em to a pulp on the ground, beat all the thorns out, and then work their little mouths around the leaves until they could get the leaves off. They would do a tremendous amount of damage.

But today, they are *gone*.

STEIGER: So you didn't start out with an ax to grind against the burros?

CAROTHERS: Hell no. I had a donkey named Daisy at the time and we used her for packing in our mammal traps in Havasu Canyon. I was originally studying human impact on the beaches.

* * *

I had a contract from the Bureau of Reclamation in like 1977 that was to do five river trips to study the fishery of the Colorado River. This was just in the beginning of the time when the water and power guys had discovered the Endangered Species Act. Reclamation was getting very conscientious or jumpy about their river operations and potential impacts on endangered species. Well, what they really wanted to do was cover their asses, so they had these questions. And so we got a contract for a hundred grand. That is a funny story as to how the museum got that contract. Chuck Minkley and I were the co-principal investigators. I never heard of Chuck until I got this call out of nowhere from the Bureau of Reclamation...it's their environmental officer, Gary Bryant, and he goes, "We'd like to contract you guys to do some fishery studies in the Grand Canyon." At that time I didn't know beans about fish, right? I mean, I knew some of them tasted pretty good when I caught 'em in Oak Creek Canyon. But I'm the bird and



Photo: John Running

Human impact studies, meter-square plots, Nankoweap Creek, Carothers, George Ruffner, unknown, 1975.

mammal guy at the Museum, I'm skinning birds. I'm a bird biologist, right? So Gary says "We want you to do this fishery study, and by the way we want you to have Chuck Minkley, Dr. Wendell Minkley's [*a prominent fishery biologist from ASU*] brother, as your co-principal investigator." I go, "Sure we can do that."

I'd already done a couple of snout trips with Peter Winn and Don Briggs...And who was the banjo player and his sister? He came on a few and his sister, she came on many river trips for years. Jerry Jordan. And Suzanne. So I already felt I could pull off taking our two donated snouts [*donated to the Museum of Northern Arizona by Lou Elliott*] downriver without too much crashing. I convinced the powers that be at the Museum that there was little liability and we took the contract. I mean, that's why SWCA is alive today. I don't know beans about it, but sure, "We can do that."

STEIGER: Now, SWCA, Steven W. Carothers and Associates—you now employ, what is it?

CAROTHERS: Three hundred and fifty people. Nineteen offices. [*As of 2014: 800 people, 26 offices.*]

STEIGER: You're doing biology all over the country. You're basically doing environmental impact studies?

CAROTHERS: Yeah, endangered species management, archaeology, geology, hydrology. You name it out there in the environmental realm, except for hazardous

waste, we don't touch that.

STEIGER: But you're all over the nation, and you're unique in that, are you not?

CAROTHERS: Yeah. There are guys that have come and started with me, like George Ruffner. He's got his own deal going in Phoenix now: and there are some other ones: Jim Tress, Bob Manygoats, Kenny Carothers, Dave Greenwald, Tom Motsinger, and some other guys that had worked for me over the years who have all started their own companies.

STEIGER: But biology made practical.

CAROTHERS: Yeah. Well, I say "We get people permits." That's what we do. If somebody's got an endangered species and they need to develop the land, they want to know how much impact they're gonna have, we do all the investigations toward assessing the reality of what is going on: and, many of us still do research in Grand Canyon.

But anyway, so I say yes to the fish study, I got in touch with Chuck Minkley. We did five river trips. The reason this study is important is that our first electrofisher in the Grand Canyon was a Redshank with a 25-horse Johnson, with the frame built-in, with Chuck "mad dog" Minkley, 225 pounds if he's an ounce, leaning off the edge of it with a net, and a 125-pound Honda 220 generator in the boat to run the electro-

fisher. And Norm Sharber had *made* the electronics into a rocket box. Okay? So we had cables coming out of a rocket box, plugged into a generator, a pole vault pole as a boom on the front with an anode, and a cathode in the back, me driving this stupid little boat, a 13-foot Redshank. It's got a little, tiny scoop of a hull, and I can barely get that thing on plane, empty. We could never get it up, so to speak... We did an entire river trip and we could never get that electrofisher to work. But we learned, and by the next trip, Norm had electricity in the water, and we were turning fish.

STEIGER: Did electrofishing—is that something people did before?

CAROTHERS: Oh yeah, absolutely! It's been known since the twenties. But the most significant part of the work we did in Grand Canyon—and this is huge, okay? Very few people know it, but it's huge. It must have been after Norm—in 1977 we had that contract to do an ecological survey in Grand Canyon. And there's a paper now published through the Grand Canyon research papers, it's 1979, it's a big thick report called "The Aquatic Ecology of Grand Canyon," and in that process we developed... electrofishing was well known at the time, but I mean you're gonna go down through the Grand Canyon and electrofish, right? How do you keep everything safe? You've got generators, anode, cathode, and what happened is that when Norm finally got a machine to work, we used a commercial machine, I think, initially.

STEIGER: So your first trip that he built this thing...?

CAROTHERS: It didn't work. We didn't catch anything with the electricity. We caught 'em with trammel nets and everything else. The *next* trip, with this commercial machine, he was knocking the s--t out of the fish. And I'm a kid from Prescott, right? I grew up in a family of seven kids, and we were meat hunters: deer hunting, fishing. I'd go to Watson Lake and Willow Lake, and we'd catch crappy and bring 'em home. My mom would cook 'em and the family would eat 'em. I mean, the only approval I think I ever got from my parents is when I killed something. (laughter) Well, think about it, I'd bring home some meat: a deer, some rabbits, quail, fish.

STEIGER: "Good job."

CAROTHERS: And so: we're shocking the Wheaties out of all these trout in Grand Canyon, and remember, when I first started going in Grand Canyon, in the late sixties, the trout fishery was only really beginning. We would go down through... Today you can go down and electrofish your ass off, down in front of Redwall Cavern, all the way in that area, and you'll catch some skinny trout, and you'll catch a few chub, and you'll catch a few carp. In *those* days, we were catching carp

that were *huge*, with gigantic fat glands, and almost nothing else. At South Canyon, you could throw a lure out and catch some really big trout. But we weren't able to catch the big ones with the electrofisher at that time. But I started filleting the trout we did catch, and I started taking smokers with me, because I wanted to smoke the fish and I wanted to eat 'em. I couldn't stand doing all these fish and not taking the meat. And so I'm filleting the fish, taking the butterflies. You take the backbone out and you've got the two halves of the fish. But I realize, "Norm, seven out of ten of these fish that I'm filleting have got broken backs, there are these big hematomas. You're messing up my smokin' fish here with your electrofisher!" Because I would come back from a trip, Lew, with maybe fifteen to twenty packs of like two pounds each of really good smoked trout. So I knew what I was talking about. "These fish are injured." And so we start the research, and we find out that the current that's being passed into these fish is breaking their backs. Seventy percent of the fish have broken backs.

STEIGER: It's too strong.

CAROTHERS: Yeah! But this is what everybody in the fishing industry is using—everybody in the world.

STEIGER: And they've been usin' that for fifty years!

CAROTHERS: Yeah! And Norm and I go off to England, and give a scientific paper on all this stuff, and revolutionized the way electrofishing is done today.

STEIGER: You mean these guys didn't realize that they were hurting the fish?

CAROTHERS: Nobody had ever taken an X-ray. Now, what Norm and I did—I mean, I'd fillet the fish, and I'm goin', "Norm, the story here is the percent of fish where the backs are broken." So we started bringing fish out. We'd go to Lees Ferry, we got contracts with Game and Fish. We'd go from Lees Ferry up to the dam on the Game and Fish contract, and we'd bring back 50, 60, 70 fish to a radiologist here in Flagstaff, and he would X-ray the fish for us, and we had this really cool study—it's in the literature. Norm then developed, in his laboratory, a pulse that was able to go ahead and bring the fish in, that didn't break their backs. We got like ten percent breakage after he had developed his pulse. The actual electricity that came out, he put into little packets of pulses, with different wave shapes than what we had been using before. And that was enough to still bring the fish in, but not to tetanize 'em so badly and cause 'em to have the broken back. And that's the technology that's still in use today in most of these electrofishing units.

STEIGER: And then you built this Dick McCallum/Brian Dierker *Ichthyofighter*? [An elaborate snout-rig.]

CAROTHERS: No, we went to a Havasu after that. We



Photo: John Running

Carothers, censusing birds in Cardenas Creek marsh (when the marsh was full of water); the endangered Southwestern Willow Flycatcher was once known from the marsh.

had Havasus—we finally got the electric box to work, and we had an anode and a cathode—cathode off the back, anode off the front—and two netters in the front of a Havasu, with no railing. We had floorboards in the Havasu that we could stand on.

STEIGER: On the ends, but somewhere you've got to bail.

CAROTHERS: Oh yeah, you had to bail out of the back. The floorboard you could lift up when you were underway for electrofishing. And you really need to know this, and I think George Ruffner will verify this, but we had a place called "Carp Eddy." It was right below Lava, at Lower Lava. We could go into there, fire that sucker up, and within twenty minutes we would be up to our knees, the two guys in the front, in carp. We would have over a hundred dead carp that we'd brought in, that were just up to our knees. I had these wool pants that I wore in the wintertime, and these Nancy Sinatra white rubber boots. I can remember the smell of those pants *months* after we got off the river trip, smellin' like carp. But in these days—you go out into that same eddy, same thing down at 219, that eddy right above that 220-Mile camp, that big fat eddy there, back then we could catch *hundreds* of carp. Now, you might catch a skinny trout, a skinny striped bass. And below Lower Lava, you're not gonna probably catch anything. But the carp had been staging. See, they'd come up from the lake. It was still in the

pre-dam—those carp thought it was the pre-dam days. That's when those guys got big.

STEIGER: They were wantin' to go up.

CAROTHERS: Yeah. They'd stage at the bottom of those rapids. And they're gone now. I doubt if very many of 'em made it up, actually.

* * *

One day—with Dave Wegner in charge of GCES [*Grand Canyon Environmental Studies*], after he had sort of taken charge of disbursing the research funds, you know, we went from there and we just kept jacking the studies on up. We were funded from then on. And the studies kept getting bigger and bigger and bigger—well, one day we were at the mouth of the Little Colorado and Wegner sent us in all this equipment by helicopter. He sent in a Redshank and a brand new 25 horse motor that he thought might come in handy. Brian Dierker and Mike Yard and Tom Moody had just gotten the new contract for the river logistics part, which I had helped them with, and Brian was down there putting this little sport boat that Wegner sent in together. I'm not sure he'd ever even run a motor trip before this. But my first real experience with up-running, it was the first time Brian was ever in one. About the time he had it put together I said, "Get in this boat. Let's go. Don't look back." And we roared out of the mouth there and launched that boat up on plane, out

of the Little Colorado. It was a research boat to set our trammel nets. But we actually got on plane and went all the way up to 60-Mile Rapid. Then the next thing I remember on that front is having Pete Resnick and Brian Dierker on my boat, and I had an Achilles with a 25 on it, and we left camp and went upstream and the next thing you knew we were in the eddy on the north side of the tongue in Tuckup. That day was my first uprun of Tuckup. Now, Tuckup's *nothing* today. Brian and Pete were with me on that, and I remember coming up the eddy and coming out into the current. You can just see Tuckup and you can feel it as I'm talking, and the boat gettin' in that and hesitating. The boat is struggling, *struggling* to get up that thing, and finally we come up out of it. And that was a huge-ass day. And from then on, it was one rapid after another and better and better boats and bigger motors. We temporarily went to the Achilles, like I have down there in the boatyard today, with a 40-horse Yamaha. We ran 40s for a long time. Then we graduated and got the Honda 50s. Whew!

STEIGER: And you guys were just playing around, you weren't doing it for the good of science?

CAROTHERS: That is not exactly true. We were using the small sport boat to set our trammel nets at night, okay? That is what we had it for. We would go into camp for the day with the main boats, and from there we would go upstream and downstream and set a string of trammel nets. Trammel nets are eight feet high and 150 feet long, and you drop 'em out into the current and the eddies and other riverine habitats, and you'd catch fish at night. We would set trammel nets and hoop nets and sometimes even gill nets. And we would need to get up from camp to go check those things all night long. The fish would die if left for several hours and we did not want that. And so we would always plan our camps somewhere where we could go up and hit a rapid and set from there on down, often to the top of the next rapid. And so I'm sure this night, we had set up to Tuckup. Okay, but we're out there, we have checked the nets, it's Brian Dierker and Pete Resnick and me, just the three of us, nobody else around. "Let's see what this thing'll do." And I'm driving, and I can remember watching Brian and Pete's eyes, not looking at the rapid, but looking at me—because it's just Tuckup.

STEIGER: "What is this idiot doin'? He's taking us up this rapid!" ...I remember talking to Bill Sanderson, and he talked about his dad, Rod Sanderson, and him and his brothers—they were runnin' these little hard-hulled powerboats in the early sixties. That's how Bob Euler went the first time. But I'm pretty sure all those guys ever did was go down. I doubt that it even oc-

curred to 'em...Now, they probably could have turned around and went back up.

CAROTHERS: But, you know, you're so scared. You got through that rapid, *why* in Hell's name would you want to go back up?!

STEIGER: Why on *earth* would you want to go back up?! But now here's these boats that are going both ways on the river. And pretty much at will—and there's been a massive amount of science done lately, and I don't think the guys who are really doing it are admitting just how many of these big-ass rapids they're running up...Anyway, let's just talk about how we got from that Redshank to the Osprey. I want to add, I just got to drive an Osprey. I just got to do one of these science trips, so I know a little bit about it, just a teeny tiny bit, and what that does for me is: I appreciate what we're talkin' about here, which is these Ospreys—here's a double-walled, hard-hulled metal boat that actually has an air chamber in it, and it's lightweight, and it's about 16-feet long and it's got a 50-horsepower motor on it, and this thing *flies*, and you can go up and down. I ran into a private guy on this science trip I just did and this guy asked me "Why a 50-horsepower motor?" And basically why a 50-horsepower motor is because you're driving up the hill. When you go up the eddy and you jump out onto that tongue and all this water's coming down and you're going up the hill...

CAROTHERS: You want that punch. You gotta beat that wave before it comes into you.

STEIGER: Well, and you're goin' uphill, and that power is a good thing for going up. Some of those hills are big!

CAROTHERS: Absolutely. Oh! That simply sends chills up my spine. A wonderful feeling. God, I love my Osprey! These things will go...I have a GPS unit that I use in mine, and I know that upstream I can get 28 miles an hour, and downstream, I'm about 32, 33 miles an hour—with a relatively empty boat. But the neat thing about the Osprey, it was built for uprunning rivers in New Zealand. Somehow or another, Brian got wind of these Ospreys, and he got one shipped over here, and then it worked out so well that then I put up, I think, 22,000 bucks and we ordered three more of 'em, and they came in, in a freighter car. And Brian and I took a pickup and a trailer and went over there to L.A. and picked up those three new Ospreys.

To be perfectly honest with you, I still feel safer in an Achilles than I do in an Osprey. I've got each. And when I do Diamond-down trips, a lot of times I'll take a sport boat, and I still feel more comfortable driving the Achilles than I do the Osprey. I think it's that I'm a little bit more old-fashioned, and I feel a lot safer with

all that rubber around me, compared to the metal. More floatation. But the Osprey has a far greater carrying capacity. I can get an Achilles on plane with a cooler full of food, and a couple of rocket boxes, and two people. On the Osprey, you can load that thing to the gunwales, four people, tons of gas, and you can still get it up on plane. And I do that all the time, because I go from Lees Ferry up to a camp upriver to do fishing trips and what not.

STEIGER: And why is getting it on plane so significant?

CAROTHERS: Well, you've got more control. Once you're up on plane, number one, your motor's a little higher out of the water, and so you're not threatened by the bottom as much as you are...If you're not on plane, that motor's hanging *way* down there. Get it up on plane, you're faster, less time to get where you're goin'. And you really do have far more control, and less motor stickin' down.

STEIGER: Well, just talking about the history of boats in Grand Canyon, I feel like this is a significant and fascinating chapter. To see these boats and the kind of boating that's going on, on the river, it's just an *amazing* chapter. John Wesley Powell, Robert Brewster Stanton, the Kolb brothers, Buzz Holmstrom, those guys would be amazed if they could see what's happenin' on the river with these boats. It's just incredible to have boats that go both ways. The Ospreys are amazing in how stable they are and how fast they go, and just their ability to go upstream. But the boating that I observed that was going on, fishing takes place at night, because that's when you catch the fish, right?

CAROTHERS: Yup. The fish are negatively phototropic, so they'll come closer to the surface when it's dark.

STEIGER: Well, I am just so amazed by both the technology—I mean, these boats are just incredible—and also the technique. To drive one of those things, it's by far the most thrilling and demanding boating that I've ever done. Here you're out there, you're running these things up the rapids at night, holdin' onto these...Sometimes you have a moon, but not always, and so you have to make light. [**CAROTHERS:** Your "Q" beams.] Yeah, and you're using these spotlights, these "Q" beams. But if you're the guy drivin' the thing, that means you're holdin' onto your "Q" beam with one hand, and your motor with the other hand, and basically all you've got is that motor handle that's gonna keep *you* in the boat, should anything go wrong.

CAROTHERS: That's right.

STEIGER: It's just incredible. But you've got the lives of your scientists, everybody sittin' there unrestrained, and you're goin' 28 miles an hour upriver in the dark, as close to shore as you can get.

CAROTHERS: How smart is that?!

STEIGER: My sense of this, on this trip I just did, was that these scientists didn't really know exactly what a hairball thing this is, or how quickly things might go awry.

CAROTHERS: It's just as well they don't.

STEIGER: Yeah, no point in really explaining...

CAROTHERS: I remember Stuart Reeder taking that boat out at night, out in front of Nankoweap then, and just motoring up and down, up and down, just learnin' how to drive it. I remember Tom Moody below Lava one time took that sport boat out and started learning how to drive upriver, gettin' his ass kicked at the base of Lower Lava, and not flipping it or anything like that, but I mean—you know how you can bury that nose in a wave and just get the s--t scared outta ya'?

I started doing trips—at NAU I started teaching a class with Stan Bues called "The Biology and Geology of the Grand Canyon." I did that for about eight years. This would be 22 years ago. Cooper was eight. I remember Cooper had to go to class with me when he was just a small kid. I remember Dierker then got involved in those trips. On that trip, we always took a sport boat. We did the electrofisher on that, and we would take a sport boat, and that's where Brian really started getting good at drivin' 'em.

That would have been '81, '82. And one time comin' up Salt Creek Rapid, Brian and I were just out horsing around. And Brian hit that wave in Salt Creek, and the floor of the boat—he was driving, I was just up in the bow, and the floor of that boat just came up and smashed me in the face and just knocked me out completely and ripped my lip. I had a gigantic—I needed stitches in my lip. I had to shave the moustache off and put butterfly bandages on that split. But I was knocked silly on that.

STEIGER: He was runnin' upriver and got into...

CAROTHERS: Yeah, deliberately running the wave, running that little hole. You know where I'm talking about? Just to see what would happen. And that's how he learned how to be the best sport boat driver there is, really. There's some good guys out there, but I've never seen anybody that can drive one like Brian can. Brian would go get—at the top of Chuar, he'll get in the little kind of a place there where he can...when you're in a kayak and you surf, and it just stays right there. I've watched him shut the sport boat motor off and stay right there, and just sit right there and surf. I would never do that. And then later on it became... People like Brian, really, figured out how to safely drive them on plane through rapids, or just drive 'em, puttin' through like you would a dory or anything else. I think that in a sport boat the safest way to get

through those rapids is just to stick up there on plane and find your slot and go for it. But that's where that came from, and now we have both the Achilles and the Ospreys for science. And what they're trying to do for the science projects now is quantify the differences in gear type and make sure that you're consistent with the same kind of gear. But the reality of it is that when you're electrofishing at night, you're measuring one day against another, or one boat against another kind of boat—like an Osprey against an Achilles. The real variable there is the skill of the boatman. It has nothing to do with the gear type. It has to do with who's got the biggest balls, and who's gonna get closest into the shore *at* night, with their sport boat. You've got 18 to twenty inches of motor hanging down in the water and you don't have a jackass. You've got a sport boat with a very slow retrieval on raising your motor, and you beat the hell out of motors.

It *is* truly remarkable. I mean, we would have *never* in a million years guessed that we could do it as effectively as we can today. I come from the school where I am scared to death every time. I've done this for 35 years, and I get above Hance, I get above Crystal, and I get above Lava, and sometimes above Deubendorff, and I am still *truly* scared. I do not *ever* take this thing lightly. And that's just running a boat *down* the rapids. Right? And then you've got a sport boat, and you've called it, you're running upriver, it's dark, you're holding a "Q" beam with one hand, and you've got your other hand on the throttle, and you're standing up. You come up on the inside of that eddy, and you jump out onto the tongue, and you shoot up to the top of it, and you make it. But sometimes you jump out into that rapid and it buries your nose and fills your boat up with water and throws you back down to the bottom, and your bilge pumps have to handle the thing, and you come and take another run at it. And by that time, the scientists that are up in the front of your boat—you've usually got two...

STEIGER: They're suggesting maybe they should walk around.

CAROTHERS: Yeah, "You want us to walk? Is there too much weight?" (laughter)

* * *

STEIGER: Now, when was the Endangered Species Act passed?

CAROTHERS: The Endangered Species Act was passed in 1973. It was amended in 1980. But it was 1973.

STEIGER: So that was under the administration of Richard Nixon.

CAROTHERS: Richard Nixon did the Endangered Spe-

cies Act, the National Environmental Policy Act, the Wild Horse and Burro Act, and the Clean Water Act. How 'bout that, for Tricky Dick? You know, I owe my entire career to the legislation that man put in there.

STEIGER: Okay, when the Endangered Species Act came along, what was your take on that? You must have been instantly aware of it—or were you not?

CAROTHERS: Well, not really. When the Endangered Species came along in '73, it was not that really big of a deal, because it was for grizzly bears and for eagles and for the really big, kind of spectacular species were the ones that you first paid attention to. People weren't thinking fishes. And today, I have a tremendous amount of work on endangered bugs. I mean, I go into caves and look for endangered bugs now. That's really gone a long way. So initially the Endangered Species Act did not drive any of this. The National Environmental Policy Act of 1969 wasn't driving any of this. What was driving the work we started out doing was the reality of the fact that river running in Grand Canyon was increasing, there's only one Grand Canyon. It increased from 200 people to 15,000 people over the span of a seven- or eight-year period of time. And the outfitters and the boatmen were complaining about impacts, and *that's* what got us all started on this. It was much later that the ramifications of NEPA and the Endangered Species Act came into play.

The Endangered Species Act is a remarkable piece of legislation. It really—and I have watched this, that's what my practice is now, I follow endangered species all over the country. I don't do a job anymore, personally, that has not some level of response to the Endangered Species Act. A landowner will hire me to determine whether or not they're exposed to it, or if they are what can they do to get out of it? I deal with this every day of my life. It's a remarkable piece of legislation. It is probably more powerful in terms of influencing land management than any other single act we have. For many, many years now, they've been trying to reauthorize and change the Endangered Species Act, make it weaker in some ways.

I've been in business since 1981, 26 years. I went through the Reagan administration, Democrats and Republicans, and every time a Republican would come in, people would go, "Wow, your business is really gonna suck now, right?" Well, what happens is—and the Bush administration really proves this—is that the laws are still in place, so you need to document what you're doing as far as NEPA and the Endangered Species Act goes. The exploitation of natural resources is accelerated every time the Republicans come in. *But* they still have to fill out the paperwork. And so I'm right there to fill out the paperwork, to do the NEPA

compliance, to do the Section 10 or Section 7 consultations through the Endangered Species Act, document the Section 404, the Clean Water Act. So we're there to document it, and business has just been on a steady... SWCA started makin', I don't know, a couple hundred thousand a year in revenues in the first year, and we'll hit \$40 million this year [2006], and it's all environmental compliance—archaeology now, for sure, about 50 percent of the revenues are archaeology. And everybody is trying to change the Endangered Species Act to make it a little bit weaker, but no one's really had much success at that.

STEIGER: Why is that?

CAROTHERS: Because that's what people want. That's what the people in this country want, is protection of those natural resources. And Democrat or Republican, as you go in to try to tamper with the Endangered Species Act, there are lots of developers that would like it to go away. I think most of my clients would in fact feel a lot better if the Endangered Species Act didn't exist. But what happens is that when people go to the polls to vote, even some of those very clients want to protect the environment, and the Endangered Species Act, probably there's nothing stronger in terms of legislation in this country, that works toward protecting the environment.

STEIGER: Okay, so when it comes to this particular little corner of the woods, here we've got the Endangered Species Act, and it's brought to bear on the fate of the humpback chub, and the Kanab amber snail and what not. Talk to me a little bit about the Big Picture there.

CAROTHERS: Okay, the Big Picture in the Grand Canyon and the endangered humpback chub and the endangered squaw fish—they call it pike minnow now—and the endangered razorback sucker, those three species were three of the eight native species of the Colorado River in Grand Canyon. But here's a giant conundrum, because... The humpback chub is doing pretty well, frankly, in Grand Canyon, and in other areas where it lives. It is hanging on with self-sustaining populations. Nobody's in there throwing baby humpback chub into the Little Colorado River to make 'em grow, like we throw baby Rio Grande silvery minnows into the Rio Grande over by Albuquerque every year. We're raisin' those guys in zoos, in big refugia. We get the babies, 100,000 babies, we let 'em go, and if we weren't doing that, the Rio Grande silvery minnow would be extinct right now. The interesting thing about Grand Canyon is that when Glen Canyon Dam went in, in 1963, when it was finally operational, it changed a river that was once warm in summer and cold in winter, muddy most of the time, and fluctuat-

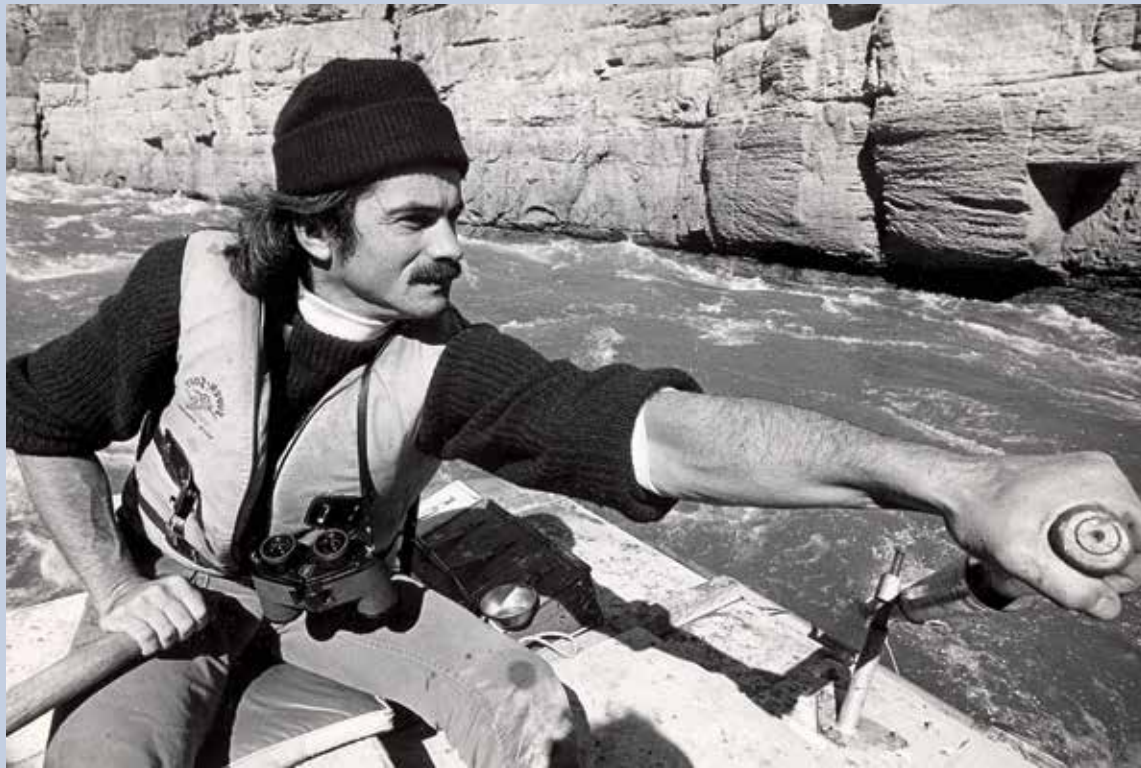
ing on a seasonal basis. It changed it into basically a contained aquarium that has clear-water flows, very cold, hypolimnetic water. They changed the Colorado River habitat from habitat for native fishes, like the humpback chub that evolved in this system, to a perfect stream for rearing rainbow trout and cutthroat trout. It's not habitat anymore for the humpback chub, in terms of the way it used to be. The humpback chub used to have competition with a few other species in there—some of them would eat them, like a pike minnow would eat a humpback chub. But by and large, the only competition that really existed was other fish, a few other species, would be eating the same kind of thing that the humpback chub would eat. Well now we know that there are about thirty nonnative species that are in that same ecosystem, and the mainstem river system is not habitat that is conducive to raising humpback chub. They can go up and spawn in the Little Colorado for several miles upstream. But in the old days, I think they spawned in the main river system where they had freshwater flows comin' in. Today, the water temperature is such that the baby humpback chub, they can't escape predators, it's too cold. Back in the old days when mama humpback had her babies, the water temperature was probably 75–80 degrees, and they were reared in nurseries in off-channel little nursery areas, overbank flows. And today, the river itself is *way* too cold. They either get raised in the Little Colorado River, or a few of 'em manage to escape. And when we had these warm-water flows, steady flows in summertime low, so that the river *could* warm up itself, and all this drought that's happened, and the low flows, we know that there were more humpback chub and more native fishes produced with... The temperature is a bigger deal than apparently the sediment. So basically I think we know how to grow native fish in there right now, but the river by itself, and the way they're running the peaking power system out of the dam, is not a river that's made for the native fishes. The only native that seems to be doin' really, really well with it are the flannel-mouth suckers and the speckled dace.

STEIGER: So how much money would you say we've spent on all this?

CAROTHERS: GCS was, I think, over \$280 million. I have a PowerPoint presentation that I give on adaptive management in the Grand Canyon, and I believe, if I'm not mistaken, I think it's almost \$300 million has been spent on these studies.

STEIGER: Which basically are driven now by the Endangered Species Act, and they revolve primarily around the chub?

CAROTHERS: Well, don't forget the Grand Canyon



Carothers rowing a snout boat through the Muav formation near Havasu Creek, 1974.

Photo: John Running

Protection Act. Now even though it hasn't panned out to be what everybody thought it was gonna be—that you need to protect the sediment resources in Grand Canyon—the Grand Canyon Protection Act is something that is driving these studies as well. And that's what's driving the focus around the sediment. The humpback chub could give a rat's ass about how much sediment is really out there in the river. They don't really care. And the Kanab amber snail is up on the wall at Vasey's Paradise and a few other places, and they don't *really* care about Glen Canyon Dam.

STEIGER: Do you think mankind has the right take on... What do you think about the Endangered Species Act? Why should I give a s--t about the humpback chub or the Kanab amber snail or any of that?

CAROTHERS: There are two answers to that. And I deal with—in Williamson County, Texas, it's a total Republican area, and the Endangered Species Act is a violation of their private property. I mean, it just is. I mean, they feel like "How stupid could you be?"

STEIGER: "The G--damned Democrats! We gotta deal with this..."

CAROTHERS: That you're worried about a bunch of G--damned cave bugs, when a school needs to be built, or a hospital, or "I just want to develop my land and sell it for homes, and I've got to worry about the golden-cheek warbler, the black-caped vireo, and *nine*

species of cave bugs?! Give me a break!" What's the answer I give those people? And then what's really in my heart, and what do I feel? It goes like this... And this came up just the other day—I'm talkin' to the Williamson County Commissioners, and they go, "You know this Endangered Species Act is a bunch of bulls--t. Why do we have it? Why do we have to protect these species?" And I go, "Well, there are two answers to that. One answer is that when the spotted owl was ranging across the Pacific Northwest and causing lumber prices to go to hell in a handbasket because you needed to protect the spotted owl, one of the side benefits, if you want to call it that, of what was going on at the time, is the researchers found under the spotted owl nests in some areas in the Pacific Northwest, this tree called the Pacific Yew tree. And that tree, in and of itself, is very rare. But through the spotted owl connection, and then going and looking at this Pacific Yew tree, it comes now that the chemical in the bark of the Pacific Yew tree, like the chemical in the bark of willow trees, is aspirin, salicylic acid, right? Well, in the bark of the Yew tree is this drug that arrests ovarian cancer. The only thing that does. *Huge* pharmacological implications that trickle down from the Endangered Species Act. And so the big part of that answer is you don't want to wipe anything out to extinction, because the 'X' gland of the cockroach just might have the key to

curing cancer.” This *always* gets ’em. This always gets ’em. You know, now I use AIDS—cancer and AIDS. “Who knows when we’re gonna find the pharmacological answer in one of these species, in a spider in a cave in Texas?” The truth is stranger than fiction in what really goes on in tropical forest pharmacology and all this stuff. And so when you can bring it back to the Republican listener, who thinks the Endangered Species Act is violation of their private property rights, if you can put it in the context that maybe his ass or his kid’s ass is gonna someday be saved because of the biotic diversities out there, we don’t want to let anything go extinct that might save mankind. Okay, well, that’s the answer you use with the Republicans. And it’s a good answer, because most people go, “Yeah, man, I could get ovarian cancer,” or “I could get this s--t, and that could save me.”

Now, what’s in my *heart* is—God, I just feel kind of goosey about the human animal being responsible for driving something into extinction. To me it’s like if we can prevent it, why *don’t* we prevent it? I don’t really believe that the cure to cancer is gonna be found in the “X” gland of a cockroach, but it might. But to me it’s just “What *right* do we have?” You know, we’re on this planet, sharing it with other forms of life, and if we can avoid driving another life form into extinction... You know, the dinosaurs and the asteroids and

stuff that are gonna eventually hit, the asteroid that’ll come and black out the world for a long time and cause mass extinctions...that happened. It happened in the past. But the extinction rate that is attributable to the human animal, just the hand of man reaching out there and cutting down the rain forests, or altering river systems, or doing whatever—the crops we sow and the insecticides that we put out there—you can really attribute...I think the standard answer is there’s 200 times the level of extinction now with the hand of man, compared to what has happened through paleontological times with other kinds of catastrophes, be it an asteroid or a volcano, whatever it was that caused the skies to darken and things to go extinct. To me, it’s just from a philosophical standpoint. If we can avoid driving something extinct, why wouldn’t we? Why *wouldn’t* we? We’re the richest country in the world, and we have the resources to do it, and besides that, we’re a young-enough country that all those things are still there. You can believe that in Europe and Israel, all the Middle Eastern countries that have been occupied—the hand of man and their G--damned goats have modified that landscape for the last 8,000 years, and anything that was going to go endangered, is gone. I remember being in Czechoslovakia right about the time the Iron Curtain was coming down. I was sent there by the State of Arizona to look at business op-



Photo: John Running

Carothers skinning small mammal specimens near Nankoweap Creek, 1975

portunities and exchange opportunities.

And I remember asking some Czechoslovakian scientists, “What about endangered species?” This is fifteen years ago. They talked among themselves for a long time, and then they came up with the answer. There was a big auditorium full of people, and there were a delegation of us from the States of about fifteen or twenty people. And they finally said, “Well, sometimes the deer don’t have hair.” I went, “Excuse me?” Well, we went and visited an area that was 40,000 hectares, over 80,000 acres of forest, ecosystem, that was downwind of a high-sulfur coal-burning plant, that was completely nude and dead. Everything in it was dead, and sometimes the deer that lived—anything that could eek out a living would come out and have these genetic abnormalities or just be in such bad shape. My point of it is that they were worried about the common stuff, the deer and the bunnies.

The stuff that we’re worried about today in terms of the natural resources, hundreds of years ago got driven to extinction in *those* countries. Look at all these endangered species we have here. It’s because we’ve only just begun to exploit—only just begun to exploit—the natural resources here.

STEIGER: Now when it comes to the Grand Canyon Monitoring and Research Center and science in the Grand Canyon in general, I think if you canvassed our community, you could find a wide variety of opinions as to what’s going on, and how that’s all gone, and how well the Grand Canyon Protection Act has worked and stuff like that. In the perfect world, if you were the king and could wave a wand and have us do the right thing, or all the right things there, what would they be? What do you think the big issues are for the *century*, and what would you have us do, what would you have happen?

CAROTHERS: I guess what’s probably *going* to happen is that they’ll base load that system. I mean, would I take down Glen Canyon Dam, or would I bypass Glen Canyon Dam? I wrote a paper on that.

STEIGER: Yeah, I remember that. You said “No.”

CAROTHERS: You wipe out the endangered fish in the Grand Canyon if you do, because you’re gonna let all those fish that are in the lake...the warm-water fish are gonna come up from Lake Mead, and the warm-water fish in Lake Powell are gonna go down there, and I think we calculated a billion fish in Lake Powell, and if you release those into Grand Canyon, just the competition for food alone...I mean, how are you going to be able to...? The reason we have such an intact endangered fishery in Grand Canyon today, is because of that cold water. If you go above Glen Canyon Dam and below Hoover Dam, and look at the relative

frequency of the native fish versus exotic fish, above Glen Canyon Dam it’s 1 percent natives, below Hoover Dam it’s 1 percent natives. In Grand Canyon, it’s ten to fifteen to twenty percent of natives versus nonnatives, and it’s simply because that cold water has kept the nonnative warm-water fishes out, and the warm-water natives are up in the tributaries where they’re still kind of happy.

You know, we know now that any flow over 8,000 cubic feet per second is exporting whatever sediment we get in Marble Canyon. Okay? There’s only one or two more floods left of dirt under the river in Marble Canyon, and that place is just...You know, the mass wasting of the sand, and it’s going to be completely armored. And I think the USGS scientists have come to the conclusion that anything over 8,000 cubic feet per second is exporting sand. So if you were going to follow the Grand Canyon Protection Act, you’d base load that system at about 8,000. And that’s exactly the kind of flow you need to be able to get 8.23 million acre feet out of a system.

STEIGER: Well, you know, I shot this interview with Martin Litton down there on the river in about 1994, I think, and the Grand Canyon Protection Act had just been passed, due to the work of a whole bunch of people. Everybody was kind of pattin’ themselves on the back, and here’s Martin Litton saying, “You guys think you’ve done something.” (laughs) He said, “You haven’t done anything. These guys are just gonna wait you out. They’re just gonna wait until nobody’s looking and then it’s gonna go right back to what it was before all this.” At that time he said, “Now what you need to do is run steady flows out of Glen Canyon, more or less seasonally adjusted steady flows and just do peaking power at Hoover.” And he said the only reason that he could come up with—why they wouldn’t do that, was because it was a credit thing. The upper basin didn’t want the lower basin...Or there was some kind of deal where they didn’t want...It messed with the agreements there.

CAROTHERS: Right. You have to balance the in-flow out-flow.

STEIGER: So just to get my story straight, you’re thinkin’ that that’s the direction that this thing ought to move toward?

CAROTHERS: Glen Canyon Dam’s been paid back for a long time. But again, it’s gonna be linked to energy costs, too. And the price of oil is—what is it now? 72 or 73 bucks a barrel? That’s a pretty efficient way to create energy, the way they’re operating Glen Canyon Dam as a peaking power system. And the key to it here, the humpback chub’s doin’ okay. So it’s not an Endangered Species Act issue with how they let water out. Willow

flycatcher, amber snail, humpback chub, razorback, they're gonna do just fine the way Glen Canyon's being operated right now—for the foreseeable future. It's the sediment, and it's the recreation. I think to comply with the Grand Canyon Protection Act, it specifically spells out sediment resources.

STEIGER: That that's what's gonna have to be done?

CAROTHERS: It probably would be easier to change the Grand Canyon Protection Act, than it would be to get those guys at the dam, with the energy costs the way they are, to change what they like to do. I mean, that's a pretty damned efficient system.

STEIGER: Any Big Picture thoughts on how science has done? What are mistakes that have been made with science, and what are things you'd like to see happen, just in that regard, for the next century?

CAROTHERS: For the next century...Monitoring, instead of them adopting a single monitoring plan on the basis of a technique—you go in and you shock against a beach for three seconds or thirty seconds or one hundred seconds, with some kind of electrofishing rig, with some kind of a pilot, and some kind of a boat. They keep changing the techniques through time, so there's no way to really track. Today, it's very difficult to compare the findings of GCES-1 and GCES-2 with GCMRC, with what the Bio-West team did in the early nineties. They're apples and oranges. And so there's really no... They're beginning to correct the database, but those are some mistakes that were made, and probably will continue to be made. As technology advances in each of these disciplines, they come up with new techniques. And instead of having a standard monitoring program that lasts the same; year after year after year after year, they keep changing in the middle of the stream. That's one mistake. The other is, people just underestimating how hard it is to do research in the Grand Canyon. It's gotten easier as time goes on. We've got SAT phones now.

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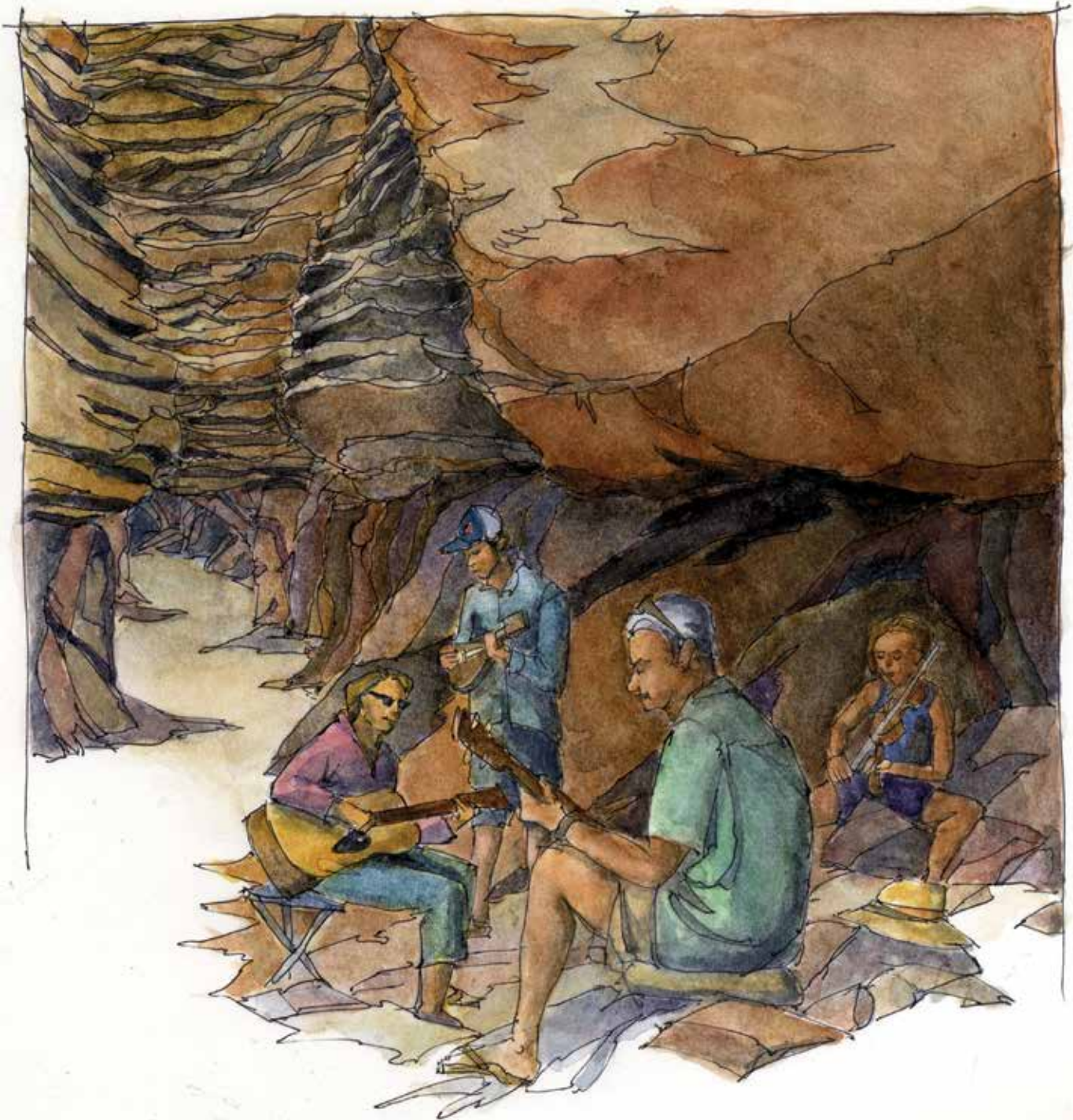
I've written stuff before in magazine articles, some of the more touchy-feely ones I've written, but what it comes down to when you're in the Grand Canyon, I really like to think I'm—and maybe it's not a good thing—closer to the animal that I've been programmed by evolution to be, than...you know, we have atavistic traits in us genetically that are: going out and running down some other animal and killing it and eating it, is kind of something that we're driven to do. We've got those tendencies in us, and I really like to believe that I have those tendencies. When I get in the Grand Canyon on a river trip—and this is why

long after I quit doing eighteen-day river trips because I had to come out and manage a company—I have for thirty years had this little private stash of river, from Diamond Creek to the lake, where I can go, and I'll launch tomorrow. Tomorrow morning we'll take the kids and we go down there and we launch. We spend three nights, and it's no different for me, I am right back on the river where the big deal for the day is where we're going to camp and what we're going to eat and how we're going to comport ourselves with our friends and family. And absolutely there's nothing about a mortgage or a report or an ex-wife or a strife or any kind of... The reality of the real world up here is suspended, and I get to be down there at the time when John Wesley Powell... I mean, it's a dangerous place, adrenaline's flowing, and I get to be an animal again. It's really, to me, it's an addiction, and I go shoot up whenever I can.

I used to come out of the canyon, off an eighteen-day river trip, and it would be in between the times before the next river trip. We're always above Lava, right? You're *always* above Lava. And we'd have these things that we called the post-river-trip blues, four or five days. "Jesus, guys, my bank account's empty. This gal is bitching at me for being gone all the time. I just got back and she's bitchin' about when I gotta leave again." You know, it was a real hard deal to make that transition. Well, I'm not in that transition anymore, I'm always on my way back down there, one way or another. It's a real place of centering for me. I mean, it's who I am, it's what I do.

You know what it is? I think of all the things that I do—I write papers and I write books and I try to be a dad, and I try to be a good husband, and I try to be a businessman—but I've never felt that I've really put it all out there, in terms of really doing my best that I could do as a human, until I got in the Grand Canyon. And I had to put together the logistics, I had to drive that boat *just right*. To come off a trip and go, "I never touched." That's Brian Dierker, "I never touched." You never touched your prop on the bottom. If you can do that, man that is being right on the mark.

Now, I've not written all the papers I should have written, or all the books I should have written about the Grand Canyon, but when I'm there, when I'm in that element, and when I'm taking care of people, and I'm cooking for people, or I'm just being a guide, it really is how I identify myself. That's where I've done my best. And I can hardly wait to get there tomorrow. I've got *so much s--t* up here that I've gotta write, and so many deadlines, but I'm just takin' my son Tanner and his ten friends on a river trip tomorrow, because I can. I can hardly wait.



The Great Uncoformists Live at Blacktail Canyon, JO.

John Owen

Financials

GRAND CANYON RIVER GUIDES, INC.
DRAFT STATEMENT OF ACTIVITIES
Fiscal year ending 6/30/14

INCOME

Foundation grants \$	\$ 37,000.00
Membership income	32,920.00
General contributions	27,663.00
GTS income	20,062.00
Circle of Friends	19,724.77
Sales (t-shirts, hats, etc...)	5,831.00
Government grants	5,277.00
First aid income	4,805.00
Non-cash contribution	3,600.00
Memorial contributions	600.00
Fall Rendezvous income	517.08
Interest Income	209.24
Cost of goods sold	(3,697.54)

Total Income \$ **154,511.55**

EXPENSES

Payroll & benefits	\$45,545.88
Contract labor	34,275.24
Printing	19,362.77
Postage	9,025.46
Rent	8,400.00
Food (GTS)	6,639.13
Outside services & outfitters	4,700.00
Insurance	3,763.88
Payroll taxes	3,326.51
Equipment rental	2,595.57
Depreciation expense	2,126.00
Telecommunications	2,124.85
Office expenses & supplies	1,772.49
Travel & per diem	1,539.56
Utilities	1,521.87
Honorarium	1,400.00
Repairs & maintenance	903.90
Professional fees	710.00
Merchant fees	647.07
Meeting	157.13
Other (bank charges, subscriptions)	144.33

Total Expenses \$ **150,681.64**

Net Income \$ **3,829.91**

GRAND CANYON RIVER GUIDES, INC.
DRAFT STATEMENT OF FINANCIAL POSITION
June 30, 2014

ASSETS

Cash in checking/savings	\$67,058
Postage & security deposits	1,260

Total Current Assets \$ **68,318**

FIXED ASSETS

Computer & office equipment	\$ 42,817
Field equipment	6,148
Database	1,088
Website	4,863
Less depreciation	(50,076)

Net Fixed Assets \$ **4,840**

LIABILITY & EQUITY

Accounts Payable	\$ 250
Payroll liabilities	\$ 1,048
Restricted funds	278
Equity	71,582

Total Liabilities & Equity \$ **73,158**

Businesses Offering Support

Thanks to the businesses that like to show their support for GCRG by offering varying discounts to members...

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River Gardens Rare Books—First editions 435/648-2688
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You can pay securely on the GCRG website at www.gcr.org or send a check to: Grand Canyon River Guides, PO Box 1934, Flagstaff, AZ 86002-1934. Note whether you're a guide member or general member.

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\$350 Life membership

\$500 Benefactor*

\$1000 Patron (A grand, get it?)*

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*benefactors and patrons get a life membership, a silver split twig figurine pendant, and our undying gratitude.

Box 1934
Flagstaff, AZ 86002

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 Walton Family Foundation, the Adopt-a-Boatman sponsors, "Circle of Friends" contributors, and innumerable GCRG members for their generous and much appreciated support of this publication.



Parting Shot: Harlan Taney with Lonnie Bedwell and Erik Weihenmayer, kayaking through Grand Canyon. Blind.