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COVER

A solo marathon canoeist in the middle of the Farmington (Conn.) Long Distance Race in late May when spring reaches its peak in New England. Stan Wass photo.

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From the Editor

In one of the recent issues of *Newsweek* last month, there was a special section on life in the outdoors, and how Americans in ever-increasing numbers are using our natural areas. There were short pieces on hiking in the Grand Canyon and rafting on the Rogue River in Oregon. The article attempted to explain this awakened need for the outdoors among the people of this country, and also touched upon the problem of overuse and abuse of our natural places.

This issue of *Down River* has three articles dealing with river use and management. David Threlfall talked with Glen Alexander, the Assistant Manager at Canyonlands National Park, and Glen gives some insights into how the permit system was adopted, and how they, at Canyonlands, decide on dividing up the permit pie. Steve Carothers of the Museum of Northern Arizona highlights the problems of disposing of human waste while on an extended wilderness raft trip. The disposal of human wastes has become a major area of concern for those interested in preserving the natural conditions on the river. Steve's article tells how to handle the problem in a safe, economical and effective way. With more and more people using the rivers, upsetting stories like Jim Churchill's are bound to be more common. Will there ever be a time when all people will have the intelligence and appreciation to respect natural places?

The *Newsweek* article was introduced by a quote from a writer whose works I have enjoyed reading, Henry David Thoreau. Although Thoreau was best known for his affiliation with Walden Pond in Concord, Mass., he was an explorer of all aspects of the natural world, and deeply respectful of its beauty.

In political circles, Thoreau is remembered by his act of civil disobedience in refusing to pay his poll tax (although he did pay other taxes). He spent a night in the Concord jail for this refusal. Two acts of civil disobedience have been threatened this summer over the commercial permit-private permit controversy. One private group plans to go down the Grand Canyon without a permit, while another group plans a similar trip down the Snake River. Hopefully, these acts will bring more attention to the plight of the private river runner. All people (one-time river runners from the city to hard-core river rats) should apply for these limited permits on an equal basis. Then, if selected, they may choose which outfitter they wish to travel with, if they need or want to go on a commercial trip.

Eric Evans

Let's Carry It ALL OUT

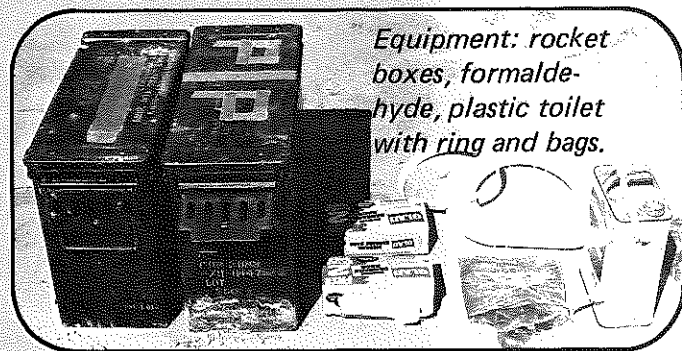
by Steven Carothers

A brief analysis of visitor use statistics on any of the navigable waterways in the United States, particularly of the West, bears mute testimony to the fact that whitewater recreation has recently become "the thing to do." Compared to 10 years ago, the pursuit of whitewater recreation has increased by an order of magnitude. Resource managers, chartered to protect the environmental quality of their areas of responsibility, quickly admit that the increase in use of white-water areas has brought with it many environmental problems. Recreational activities and behavioral patterns that were once thought acceptable in back-country areas may now be the very basis for considerable environmental destruction. What? Come now, can we really mean that the very elite groups of wilderness enthusiasts and users are perhaps destroying the quality they have so diligently pursued? The answer to that question is a qualified yes.

To cite examples, the exploitation of the Colorado River's wilderness resources is a classic example of this problem. In 1967 barely 2,100 people chartered passage on the Colorado River—a wilderness adventure covering anywhere from 225 to 285 miles of river and lasting seven to 18 days. By the end of 1973, 15,000 people per year were seeking this experience, an increase of about 700 per cent in six years. Since 1973, over 15,000 people have annually shared the excitement and beauty of a boating trip down the Colorado River through Grand Canyon National Park. Most of the river use is concentrated during the spring and summer months, as the cold weather of fall and winter is much too inhospitable for the majority of the commercial river travelers. The Park Service became justifiably alarmed at the annual visitor use statistics, and in 1973, they decided to forbid any additional increase in the number of people running the river. Until they were satisfied that the annual influx of visitors was not causing irreparable ecological damage to the Canyon's streamside resources, they intended to continue to regulate the recreation use of the system. Since 1973, research scientists from a score or more institutions have been investigating the tricky problem of "human impact" along the Colorado River. The results of those studies have been submitted to the National Park Service and will soon be available through the Superintendent, Grand Canyon National Park.

Although many visitor activities and behavioral patterns were identified as being detrimental to the quality of the Park resources, one of the major problems, and the principal subject of this article, was found to be the method by which river groups disposed of their human feces. Although this may be considered to be one of the most significant environmental and aesthetic problems associated with the river running industry, it is also one of the easiest problems to mitigate. The problem is basically this: 15,000 persons per year travel the Colorado

River, remaining in the Canyon an average of about 8.7 days. This number of people, in that length of time, produce approximately 20 tons of solid wastes. Current Park regulations require that these wastes be containerized and buried away from the main campsite and above the present "high water line" of the river. The burial of these wastes in the beaches of the Colorado River is now known to be causing irreversible impacts on elements of the natural resources of the Grand Can-

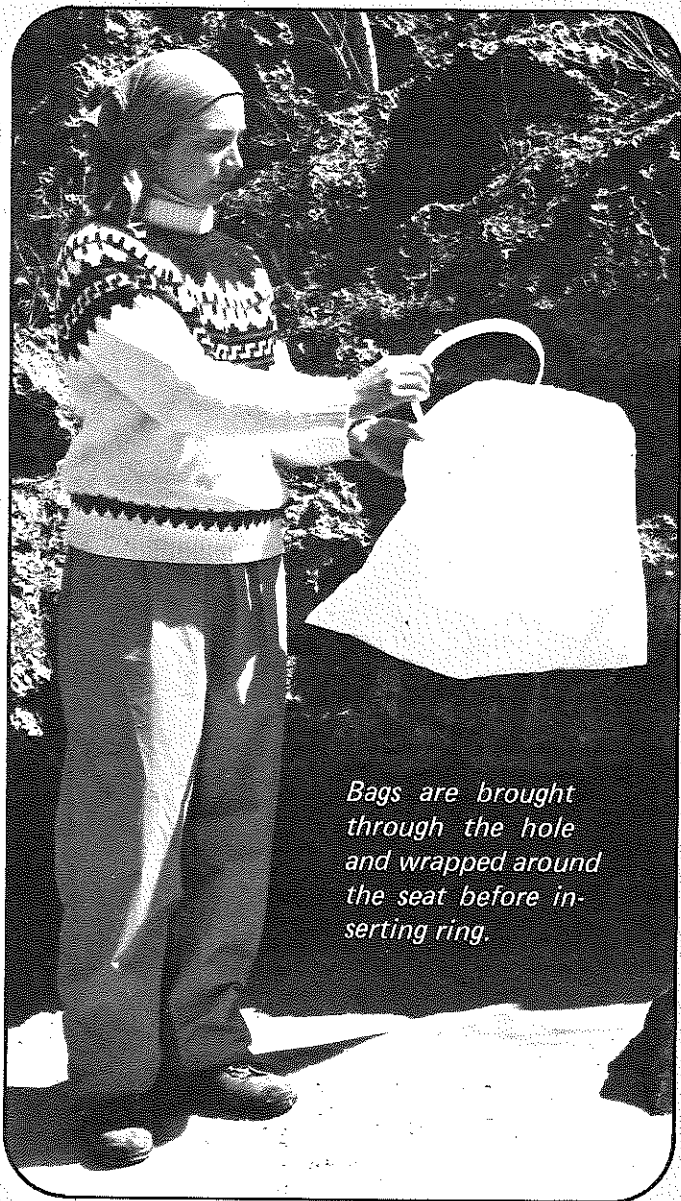


Equipment: rocket boxes, formaldehyde, plastic toilet with ring and bags.

yon. The major impact of this waste disposal is associated with the digging activities, the initial disturbance of the soil profile and thus the seed bed for annual plants, and the total volume of wastes that must be disposed of during the five-month river running season.

Although almost 400 campable beaches may be found along the Colorado River from Lees Ferry to Lake Mead, fewer than 100 of these receive 75% of all camping activities during one season. This results in an average of 40 dumps/year on most moderately used beaches and up to 100 to 150 dumps per year on the heavily used areas. These beaches are usually less than 5 acres in size and on these areas over 5,000 2ft. x 3ft. waste disposal holes are annually excavated for the "proper" disposal of the feces. If the Colorado River were under a natural river regime, that is, if the spring and fall floods of pre-Glen Canyon Dam days still inundated and cleaned the beaches, this might not be quite so bad, but this dam, located 15 miles upstream of Lees Ferry, has forever checked the high flood waters that were responsible for cleansing the Canyon beaches. Whereas flood waters could reach as high as 250,000 cfs during the pre-dam regime, the highest flood waters that system has received since the dam was put into operation in 1961 has been about 50,000 cfs. Thus, the natural purging capacity of the system has been dramatically reduced. For the most part, the only movement of the beach sands has now been limited to that produced by the wind—an insufficient amount to cleanse 20 tons of human feces per year. By the time the visitor user levels reached the peak of 15,000 per year, boatmen

would frequently encounter the wastes of the last party to use the beach when attempting to dispose of their group's wastes. Not only was this an aesthetic shock, to say nothing of the unpleasant task of actually dumping the contents of a porta-potty into a 3 ft. hole, but questions concerning health hazards and infectious contamination also arose.



Bags are brought through the hole and wrapped around the seat before inserting ring.

Few people gave it much thought, that the cheerful chef who prepared the passengers' daily meals was also the same individual who was responsible for daily disposing of the metabolic products of his cuisine delight. When pumping a porta-potty, it is usually difficult to not come in direct contact with the potty contents. Bacteriological investigations into this problem reveal that 99.98 per cent of all the fecal pathogens expired within one month of burial. From this study we can be reasonably assured that most, if not all, of the fecal contaminants from one season are dead before the next season begins, but it is clear that contamination is possible due to the handling and accidental exhumation of these products during the same season they were initially buried. That, coupled with the known destruction to the environment due to the digging activities, has warranted the development of a new human waste disposal system.

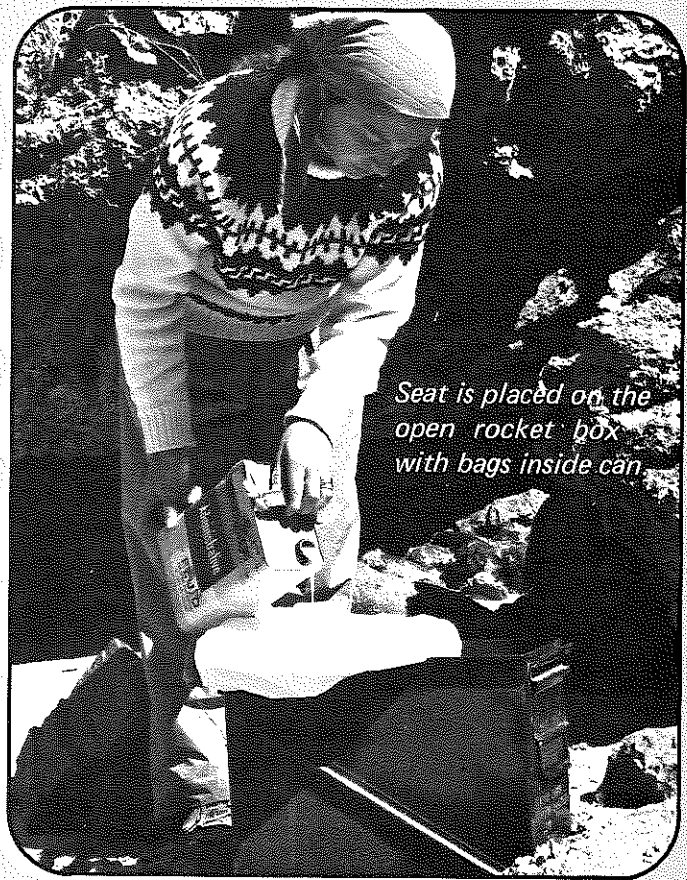
Since the fall of 1976 the river research team of the Museum of Northern Arizona has been conducting investigations into the

problem of alternative methods of human waste disposal. We have since developed a system whereby *all* the fecal products can be simply containerized, chemically rendered sterile and, like the organic and inorganic garbage, carried on the river craft to the debarkation point where all the waste products generated on even the longest of river trips can be properly disposed of in landfills. The actual cost of the technique and the amount of handling of the products is less than that currently experienced through the presently used porta-potty system. Yes, it is time for change—we *can* carry it all out, safely and economically.

HAUL-OUT SYSTEM

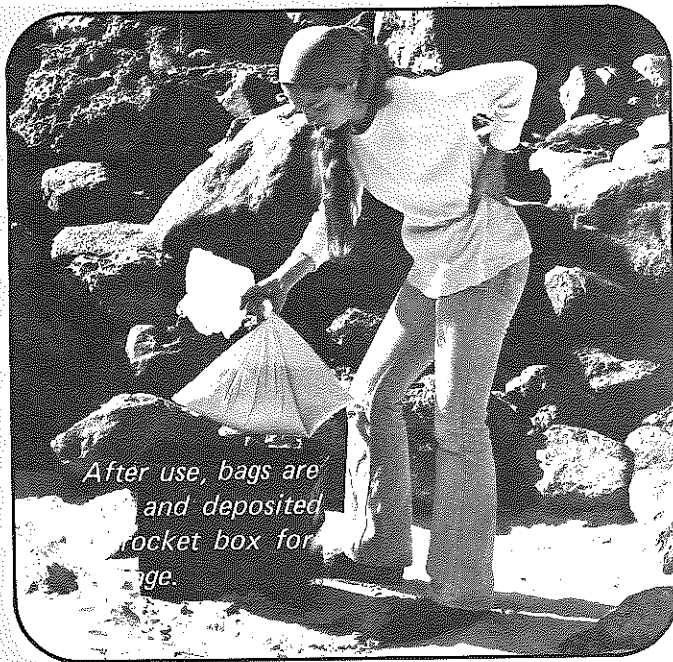
The necessary components are as follows:

- Ammo cans, commonly called 20 mm rocket boxes, measuring 18 3/4" x 8 1/8" x 14 1/2".
- Two plastic toilet seats with removable inside ring.
- Large (5 ml) heavy-duty plastic garbage bags.
- 2' x 2'6" "tall kitchen" (1.75 to 3 ml) plastic garbage bags.
- Formaldehyde solution (37.5 percent HCHO).
- Rubber gloves.
- Toilet paper, hand washing bucket, hand soap.



Seat is placed on the open rocket box with bags inside can.

The system is set up as follows: One of the rocket boxes serves as the actual toilet container. The rocket box is first lined with one of the heavy duty large garbage bags. Next, two of the 2' x 2'6" "tall kitchen" bags are attached to the ring on the toilet seat. One bag would probably suffice for a small party, but if you shop wisely, these bags will only cost about 3-10 cents each and the added strength gained is well worth the additional expenditure. The toilet seat and attached bags are then placed into the ammo can and the formaldehyde solution added. The toilet is now ready for use. The hand-washing bucket and the hand soap can be placed close by for post-defecation use. Used toilet paper should be placed into a plastic bag that



After use, bags are
and deposited
rocket box for
age.

can be either affixed to the ammo can or weighted down with a rock and placed close by. Articles particular to feminine hygiene (tampons and sanitary napkins) can be placed directly into the toilet. After each use, the toilet should then be covered with a large heavy-duty garbage bag, thus discouraging flies and other fecalphyllic insects. When camp is to be broken, it takes only a few minutes to dismantle the toilet system and store the feces. Rubber gloves should be donned, the inside ring of the toilet removed and the bags containing the feces removed, the excess air squeezed out and then simply tied off. At this point, place the bags containing the feces into yet another "tall kitchen" bag and before tying this off, place the used toilet paper alongside the bags containing the feces. This is then tied off as before, and the bags with feces and used toilet paper are then placed into the rocket box (which is also lined with a large garbage bag), the lid is sealed and the container ready for storage until the next day's load. The toilet seat, ring, plastic bags, rubber gloves, toilet paper, and formaldehyde are then stored in another ammo can—completely ready for the next camp's use. It is necessary to only remove two cans per night from the boat, one for the storage of the equipment, another for actual use as a toilet and subsequent storage of the fecal products.

Although there will undoubtedly be many innovative improvements on this system, the basic tenet is to safely containerize the feces, prevent it from generating methane gas in the absence of air in the ammo cans, and taking it with you—leaving nothing more on the beach area than was there when you arrived. This system works. Try it, you'll like it.

COMMENTS

Now, several important points must be made if you are to get satisfactory results from this system that has disrespectfully been dubbed "The Carothers Crapper."

The number of ammo cans needed are a function of the number of people and the length of the trip. On a recent 12-day commercial trip (Wilderness World) with 33 participants including crew, six cans were needed for fecal storage and one can for the equipment storage. In general, we have found that it is easy

to containerize about 80 to 90 person-days of feces in one rocket box. Thus, for an eight day, 10-person trip, you would need only one rocket box for feces and one rocket box for equipment.

A 40 per cent solution of formaldehyde in water is known in commerce under the name Formol or Formalin. When used in a 10 per cent solution, it is perfectly adequate for stopping the bacterial breakdown of feces, a by-product of which is the production of methane gas, the substance responsible for most of the offensive odor produced by the decomposing feces. By using approximately one quart of 10 per cent formaldehyde (four parts water to one part commercial formaldehyde) we have "preserved" and disinfected the feces we carry out on our river craft. The formaldehyde solution may be obtained in most drugstores, pharmaceutical or chemical supply houses. One gallon of 40 per cent solution is sufficient for 16 days of use at one quart of 10 per cent solution per day.

Why not either put the used toilet paper directly on the feces or burn it? Placing the used toilet paper on the feces would cause two problems: the feces bag would fill up too rapidly and the paper would absorb all of the added chemical disinfectant. Burning of toilet paper has resulted in at least 10 reported brush fires in the Grand Canyon in the past three years. Also, the ash residue left by the burning of paper is unsightly.

How many plastic bags do we need? For each day's use, one large heavy-duty bag and a minimum of four "tall kitchen" bags are needed—one for the used toilet paper and three for containerizing the feces.

For a 10-day river trip with 10 to 30 persons, the following expenditures must be made for the first-time use. For each trip after that, subtract the cost of the ammo cans, plastic toilet seat and rubber gloves.

4 rocket boxes @ \$8.00 each	\$32.00
2 plastic toilet seat w/ring @ \$5.00 each (two because you may need a spare—being plastic they are subject to breakage after sustained use)	10.00
rubber gloves @ \$1.00 each	1.00
1 gal. 40% formaldehyde solution @ \$3.00/gal.	3.00
plastic bags	
30 "tall kitchen" 2' x 2½' @ 10c each	3.00
10 large heavy duty garbage bags @20c each	2.00
Total cost first trip	\$ 51.00
Total cost each subsequent trip (items 4 & 5)	\$8.00

What do we do with the feces upon return to home base? In Flagstaff, Arizona, we have made arrangements with the city's sanitary landfill. We notify them as to the contents of our bags, they dig a trench and we therein deposit our bags.

The National Park Service Act of 1916 demands that we manage these natural areas for posterity. The research has demonstrated that leaving our feces behind in natural systems that cannot purge themselves of these wastes is causing irreversible damage. We have developed a system that mitigates that damage. For the sake of our children and their descendants, let's manage these areas for posterity. It is time for change—please carry it all out.

(The author gratefully acknowledges the invaluable advice, assistance and cooperation from the following: Marvin Jensen and Steve Martin, Grand Canyon National Park; Robert Jensen, Neita Carothers and Norman Sharber, Museum of Northern Arizona; and Tom Olsen, Wilderness World. The work that led to the development of this system was supported by NPS Contract No. CX821070012 to S.W. Carothers.) •