

(WPE Study 7/87)

CAPITOL REEF NATIONAL PARK
WATERPOCKET ECOLOGY/MACROINVERTEBRATE RESEARCH
PROJECT DESCRIPTION AND SCOPE OF WORK

I. **Background information-** Capitol Reef National Park was established to specifically protect the Waterpocket Fold in Utah (also called Capitol Reef), a north-south trending monocline that extends 70 miles from southern Sevier County to Lake Powell. The fold is mostly composed of variously aged sandstone layers that have eroded over the eons to form spectacular canyons, cliffs, spires, and domes. The fold is specifically named for the numerous waterpockets that have formed in upper portion of the fold mostly in the exposed Navajo Sandstone layer. Water erosion on the reef takes place under a climatic regime that allows for approximately 7 inches of precipitation annually, most coming in the summer in the form of intense thunderstorms.

Waterpockets (or tinajas) are usually formed in small drainages (sometimes depressions) by water flowing off the fold during precipitation events. The waterpockets are variously sized; ranging from a few liters in volume to many thousands of liters. The exposure of an individual waterpocket to the sun along with its size and surface area dictates the water's permanence. Those that are small and directly exposed to the sun dry quickly after being filled by rain (within days) while large waterpockets in protected areas can sustain free water for months. Runoff from isolated summer thundershowers can, if sufficient enough, fill waterpockets in specific drainages. If precipitation is intense, individual waterpockets can "wash out." Surrounding some waterpockets, where washouts have not occurred recently, lush riparian vegetation has developed. In the arid southern Utah environment, these waterpockets can be an important source of water to man and wildlife.

Livestock grazing occurs in much of Capitol Reef National Park (approximately 70 percent). Grazing specifically occurs in the vicinity of many of the more accessible waterpockets that occur on the lower elevations of the fold. Certain waterpockets are specifically used as stock watering facilities.

The National Park Service (NPS) at Capitol Reef conducted a one year study (1985 - 1986) to determine the effects of livestock on waterpocket aquatic ecology. This initial study emphasized the basic chemical and system dynamics of individual waterpockets and the temporal and spacial changes that occur both naturally and in those that are affected by livestock. Biological dynamics in these waterpockets are thought to relate to temporal and spacial species changes in zooplankton, herptofauna, and macroinvertebrate populations.

After completing this initial study, it is felt that further work is needed both to fully comprehend the overall ecology of the systems and to determine what effect livestock may be having on them. Specifically, a long term study is needed to characterize and define the natural and altered chemical and physical dynamics of the systems and to relate these dynamics on the aquatic micro and macroinvertebrate inhabitants.

Funding for the first year this project has been established at \$10,000. It is expected that this study will require several years to complete (2-3 years). Funding for subsequent years will be contingent upon the availability of funds and the successful completion of the preceding years research that must have indicated that further work would be fruitful.

II General Objectives- The overall objectives of this study are the following:

A. Quantify the overall hydrological, chemical, and physical characteristics of representative tinajas and tinaja systems that occur in the southern section of Capitol Reef National Park (Halls Creek region).

B. Determine the temporal and spacial variability that occurs in these parameters.

C. Quantitatively determine the overall ecology and species composition of the aquatic micro and macroinvertebrate populations (zooplankton, phytoplankton, insects, crustaceans, etc.) in the waterpockets of the south section of the Water-pocket Fold.

D. Determine the changes that occur to these populations as a result of disturbance events, normal climatological variability, flooding, desiccation, and inputs by livestock (urine, feces).

E. Determine the temporal (seasonal) and spacial (north-south) changes to these populations.

F. Determine the specific effects of livestock on the chemical and physical characteristics of these systems.

III Scope of work- The proposed waterpocket ecology study at Capitol Reef National Park is expected to develop specific information on the following:

Chemical/physical Parameters

A. Characterize the cation/anion balance within each studied tinaja and quantify changes both temporally and spatially. Determine how these balances are altered by livestock use of the systems and detail how the aquatic biology may be af-

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fects.

B. Measure and quantify the physical characteristics of the tinajas, i.e., total nitrogen, phosphorus, and chlorophyll a, oxygen profiles, pH, turbidity, conductivity etc., and relate them to changes to the aquatic micro and macroinvertebrate populations.

C. Determine how livestock use of the systems alters the physical characteristics of the tinajas, i.e., toxic effects of ammonia for example.

D. Define how normal micro and macroclimatological and seasonal changes affect the physical characteristics of the tinajas.

E. Determine how the spacial variability of the tinajas affects the chemical and physical parameters.

Aquatic Invertebrate Characteristics

A. Quantitatively determine the diversity and abundance of the microinvertebrates (zooplankton, phytoplankton etc.) and macroinvertebrates in the aquatic communities of the waterpockets within Capitol Reef National Park.

B. Determine changes in the above communities with regard to time (seasonally and between precipitation events) and space (north-south latitudinal gradient, elevational gradient in one drainage, chemical changes occurring between precipitation events, and the influence of light and shade). Determine recruitment and dispersal dynamics.

C. Determine the various disturbances that affect these systems, i.e., flooding, desiccation, livestock etc., and describe how individual species and communities adapt.

D. Quantify the influence of the above disturbances on the macroinvertebrate populations, i.e., reduced numbers, changes in species composition, changes in life history of species etc.

E. Specifically determine the effects of livestock on the macroinvertebrate populations in the aquatic community.

F. Quantitatively describe recolonization dynamics following the above influences (rates of recolonization, specifics on species succession within individual waterpockets, and changes in community structure following a particular disturbance event).

G. Quantify and describe the food habits and food webs of the macroinvertebrate inhabiting the waterpockets.

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H. Describe dispersal mechanisms of the species inhabiting the waterpockets

I. Make a representative collection of the various macro-invertebrates inhabiting the waterpockets.

IV Contract obligations for project implementation-,The contractor will meet with representatives of Capitol Reef National Park before work begins for the purpose of orientation, briefing, and other matters. The contractor is required to submit a detailed workplan and schedule prior to the initiation of work.

V. Contract requirements-

A. Reports and materials submitted

1. Work will begin within fourteen (14) days of award of this contract (purchase order).

2. Three copies of the final report detailing the results of the first year of the study will be submitted to the Resource Management Specialist (the Contracting Officer's Representative [COR]) no later than September 30, 1988. All pages of the report will be numbered and bound except one copy which will be unbound. The first year final report must be prepared in a format that indicates technical competence. In addition, the report will be submitted on computer diskette (5 1/4") in Wordperfect format or in a format that can be easily converted to Wordperfect (using the Convert program).

3. Before acceptance of the final report, the principal investigator will present his findings to the park and regional staff in a formal seminar setting. This meeting may take place in the park or the Regional Office in Denver.

4. The final report will be submitted in draft form to the COR at least one month prior to the due date so that corrections and comments can be made and incorporated into the final report.

5. The principal investigator is expected to keep in close contact with the COR with regard to progress on the project. Any delays or other problems must be brought to the attention of the COR in a timely fashion.

6. Progress Reports will contain all information and data gained over the time frame of the reporting period. The reports will be bound and typed and will contain a detailed description of the work and analysis accomplished.

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B. Professional standards- Potential contractors will be considered qualified for this contract when they meet the standards detailed below. A vitae is required for the principal investigator and any major contributors.

1. Principal investigator- The person in charge of this project must have a PhD in aquatic biology, entomology, aquatic ecology or a related field or an equivalent level of professional experience in field research and data analysis. Specific experience with the environs of Capitol Reef National Park and specifically the Waterpocket Fold is desirable.

2. Project assistants- Individuals contributing professional information on the project must have a BS or BA degree in a natural or biological science.

3. Institutional or corporate qualifications- Any institution, organization or firm awarded this contract must have an established system of accounting that is capable of maintaining records of all financial matters relating to this contract and evidence that the organization completes contracts in a timely manner.

VI Contract payments- Partial payments may be made on this contract of up to 70 percent of the maximum contract award. Each request for payment must include a progress report (as described above). A specific invoice for the partial payment is needed. The remaining 30 percent of the contract award will only be made on submission and acceptance of the final report.

VII Proposal submission-

A. Offerors must submit two copies of their research proposal. Each offer should be submitted on the most favorable terms possible from a price and technical standpoint. The budget for the proposal must be submitted separately in a sealed envelope that is enclosed with the proposal submission.

B. Proposals must be signed by an official representative of the organization who is legally empowered to obligate the organization to such an obligation.

C. Offerors must submit a separate proposal for each year of the intended study. Each proposal will be submitted and approved prior to the initiation of work for that year. It is expected that the entire study will require at least three years to complete. Funding for the first phase (year) has been established. Subsequent years will be dependent on the availability of funds and satisfactory completion of the first years work.

D. A budget is required with the proposal. It will include amounts of time, money, supplies, and materials that will be allocated to the various aspects of the study. A separate budget will accompany each years proposal.

E. Proposals will contain specific information including the following:

- a. Description of project and literature review
- b. Hypotheses to be tested
- c. Methodology to test the above hypotheses
- d. Analysis techniques to be used
- e. Proposed time schedule for fieldwork

F. Review and selection of the most appropriate proposal from those submitted will be made so as to negotiate and award the contract (purchase order) on or before September 15, 1987. Only those proposals delivered to the Purchasing Agent at Capitol Reef National Park on or before August 25, 1987 will be considered.

Mail all proposals to: Purchasing Agent
National Park Service
Capitol Reef National Park
Torrey, Utah 84775

G. Any questions regarding the technical aspects of this request should be directed to the Contracting Officers Representative, Norm Henderson at the above address or by telephone at 801-425-3791.

VIII NPS assistance on project- Aside from the monetary award of this contract, Capitol Reef National Park will provide for certain other amenities.

A. Temporary housing- The park will provide temporary housing for researchers working on the project. This housing will be either a shared apartment in the headquarters area of the park or in a trailer in the South District. The apartment may, at times, be shared with other investigators conducting research in the park.

B. Radio communications- The park will provide radio communications to researchers in the field. This will be the temporary loan of a hand-held radio while they are conducting their fieldwork.

C. Field Assistance- Field assistance may be provided from park staff on an as-available basis to collect field samples. It is expected that up to 10 hours each week may be devoted. Field equipment, i.e., measuring tapes, compasses, etc., may also be available.

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IX ~~Evaluation, negotiation, and award of contract-~~

A. Evaluation- Responses to this request will be evaluated by the Resource Management Specialist; the final decision will be made by the Purchasing Agent. Neutral outside professionals may be utilized as review consultants.

Proposals will be evaluated according to the following criteria and weights:

1. Knowledge and understanding of pertinent studies and literature (20 points).
2. Theoretical soundness of the proposed work to successfully address the stated objectives. This section can only be evaluated adequately when the hypotheses are stated clearly and a complete study design to test them (along with appropriate methodology) is presented (45 points).
3. Study team composition (10 points).
4. Previous work by the Principal Investigator related to the study subject (25 points).
5. Total cost of the proposal (10 points).

B. Negotiations and award- Negotiations will be conducted with all offerors in the competitive range, to the extent time will permit. The competitive range shall be established by the Purchasing Agent after the technical and price evaluation has been made on all submissions. If proposals within the competitive range are all determined to be technically acceptable, award of the contract may or may not be made to the offeror with the lowest price. The relative weights of the technical criteria have greater consideration. The right is always reserved to award a contract on other than the lowest price basis if a higher priced proposal is rated significantly higher in quality.

This request does not commit the government to award a contract nor to pay any costs incurred in the submission of a proposal. The government reserves the right to reject any or all proposals or to make award without further discussion.