Richard

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IA. COOPERATIVE AGREEMENT: CA 8024-8-0002

NAME: QUARTERLY MANAGEMENT AND TECHNICAL REPORT

PRINCIPAL INVESTIGATORS: DEAN W. BLINN and LAWRENCE E. STEVENS

GOVERNMENT TECHNICAL REPRESENTIVE: PETER ROWLANDS

SHORT TITLE OF WORK: THE ECOLOGY OF THE AQUATIC FOOD BASE IN THE COLORADO RIVER.

EFFECTIVE DATE OF COOPERATIVE AGREEMENT: 13 AUGUST 1992

COOPERATIVE AGREEMENT EXPIRATION DATE: 1 OCTOBER 1994

DATE OF THIS REPORT: 31 March 1994

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II. INTRODUCTION:

Growing concern over the impacts of river regulation on environmental resources in the Colorado River corridor below Glen Canyon Dam prompted the Department of the Interior to develop the Bureau of Reclamation's Glen Canyon Environmental Impact Statement. Following completion of GCES Phase I, the National Academy of Science recommended that further studies integrate interactive phenomena and processes at the ecosystem level in this system (GCES Phase II). The algae and macroinvertebrates provide an important food base for fish and terrestrial fauna and link the aquatic and terrestrial components of the ecosystem. This study of the aquatic food base in the Colorado River was designed to further monitor the effects of discharge on aquatic primary producers and primary consumers in the Colorado River corridor downstream from Glen Canyon Dam through the study objectives.

II A. MAJOR ACCOMPLISHMENTS DURING THIS QUARTER:

Seasonal river monitoring trips were conducted during January and March. The January trip was conducted under maximum flows allowed by interim flow regulations (12,000-20,000 cfs). This flow regime provided an opportunity to examine drift rates at high flows which normally have not occurred during our collecting periods. There was a 50% increase in drifting material during these high flows compared to months with lower flows. We also experienced clear water throughout the river corridor and a corresponding increase in algal and macroinvertebrate biomass in comparison to previous winter collections.

Petersen sites (low velocity/fine sediments) are becoming increasingly difficult to sample with the 30 lb dredge. Collectors are not getting the penetration needed to gather large quantities of sediment due to compaction of sediment in the eddies. Interim flows appear to be filling in the eddies with fine sand. This phenomenon is most evident in the large eddies at South Canyon (31.5R) and Nankoweap Canyon (53.0R) where the upstream end of the eddies have large islands that are above water at about 10,000 cfs. Sediment samples are currently being examined for clast composition.

Tanner Cobble (68.5L) had unusually high productivity, in fact higher than Lees Ferry cobble collections. This may be a result of nutrients leaching into the river from Tanner Wash after the August 1993 spate. The river may be leaching nutrients from the large cobble bar that was pushed into the river at the head of Tanner Rapid (68.2L). This spate has also enlarged the Tanner rapid-pool and created an improved habitat at the Tanner dredge site.

We measured the biotic composition of drift from tributaries on the January trip. Tributaries were at winter low flows and therefore contributed <5% of the total mainstem drift. Nankoweap Creek still had a travertine cemented bottom from the

1993 winter storms. Limited spawning material for trout was available this year. It may take several minor spates to replenish spawning gravels to 1992 levels.

The March collection trip was conducted under low flows (5,000-12,000 cfs) with slightly turbid waters in Marble Canyon and very turbid waters in Grand Canyon below the Little Colorado River. We experienced even more difficulty collecting in pools during March and will have to add "wing" weights to the Petersen Dredge for the June trip in order to improve sampling efficiency. Gauging station sites are historically low in primary and secondary producer biomass and detritus in comparison to well developed eddie/pools. In order to quantify the relation between current and biomass on the soft substrates, we now measure water velocity while lowering the dredge. Productive sites have less than 1/2 the current velocity (<0.1 m/s) of unproductive sites and transects within a site (>0.1 m/s).

We observed typical amounts of algal and macroinvertebrate biomass on cobble bars for this time of year (March) with the exception of Tanner Cobble which again was higher than Lees Ferry. Cobbles and Cladophora at Lees Ferry were colonized by a thick mat of diatoms that appeared to be reducing Cladophora viability. Several filamentous green algal species (Zygnematales spp., Ulothrix spp) were also more abundant. These two observations may be related to elevated nutrients due to turnover in Lake Powell. Main stem drift was dominated by midge larvae, pupae and adults associated with Cladophora. The low flows do not seem to scour detritus from the bottom, while the turbid water cause a release of Cladophora filaments due to lack of photosynthesis and/or abrasion. Tributary drift was very similar to the January collection.

Recolonization/relocation experiments at Lees Ferry and Cathedral Wash (3.1C) were examined in January. Preliminary data showed near complete colonization for submerged cobbles at both sites after 9 months. Relocation cobbles showed a slower colonization rate for algae but not for macroinvertebrates. We have one more collection period for relocation cobbles and two for recolonization. A collection trip is planned for late April and we anticipate complete recovery of the submerged cobbles and hope to see definite impacts of turbid flow at the Cathedral Wash site if the Paria River continues to input suspended sediment.

Primary production estimates were collected in-situ at Lees Ferry, Cathedral Island and Gorilla Island (220.0C). Preliminary data showed a 15% decrease in productivity between Lees Ferry and Cathedral Wash this winter. We had expected a greater difference in carbon synthesis between these two sites, but the abnormally dry fall and winter has reduced the turbidity below the confluence of the Paria River. Primary production estimates at Gorilla Island were 65% lower than Lees Ferry. We plan a series of collections for this summer for comparison with winter collections.

Michael Shaver will be presenting a paper at the Arizona-Nevada Academy of Sciences on 16 April in Mesa, Arizona, and a poster at the annual meeting of the North American Benthological Society in Orlando, Florida. Both presentations are entitled:

Reciprocal transplants in clear and turbid water habitats in the regulated Colorado River, Grand Canyon, Arizona.

II B. PROBLEMS ENCOUNTERED:

No problems were encountered during this quarter.

II C. FISCAL STATUS:

1. Cooperative Agreement Amount: $84,864 (FY92) + $171,736 (FY93) +$143,232 (FY94) TOTAL: $399,832
2. Expenditures and Commitments to Date: $273,279
3. Estimated Funds Required to Complete Work: $126,553

II D. ACTION REQUIRED BY NPS:

No action is requested from the NPS other than continued administrative support of this report.

II E. FUTURE PLANS:

Future plans include a June river trip where we will access tributary biomass and composition along with the other monitoring parameters. Loren Haury of Scripps Oceanographic Institute will be our guest researcher and will be examining microplankton in the main stem and tributaries as he did in Phase 1 of the GCES program. Recolonization/relocation collections and primary production estimates will also be completed this spring/summer. We will also analyze data for the final report.

II F. Equipment Purchases

None

II G. ITEMIZATION OF QUARTERLY EXPENDITURES:

Salaries:	$11,751
Supplies:	1,630
Travel:	829
Equipment:	0
NAU Overhead:	7,156