PNME-773

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THE HEBREW UNIVERSITY OF JERUSALEM

Institute of Earth Sciences
Department of Physical Geography

February 18, 1988

US-Israel AID/CDR Program C7-151

FLOODS IN EPHEMERAL STREAMS: EVALUATIONS BASED ON GEOMORPHOLOGY

PROGRESS REPORT, JUNE - NOVEMBER 1987

The Hebrew University research team, consisting of Schick, Grodek, Hahn and Hassan, visited Botswana for varying periods during August-October 1987. The team collaborated with Shaw and a total of 15 man-weeks were invested in the field installation.

Most of the work was devoted to the main experimental site of the project -- the Metsemothlaba River between Thamaga and Moshupa. A reach 800 meters long was surveyed and ENMOS tipping bucket rain recorders and pressure transducer activated water-level recorders, coupled to 32K EPROM memory nodules, were installed at each end. Two automatic multiple-stage suspended sediments samplers were also installed, one at each end of the reach. One of these samplers was specially designed for this project in the Fine Mechanics Workshop of the Hebrew University. It was brought to Botswana by the Israeli team and duplicated in the Workshop of the Government of Botswana, Department of Water Affairs.

The survey of the experimental reach consisted of 15 benchmark-based cross sections. Further, six sections of scour chains with a total of 60 individual chains, each inserted to a depth of one meter into the channel bed, were installed. 595 small synthetic magnetized pebbles (mean weight approx 15 grams) and 149 large natural magnetized pebbles (size 32-90 mm) were injected into the bed at the upstream end of the experimental reach. The small pebbles were manufactured in the Laboratory of Geomorphology of the Hebrew University. The large pebbles are Judean limestone with magnets inserted into them by drilling. (Local natural pebbles are mostly quartzite and undrillable due to their hardness). All pebbles were brought by the field team as accompanying baggage. The same is true of the ENMOS instrumentation.

Stratigraphic sections: Five longitudinal and five transversal trenches were dug in the channel bed. Their alluvial stratigraphy was documented in detail, and the material was sampled for subsequent laboratory study. In addition, a set of representative samples was collected from the surface of the channel bed, for a subsequent detailed grain size analysis.

In the secondary experimental reaches on Taupye and Bonwapitse rivers -- each situated near a Water Affairs Department gauging station -- the following tasks were accomplished:

(i) A schematic map was prepared for each site;
(ii) Five sections, benchmark based, were surveyed across the river channel at each site;
(iii) Small synthetic and large natural magnetized pebbles wer emplaced: 300 and 71, respectively in the Taupye River; and 200 and 73, respectively in the Bonwapitse River.
(iv) Sediment samples were collected from the channel bed in both rivers.

In view of the considerable upgrading of activities on the main experimental reach on the Metsemothlaba River, in part spurred by the public interest associated with the selection process for a second dam for the water supply to the city of Gaborone, it was decided to forego the original plan to establish a third secondary site on one of the rivers of northern Botswana.

In the counterpart field sites in Israel, the Nahal Shiqma site was located about 4 km downstream of the Government of Israel Hydrological Service gauging station of Bror Hayil. In November, the experimental reach was surveyed, five benchmark based cross sections were measured, 12 chains in four stratigraphic sections were installed, and 450 small synthetic and 150 large natural magnetized pebbles were injected into the sandy stream bed. A more detailed report on this activity will be included in the next progress report.

The Nahal Shiqma site, due to its similarity in many respects to the Metsemotlhaba site in Botswana, has been designed as the main Israeli counterpart of the project. The Nahal Yael and Nahal Hebron sites will serve as secondary site. Because of massive sewage effluents at the Nahal Og site, it is now doubtful whether this site could still be used for this project.

Acknowledgements: We thank Prof. John Cooke, Head of the Department of Environmental Science, University of Botswana, and his staff, for various help and support; Water Affairs Department personnel -- especially Messrs. Khupe, Childe and Mollentze -- for assistance and interest; and US-AID staff in Gaborone (Messrs. Hummon and Elliot) and Tel Aviv (Mr. Rock).

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Attachment: Progress Report by Dr. Paul Shaw
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Department of Environmental Science
4th December 1987

US-Israel CDR Programme C7-151
Floods in ephemeral streams: Evaluations based on geomorphology

Progress report 2: June-November 1987

The following progress has been made on the implementation of the above project in Botswana:

1. Professor Schick and a team of post-graduate students and technicians visited Botswana for varying lengths of time between the 8th August and 8th October to set up the experimental sites and install equipment as follows:

   a. At the main experimental site on the Metsemotlhaba River surveys and studies of the experimental reach were carried out, followed by the implacement of magnetic tracers as per programme.
   b. Automatic water level recorders were installed at up and down stream gauging sites, together with 2 automatic multiple-stage suspended sediment samplers. One of these sediment samplers was built in the workshop at the Department of Water Affairs under the supervision of Mr Grodek.
   c. On the secondary sites at Taupye and Bonwapitse surveys and studies of the experimental reaches were carried out, followed by tracer implacement.
   d. With the arrival of two data recorders in November, automatic rain gauges have been installed at Metsemotlhaba, thereby completing the installation phase of the project. The equipment has been calibrated, tested, and is operational.

2. The rains arrived late in Botswana this year, but hydrological events so far have been promising. Major floods occured in the Mahalapye region at the end of November, including a flood in the Bonwapitse River that caused major disruption to communications. The Metsemotlhaba has experienced two minor flow events, in early and late November, which have initiated movement in the magnetic tracers. These developments are being monitored at the present time.

3. Negotiations are continuing with the Department of Water Affairs to identify and release a suitable candidate for post-graduate training on the project. It is hoped to register a DWA employee for a Masters degree in August 1988.

4. A high level of cooperation has been achieved with the Department of Water Affairs in setting up and running the project, and we are grateful for their assistance.

Dr Paul Shaw