

LIBRARY
WALNUT CANYON NAT'L MON.
FLAGSTAFF, ARIZONA

FLAGSTAFF AREA NATIONAL MONUMENTS
6400 N HWY 89
FLAGSTAFF, AZ 86004

POOL SURVEY
WALNUT CANYON
11 June 1973

Submitted By
James L. Ellis
September 3, 1973

REF
WACA
551.48
ELL

Introduction

Since an earthen stock dam was constructed across the upper end of Walnut Canyon in 1904, the natural flow of water through Walnut Canyon has been blocked off. As a result water has flowed through Walnut Canyon only five times in the last 58 years. The two recent flows were in 1949 and 1973. Very little data on rate of flow, depth of water, or duration of flow was recorded prior to 1973. The notation for 1949 reads, "sizeable stream of water."

Deep deposits of sediment have built up, and thick vegetation has grown along the canyon bottom. The natural flushing action of the spring runoff and summer thunderstorms have not occurred regularly for the past 58 years. The heavy deposits of sediment soak up whatever water falls in the canyon during the wet seasons.

For water to stand or flow in Walnut Canyon the input must be sufficient to fill whatever underground reservoir exists. The amount of water necessary to create standing water is unknown. One time when there is sufficient water in the canyon is during the spring when runoff occurs. A long wet winter in 1972-73 with 128 inches of snow recorded at Walnut Canyon brought the runoff to above normal conditions. Rarely is the runoff through the side canyons enough to cause water to stand in Walnut Canyon. However, with almost 5 inches of moisture in March 1973 standing water was visible in the canyon prior to the overflow of the Lake Mary Dam. On 11 April 1973 water was seen below the Visitors' Center. Twenty-four hours later it had traveled around the island; a distance of approximately a quarter mile. Water entering Walnut Canyon from Lake Mary must overflow two dams; one at the upper lake and the other at the lower lake. Upper Lake Mary overflowed on 12 April 1973. The overflow filled the

lower lake, and on 17 April the lower lake began to discharge water directly into Walnut Canyon. Flagstaff city engineers estimated between 337,500 and 382,500 gal./min. were emptied into Walnut Canyon. The volume of flow measured by Vieira on 14 May 1973 below the island was 40 cfs or 16,000 gal./min. One week later the volume had dropped to 6.4 cfs or 2,630 gal./min. All of the visible flow of water had stopped by 26 May 1973. Standing pools of water were sampled by Ellis on 11 June 1973, and all of the standing water was gone by the 28th of June.

A Physical and Biological Description of the Study Area

The classification of Walnut Creek, Walnut Canyon based upon biotic provinces, and source and permanence of water is Desert Foothill (upper Sonoran Life Zone; Pinon Pine-Juniper) short flow intermittent stream. This classification is somewhat modified, because the water does not flow every year.

A 2.25 mile section of canyon bottom was traversed. Nine pools were sampled for aquatic Flora and Fauna (Fig. 1). Water temperature was 56° F. with air temperature ranging from 55° F. in the early morning to 82° F. by afternoon. Pools ranged in size from 10' x 6' x 2.5" to 150" x 12' x 6'. Below the last overlook and Southeast of the Visitors' Center is a long series of pools extending about 1,000 feet along the base of the Toroweep formation. Very little water was found from this point on. The canyon opens up in this section, and the stream bed is a series of large gravel and sand bars. The larger pools (I, III, V, VII, and VIII) were located where the Toroweep was washed out, thereby creating natural dams. Small pools (II and IV) and small catch basins were scattered at random throughout the canyon. The maximum water depth, which was estimated from high water marks, was approximately 10 feet in the

narrow part of the canyon to 5 feet in the more open sections. No flowing water was observed. Seepage varied along much of the Toroweep from just a damp spot to 15 drops/min., which added little water to the canyon.

Biota-Invertebrates

Only qualitative sampling was conducted during the survey. All samples were collected with a lath screen and preserved in alcohol. The classification was taken to family using the standard keys. Six orders and nine families of insects were collected in the pools surveyed. The following is a list of the invertebrates that were collected:

- Arthropoda
 - Crustacea
 - Cladocera
 - Daphnidae
 - Insecta
 - Ephemeroptera
 - Baetidae
 - Odonata
 - Zygoptera
 - Hemiptera
 - Corixidae
 - Gerridae
 - Lepidoptera
 - - - - -
 - Coleoptera
 - Dytiscidae
 - Psephenidae
 - Diptera
 - Culicidae
 - Syprhidae

Observation of the Ecology

Aquatic stages of many invertebrates are found most often in shallow ponds and streams. Pools in intermittent stream systems tend to concentrate organisms wherever water is permanent.

The most numerous organism collected was Daphnia, the water flea.

Daphnia was found in extremely large numbers in every pool sampled. Lake Mary is noted for its high population of Daphnia, and it is presumed that those found in Walnut Canyon washed in from Lake Mary.

Almost as abundant in numbers as the water flea were the Culicidae, the mosquitoes. The larvae were also found in all pools in large numbers. Mosquitoes are common this time of year wherever standing water is found.

Pools VI and VII had very large concentrations of Synphidae, the flower flies. Reasons for the restriction to these two pools is unknown. The flower flies are major pollinators of flowers second only to the bees. Adult stages were observed in large numbers around the Visitors' Center.

The Dytiscidae larvae, predaceous water beetles, showed a definite habitat preference and were found only in the pools with gravel bottoms. These larvae are very predaceous, feeding on just about anything smaller than themselves.

The following insects were represented by single specimens: Odonata-damselflies; Ephemeroptera-mayflies; Hemiptera-Corixidae-water boatman; Lepidoptera- ; Coleoptera-Psephenidae-water penny.

Only one surface insect was observed. A mature water strider, Gerris was seen at pool IV, but was not collected.

Vertebrate

A few immature stages of toads were collected along the base of the island. No adults were observed. Rainbow trout and green sunfish were trapped in small pools or found in dried sections of the stream bed.

No aquatic vegetation was observed, however, several terrestrial plants were inundated by the water. e.g. yucca and juniper. Horsetail

Equisetum has been collected in one location of the canyon. This location was inaccessible due to pool IV. Very little vegetation was removed by the flowing water. Only one large aspen tree was toppled, because of the undercutting of a bank.

The seep along the Toroweep has produced a lush growth of fern. The growth in the bottom of the canyon is the most dense, that has been observed in four years.

It is presumed that all organisms which were collected were either washed in from Lake Mary (fish), or eggs that were deposited after the water entered the canyon (mosquitoes).