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Surface Water Observations in Mortandad Canyon

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FEB 23 2005
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February 2005

LA-UR-05-1173

Observations of surface water occurrence have been made in Mortandad Canyon and major tributaries to aid in the design of a biota sampling plan and a surface water sampling strategy as part of canyons investigations in the Environmental Stewardship Remediation Services (ENV-RS) project. Observations have been focused in reaches that have been the site of sediment investigations, and were largely made between June 2003 and January 2005. Additional observations of "no water" are included from work in 2001 to provide further documentation of dry reaches. These observations include both relatively clear flowing water and pools that persist for some period of time after runoff events. Transient stormwater runoff, consisting of turbid water that occurs for brief periods after rain storms, is excluded because the duration of such flows is considered too short to contribute to chronic human health or ecologic risk. However, stormwater is included if it persisted in pools long enough for most of the sediment to settle out. Observations were recorded by Paul Drakos (Glorieta Geoscience, Inc.), Jared Lyman (EES-9), and myself.

Observations are summarized in Table 1, indicating whether water was observed or not observed in a reach during a given month, or if instead a reach was not visited. Table 1 also indicates the percent of months with observations in each reach when water was observed. These percentages are partly dependant on the timing of site visits, including the particular climatic conditions prior to site visits, which vary from year to year and also within individual months. The actual percentages are therefore best used to indicate relative frequency of water between the different reaches, including which reaches are wettest and which are driest, and not precise frequencies of occurrence.

Surface water in the Mortandad Canyon watershed originates either as effluent releases or as stormwater or snowmelt runoff. The distribution of surface water at any time is affected by the proximity to outfalls and by recent climatic conditions, by the occurrence and size of bedrock depressions or scour holes, and by the thickness of alluvium. Where present, surface water can be discontinuous within a reach, alternately stopping where the flow entirely infiltrates into alluvium and emerging downstream where the alluvium thins; transitions from alluvial channels to bedrock channels are common locations of surface water supplied by the discharge of shallow alluvial groundwater.

Four reaches have had surface water during each site visit (E-1W, E-1E, M-1W, and M-2W), and these reaches all receive effluent discharges from National Pollutant Discharge Elimination System (NPDES) outfalls. Reach E-1W is downstream from NPDES outfall EPA03A-181 at TA-55, and includes the most extensive area of cattail wetlands in the watershed. During the driest periods, water was only observed in E-1W at the downstream end where the alluvium thins. Reach E-1E is downstream from E-1W and from NPDES outfall EPA03A-051 from the

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TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF), and receives water from both sources. Except during periods of effluent discharge from the RLWTF outfall, surface water is generally discontinuous in E-1E. Reach M-1W is downstream from NPDES outfall EPA03A-021 in TA-3, and also receives runoff from extensive paved areas at the head of the watershed. Water was always observed in bedrock pools in the east part of M-1W, and was usually observed in a bedrock area closer to the outfall and in the middle of the reach downstream from a headcut into alluvium; a cattail wetland is present here, although it appeared more vigorous during field work in 1998. Reach M-2W is downstream from E-1E and receives discharges from the TA-50 RLWTF outfall. Surface water is generally discontinuous in M-2W associated with infiltration into and emergence from the stream bed, as well as persistence in some pools.

Seven reaches (and associated subreaches) have had no observations of surface water during site visits: M-3, M-4, M-5, M-6, MCW-1, MCW-2, and TS-3. Surface water in these reaches is associated with short-lived stormwater or snowmelt runoff events, and is apparently entirely ephemeral (with the possible exception of water that ponds for various lengths of times in the sediment traps in M-4).

The remaining reaches had water present during at least two site visits, and were dry during at least one visit. In these reaches, the most persistent water has been observed in reach "TS-1W+", in a deep bedrock pool near the head of Ten Site Canyon immediately west of the main TS-1W investigation reach; this pool is supplied by stormwater and snowmelt runoff, and can persist for months after an event. Relatively deep and persistent bedrock pools are also present downstream in reach TS-2E and downstream from reach M-1E. Water was also observed more than half the time in several other reaches, including M-2E with discontinuous flow and pools similar to occurrences in M-2W, and E-1FW and M-1E which possess cattail wetlands (note that the E-1FW wetlands are located east of the sediment investigation area). Relatively persistent water in other reaches was found in depressions between boulders or scour holes (TS-1W and TS-1C), in shallow bedrock depressions (TS-1E), and in areas with fluctuating water tables in alluvium (M-1C).

Table 1. Summary of Monthly Surface Water Observations in Mortandad Canyon Watershed*

Reach	2001	Month/Year 6/03	7/03	8/03	9/03	11/03	3/04	4/04	5/04	6/04	7/04	8/04	9/04	10/04	11/04	1/05	Percent of Observations With Surface Water	Notes
E-1FW		1	-	-	1	-	-	1	0	0	-	0	1	1	-	1	67%	supplied by stormwater runoff; common high water table in willows and cattails
E-1W		1	-	-	1	-	1	1	1	1	-	1	1	1	-	1	100%	supplied by TA-55 outfall; extensive cattail wetlands
E-1E		1	1	-	1	-	1	-	1	1	-	1	1	1	-	1	100%	supplied by TA-55 and TA-50 outfalls; typically discontinuous flow
M-1W		1	1	-	1	1	-	1	1	1	1	1	1	1	-	1	100%	supplied by TA-3 outfall and road runoff; partly bedrock pools and emergence from alluvium
M-1C		-	-	-	1	0	-	1	0	0	0	1	0	1	-	1	50%	intermittent water associated with fluctuating water table in alluvium
M-1E		1	-	-	1	0	-	1	1	0	0	1	1	1	-	1	73%	cattail wetlands with common water, associated with fluctuating water table in alluvium
M-2W		-	1	-	-	-	-	-	1	1	-	1	1	1	-	1	100%	typically discontinuous flowing water and pools downstream from outfalls
M-2E		-	0	-	-	-	-	-	1	0	-	1	1	1	1	1	75%	discontinous flowing water and pools, when present
M-3		-	0	-	-	-	-	-	0	0	-	0	0	-	-	-	0%	no water ever observed; rare stormwater runoff
M-4	0	-	0	-	-	-	-	0	0	0	-	0	0	-	-	-	0%	no water ever observed; rare stormwater runoff
M-5	0	-	0	-	-	-	0	0	0	0	-	0	-	-	-	-	0%	no water ever observed; rare stormwater runoff
M-6	0	-	-	-	-	-	-	-	-	0	-	-		-	-	-	0%	no water ever observed; rare stormwater runoff
MCW-1	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	no water ever observed; rare stormwater runoff
MCW-2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	no water ever observed; rare stormwater runoff
"TS-1W+"		-	-	-	1	-	-	1	1	0	-	1	1	1	1	1	89%	persistent deep bedrock pool
TS-1W		-	0	-	1	-	-	1	0	0	0	1	0.5	1	1	1	59%	intermittent pools in boulders (near "hummock" cleanup site and elsewhere)
TS-1C		-	0	-	-	-	-	-	-	0	0	1	1	1	1	1	63%	water most common in scour hole at west end of reach
TS-1E		-	0	-		-	-	-	-	0	0	1	1	1	-	1	57%	water most common in shallow pools in bedrock floored part of reach
TS-2W		-	0	-	-	-	-	-	0	0	0	1	0	0.5	-	1	31%	water seen beginning at headcut, emerging from alluvium
TS-2C		-	0	-	-	-	-	-	0	0	0	0	0	0.5	-	1	19%	water present after long-duration storms that saturate alluvium in TS-2W
TS-2E		-	1	1	-	-	-	-	0	0	-	1	1	1	-	1	75%	multiple bedrock pools, one relatively persistent
TS-3	0	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	0%	no water ever observed; rare stormwater runoff

* Observations recorded by S. Reneau, P. Drakos, and J. Lyman. In each cell, "1" indicates surface water was observed in that month in that reach, "0" indicates the reach was visited and no water was observed, "0.5" indicates water was observed during one visit and not during an additional visit that month, and "-" indicates the reach was not visited in that month.