



A & N Technical Services, Inc.

Memorandum

To: Dick Diamond, IRWD
From: Thomas W. Chesnutt, Ph.D.
Date: February 26, 2004
Re: Residential Runoff Reduction Study Update – 2003 Runoff Data

Finding

The 2003 measures of runoff from the Residential Runoff Reduction Sites 1001, 1004, 1005 support the findings of the earlier data: Site 1001 has a consistently lower mean level of urban runoff *and* a smaller variation in runoff.

Approach

A & N Technical Services performed data manipulation, collation, and validation on 2003 flow data collected in the R3 Study. The raw flow measures were provided in spreadsheet form. First, the spreadsheets of flow data from three study sites were incorporated into database form. This entailed the writing of a program for each site to convert the spreadsheets that also accounted for variations of form. Second, we performed validation checks on the estimated flow rates to check for consistency problems. Where correctable, revisions will be performed to the flow estimates. Last, these raw data exhibit an inconsistent time step, varying from 5-30 minutes. The raw data for each site was converted into their consistent daily basis—mean flow and total daily volume. The consistent time series version of flow data in the three study sites was then combined into a single consistent database with a consistent time series across sites. A consistent time-step, in term, allows valid comparisons across sites.

An attached spreadsheet contains the raw estimated daily runoff data—mean daily flow, total daily volume, and an indicator measure of data quality. As was experienced with the earlier data, there were considerable measurement issues that the IRWD team had to overcome to obtain consistent measures of flow. The project team coded a data quality indicator (“rank”) for each subcomponent of the flow measure—instantaneous velocity and flow height. A combined indicator was also developed. The data quality indicator was set to 2 for measures that were known to be bad (rank=2). The data quality indicator was set to 1 for measures of questionable data quality (rank=1). Thus, the data quality indicator rank would take on the value 222 if all three measures (velocity, height, and estimated flow) were known to be bad and would take on the value 111 if all three

were of questionable data quality. A value of zero was assigned to measures having no known or suspected data quality issues.

The data are summarized in two ways. First, the descriptive statistics of the mean daily flow volume (adjusted by site area) at each of the three sites in this post-installation period are examined. The estimated mean daily runoff flow is expressed in inches per acre. Second, a graph of 2003 runoff data is developed for each site that displays the raw data and a lowess-smoothed line of central tendency. (Lowess smoothers are a robust data analytic technique that can convey a sense of the level of runoff.)

Table 1 provides the descriptive statistics of mean dry day runoff height at the three sites. (Note that the number of observations per site are reduced due to the exclusion of flow measures on wet days and exclusion of flow measures due to data quality concerns.) The 2003 flow data were also graphed for the three sites. These figures follow. Site 1001 that received the ET controller and education intervention consistently displays both lower levels of runoff and lower variability in runoff. Site 1004 displays very large variability in runoff; this level of variability is the norm rather than the exception. The months of May and June in 2003 did experience wetter than normal (May) and cooler than normal (June) weather patterns.

Table 1: Estimated Mean Dry Day Runoff Height
January 2003 – August 2003
(in inches per unit area)
(Height=Runoff Volume/Site Permeable Area)

Site	Obs	Mean	Std. Dev.	Min	Max
Site 1001 (ET controllers +ed.) Runoff Height	136	1.03	0.72	0	3.90
Site 1005 (Education only) Runoff Height	160	1.79	2.75	0	27.29
Site 1004 (“Control”) Runoff Height	136	2.29	2.83	0	14.25

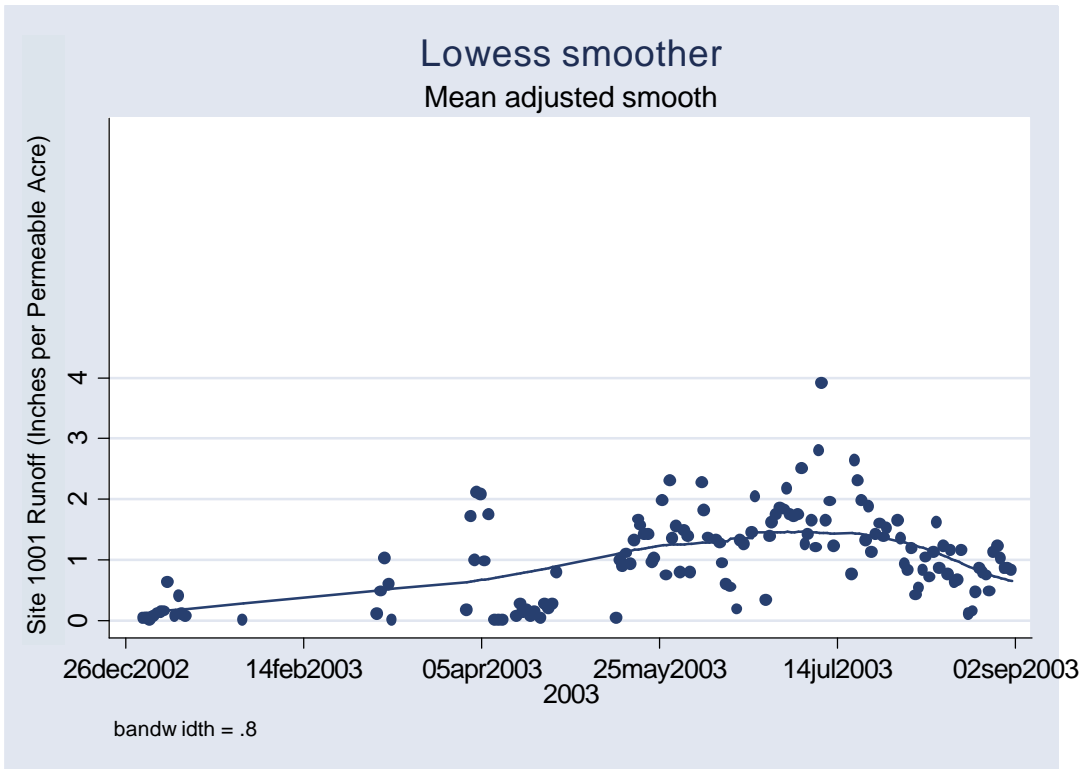


Figure 1: Site 1001 ET Control and Education Intervention

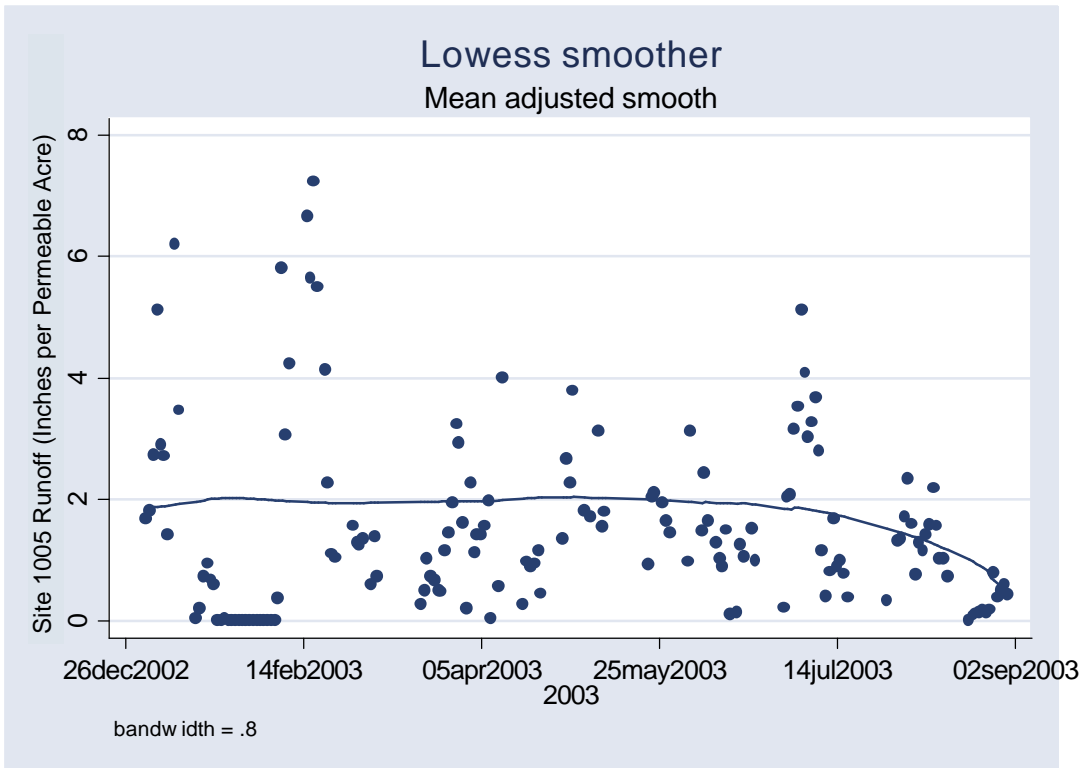


Figure 2: Site 1005 Education Only Site

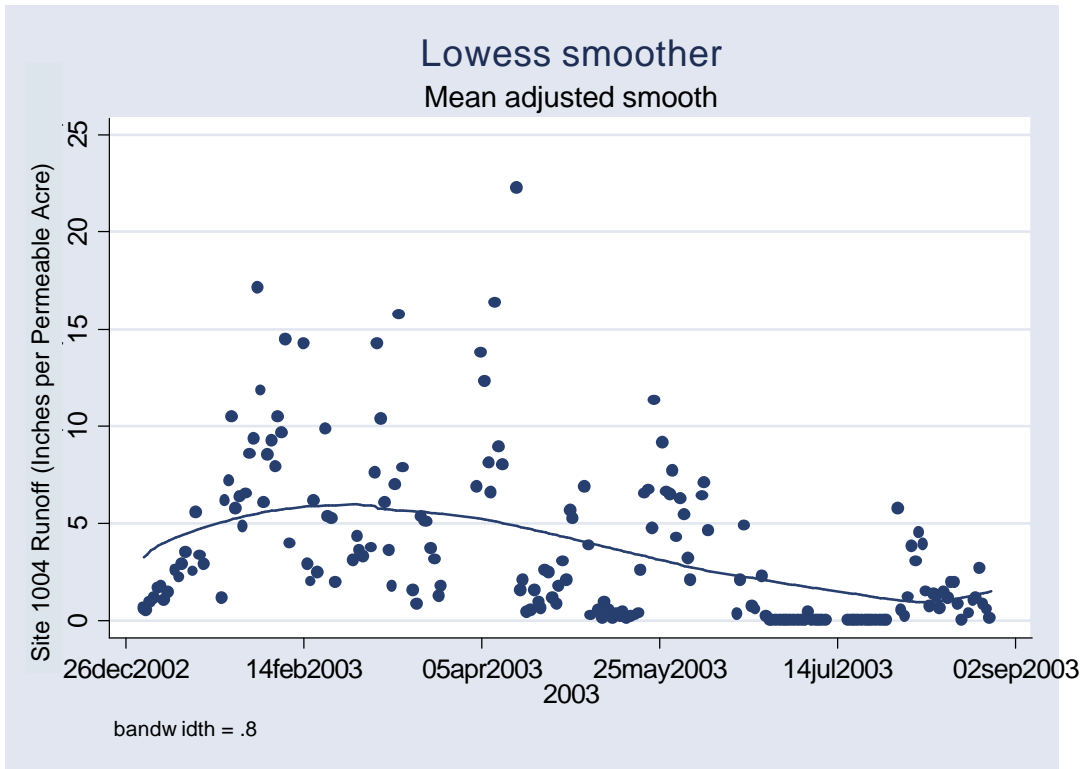


Figure 3: Site 1004 "Control" site