CHAPTER 3
MONITORING DATA

3.1 Data Collection

Introduction

The purpose of the monitoring activities was to determine the amounts and kinds of trash in the Anacostia River and tributaries and to determine the potential sources of the trash on the land. The data gathered would be needed to provide a baseline to use in developing a plan to reduce the levels of trash in the streams. To the extent possible, "hotspots" needed to be identified both in the waterways and on land. Also, the data would be used as a reference in future years to determine the effectiveness of the reduction plan, and the data would be supportive of the proposed Trash TMDL. It was understood that additional data would need to be collected for the TMDL.

Coordination

It was requested that the data collection procedures developed by the Metropolitan Washington Council of Governments (MWCOG) and Alice Ferguson Foundation (AFF) be followed to the extent reasonable. Meetings and conference calls were held to discuss the monitoring procedures. The methodologies developed for this effort were coordinated with the involved parties and were essentially modified techniques from MWCOG trash surveys using modified forms from AFF. The Environmental Protection Agency (EPA) does not have any approved methods for trash monitoring. A Quality Assurance Project Plan was developed and submitted to the District of Columbia Department of Environment (DDOE) prior to any monitoring being conducted.

A midterm review of the monitoring activities was conducted and two additional stations were added to determine the trash levels in MD above the DC line on the Anacostia and on Watts Branch.

Methodology

Transects were established using known locations such as bridges, street corners or other easily identifiable landmarks when possible. When landmarks were not available, such as in some of the streams, a GPS was used to acquire coordinates and tape was used as a marker. A normalizing index was developed that rated the likelihood of a transect collecting trash. A rating index of 1-5 was used, with a rating of 1 being a bare concrete channel or seawall and a rating of 5 being dense vegetation within the stream channel. Debris dams and log jams which acted as sieves to strain and collect trash were recorded to further rate the likelihood of a stream channel retaining trash.

Only visible trash was counted. In cases where there were several hundred items present of the same type such as plastic bags and food wrappers, estimates would be used instead of a detailed count. As can be seen in Figure 3.1.1, certain items are visible and easily counted individually. The plastic bags wrapped around the limb in the foreground would be estimated, the few that are visible in the log jam would be counted individually and the ones buried in the leaves out of sight would not be counted. Such log jams would be counted from the front and the rear to insure all visible trash was recorded.

Figure 3.1.1
Trash collected by a log jam

The photo below (Figure 3.1.2) is probably the most extreme situation of undercounting that occurred. The bottles and cups are nearly two feet deep on the photo bottom and left side, which means that nearly a third of the items are not visible, and by the methodology used, are not counted.

Figure 3.1.2
Most extreme example of undercounting due to methodology used

The survey counted to bank full depth. In Figure 3.1.3 below, demonstrates that such a measure is open to judgment. This photo was taken on the last survey and one will notice that there is a piece of vinyl siding in the upper right hand corner wrapped around a tree. That piece of siding has probably moved 3 miles downstream in nine months.

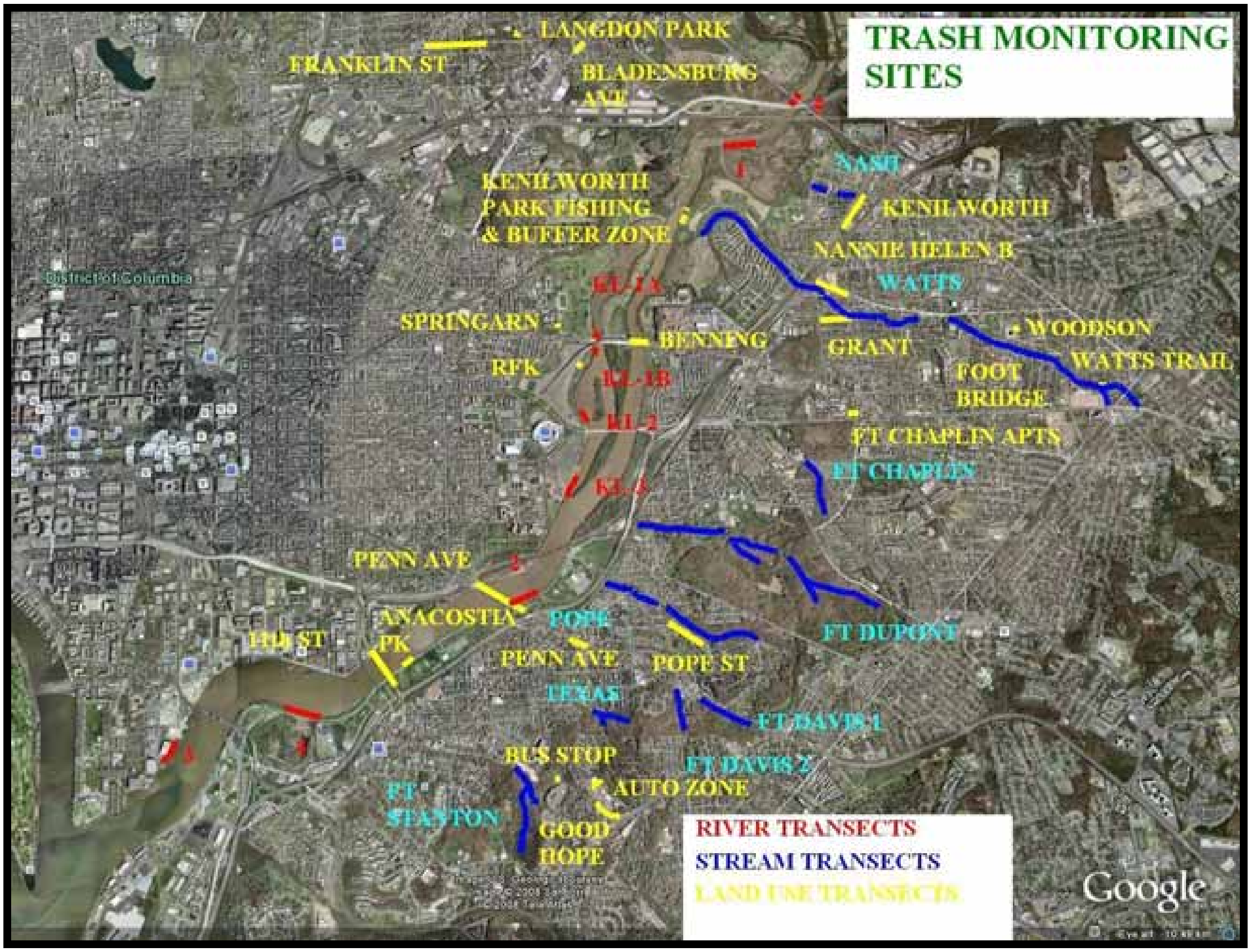
Figure 3.1.3
Bankfull Depth

One issue arose that created a few anomalies in the data. Two of the streams had moderately to severely braided sections. There was no plan for dealing with those conditions, and the first trash count of the Ft. Stanton tributary included every portion of every channel, causing the counts to be very high. Subsequently, the method of counting only in one channel was used. Ft. DuPont below Minnesota Avenue is slightly braided, and the same channel was not counted every time since the majority of the flow was flowing down different channels on different survey days.

Monitoring Sites

The map in Figure 3.1.4 shows the Anacostia River and Kingman Lake transects highlighted in red. The streams surveyed are in blue and the land use sites are in yellow.

Figure 3.1.4
Monitoring Sites



Anacostia and Kingman Lake

Transects were established on the main stem of the Anacostia and surveyed quarterly. The transects consisted of different types of shoreline.

1. Above New York Avenue Bridge – West side - mudflat
2. Below New York Avenue Bridge – East side - seawall
3. Pennsylvania Avenue storm sewer outfall – East side- seawall
4. Poplar Point at the Stickfoot Sewer Outfall - East side- broken seawall
5. Buzzard Point – West side- riprap and sloped gravel shoreline

Transects were established along the shoreline of Kingman Lake adjacent to the major outfalls and at the downstream entrance near the Northeast Boundary Sewer CSO outfall, and they were surveyed quarterly.

1. Above Benning Road - mudflat
2. Below Benning Road - mudflat
3. Along the wetland – hay bale barrier
4. Above North East Boundary Combined Sewer- mudflat

Tributaries

The tributaries and their drainage basins were surveyed quarterly. Each tributary was divided into segments of approximately 500 - 1000 foot lengths and the amount and types of trash and debris in the stream channel were determined. Because these are urban streams, segments length were determined by street crossings or other recognizable land marks when possible. The study did not include intermittent streams. If a stream channel was dry, it was not surveyed, and the survey would begin once actively flowing water was observed. Transects did not extend into the tidal zone of tributaries. It should be noted that the summer of 2007 was very dry so some stream segments might have water in wetter years or seasons.

1. Ft Davis 1 (Penn. Ave)	Number of segments = 1
2. Ft Davis 2 (Branch Ave)	Number of segments = 1
2. Watts Branch	Number of segments = 14
3. Texas Avenue	Number of segments = 2
4. Fort Stanton	Number of segments = 3
5. Nash Run	Number of segments = 2
6. Pope Branch	Number of segments = 3
7. Ft DuPont	Number of segments = 10
8. Ft Chaplin	Number of segments = 2

Land Use Surveys

Different types of land uses were selected for determining the amount of trash that could potentially be transported to a waterway. An attempt was made to have landuse transects in all of the major basins. Transects were be established and the area measured and detailed counts conducted quarterly.

Parks

1. Kenilworth Park fishing area
2. Watts Branch Park below Recreation Center
3. Langdon Park – Hickey run

Recreational Fields

1. Kenilworth Park soccer field buffer zone
2. Anacostia Park soccer field buffer zone

Trails

1. Watts Branch Foot Bridge at Eads Street

Commercial Streets

1. Pennsylvania Ave. - Minnesota Ave.– 27th St, south side
2. Good Hope Rd. -25th – Alabama, east side
3. Nannie Helen Burroughs – Minnesota -44th St, west side
4. Bladensburg – South Dakota – 30th St, north side

Residential Streets

1. Pope Street, Branch – Nash west side
2. Grant St - 42-44 St east side
3. Franklin St – Rhode Island Ave – 17th St., south side
4. Franklin St- 17-18th St, south side
5. Franklin St 18-20th St, south side (also school and parkland use)

Light Industrial Streets

1. I-295 Service Road - Foot bridge/crosswalk – Polk St, south side

Parking lots

1. Auto Zone at Naylor and Good Hope Road
2. RFK parking lot
3. Ft Chaplin Apts. & Townhomes parking lot

Institutional

1. HD Woodson High School- Watts Branch
2. Phelps/ Brown School – Kingman Lake

Transportation

1. Bus stops - Good Hope Road

Bridges

1. 11th Street Bridge
2. Pennsylvania Avenue
3. Benning Road

Windshield Surveys

The drainage basins of each tributary and or MS4 system were surveyed quarterly for trash that might reach the tributary. This was done by windshield survey of all of the streets. The streets were broken down into about one block to two block long segments. The survey team would drive along in a vehicle at about 20 mph. A person would count all of the visible trash that could be seen from the passenger side window. The visible space would be from about 10 feet from the curb of the road to a point 10-12 feet from the curb to private property. This would theoretically include the tree space and the sidewalk. Only one side of each block was counted, and on different surveys there was no attempt to count the same side of the same block. Obviously, parked vehicles affected the amount of trash that could be seen. No attempt was made to identify types of trash. Only a gross count was made. The windshield survey was halted during periods of reduced visibility such as intense rainstorms and snow storms. The street transects under the land use monitoring are related to the windshield surveys and can be used to adjust the data.

Special Studies

While not part of the work plan, there were events that occurred that prompted the collection of additional data to further understand the normal data and to clarify issues that arose. Five such studies were done.

1. The effects of rainfall on windshield counts.
2. The effect of counting on different sides of the street during windshield counts.
3. The effects of week days versus weekend windshield counts.
4. The effects of garbage collection on transect counts.
5. Broken glass counts in the stream beds.

Schedule of Monitoring

The monitoring was performed quarterly and spanned approximately two to three weeks of time. Data collection was suspended for leaf-fall and snow-fall because the trash could not be seen. Stream surveys were interrupted by the May 8, 2008 rainfall which produced flood flows. The invasive porcelain berry vines in Ft Stanton were simply impenetrable during the summer survey.

The first quarter data was collected in late August, early September 2007.
The second quarter data was collected in November and December 2007.
The third quarter data was collected in February and March 2008.
The fourth and final quarter of data was collected in May and June 2008.

Monitoring Sites Detailed Locations

<u>Anacostia Mainstem Stations</u>

1. New York Avenue Bridge

START DESCRIPTION: First path to river
END DESCRIPTION: Mouth of Kenilworth Marsh
LENGTH: 941’
WIDTH: mid channel

BANKFULL DEPTH: top of seawall
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 1 very sparse vegetation in the channel

Figure 3.1.5
Anacostia Mainstream Stations: New York Avenue Bridge

2. Pennsylvania Avenue Storm Sewer

START DESCRIPTION: UPSTREAM EDGE OF PARKING LOT
END DESCRIPTION: UPSTREAM EDGE OF PENN AVE BRIDGE
LENGTH: 875'
WIDTH: SEAWALL TO MIDCHANNEL
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 1 SPARSE

Figure 3.1.6
Anacostia: Pennsylvania Avenue Storm Sewer

3. Buzzard Point

START DESCRIPTION:SMOKING GAZEBO
END DESCRIPTION: POINT ABOVE JAMES CREEK MARINA
LENGTH: 651'
WIDTH: 5'
BANKFULL DEPTH: 2'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2 – RIPRAP ALONG BANK

Figure 3.1.7
Anacostia: Buzzard Point

4. Poplar Point

START DESCRIPTION: Park Police HQ drive way
END DESCRIPTION: 450 ft below Stickfoot sewer
LENGTH: 1000’
WIDTH: Seawall to mid channel
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 1 for downstream count and 4 for upstream count

The Seawall was broken in places. Upstream of stick foot sewer for 600 feet the trash was counted behind the seawall to high tide line. Below the Stickfoot sewer, trash was counted only in front of seawall

Figure 3.1.8
Anacostia: Poplar Point

5. Above New York Ave

START DESCRIPTION: Bridge
END DESCRIPTION: first wetland fence upstream
LENGTH: 526’
WIDTH: 20 feet at low tide
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 1 mostly a mudflat

This station straddles the DC/MD boundary and was added after the midterm review of the data.

Figure 3.1.9
Anacostia: Above New York Avenue

Kingman Lake Station

KL-1a. Benning Road Bridge Upstream

START DESCRIPTION: Storm sewer out fall
END DESCRIPTION: Bridge abutment
LENGTH: 346’
WIDTH: 10 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2 - mostly mud banks

Figure 3.1.10
Kingman Lake Stations: Benning Road Bridge Upstream

KL-1b.   Benning Road Bridge downstream

START DESCRIPTION: approximately 300 ft downstream of bridge abutment is orange transect tape on a willow tree
END DESCRIPTION: about 200 ft from the first transect tape will be a second transect tape
LENGTH: 200’
WIDTH: 15’
BANKFULL DEPTH: 2’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2 - mostly mud banks

Transect located to avoid homeless person living under the Benning Road bridge.

Figure 3.1.11
Kingman Lake: Benning Road Bridge Downstream

KL-2. East Capitol Street Marsh

START DESCRIPTION: Marsh beginning at storm sewer outfall
END DESCRIPTION: Marsh ending at upstream edge of East Capitol Street Bridge
LENGTH: 441’
WIDTH: 5’
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Survey conducted by walking along the marsh wall and counting trash on the water side of the retaining wall.

Figure 3.1.12
Kingman Lake: East Capitol Street Marsh

KL-3. Northeast Boundary Sewer

START DESCRIPTION: STORM DRAIN
END DESCRIPTION: Storm Drain
LENGTH: 689'
WIDTH: 10'
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

This station is basically the intertidal zone.

Figure 3.1.13
Kingman Lake: Northeast Boundary Sewer

Watts Branch Station

WB-1. Southern – 61 St

START DESCRIPTION: Bridge at Southern Avenue
END DESCRIPTION: Bridge at 61st Street
LENGTH: 569 ft
WIDTH: 12 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.14
Watts Branch: Southern – 61 St

WB-MD. East Capitol - Southern

START DESCRIPTION: Bridge at Eagle St
END DESCRIPTION: Bridge at Southern Avenue
LENGTH: 447 ft
WIDTH: 12 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.15
Watts Branch: East Capital - Southern

WB-1a. Tributary

START DESCRIPTION: Mainstem
END DESCRIPTION: East Capitol
LENGTH: 567
WIDTH: 12 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.16
Watts Branch: Tributary

WB-2. 61 St – 58 St

START DESCRIPTION: 61[ST] STREET BRIDGE
END DESCRIPTION: 58th Street
LENGTH: 1339ft
WIDTH: 12 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.17
Watts Branch: 61 St – 58 St

WB-3. 58 St – 55 St

START DESCRIPTION: 58TH STREET BRIDGE
END DESCRIPTION: 55TH STREET BIRDGE
LENGTH: 1364 ft
WIDTH: 10ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.18
Watts Branch: 58 St – 55 St

WB-4. 55 St – Division Ave

START DESCRIPTION: 55TH STREET BRIDGE
END DESCRIPTION: DIVISION AVE BRIDGE
LENGTH: 1373ft
WIDTH: 12 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.19
Watts Branch: 55 St – Division Ave

WB-5. Division Ave – 50 St

START DESCRIPTION: DIVISION AVENUE BRIDGE
END DESCRIPTION: 50^{TH} STREET TUNNEL
LENGTH: 1049 ft
WIDTH: 20 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.20
Watts Branch: Division Ave – 50 St

WB-6. 50 St – 48 St

START DESCRIPTION: TUNNEL OUTLET AT 50TH STREET
END DESCRIPTION: 48TH STREET BRIDGE
LENGTH: 536 ft
WIDTH: 10 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.21
Watts Branch: 50 St – 48 St

WB-7. 48 St – 44St

START DESCRIPTION: 48TH STREET BRIDGE
END DESCRIPTION:
LENGTH: 1538ft
WIDTH: 20 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 5

Figure 3.1.22
Watts Branch: 48 St – 44St

WB-8. 44St – Hunt Pl

START DESCRIPTION: 44th Street
END DESCRIPTION: Hunt Place
LENGTH: 1091ft
WIDTH: 15 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.23
Watts Branch: 44St – Hunt Pl

WB-9. Hunt Pl – Kenilworth Ave

START DESCRIPTION: Hunt Place
END DESCRIPTION: Kenilworth Avenue
LENGTH: 1007 ft
WIDTH: 20 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 1

Figure 3.1.24
Watts Branch: Hunt Pl – Kenilworth Ave

WB-10. Kenilworth Ave – Foot Bridge

START DESCRIPTION: Kenilworth Avenue
END DESCRIPTION: Foot Bridge
LENGTH: 1727 ft
WIDTH: 25 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 5

Figure 3.1.25
Watts Branch: Kenilworth Ave – Foot Bridge

WB-11. Foot Bridge – 1000’

START DESCRIPTION: FOOT BRIDGE
END DESCRIPTION: ORANGE TRANSECT TAPE ON FALLEN TREE – GO TO FIRST WEEPING WILLOW
LENGTH: 937 ft
WIDTH: 25 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 5

Figure 3.1.26
Watts Branch: Foot Bridge – 1000’

WB-12. Station 11 to small tributary.

START DESCRIPTION: Orange transect tape on downed tree near first weeping willow
END DESCRIPTION: Small Tributary
LENGTH: 1209 ft
WIDTH: 25 ft
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 4

Beaver dam at the Tributary and tidal affects

Figure 3.1.27
Watts Branch: Station 11 to small tributary.

Texas Avenue – Mainstem

START DESCRIPTION: 27th Street
END DESCRIPTION: PIPE
LENGTH: 475’
WIDTH: 2’
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.28
Texas Avenue Mainstem

Texas Avenue – tributary

START DESCRIPTION: Culvert at Hiking Trail
END DESCRIPTION: Mainstem
LENGTH: 768’
WIDTH: 2’
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.29
Texas Avenue – Tributary

Fort Stanton

Fort Stanton: 1

START DESCRIPTION: Tributary Junction
END DESCRIPTION: PIPE WITH 4 INCH SPACING GRATE
LENGTH: 801'
WIDTH: 3'
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 5

Figure 3.1.30
Fort Stanton: 1

Fort Stanton: 2

START DESCRIPTION: Storm Sewer
END DESCRIPTION: Tributary Junction
LENGTH: 516'
WIDTH: 3'
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 4

Figure 3.1.31
Fort Stanton: 2

Fort Stanton: 3

START DESCRIPTION: About 200 feet below the Storm Sewer
END DESCRIPTION: Tributary Junction
LENGTH: 1960'
WIDTH: 3'
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.32
Fort Stanton: 3

Nash Run

NR-1 I-295 – Pipe

START DESCRIPTION: I-295 Service Road
END DESCRIPTION: Upstream end of conduits
LENGTH: 704’
WIDTH: 12
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.33
Nash Run: I-295 – Pipe

NR-2 Pipe -Anacostia Ave

START DESCRIPTION: Downstream end of conduits
END DESCRIPTION: Anacostia Avenue
LENGTH: 466
WIDTH: 12
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.34
Nash Run: Pipe -Anacostia Ave

Pope Branch

PB-1. Nash – Branch Ave

START DESCRIPTION: Outfall at Nash and Texas
END DESCRIPTION: Branch Avenue
LENGTH: 2914'
WIDTH: 5'
BANKFULL DEPTH: 1'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.35
Pope Branch: Nash – Branch Ave

PB-2. Anacostia Rd – Minnesota Ave

START DESCRIPTION: Minnesota avenue
END DESCRIPTION: Branch Avenue
LENGTH: 802
WIDTH: 5’
BANKFULL DEPTH: 1’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.36
Pope Branch: Anacostia Rd – Minnesota Ave

PB-3. Minnesota Ave – Fairlawn

START DESCRIPTION: Minnesota Avenue
END DESCRIPTION: Fairlawn Avenue trash rack with 4" spacing
LENGTH: 734'
WIDTH: 5'
BANKFULL DEPTH: 1'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3.5

Figure 3.1.37
Pope Branch: Minnesota Ave – Fairlawn

Ft Dupont

Segment 1

This segment was dry and not monitored.

Figure 3.1.38
Ft. Dupont: Segment 1

FDp-2.
START DESCRIPTION: FOOT BRIDGE
END DESCRIPTION: ORANGE TRANSECT TAPE ON FALLEN OVERHEAD TREE
LENGTH: 1060
WIDTH: 5
BANKFULL DEPTH: 10'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.39
Ft. Dupont: 2

FDp-3. Segment 2 – trib junction

START DESCRIPTION: ORANGE TRANSECT TAPE ON FALLEN OVERHEAD TREE
END DESCRIPTION: TRIB JUNCTION
LENGTH: 930
WIDTH: 6
BANKFULL DEPTH: 4’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.40
Fort Dupont: Segment 2 – trib junction

FDP-3a.   Trib Junction - ~ Ft Davis Dr

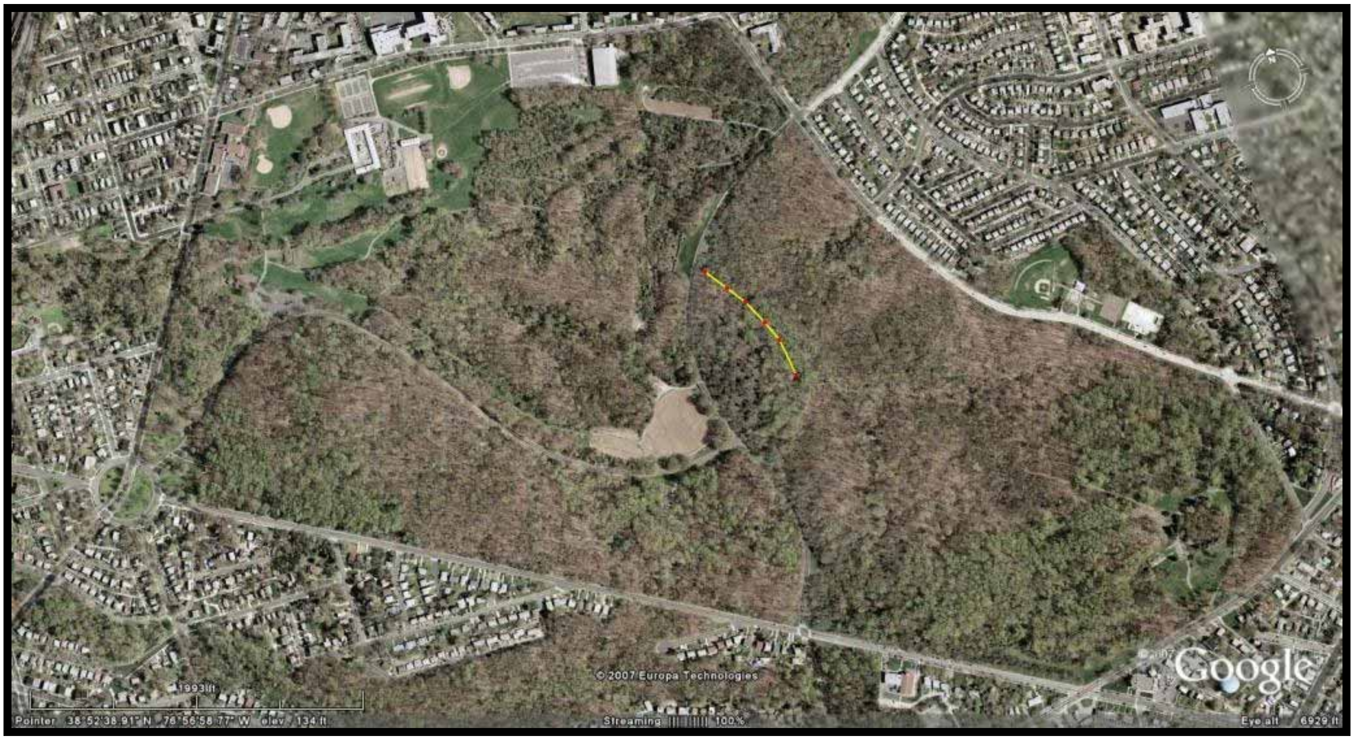
START DESCRIPTION: Confluence
END DESCRIPTION: culvert
LENGTH: 450 ft
WIDTH: 4’
BANKFULL DEPTH: 3’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.41
Fort Dupont: Trib Junction - ~ Ft Davis Dr

FDp-4. Junction – Ft Davis Dr

START DESCRIPTION: Tributary junction
END DESCRIPTION: Ft Davis Drive
LENGTH: 870 ft
WIDTH: 6’
BANKFULL DEPTH: 2’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 21

Figure 3.1.42
Fort Dupont: Junction – Ft Davis Dr



FDp-5. Ft Davis Dr – meadow

START DESCRIPTION: LARGE PIPE OUTLET
END DESCRIPTION: PIPE WITH BEAVER DAM
LENGTH: 1145 ft
WIDTH: 6’
BANKFULL DEPTH: 1’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3 WITH INTERMITTENT FLOW

The beaver dam was broached by the NPS during the course of the study

Figure 3.1.43
Fort Dupont: Ft Davis Dr – meadow

FDp- 5a.   Lower Tributary

START DESCRIPTION: MAINSTEM
END DESCRIPTION: PIPE
LENGTH: 570’
WIDTH: 3’
BANKFULL DEPTH: 1’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.44
Fort Dupont: Lower Tributary

FDp-6. Meadow – Path

START DESCRIPTION: LOWER END OF PIPE
END DESCRIPTION: PATH BRIDGE
LENGTH: 499
WIDTH: 6
BANKFULL DEPTH: 1 FT- PARTIALLY DRY/ INTERMITTENT
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.45
Fort Dupont: Meadow - Path

FDp-7. Path – Minnesota

START DESCRIPTION: PATH BRIDGE
END DESCRIPTION: Minnesota Avenue
LENGTH: 540’
WIDTH: 4’
BANKFULL DEPTH: 2’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.46
Fort Dupont: Path – Minnesota

FDp-8. Minnesota Ave – Railroad
START DESCRIPTION: Minnesota Avenue
END DESCRIPTION: Pipe at Railroad
LENGTH: 1187'
WIDTH: 4'
BANKFULL DEPTH: 2'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 2

Figure 3.1.47
Fort Dupont: Minnesota Ave – Railroad

Ft Chapin

1. Headwater – 1000’

START DESCRIPTION: Pipe outlet
END DESCRIPTION: Orange transect tape on fallen tree
LENGTH: 1000’
WIDTH: 10’
BANKFULL DEPTH: 3’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 4

Figure 3.1.48
Fort Chapin: Headwater – 1000’

2. Segment 1 – C St – 750’

START DESCRIPTION: Orange transect tape on fallen tree
END DESCRIPTION: TRASH RACK WITH 4 INCH SPACING
LENGTH: 750’
WIDTH: 15’
BANKFULL DEPTH: 3’
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 4

Figure 3.1.49
Ft. Chapin: Segment 1

Ft. Davis

Ft Davis -1

START DESCRIPTION: Seep
END DESCRIPTION: Pipe at Penn and Carpenter
LENGTH: 1502"
WIDTH: 5'
BANKFULL DEPTH: 1'
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 3

Figure 3.1.50
Fort Davis: 1

Ft. Davis

Ft Davis -2

START DESCRIPTION: TWO PIPE OUTFALLS
END DESCRIPTION: PIPE
LENGTH: 624’
WIDTH: 5’
BANKFULL DEPTH: 2 FEET
CHANNEL VEGETATION, ROOTS, OBSTRUCTIONS: 4

Figure 3.1.51
Fort Davis: 2

Land Use Resources

Parks

1. Kenilworth Park (fishing area)

Figure 3.1.52
Kenilworth Park fishing area

Land Use Resources

2. Watts Branch Park below Recreation Center

Figure 3.1.53
Watts Branch Park below Recreation Center

Land Use Resources

3. Langdon Park – Hickey Run 100’ X100’

Figure 3.1.54
Park – Hickey Run

Recreational Fields

1. Kenilworth- buffer strip

Length 300 feet width 3 feet

Figure 3.1.55
Kenilworth- buffer strip

Recreational Fields

2. Anacostia – buffer strip

Length 347 feet width 3 feet

Figure 3.1.56
Anacostia – buffer strip

Trails

1. Watts Branch Foot Bridge At Eads Street

Length 242 ft X 20ft

Figure 3.1.57
Watts Branch Foot Bridge at Eads Street

Commercial Streets

1. Pennsylvania Ave- Minnesota – 27th St, south side
2. Good Hope Rd -25th – Alabama, east side
3. Helen Nannie Burroughs – Minnesota -44th St, west side
4. Bladensburg – South Dakota – 30th St, north side

Residential

1. Pope Street, Branch – Nash west side
2. Grant St - 42-44 St east side
3. Franklin St – Rhode Island Ave – 17th St., south side
4. Franklin St- 17-18th St, south side
5 Franklin St 18-20th St, south side

Light Industrial

1. I-295 Service Road - Foot bridge/crosswalk – Polk St, south side

Box Store

1. Auto Zone parking lot at Naylor and Good Hope Road

Figure 3.1.58
Auto Zone parking lot at Naylor and Good Hope Road

Box Stores

2. Ft Chaplin Park Apts & Townhomes

Figure 3.1.59
Ft. Chaplin Park Apts & Town homes

Box Stores

3. RFK Parking lot.

Figure 3.1.60
RFK Parking lot

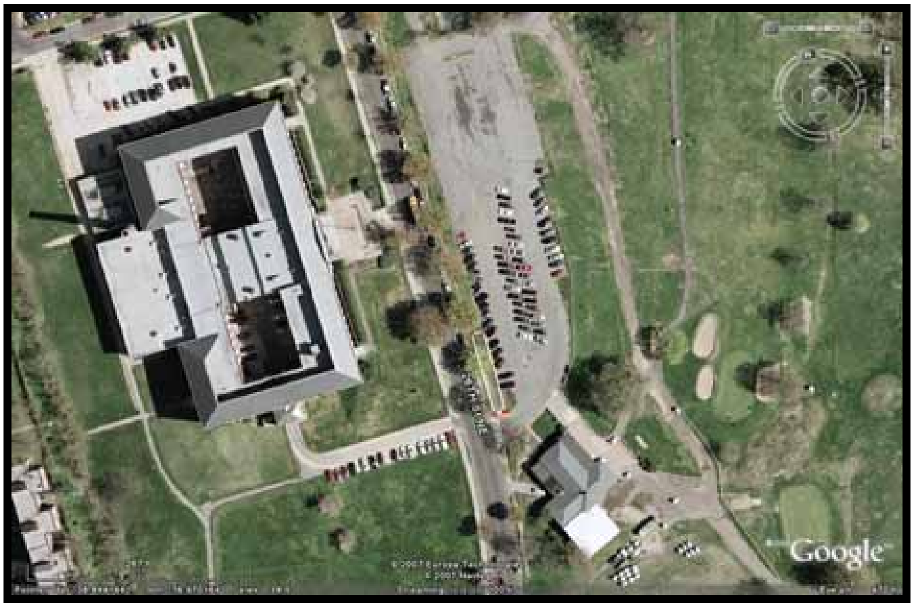
Institutional

1. HD Woodson High School- Watts Branch

Figure 3.1.61
Woodson High School – Watts Branch

2. Phelps/Brown High School – Kingman Lake

Figure 3.1.62
Phelps/Brown High School



Transportation

1. Bus stops - Good Hope Road

Figure 3.1.63
Bus stops – Good Hope Road

Bridge Stations

1. Penn Ave Northbound- Anacostia
   Length 1254 ft

Figure 3.1.64
Penn Ave Northbound

Bridge Stations

2. Benning Road Northbound – Kingman Lake

   Length 703 ft

Figure 3.1.65
Benning Road Northbound

Bridge Stations

3. 11th Street Bridge Northbound – Anacostia

Length 1219 ft
Stairway to stairway

Figure 3.1.66
11th Street Bridge Northbound

Data Forms

The data forms for the stream surveys and land transects were modified after the summer survey to be more convenient to the user. The category “cup lids and straws” was deleted and the category “tires” was added. Glass was recorded on the front page of the survey form.

Survey Form

The first page of the survey form was completed on the first survey, and thereafter it was printed as the completed form along with a picture of the transect area for each subsequent survey.

Following the survey forms are the definitions for each category and an estimated weight of the general type of items.

STATION DESCRIPTION

NAME:____

WATERSHED:____

TYPE OF STATION: (Stream or landuse)____________________________________

START COORDINATES:____
START DESCRIPTION:____
END COORDINATES:____
END DESCRIPTION:____
WIDTH:____
BANKFULL DEPTH____

VEGETATION, ROOTS, OBSTRUCTIONS:
CHANNEL____
TRANSECT/BANK____

TRANSECT AREAL DIMENSIONS:_______________________________________

TRANSECT IDENTIFYING FEATURES:
____

____

____

NOTE: VEGETATION SHOULD BE DESCRIBED NUMERICALLY USING THE FOLLOWING SCALE.

1. NONE – PAVEMENT, SIDEWALK OR GRAVEL
2. SLIGHT -MOWED LAWN, A FEW ROOTS AND BUSHES
3. MODERATE- BANKS HAVE OVERSTORY OF TREES AND UNDERSTORY THAT IS EASILY WALKED THROUGH.
4. DENSE – THICK, UNDERSTORY OR WAIST HIGH WEED BUFFER THAT WOULD TRAP MOST TRASH.
5. IMPENETRABLE- UNDERSTORY WITH VINES AND WEEDS THAT WOULD ELIMINATE ANY POSSIBILITY OF TRASH REACHING A STREAM .

Table 3.1.1
Survey Form

STATION			
TRASH			
plastic bags			
Liquor	Bottles		
Beer	Bottles		
	Cans		
Soft Drinks	Bottles		
	Cans		
Water	Plastic		
Sports Drinks	Plastic		
Juice	Cans		
	Bottles		
cups	Styrofoam		
	Styrofoam		
	Styrofoam		
	Plastic		
	Paper		
Aseptic (sterile packaging)	Food Wrappers		
	Take-out food packaging		
	Cigarette packs, matches, cigars, tobacco		
	Napkins, paper towels, tissues		
Beverage carriers	**Rings, cartons**		
Toiletries	Toiletries		
	Drugs		
	Games, cassettes, CDs		
TOYS	toys, balls	-	-
	Misc. Other		
LITTER	**Newspapers, Magazine, Books**		
	Advertising, signs, cards		
	Home food packaging		

Styrofoam, plates				
Styrofoam, foam packaging				
Styrofoam, chunks large				
Styrofoam chunks small				
	Other misc. cartons			
	Other metal, foil packets			
	Other fabric			
	Clothing			
Auto	**Products**	containers		
DEBRIS				
	Vehicle	Small car parts <1ft		
		Large car parts >1 ft		
		Tires		
	Construction material	Small items: < 1sq. Ft		
		Large items: > 1 sq. ft.		
	Appliances, bicycles, shopping carts, etc.			
	Carpet			
	Misc large Debris			
	Misc plastic			
LOGJAMS		Trash traps		
		Site Number		
		Other		
Sampler				
			Date	

Definitions and Weight

Plastic Bags- Plastic grocery bags, shopping bags, garbage bags, newspaper sleeves, and the shreds or parts of torn bags. Wt = 0.1 – 0.12 ounce

Liquor Bottles- Bottles that originally held an alcoholic beverage other than beer, such as wine, vodka, whiskey, rum, or bottled mixed drinks. Includes all sizes and types of bottles, from plastic single shot mini bottles to large multiple-serving size glass bottles. Broken bottles are only included if they are roughly 90% intact. Wt = 9.3 ounces

Beer Bottles- Glass bottles that originally held beer or a similar malt beverage. In the absence of a distinguishing label, bottle shape and color are used to deduce the original contents. Broken bottles are only included if roughly 90% intact. Wt = 7 ounces

Beer Cans- Metal cans of various sizes, whether flattened or not, that appear to originally have contained beer or a similar malt beverage. This also includes beverages that are beer based, but have additives such as caffeine and may be marketed as a form of alcoholic energy drink. In the absence of a clearly distinguishable label, a best guess of original contents is made based on size, shape, and any remaining label color and patterns; unlabeled cans may be confused with soft drink or juice cans. Wt = 0.5 ounces

Soft Drink Bottles- Bottles of any size, usually plastic and rarely glass, that originally contained a non-alcoholic, carbonated beverage. In the absence of a contradicting label or distinguishing bottle cap, any bottle shaped like a standard soft drink bottle falls into this category, even though a small number of waters and juices are distributed in similar bottles. All bottles, whether crushed or torn, are included if they can be identified. Wt = 1.0 ounces

Soft Drink Cans- Metal cans, whether flattened or not, that originally contained a non-alcoholic, carbonated beverage. Also includes similarly marketed and distributed non-carbonated tea i.e., Arizona Tea. In the absence of a clearly distinguishable label, a best guess of original contents is made based on size, shape, and any remaining label color and patterns; unlabeled cans may be confused with beer or juice cans. Wt = 0.45 ounces

Water, Plastic- Plastic bottles originally sold containing drinking water. Does not include gallon jugs or any larger bottles intended for use with a dispenser. Does not include lost re-usable water bottles. Wt = 0.65 ounces

Sports Drinks, Plastic- Plastic bottles that originally held a non-alcoholic, non-carbonated beverage commonly marketed for improved hydration during sports, e.g., Gatorade, Powerade. Also includes "enhanced water," water that has been heavily augmented with flavor, color, or sugars e.g., Vitamin Water, Propel Fitness Water. These beverages come in a fairly unique style of bottle that makes them easy to distinguish. Rarely, juice may be sold in a similar style bottle and though those juice bottles are generally smaller, they may be confused with a sports drink bottle when unlabeled. Wt = 1.55 ounces

Juice Cans- Metal cans that originally contained a non-alcoholic, non-carbonated beverage marketed as a juice drink, whether or not the actual beverage contained any real fruit juice. In the absence of a clearly distinguishable label, a best guess of original contents is made based on size, shape, and any remaining label color and patterns; unlabeled cans may be confused with soft drink or beer cans. Wt = 0.5 ounces

Juice Bottles- Glass or plastic bottles that originally contained a non-alcoholic, non-carbonated beverage marketed as a juice drink, whether or not the actual beverage contained any real fruit juice. Juice bottles come in many shapes and sizes and are most easily identified by their label. Wt = 1.3 ounces

Styrofoam Cups- Foam beverage cups or large pieces of those cups. Pieces can be identified by the distinctive rim and curved shape. Includes all types of foam beverage cups, from small 8 oz generic white coffee cups to extra large size cups commonly used with lids and straws to sell fountain soda and iced beverages. If several pieces of the same cup appear in one area, they are counted as a single cup. Styrofoam is a word that is used for objects that are more correctly made from expanded polystyrene foam (EPF). Wt = 0.2 ounces

Plastic Cups- Disposable cups made of plastic or large pieces of those cups. If several pieces of the same cup appear in one area, they are counted as a single cup. Wt = 0.4 ounces

Paper Cup- Disposable cups made of paper, most often heavily treated or coated paper. If several pieces of the same cup appear in one area, they are counted as a single cup. Wt = 0.3 ounces

Food Wrappers- This includes many kinds of wrappers and bags that food comes packaged in, such as potato chip bags, candy wrappers, packaging from individually wrapped pastries or sandwiches, etc. Also includes juice pouches (i.e., Capri Sun.) Also included are discarded packets of flavored rolling paper intended for use with loose tobacco. The packages look so much like candy wrappers with their large colorful cartoon pictures of whatever fruit they are flavored to resemble that they were always included in the food wrapper count. Wt = 0.1 ounces

Take Out Food Packaging- Anything used in the packaging of prepared foods, including Styrofoam, plastic, or cardboard hinged lid containers, disposable lidded containers, and French fry cups. Wt = 0.25 ounces for EPF clamshells

Cigarette Packs, Matches, Cigars, Tobacco- Smoking related products and their packaging. Does not include cigarette butts or other items of less than 1 inch. Wt = 0.2 ounces

Napkins, Paper Towels, Tissues- Disposable paper-based products intended for cleaning or drying. Wt = 0.15 ounces

Beverage Carriers, Rings, Cartons- Plastic ring-type beverage carriers, cardboard carriers or boxes. Wt = 1.5 ounces

Toiletries- External personal care products and their packaging, including soap, shampoo, lotions, antiperspirant, cosmetics, and fragrances. Wt = 2.0 ounces

Drugs- Prescription and over-the-counter therapeutic drug packaging, usually plastic bottles, as well as illegal drug packaging and paraphernalia, including tiny baggies and hypodermic syringes. Wt = 1.0 ounces

Games, Cassettes, CDs- Includes audio or computer CDs, audio or video cassettes and their tape, and vinyl records. Wt = 0.55 ounces

Toys, Balls- Includes all types and sizes of recreational balls made from any material and any toy or part of a toy larger than 1 inch. A piece of plastic may carry a brand name, picture, or pattern that make it clear it came from a toy or the shape and color of the piece may be identifiable as a toy part. Some toy parts are not recognizable and may have been categorized as miscellaneous plastic. Wt = 14.0 ounces (soccer)

Toys, Misc. Other- Includes things that are not strictly toys, but fit in no other categories, such as backpacks, school supplies, wallets, credit and identification cards, portable CD players, calculators, cell phones, batteries, etc. Wt = 4.0 ounces

Newspapers, Magazine, Books- Any paper publication. In the case of a book torn in half, the two parts are counted as a single item. In the case of a newspaper blown apart, each sheet is counted individually. In the rare case that a newspaper is still all folded together, it is counted as a single item. Wt = 0.6 ounces per double page

Advertising, Signs, Cards- Includes corrugated plastic advertising signs, election posters, paper flyers, postcard advertisements, and lost street signs. Wt = 2.0 ounces

Home Food Packaging- Packaging from foods traditionally eaten in the home or that would require a special tool to open or prepare. Includes cans that require a can opener, packets of powdered mashed potato, cake mix boxes, milk jugs, etc. Wt = 2.0 ounces

Styrofoam plates- Expanded polystyrene foam plates or parts of plates. In the case of multiple pieces of plate that clearly came from the same plate, the pieces are counted as a singe plate. If the pieces may have come from different plates, a rough guess is made of how many plates are represented. Wt = 0.25 ounces

Styrofoam, foam packaging- Foam packing material such as foam packing peanuts or foam wrapping sheets. Wt = 0.65 ounces

Styrofoam Chunks- Miscellaneous and unidentifiable pieces of foam. If the piece is less than 12 square inches, it is considered Small. Large is 12 square inches or more. Small Wt = 0.6 ounces. Large Wt = 2.0 ounces

Other Misc. Cartons-Bottle, cartons, and containers that do not fit in any other category. Includes large juice and water jugs. Wt = 2.7 ounces

Other Metal, Foil Packets- Metal food or drink containers not covered by other categories and aluminum foil. Wt = 0.5 ounces

Other Fabric- Fabric that cannot be identified or did not come from clothes or as part of a car or appliance. Includes blankets, towels, and cloth used to wrap items for transport. Wt = 8 ounces

Clothing- In addition to the usual clothes such as shirts, pants, and socks, clothing also includes hats, shoes, purses, and umbrellas. Wt = 10 ounces

Auto Products Containers- Bottles, cans, tubes, and other containers that held products used in the care and maintenance of an automobile. Includes oil and other engine fluid bottles, washer fluid bottles, and car wax or polish containers. Wt = 3.0 ounces

Vehicle Debris- Anything that was once part of an automobile. Includes various metal auto parts, pieces of the car body, seats, hubcaps, mirrors, hood ornaments, and license plates. Items less than 1 square foot were marked as Small; items of 1 square foot or larger were counted as Large. Though there is a separate category for tires, many were instead counted as Large Car Parts in this category. A tire with no wheel inside of it weighs about 24 pounds. The average large car part that is not a tire weights perhaps 2 pounds. A small car part Wt = 0. 25 ounces, Large car part Wt = 5 pounds

Construction Material- Items that were used in the construction or deconstruction of something. Includes building material such as lumber, vinyl tile, siding, or roofing material. Also includes tools such as hammers, shovels, and hoses. Small Wt = 0.5 pounds Large Wt = 4.0 pounds

Appliances- Includes bicycles, shopping carts, strollers, scooters, lawnmowers, furniture, and appliances such as washing machines, refrigerators, radiators, etc. Wt = 10 pounds

Carpet- Includes carpet and carpet pad. Wt = 20 pounds

Miscellaneous Large Debris- Large debris that does not fit in any other category or is not identifiable. Includes garbage cans and recycling bins. Wt = 2 pounds

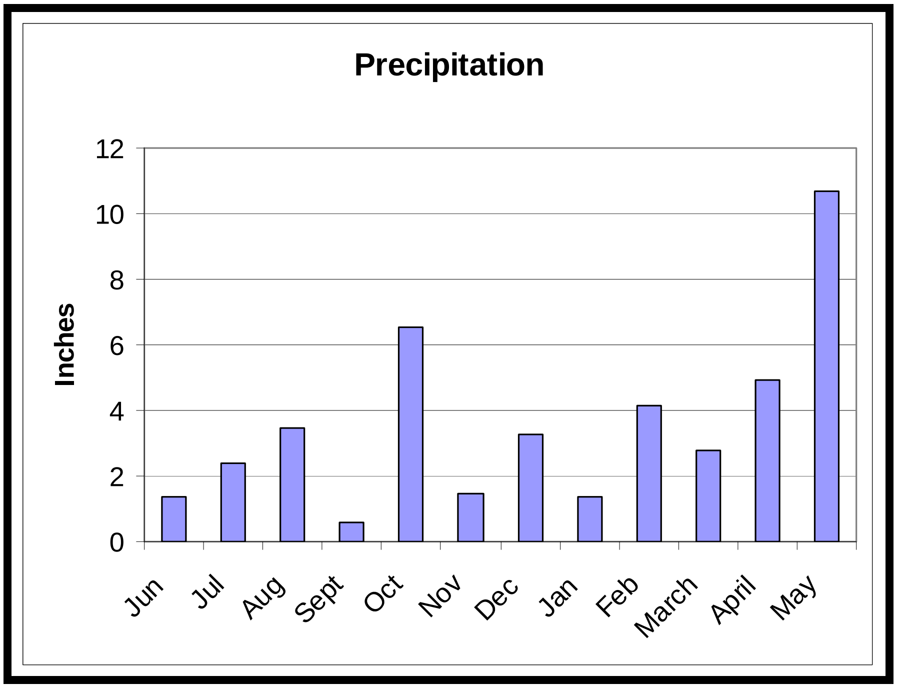
Miscellaneous Plastic- All plastic debris that does not fit in any other category or is not identifiable. Wt = 1 pound

3.2 RIVER AND STREAM TRASH DATA

Introduction

Trash was surveyed quarterly in the Anacostia Basin. The summer data collection occurred in August and September, 2007. The fall data collection occurred in November and was suspended until the leaf-fall and the DPW leaf collection was over, and it then finished in January, 2008. The winter collection occurred in March and April 2008, and the spring collection occurred in May 2008, with an interruption by very heavy rainfall causing it to be finished in June of 2008. The rain of May 8-12 was about a 25 year storm and the monthly total was near the level of record.

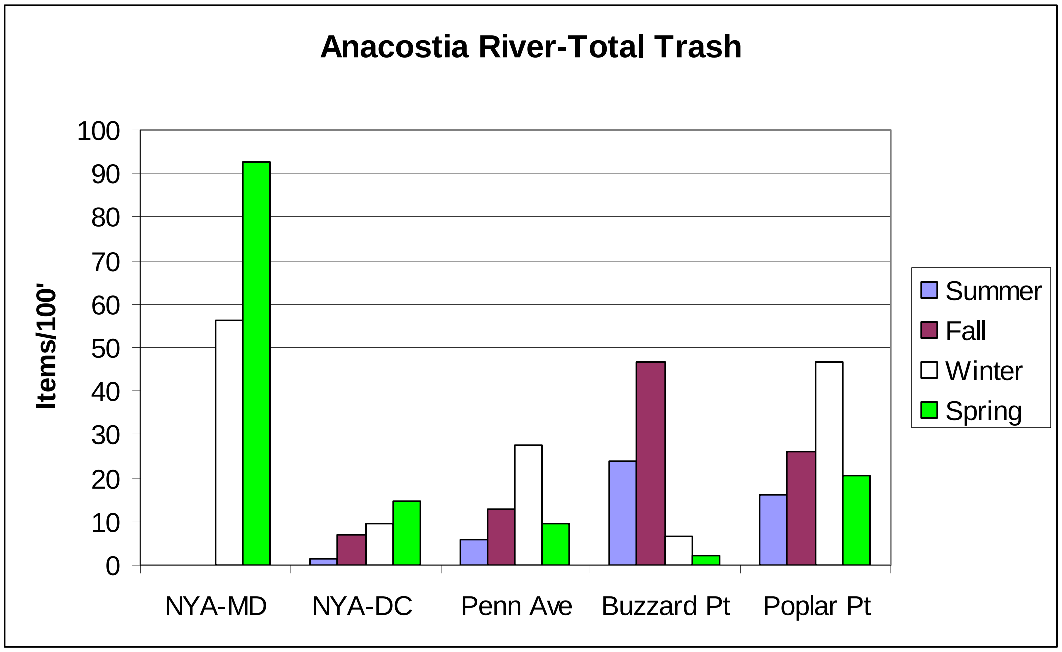
Figure 3.2.1
Precipitation
June 2007- May 2008



Anacostia River Transects

Five transects were monitored in the Anacostia River. Four of these were surveyed during each of the four quarters, and the station above the New York Avenue Bridge was added and included during the last two quarterly surveys inorder to have a mudflat station at the MD-DC boundary. There were basically two types of shore lines surveyed: mudflats and seawalls. The total trash data from the five stations for each of the four quarterly surveys are shown in Figure 3.2.2 below

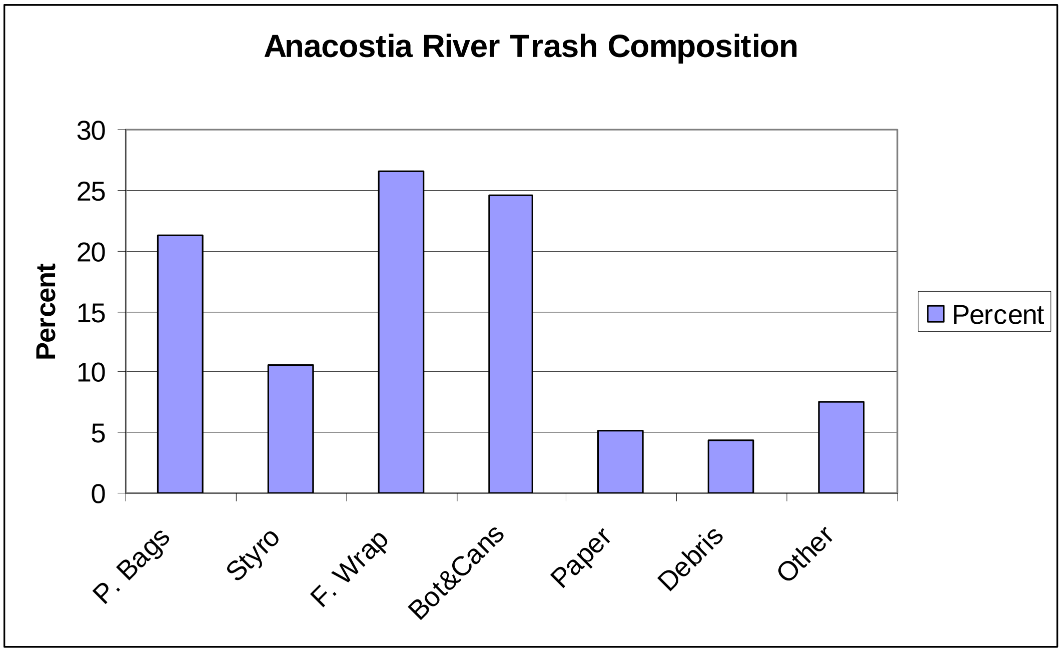
Figure 3.2.2
Anacostia River – Total Trash



The data clearly show that the station above New York Avenue (NYA-MD) has more accumulated trash than any other station surveyed on the Anacostia River. About half of the station is in DC and about half of it is in Maryland. The station is a wide mudflat. The NYA-DC station is across the river and downstream of New York Avenue, but is characterized by a seawall and there is nothing there to trap and hold trash. Since this site is immediately downstream of the Lower Beaverdam Creek tributary, it would be reasonable that there could be a large supply of trash present, but since a vertical seawall is present there, it does not trap and accumulate trash. Similarly, the Pennsylvania Avenue station has only a few bushes growing in the seawall to trap trash. Buzzard Point is a semi rip-rapped shore line with a small amount of mudflat. Poplar Point has a seawall but it is broken in many places and trash gets trapped behind it in tidal pools; also, it has a large sand bar at the Stickfoot sewer outfall. One can conclude that the different stations have different trash trapping efficiencies. More importantly, one can conclude that the Anacostia River has an average of 29 pieces of trash per 100 feet of shoreline at the present time. This amount of trash is doubled if you count both shorelines to about 58 pieces of trash per 100 feet of river and this does not include any estimate of trash lying underwater in the river.

On the District side of the river, the New York Avenue and South Dakota Avenue interchange has a large wet pond which removes trash from the storm water before discharge. The Fort Lincoln New Town development also has stormwater BMPs that remove trash. Thus, there is no large source of trash from the District. From Maryland, Lower Beaverdam Creek is known to export large quantities of trash.

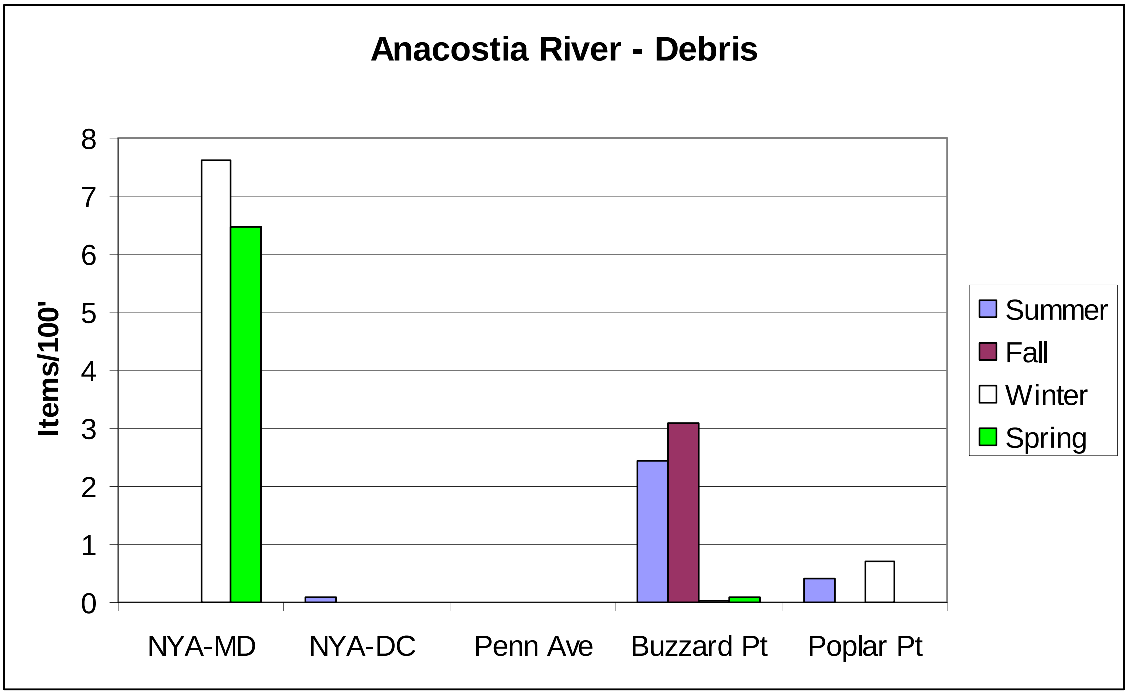
Figure 3.2.3
Anacostia River Trash Composition



Counting plastic bags in the Anacostia River is problematic; and, it was only discovered in the fourth quarter that the plastic bags initially float and then become sediment laden inside and outside and settle to the bottom. The mud coating camouflages them and they are extraordinarily difficult to see. At seawall stations there is very little river bottom exposed, so not many bags are counted. The fourth quarter data at the NYA-MD station contains a relatively accurate count of plastic bags. There are 1.6 plastic bags per 100 square feet of exposed river bottom. More than 20% of the fourth quarter survey items were plastic bags. Styrofoam items (cups, clamshells, plates and any chunks and pieces) were 10%. Food wrappers were the largest category, exceeding 25 %, and the drink bottles and cans were about 25 % as well. Paper items (cigarette packaging, matches books, newspaper, napkins and advertising material) were about 5%, as were debris items.

One of the interesting things is that the winter counts were collected prior to the Anacostia Watershed Society's Annual Anacostia River Earth Day Trash Cleanup, and the spring survey was collected after the survey. The NYA –MD spring survey was performed after the May 8-12, 2008 heavy rainfall of 7.41 inches which moved a lot of trash into the river, but the other stations were completed before the rain. It appears that the AWS Cleanup has a measureable effect on the amounts of trash along the banks of the Anacostia.

Figure 3.2.4
Anacostia River – Debris

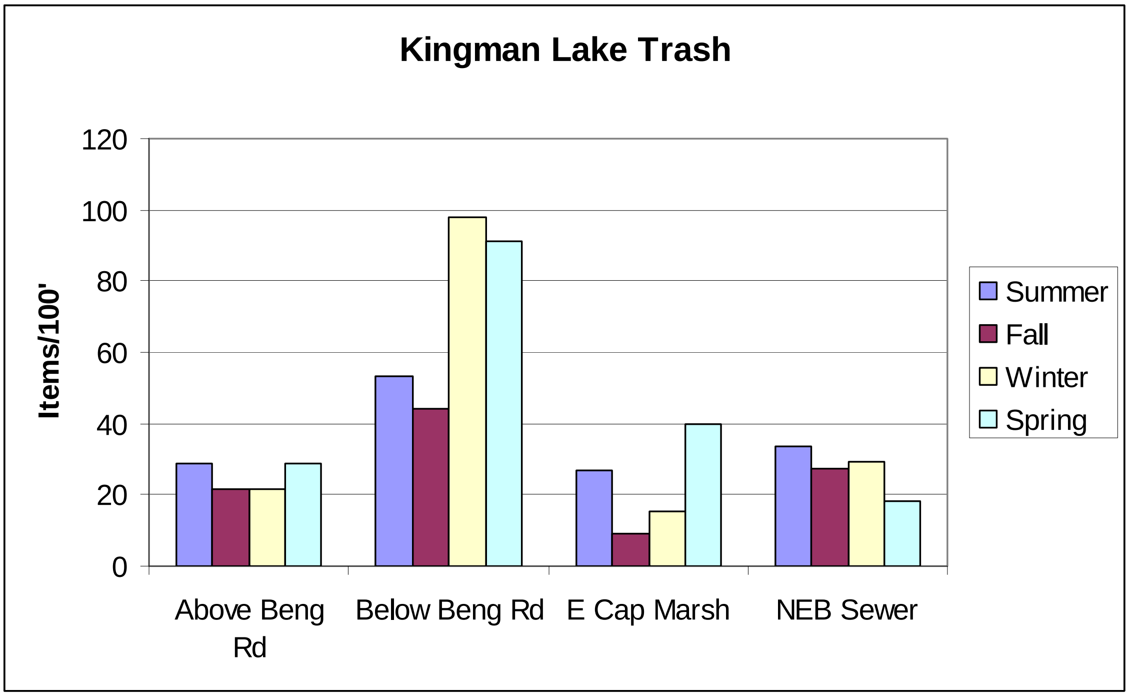


Debris is similar to plastic bags in that it is chiefly the type of material that will settle to the bottom. Therefore, the station that has the most exposed river bottom may have more debris than stations where only floating materials are observed. If one normalizes the debris data to items per 100 square feet of observable river bottom, then Buzzard Point and NYA-MD would have very similar levels.

Kingman Lake

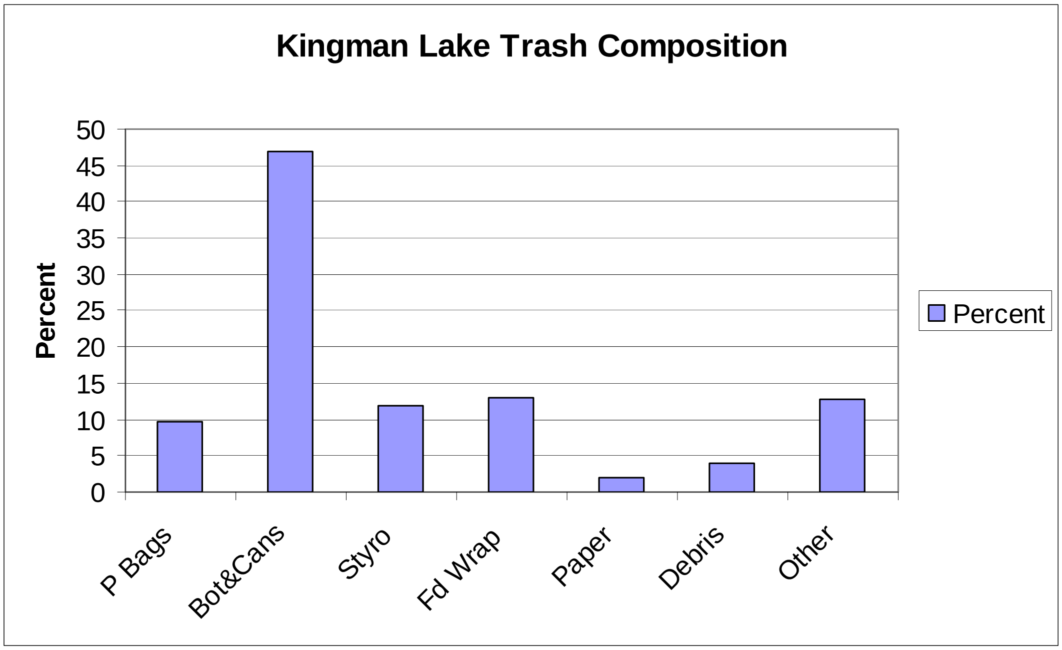
Kingman Lake can receive trash from four sources: 1) it can be carried in by tidal action from the Anacostia River; 2) it can be delivered by storm sewers; 3) the NE Boundary Combined Sewer Overflow (CSO) can discharge, or; 4) it can be deposited as litter by users of the shoreline. The average amount of trash per hundred feet was 36.7 items.

Figure 3.2.5
Kingman Lake Trash



The station above Benning Road Bridge is just below a storm sewer, while the station below Benning Road Bridge is adjacent to a homeless person who lives next to the Bridge. Homeless people generate significant localized accumulations of trash along water bodies. The storm sewer does not seem to produce a high level of trash in the transect area. The dike of hay bales protecting the marsh collects a significant amount of trash. Interestingly enough, there was no observable effect caused by the Northeast Boundary Sewer, which is a major combined sewer overflow discharge location, on the amount of trash present.

Figure 3.2.6
Kingman Lake Trash Composition



The composition of trash within Kingman Lake is characterized by a predominance of bottles and cans. These seem to come from the RFK parking lot as the underbrush next to the transect area is loaded with beer cans and beer bottles. It is unclear how high the counts would be without the underbrush to serve as a buffer zone, but perhaps three times more would be a reasonable estimate. What the data do not show is that a significant amount of debris is items such as grills and folding chairs from tailgating parties. About two percent of all items are composed of paper.

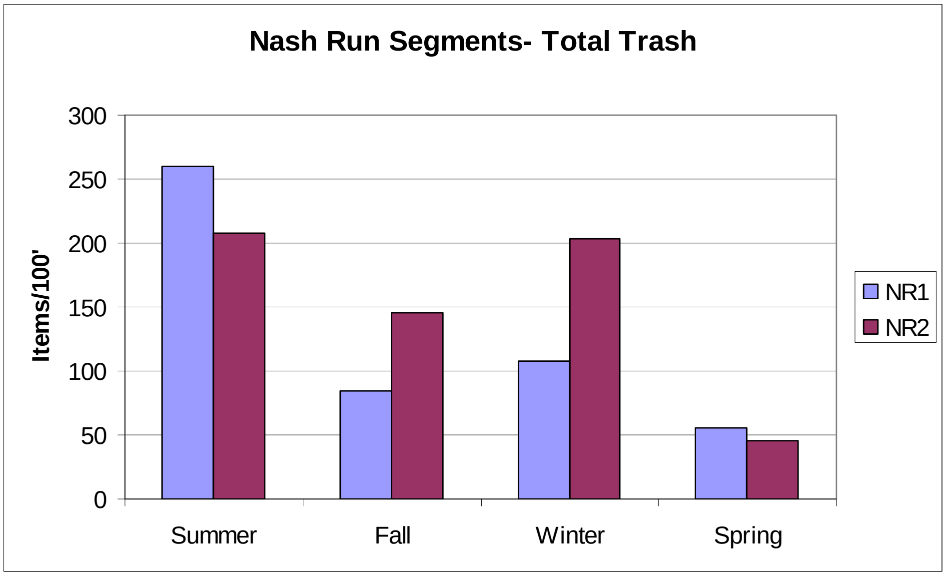
Tributaries

The tributaries to the Anacostia were surveyed quarterly.

Nash Run

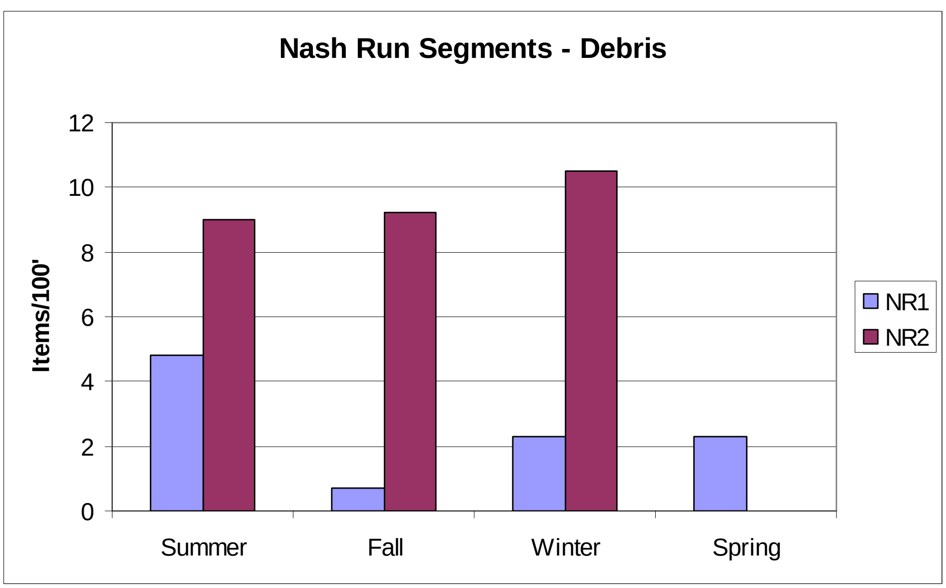
This very small tributary has astronomical levels of trash. At levels of 260 pieces of trash per 100 feet it is the dirtiest of all streams. Even in the spring, when it was "clean" it had more trash than most tributaries. While not a part of the surveyed segments, the portion of Nash Run in the Aquatic Gardens was observed during the AWS Earth Day Cleanup. There are thousands and thousands of pieces of trash in the braided and tidal section.

Figure 3.2.7
Nash Run Segments – Total Trash



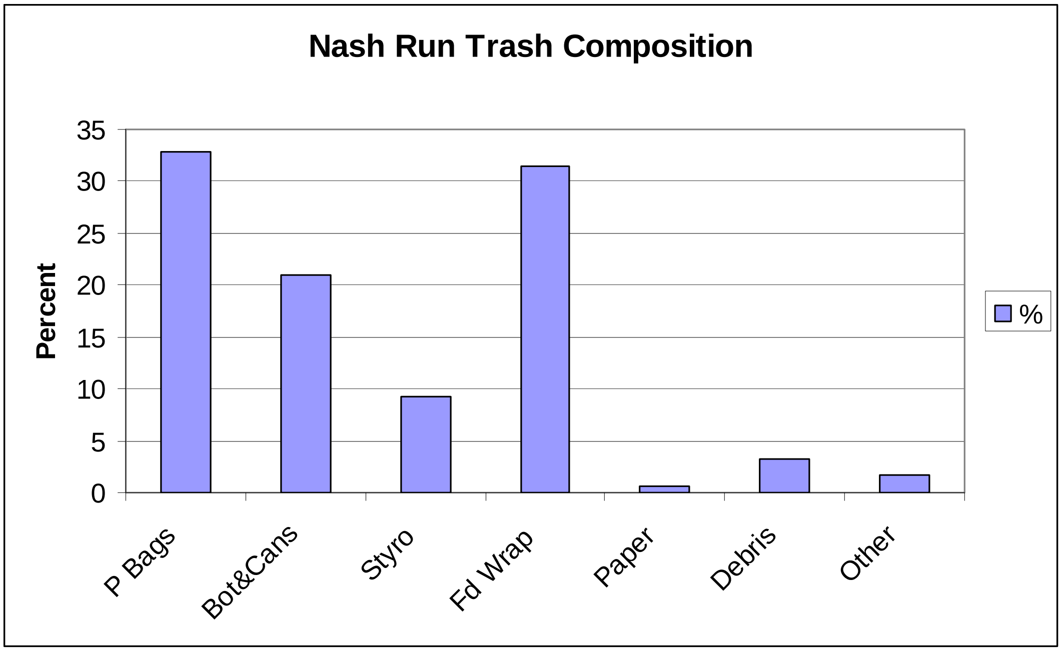
The levels of trash in Nash Run decreased by 80% over the period of the study. Most of the decrease was in the upper segment. It may be that after the dry summer the rainfall in October flushed it downstream. Following Earth Day, both segments were less trashy, although they still had 50 pieces of trash per 100 feet.

Figure 3.2.8
Nash Run Segments - Debris



The lower segment of Nash Run, which runs from the culvert to Anacostia Avenue, had consistently about 43 pieces of debris. After the Earth Day Clean Up it had no debris and the levels of trash had also decreased by about 75%.

Figure 3.2.9
Nash Run Trash Composition

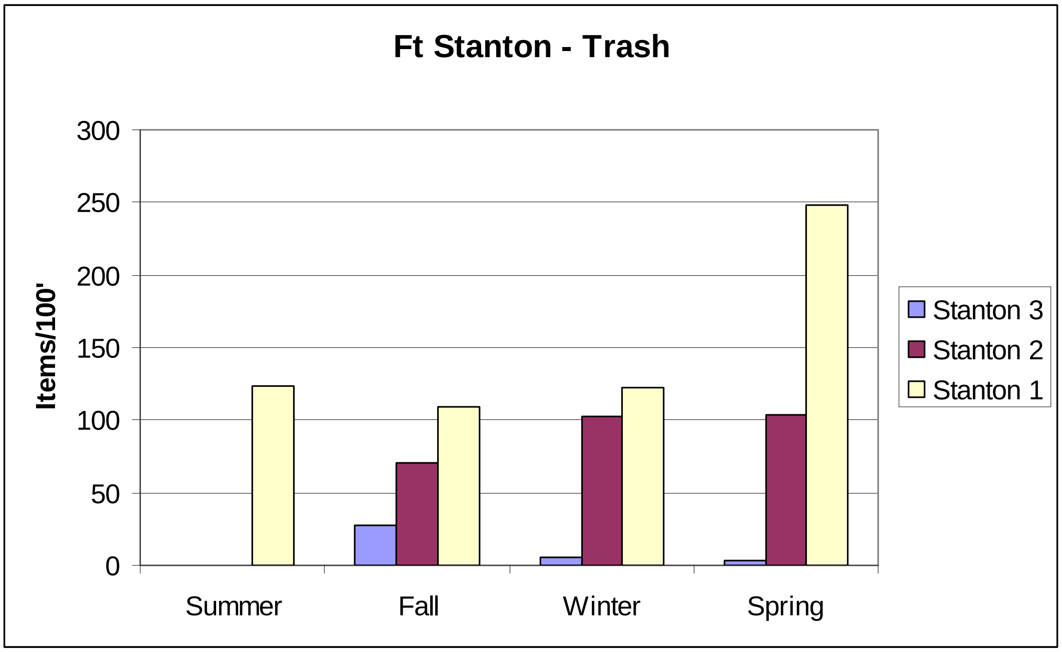


Trash composition was characterized by nearly equal amounts of plastic bags, drink containers and snack wrappers. About one percent was paper items.

Ft. Stanton

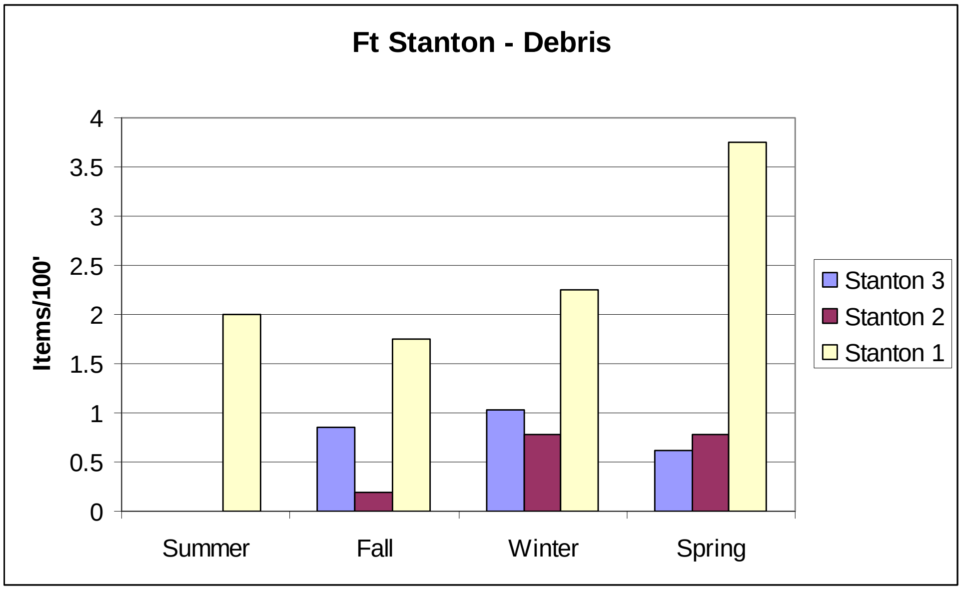
Ft. Stanton was a very challenging stream to survey. The tributary was dry in at least the upper reaches and was not surveyed in the summer. The main stem was overgrown with porcelain berry vines and blackberry briars. In the fall, once the leaves were off and access improved, a detailed survey was made.

Figure 3.2.10
Ft. Stanton – Trash



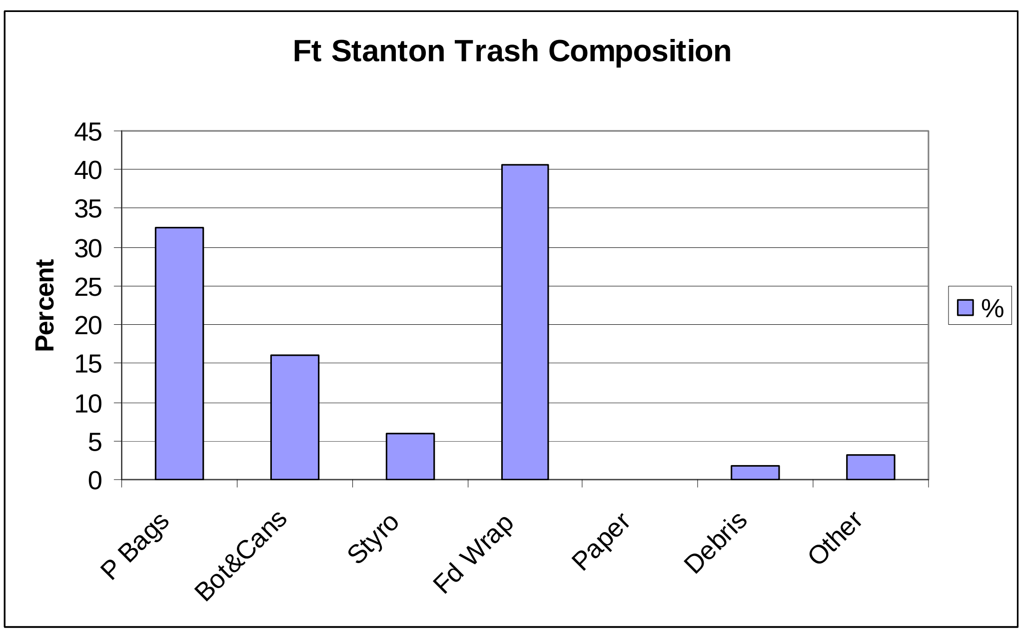
The tributary arising in the vicinity of the Smithsonian Anacostia Community Museum has a very low level of trash. This stream segment, Stanton 3, becomes braided in one area and the fall survey included counts of the entire braided area. The ensuing counts were conducted of only one channel, and the counts are noticeably lower. The origin of the tributary is difficult to determine because of the overgrowth of porcelain berry vines. These vines have trapped several thousand plastic bottles and a variety of plastic and Styrofoam cups from the storm sewer discharge. Following the May, 2008 heavy rainfall events, the trash levels had doubled in the main stem, Segment 1.

Figure 3.2.11
Ft. Stanton – Debris



The debris in the small tributary is all very old tires which have been there for decades. In the main stem stations, debris is mostly construction lumber. The source of the lumber is not clear.

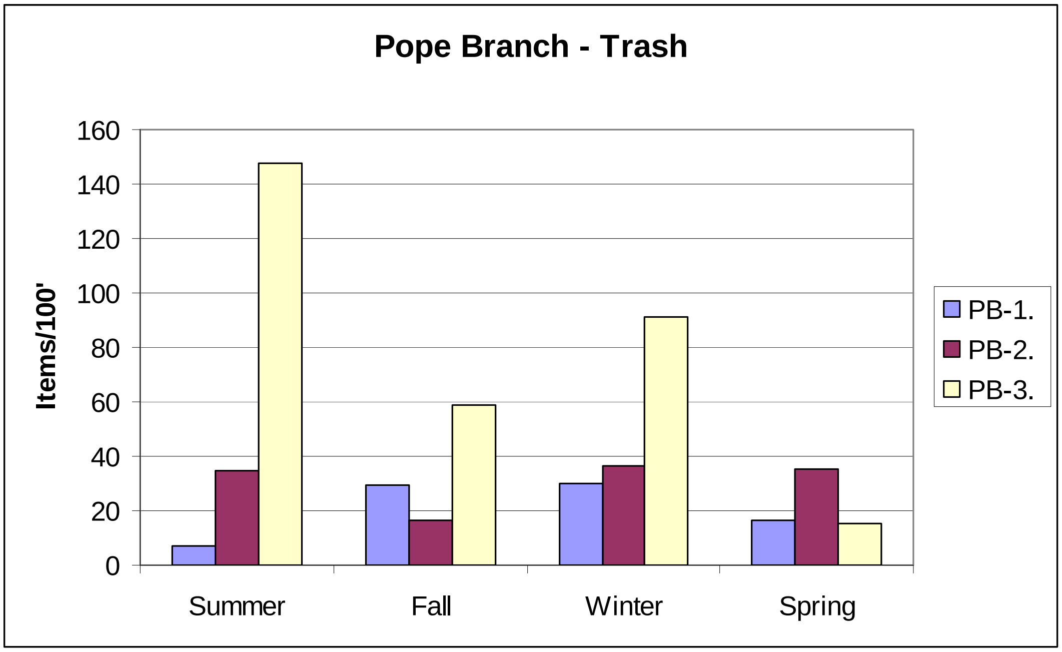
Figure 3.2.12
Ft. Stanton Trash Composition



Ninety percent of the trash is principally four categories: plastic bags, bottles and cans, Styrofoam items and snack wrappers. Paper items are almost non-existent, even when trash levels rise to 250 items per 100 feet.

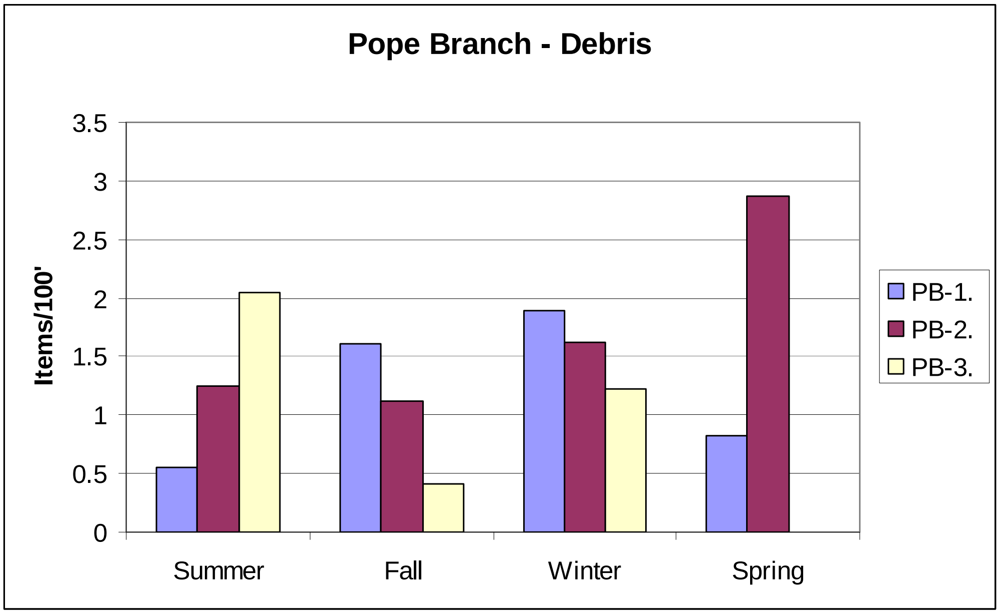
Pope Branch

Figure 3.2.13
Pope Branch - Trash



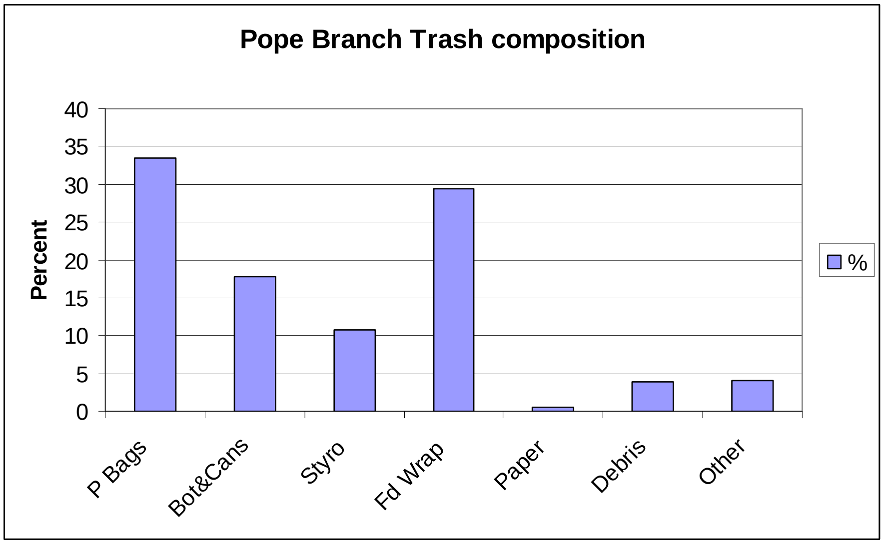
The upper two segments of Pope have relatively low levels of trash; however, the segment between Minnesota Avenue and Fairlawn Ave. has high levels. The lower segment trash levels decreased after the first survey. Once again it is notable that the fourth quarter levels had decreased tremendously.

Figure 3.2.14
Pope Branch – Debris



Debris levels in the lower segment decreased markedly in the fourth quarter.

Figure 3.2.15
Pope Branch Trash - Composition

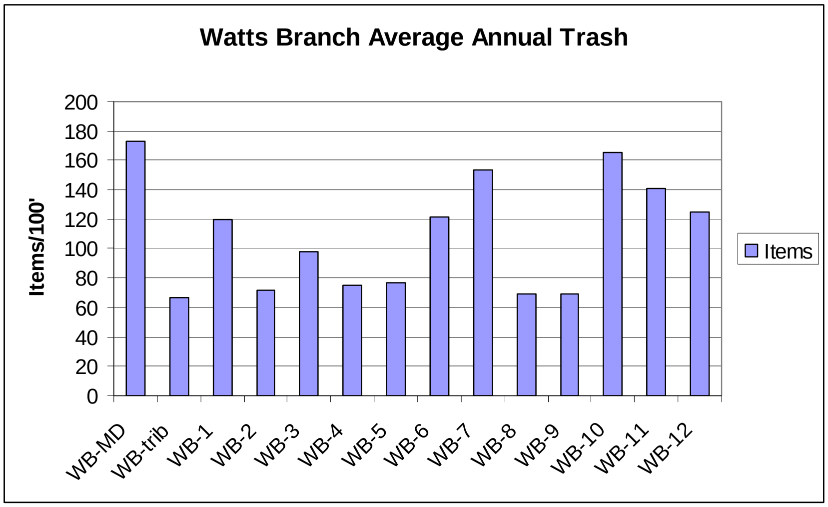


Ninety percent of the trash was plastic bags, drink containers, Styrofoam and snack wrappers. There are almost no paper items.

Watts Branch

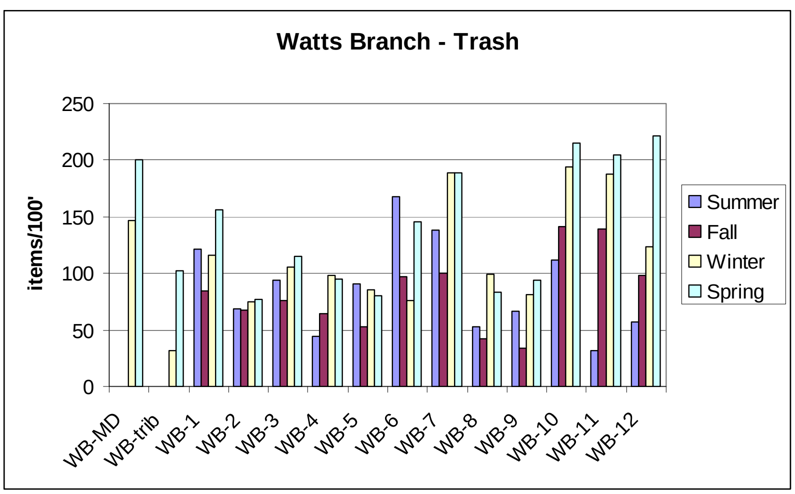
Trash levels in Watts Branch are extremely high. The segment in MD had more trash per unit length than any of the DC segments. The small tributary has moderate levels of trash compared to the other segments. Even the cleanest segments have over 60 pieces of trash per 100 feet.

Figure 3.2.16
Watts Branch Average Annual Trash



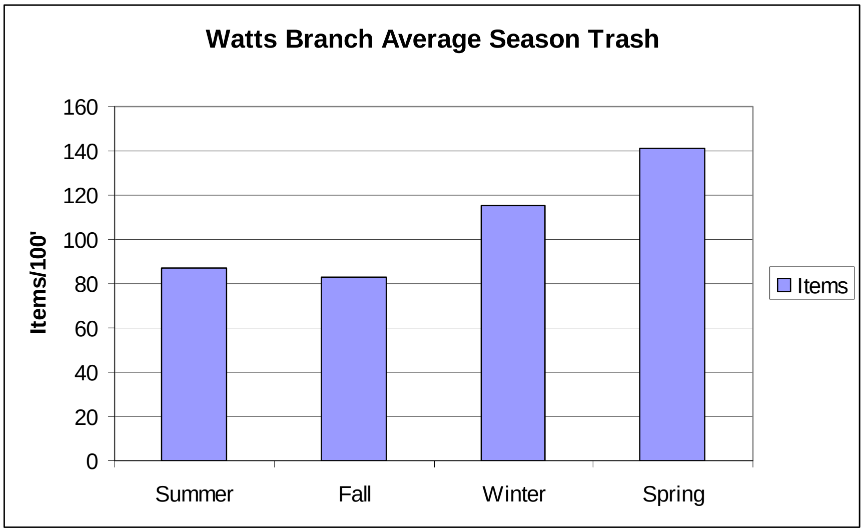
Most segments had higher levels of trash in the winter and spring (Figure 3.2.17).

Figure 3.2.17
Watts Branch – Trash



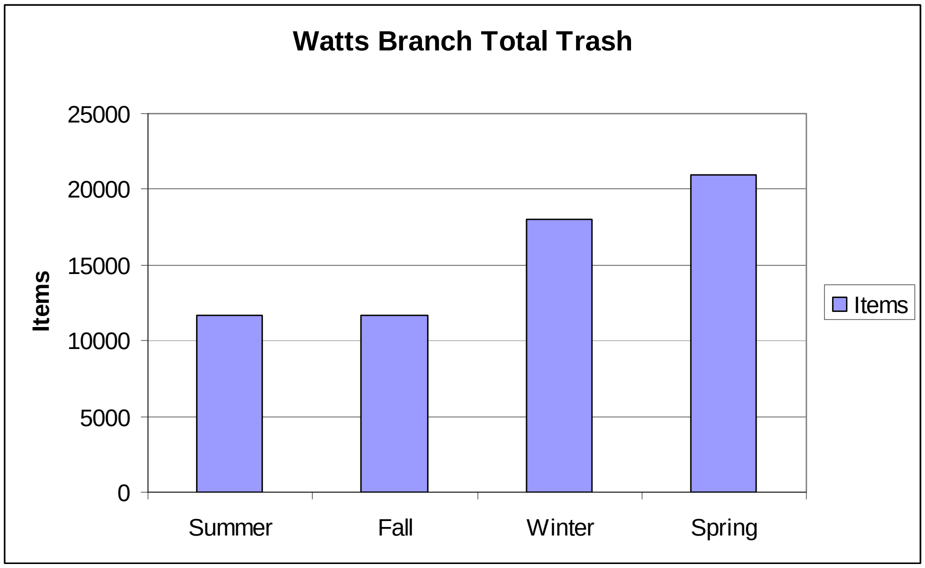
Averaging the level of trash per segment shows the general pattern of increase. This was not a weighted average as the different lengths of the segments were not taken into account (Fig. 3.2.18)

Figure 3.2.18
Watts Branch Average Seasonal Trash



Looking at the total number of item per survey, one should remember that two new segments are included in the Winter and Spring surveys, but even that does not account for the amount of trash in the stream doubling.

Figure 3.2.19
Watts Branch Total Trash



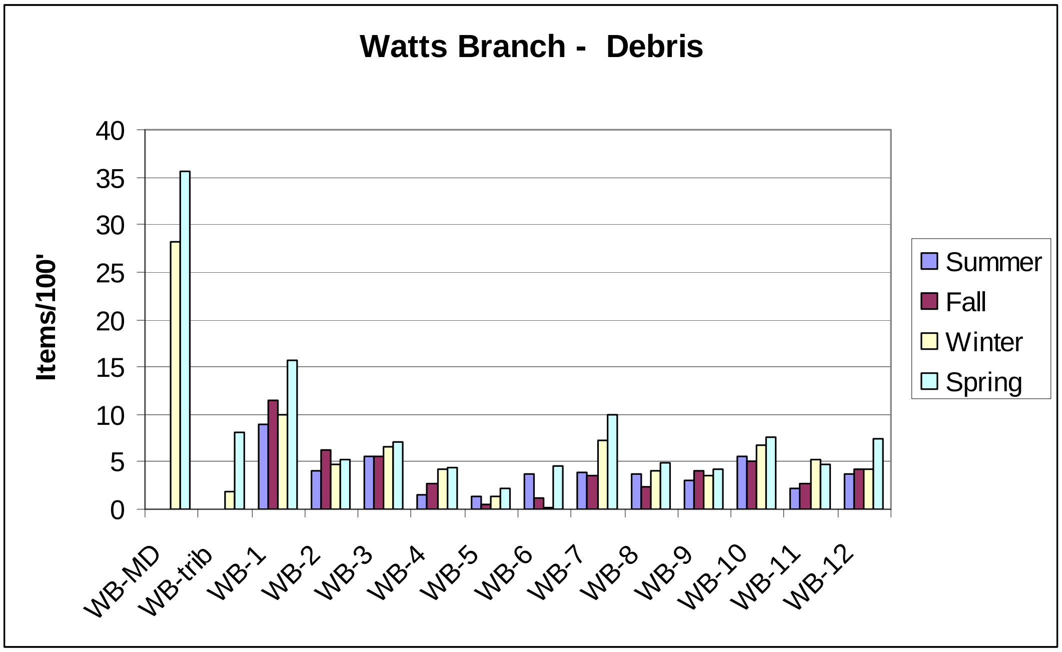
Figures 3.2.20 & 3.2.21 below are two pictures of the same location, with one taken during the fall survey and one taken in the spring survey (see also the cover photo). There is an orange transect marking tape hanging from the tree limb in the far background. Trash is at least two feet deep but according to the survey methodology only the "visible" portion is counted.

Figure 3.2.20
Fall Survey

Figure 3.2.21
Spring Survey

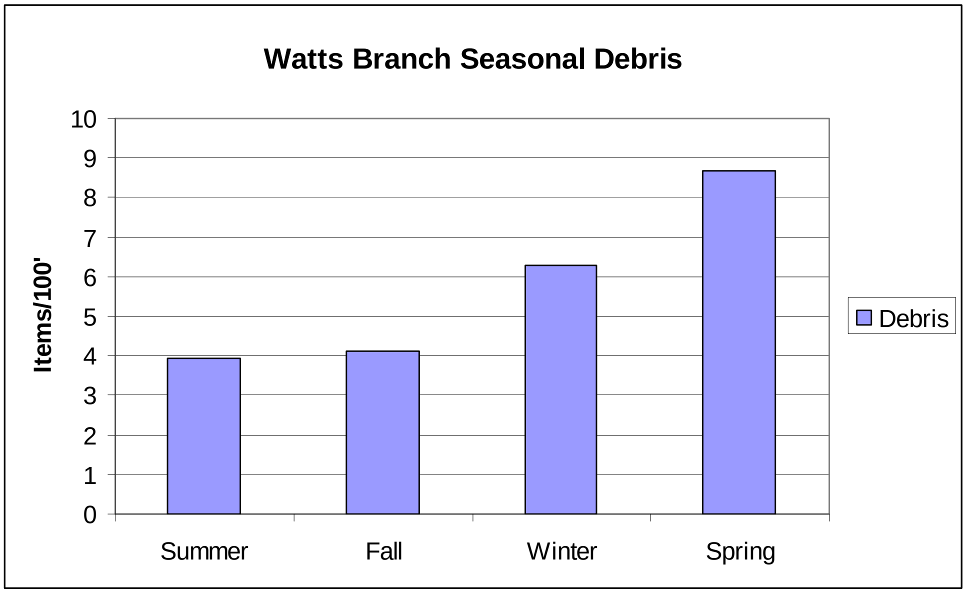
Debris in the Maryland segment of Watts Branch is very high. This debris is dumped in two locations in Maryland and is transported downstream into the District. An interesting observation was that an amount of vinyl siding found in WB-1 in the summer was no longer in WB-1 in the fall, but had been scattered downstream. By the spring survey, it had reached the last three segments, and much of it was partially buried. There were two locations in the District where excessive dumping had actually caused items to reach the water, and action are recommended in the implementation plan for Watts Branch.

Figure 3.2.22
Watts Branch - Debris



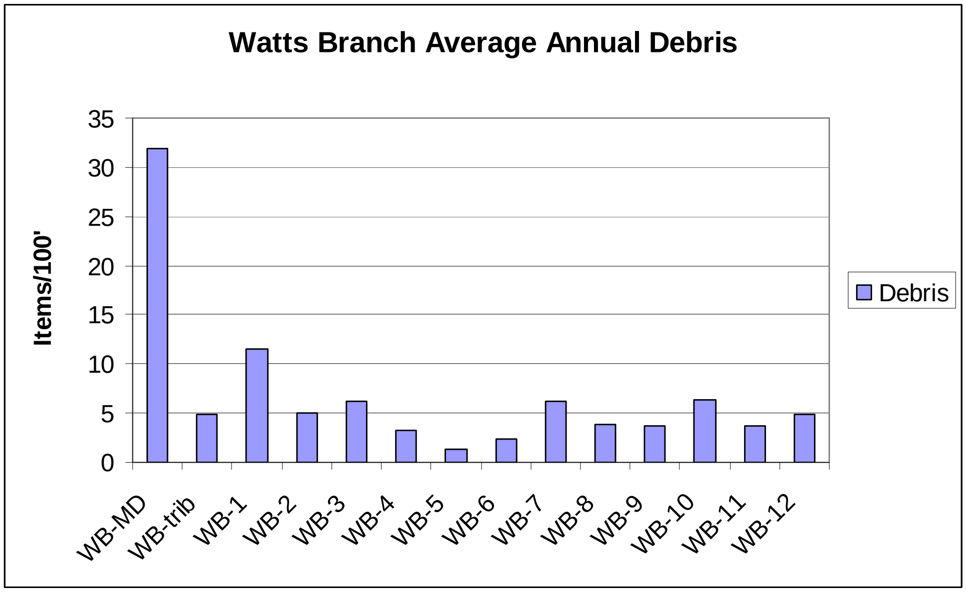
Debris increased in the same ratio as trash on a seasonal basis, as seen in Figure 3.2.23.

Figure 3.2.23
Watts Branch – Seasonal Debris



The annual average of debris simply makes the point that Maryland is a large source of debris to the District.

Figure 3.2.24
Watts Branch – Average Annual Debris



If one removes the tributary segment and expands the scale a little, as shown in Figure 3.2.25, the effect of Maryland on the District becomes much clearer. The dumping in Maryland is moving debris into the District segments.

Figure 3.2.25
Watts Branch – Average Annual Debris

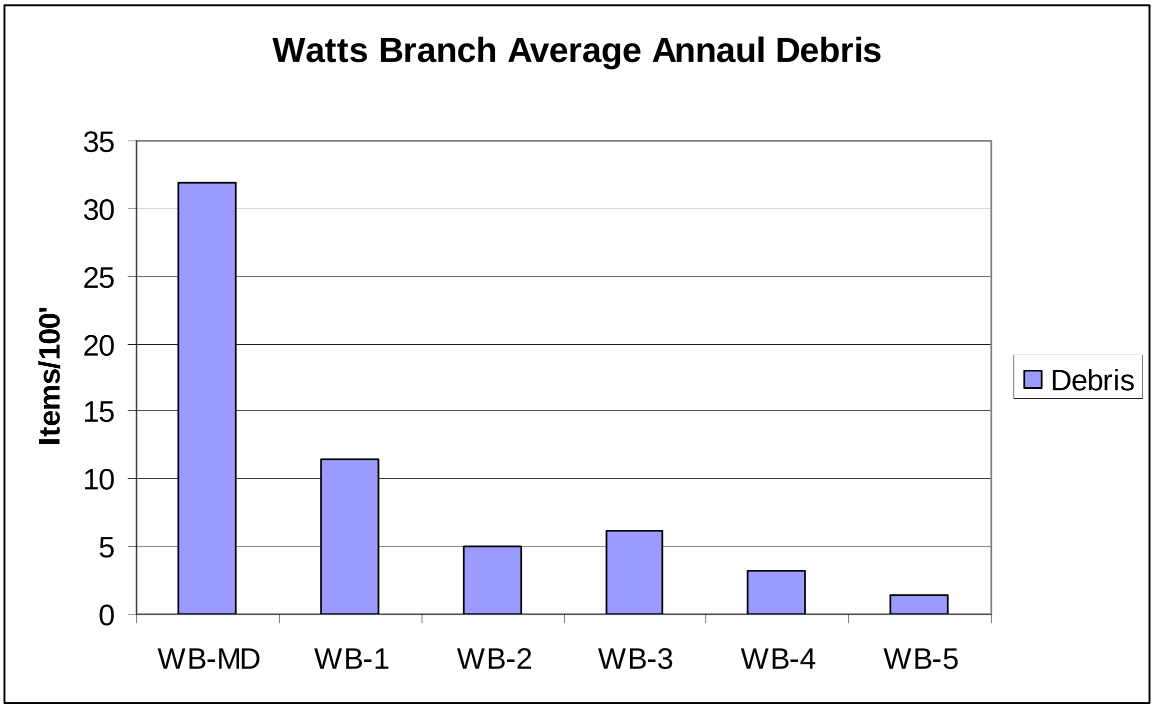


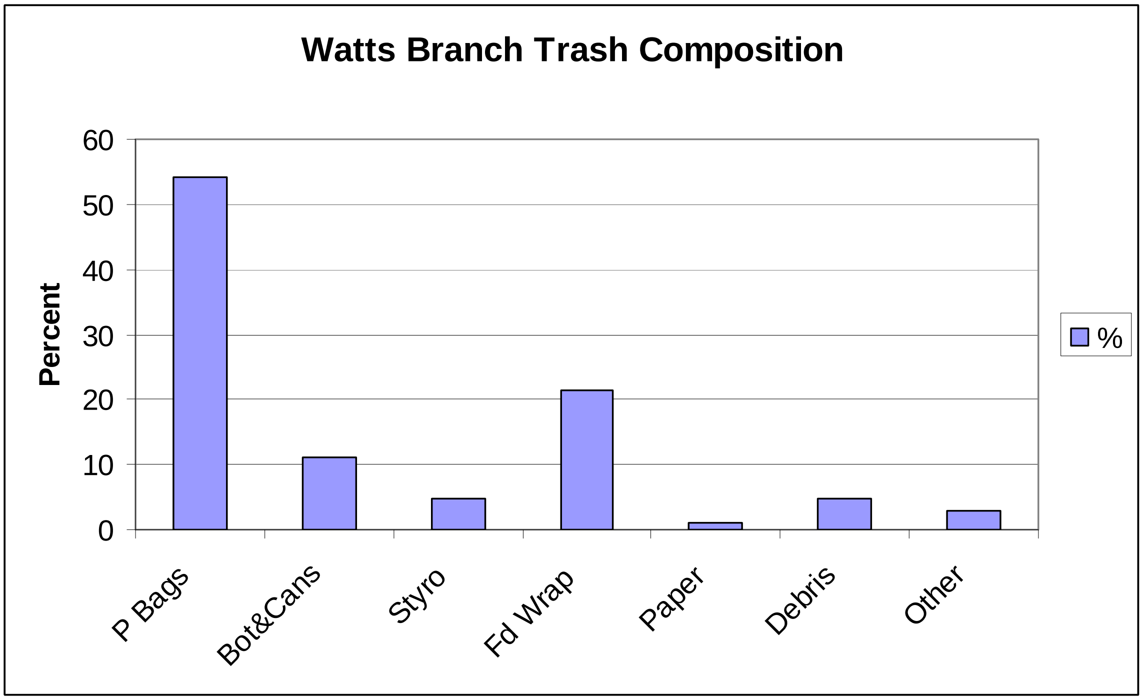
Figure 3.2.26 shows a picture of debris in the Maryland segment of Watts Branch.

In the picture are the following items starting in the lower left and moving counterclockwise: length of pipe, 55 gallon drum, large picnic table umbrella, 55 gallon drum, hot water heater, plastic highway drum, tire, 5 gallon bucket, a car door, a wheel, and a shopping cart.

Figure 3.2.26
Debris in the Maryland segment of Watts Branch

Watts Branch is the largest tributary to the Anacostia in DC and it is dominated by plastic bags. Over half of the trash is plastic bags as shown in Figure 3.2.27.

Figure 3.2.27
Watts Branch – Trash Composition



The only way to describe the blight is with pictures. The following photos (Figs. 3.2.28-3.2.34) provide an idea of what the stream looks like with that many plastic bags.

Figure 3.2.28
Plastic Bags in the stream

Figure 3.2.29
Plastic Bags in Watts Branch

Figure 3.2.30
Plastic Bags in Watts Branch

Figure 3.2.31
Plastic Bags in Watts Branch

Figure 3.2.32
Plastic Bags in Watts Branch

Figure 3.2.33
Plastic Bags in Watts Branch

Figure 3.2.34
Plastic Bags in Watts Branch

The only place that paper bags were observed are where people throw their beer cans into the stream still inside the paper bag near Division Street and at the foot bridge behind MacDonald's on Nannie Helen Burroughs. Neither source of paper bags are found more than a few hundred feet downstream of the point of being discarded. The plastic bags observed are small carryout bags capable of holding one drink and one snack item. There are no Safeway or Giant stores in the drainage basin and the distinctive blue or tan plastic bags were very seldom seen. Perhaps one plastic bag in a thousand would be those distinctive colors.

Figures 3.2.35 - 3.2.37 are pictures showing the effects drug users have on Watts Branch.

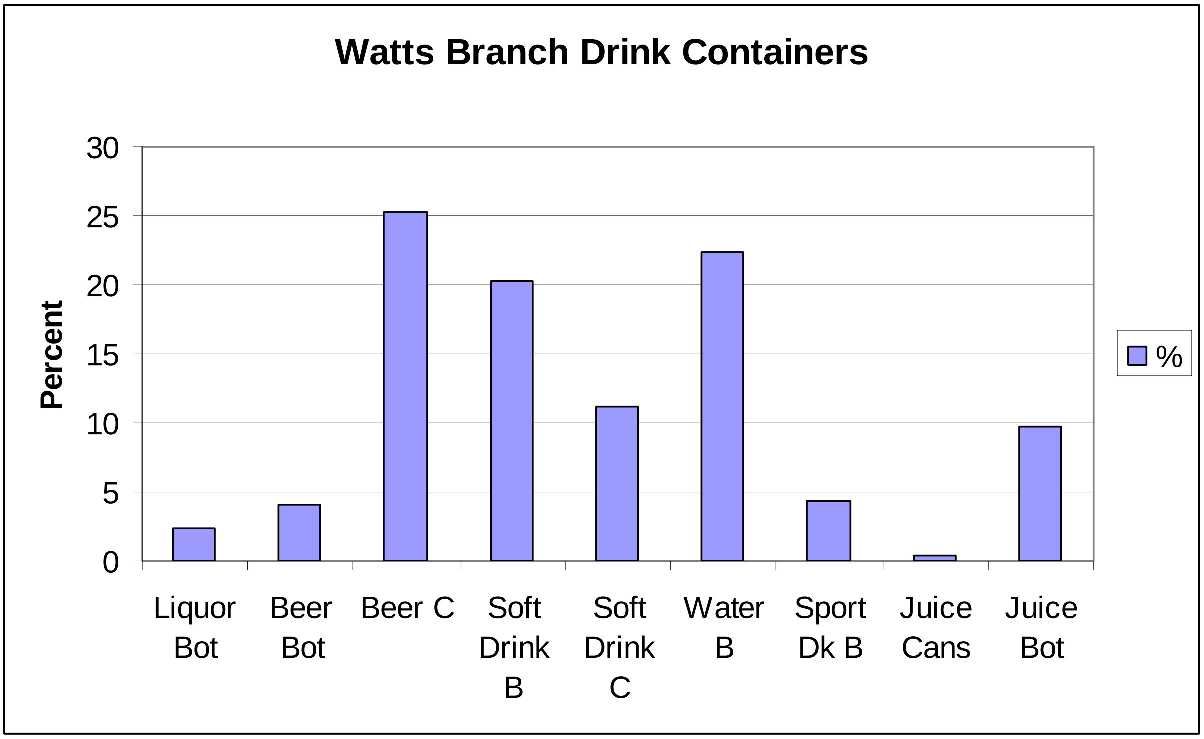
Figure 3.2.35
Paper bags and debris left where drug and alcohol users loiter

Figure 3.2.36
Drug paraphernalia found near streambed

Figure 3.2.37
Trash found in the streambed

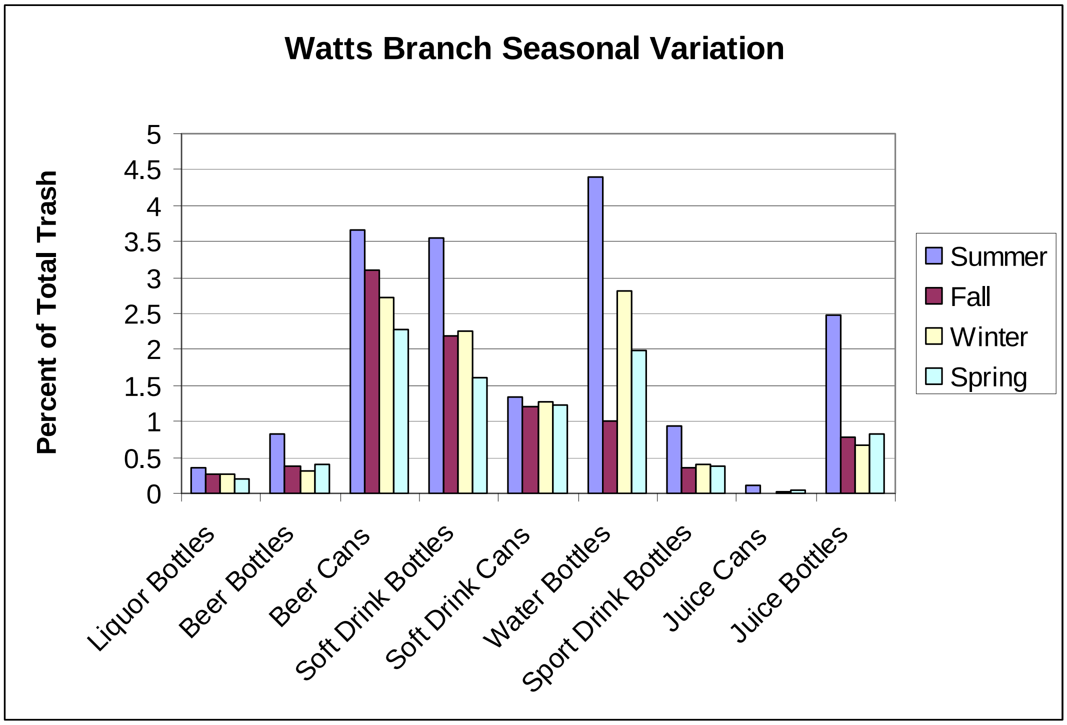
There are many myths about trash, and one of them is the belief that the bottles and cans are all from beer drinkers. The number of water bottles was the most surprising discovery. The truth is interesting (Figure 3.2.38).

Figure 3.2.38
Watts Branch – Drink Containers



One can inspect the seasonal variation of the bottles (Figure 3.2.39) to see if there is a strong seasonal signal, and it appears that there was a significant decrease during the November survey, although this may be an artifact of reduced counts due to the tremendous amount of leaves. It was estimated that the counts might be as much as 20% lower due to the leaves present, and, later, when even more forested tributaries were surveyed, the visibility was so bad that all surveying was halted.

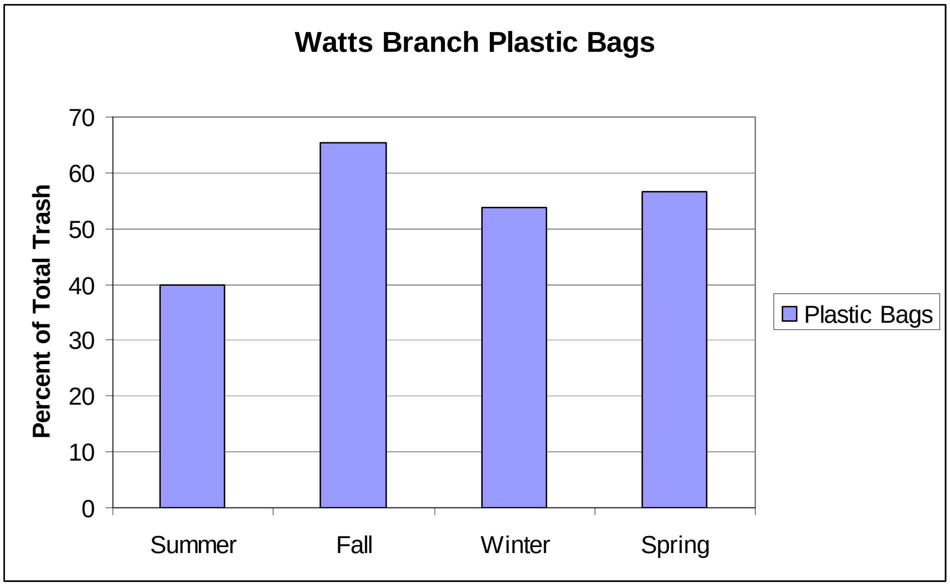
Figure 3.2.39
Watts Branch – Seasonal Variation of Bottles and Cans



Review of the percentage of total observed trash shows that the percentage of the trash that is bottles and cans decreases from the warmer months through the colder months; although, the absolute number remained about the same for the summer, winter and Spring surveys.

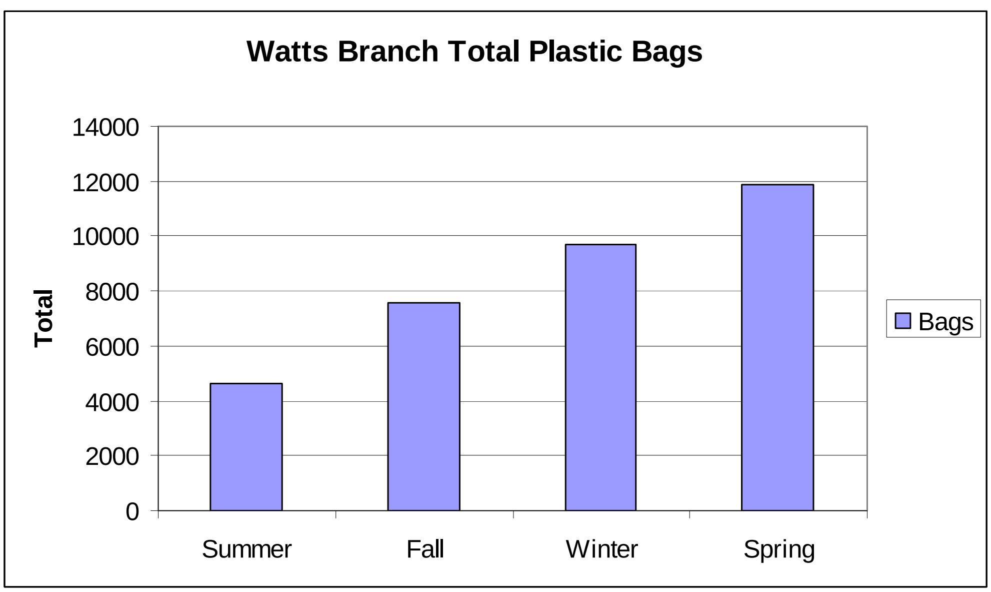
The seasonal composition of plastic bags did not change much, except that being as they are often suspended above the water line, they were more visible to the survey team during the Fall survey. (Figure 3.2.40).

Figure 3.2.40
Watts Branch – Plastic Bags



The total amount of plastic bags in Watts Branch doubled over the survey period, even though the portion that was plastic bags remained relatively constant (Figure 3.2.41).

Figure 3.2.41
Watts Branch – Total Plastic Bags



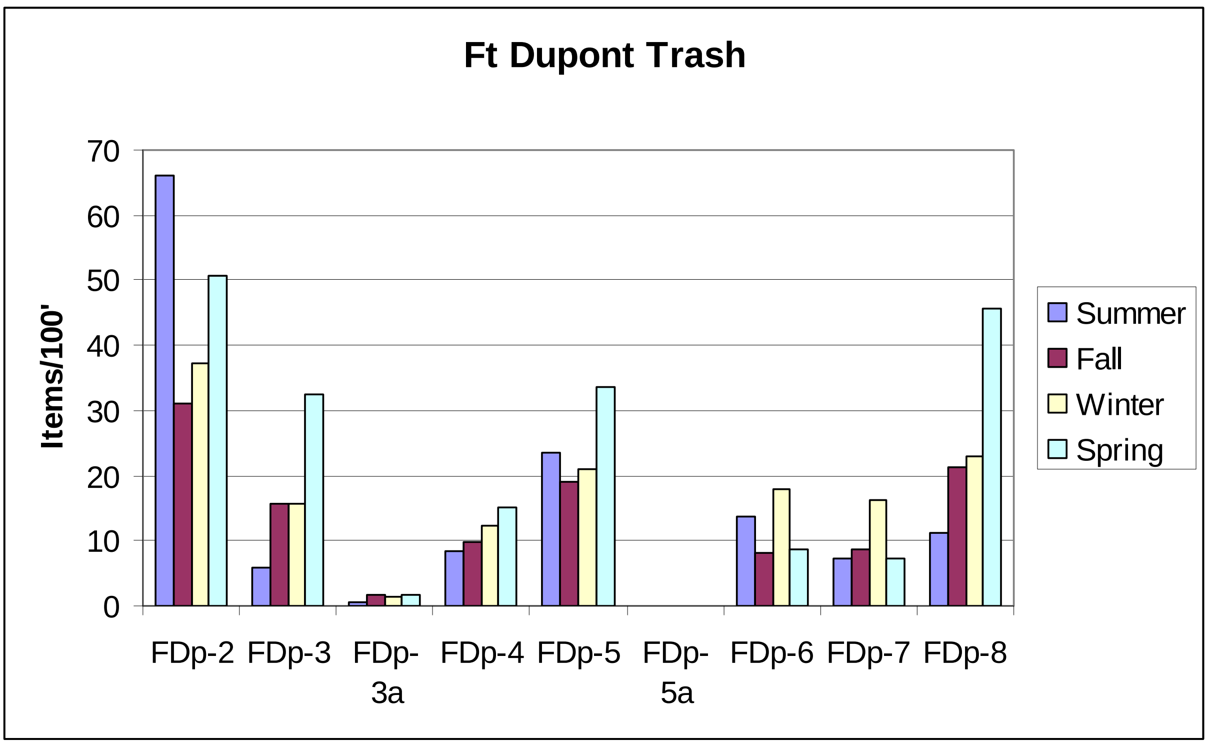
There is one plastic bag for every 1.2 feet of stream.

Fort DuPont

Fort DuPont drainage basin is predominantly parkland, and much of the stream is relatively clean, with trash counts below 20 items per 100 feet. The two small tributaries are very clean since they have no storm sewer outfalls emptying into them.

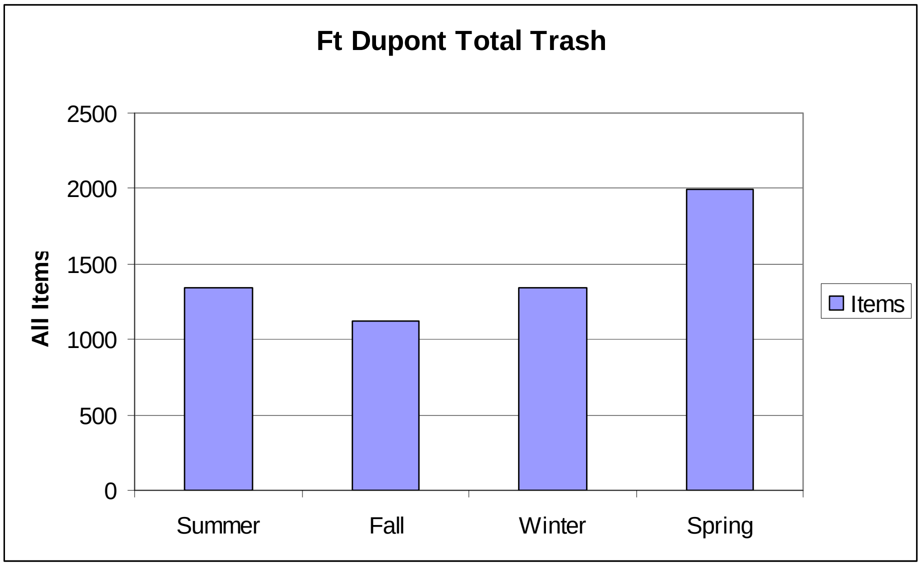
Segment 1 was not monitored because it was dry, so the survey started with FDp-2. There are a few storms sewers which discharge to FDp-1 and 2, but none to FDp-3 and FDp-4. The levels of trash decrease significantly as the distance from the storm sewer discharges increases. The tributary has very little trash. Trash levels increase again in FDp-5 because of unmapped storm sewer outfalls serving Ft Davis Drive. The little tributary FDp-5a has no trash. Trash levels continue to decrease in the next two segments and then increase in the segment below Minnesota Avenue because of the storm sewer outfalls. (Figure 3.2.42).

Figure 3.2.42
Ft. Dupont - Trash



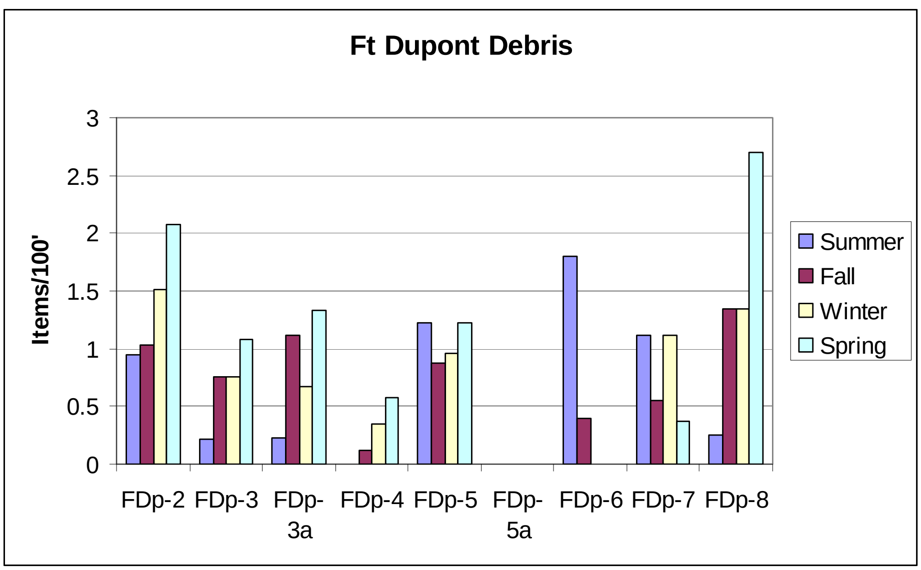
Total trash behaved much as in Watts Branch, with a large increase in the fourth quarter (Figure 3.2.43).

Figure 3.2.43
Ft. Dupont – Total Trash



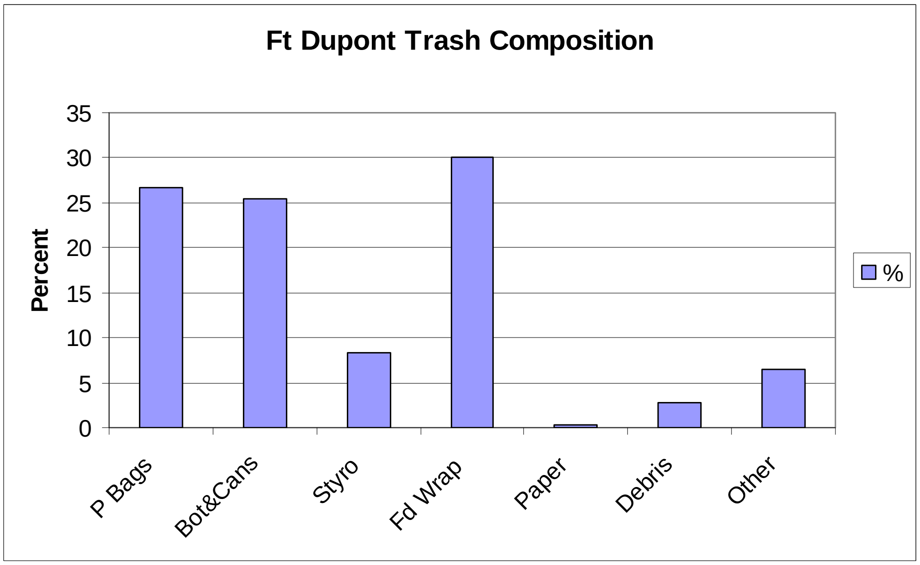
The levels of debris increased dramatically in the fourth quarter, particularly in those segments with MS4 discharges (Figure 3.2.44).

Figure 3.2.44
Ft. Dupont – Debris



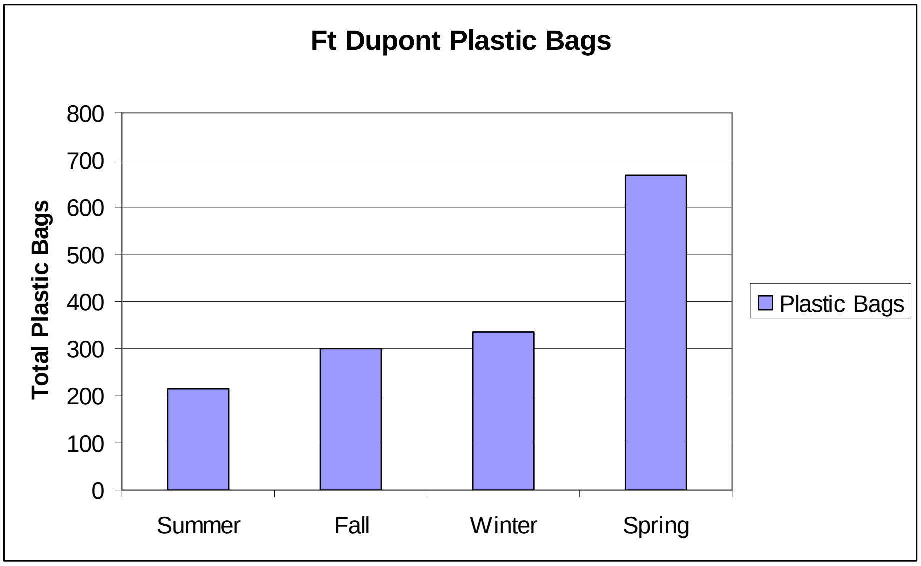
About 80% of the trash is the same four categories with paper being very low (Figure 3.2.45).

Figure 3.2.45
Ft. Dupont – Trash Composition



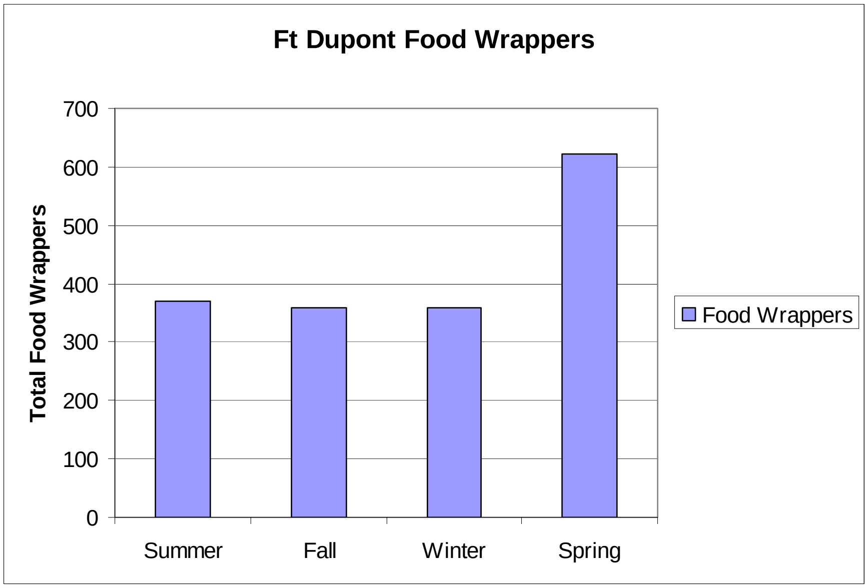
Even with only a few storm sewers, the level of plastic bags tripled with time (Figure 3.2.46).

Figure 3.2.46
Ft. Dupont – Plastic Bags



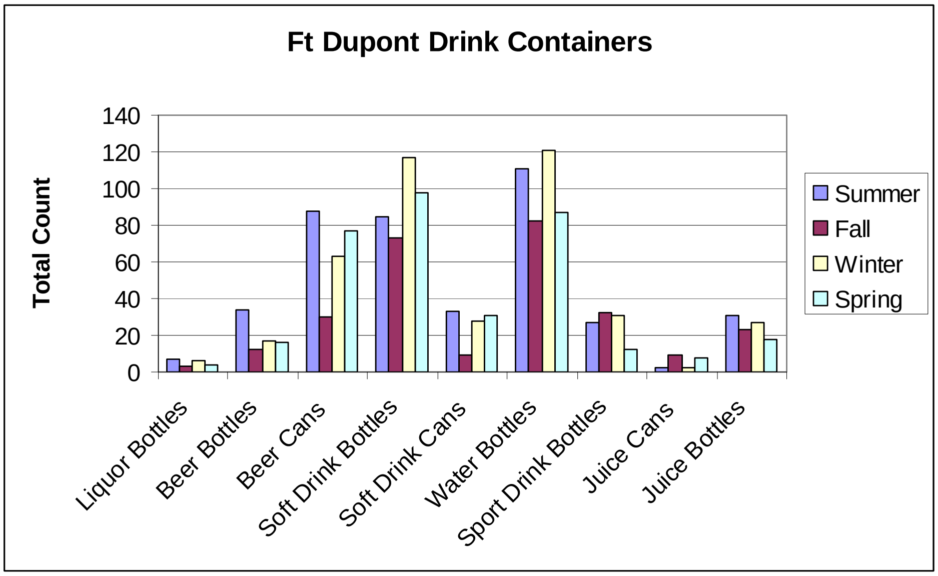
The food wrappers are plastic and are transported the same as plastic bags. They are, in fact, simply form fitted plastic bags. The amount of these in the streams is phenomenal (Figure 3.2.47).

Figure 3.2.47
Ft. Dupont – Food Wrappers



The ratio of the different bottles is about the same as other streams except that soft drink cans are a little lower (Figure 3.2.48).

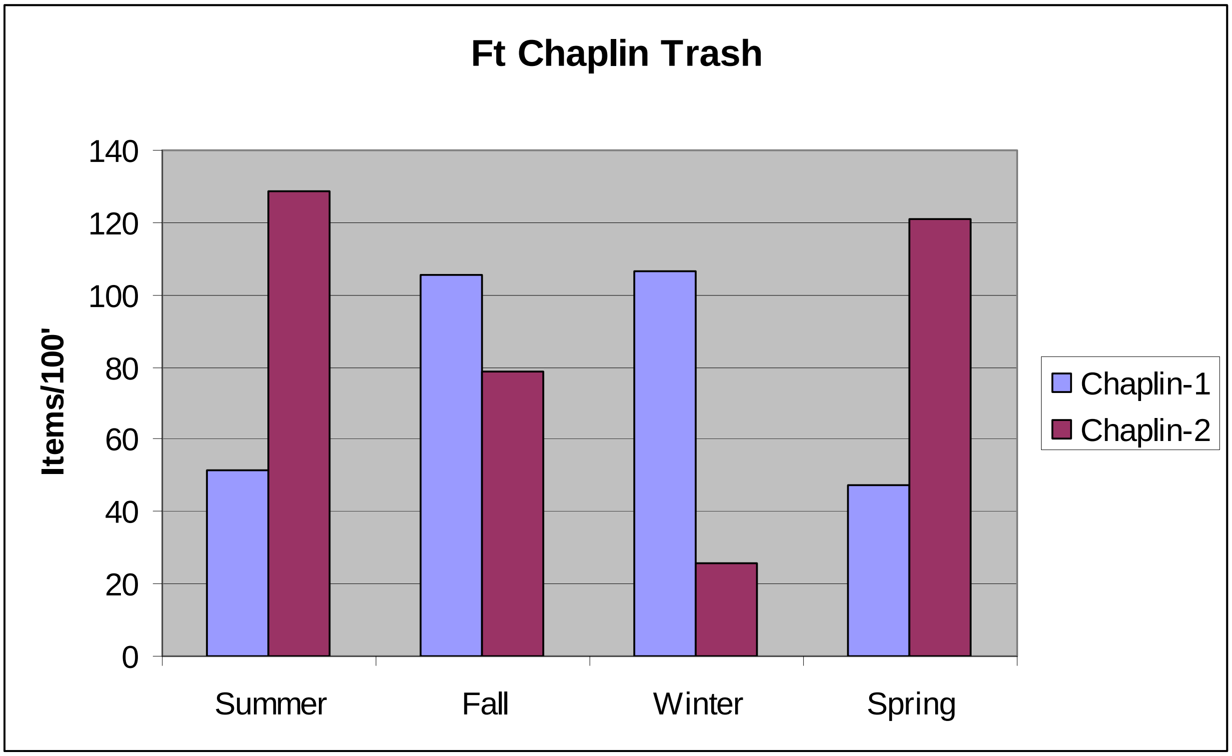
Figure 3.2.48
Ft. Dupont – Drink Containers



Fort Chaplin

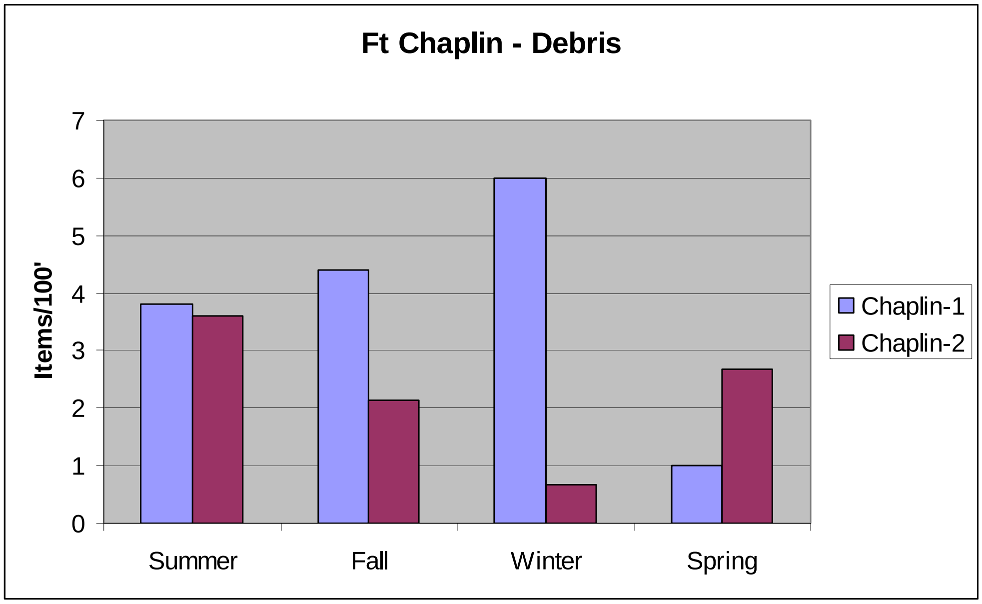
Interestingly, the two segments of Ft. Chaplin displayed exactly the opposite trend with the upper section being high in the middle quarters and the lower segment being higher in the summer and spring. Total trash in the stream was relatively constant (Figure 3.2.49).

Figure 3.2.49
Ft. Chaplin – Trash



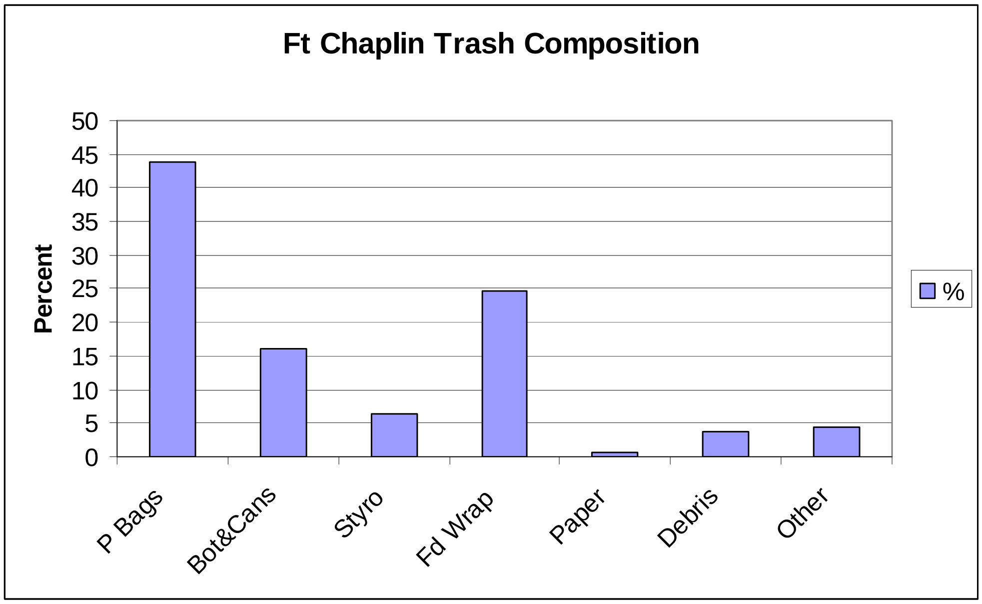
The storm of May, 2008 appears to have shifted the debris from segment 1 to segment 2 (Figure 3.2.50).

Figure 3.2.50
Ft. Chaplin – Debris



The stream is dominated by plastic bags and the four food and drink related items are 90% of the trash (Figure 3.2.51).

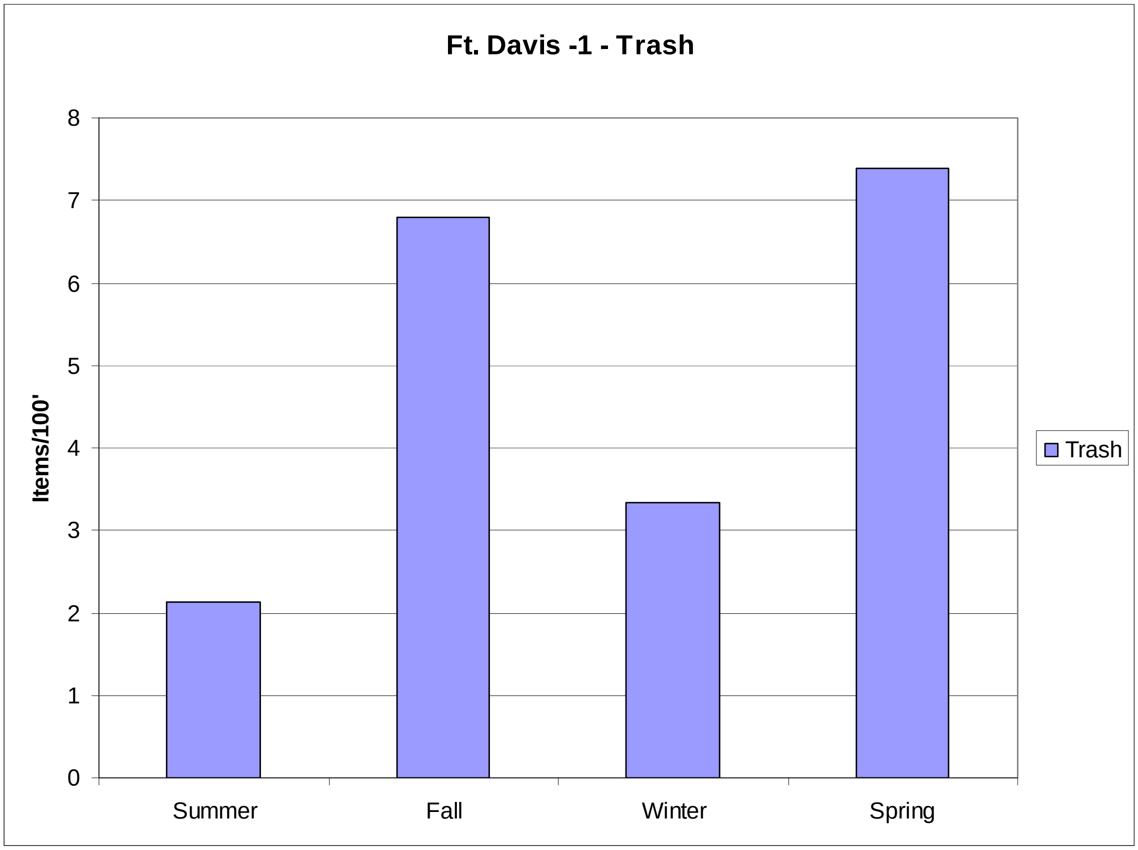
Figure 3.2.51
Ft. Chaplin – Trash Composition



Fort Davis

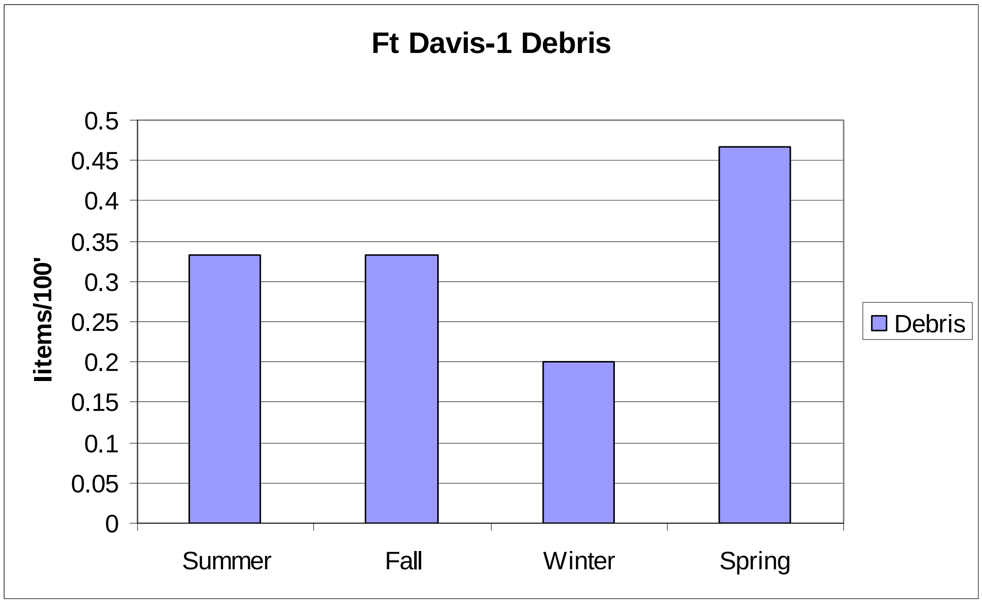
Fort Davis -1, which runs along Pennsylvania Avenue, is a pleasant and clean little stream. A beaver had attempted to colonize it at one time, but no longer lived there. Instead of containing 250 pieces of trash per hundred feet, there are only about 5 pieces (Figure 3.2.52).

Figure 3.2.52
Ft. Davis-1- Trash



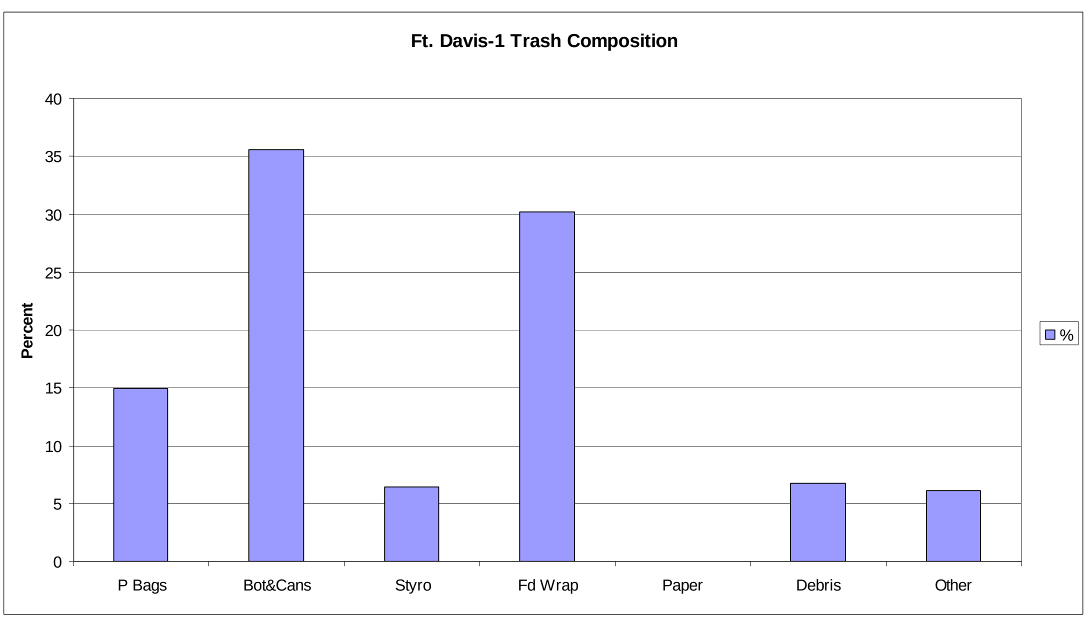
The amount of debris in the stream is only about 5 pieces over a 1500 foot length.

Figure 3.2.53
Ft. Davis – 1 – Debris



In this stream bottles and cans predominate, possibly because there is little pedestrian activity, but mostly commuter traffic along Pennsylvania Avenue. There was absolutely no paper of any kind ever found in this stream (Figure 3.2.54).

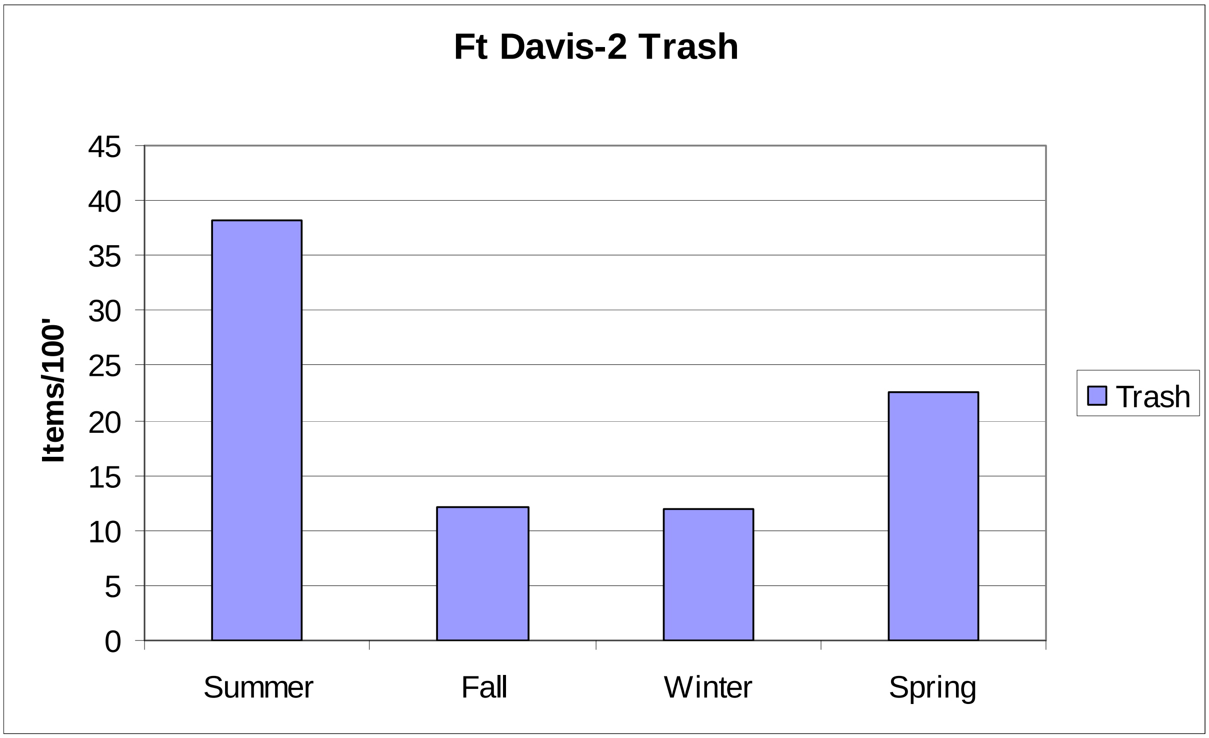
Figure 3.2.54
Fr. Davis – Trash Composition



Fort Davis - 2

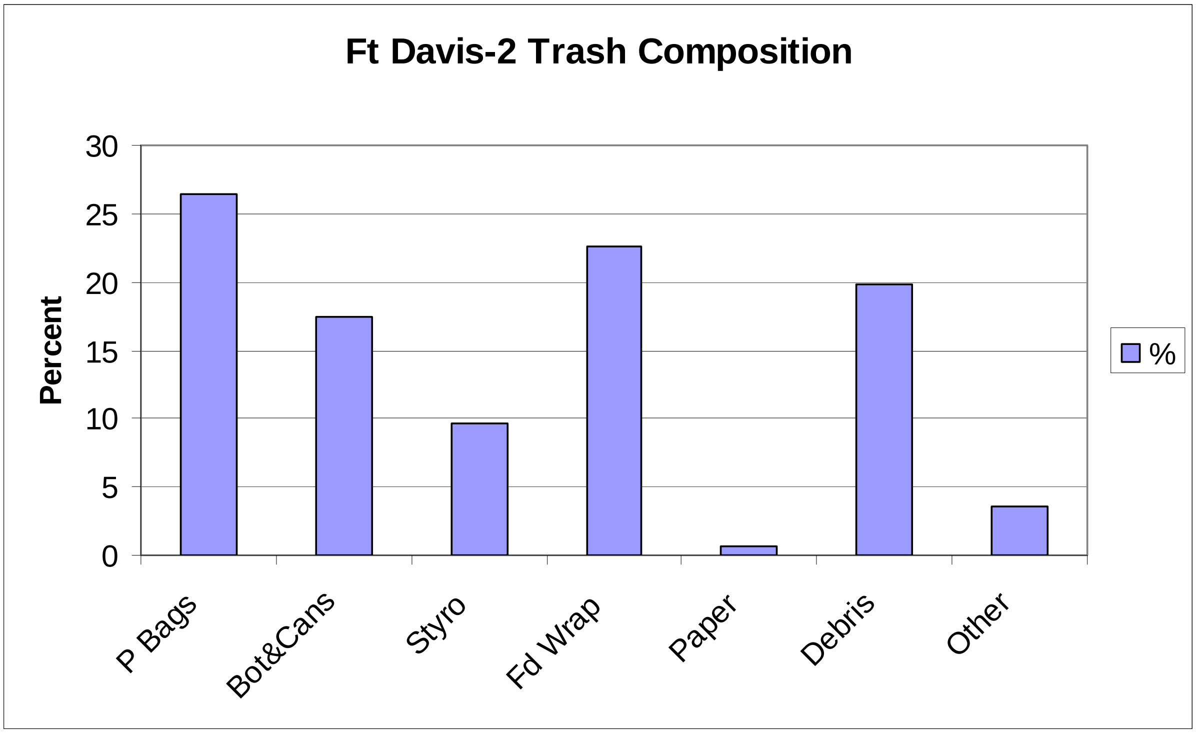
The stream along Branch Avenue varies between moderate levels of trash to fairly low levels. Access is difficult and the banks are severely eroded. Trash levels were higher in the summer and spring (Figure 3.2.55).

Figure 3.2.55
Ft. Davis – 2 – Trash



Because the stream is relatively protected by a buffer strip of forest, there is very little variation in the amount of debris. Larger material tends to remain, and the smaller material moves or gets buried. A significant amount of debris has probably been there for decades and there are a significant number of old tires (Figure 3.2.56).

Figure 3.2.56
Ft. Davis – 2 – Trash Composition

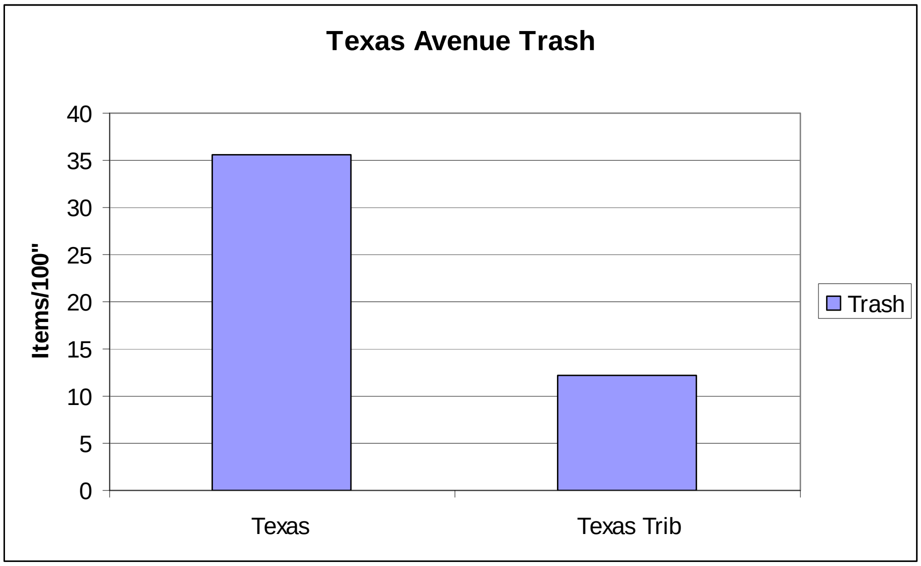


Once again four items account for 70% of the trash. Paper products are basically absent. Because the general level of trash is moderate the percentage of debris is a bigger number even though there is not a lot of debris.

Texas Avenue Tributary

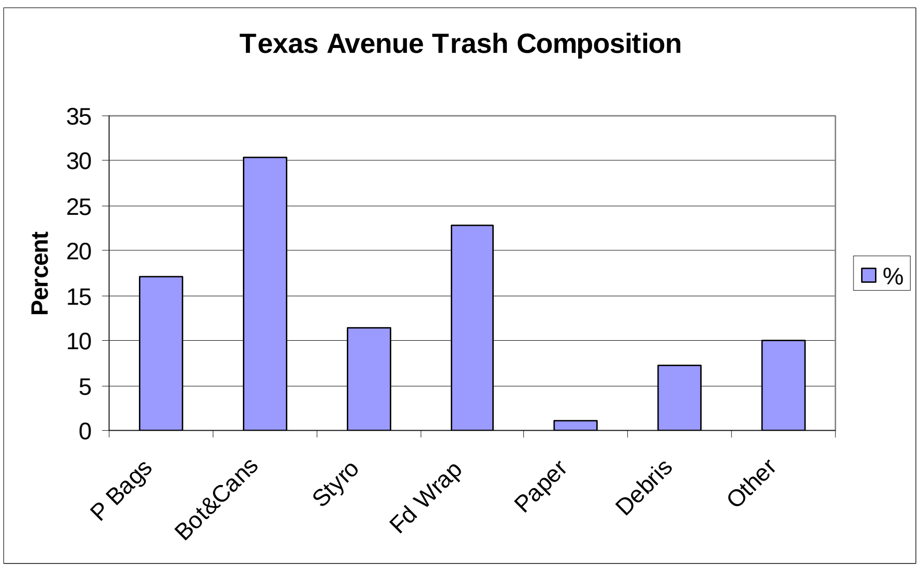
The Texas Avenue Tributary was only surveyed in the Spring. The main stem of the stream has more trash than the tributary arm because it receives most of the storm sewer inputs (Figure 3.2.57).

Figure 3.2.57
Texas Avenue – Trash



The big four comprise 75% of the trash items, and paper products are minimal. "Other" was a bigger category than normal and is mostly plastic cups (Figure 3.2.58).

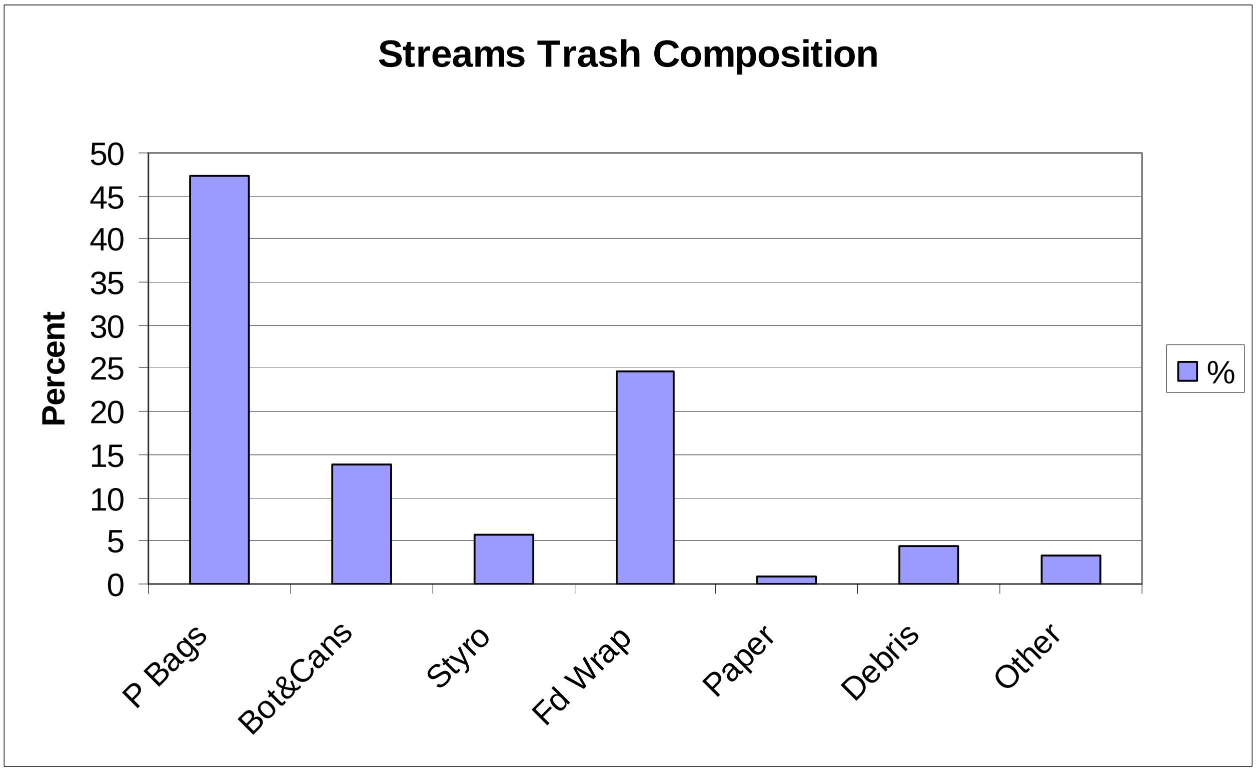
Figure 3.2.58
Texas Avenue – Trash Composition



Composite of All Stream Data

Summing up the trash by category for all of the stream segments surveyed provides an overview of the situation. Of course, this composite is dominated by Watts Branch which is large compared to the rest of the streams. Plastic bags dominate the streams at 47% of the total, with the snack wrappers comprising a quarter of all items. Bottles and cans are 15 % of the problem followed by Styrofoam at 6 %. These four items are 93% of the trash. Paper products simply are not a factor (Figure 3.2.59).

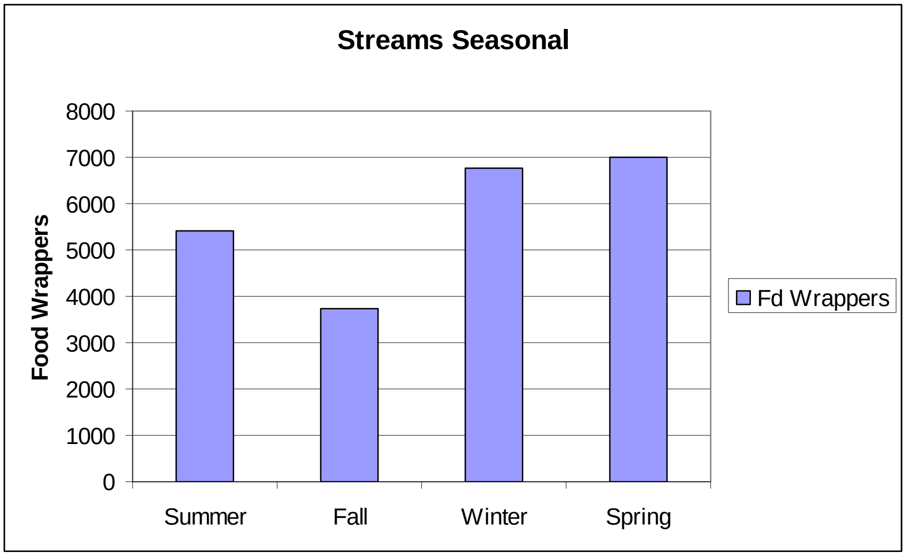
Figure 3.2.59
Stream Trash – Composition



In terms of raw numbers, there were over 14,000 plastic bags counted in the spring survey. During the one year of the study, the number doubled.

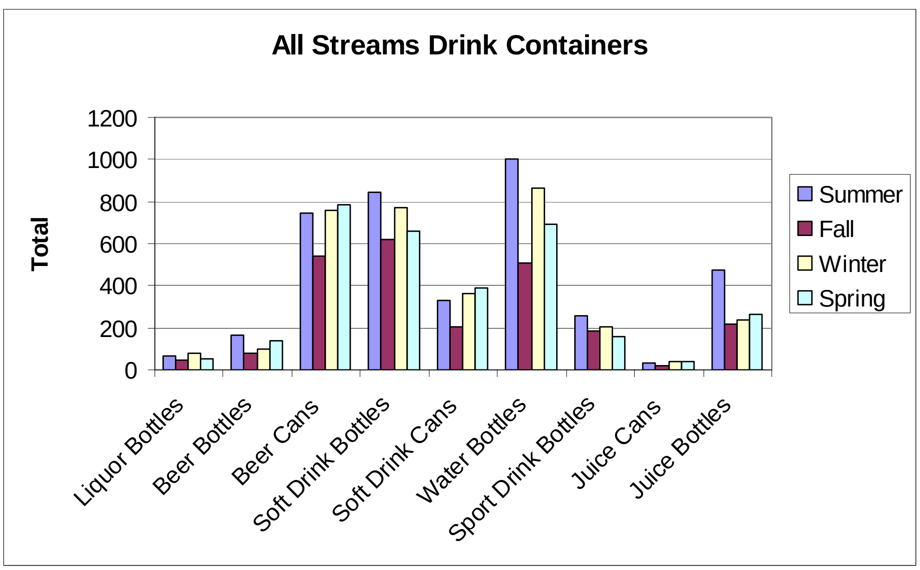
The occurrence of food wrappers was examined to determine if there was a seasonal signal, and a decrease in the fall was found (Figure 3.2.60).

Figure 3.2.60
Streams Seasonal



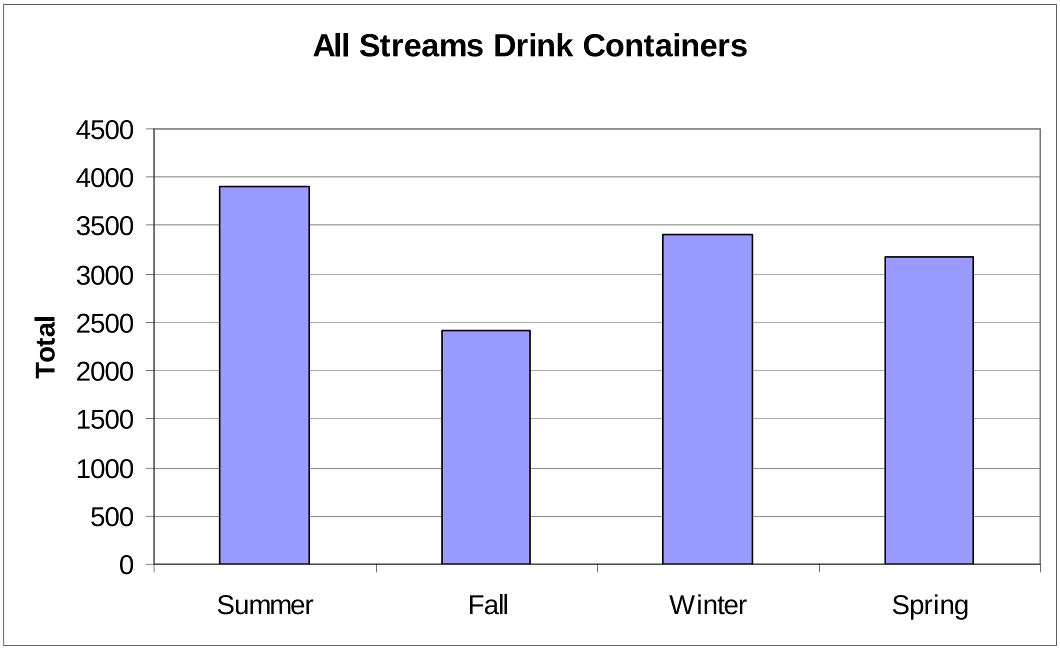
Interestingly, the number of bottles and cans showed the same pattern of decreasing in the fall as did the food wrappers. It is not known why this occurs, but two explanations are: people are not outside in the cold weather to litter as much, or they are just more difficult to count with a lot of leaves present (Figure 3.2.61).

Figure 3.2.61
All Streams – Drink Containers



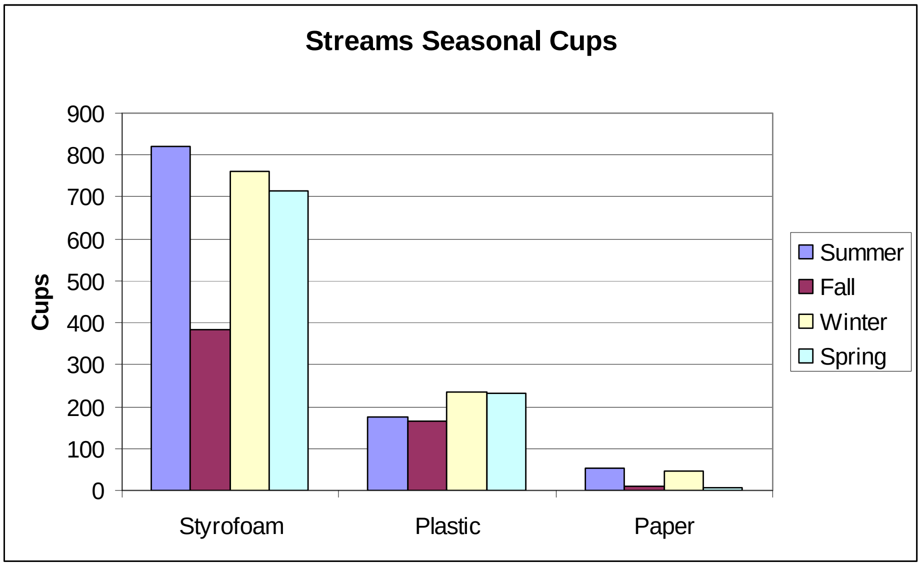
The ratio of beer cans to beer bottles in the streams is 7 to 1 (Figure 3.2.62). This fact will become important in the discussion of broken pieces of glass, and in the land transect data analysis presented later in the chapter.

Figure 3.2.62
All Streams – Drink Containers



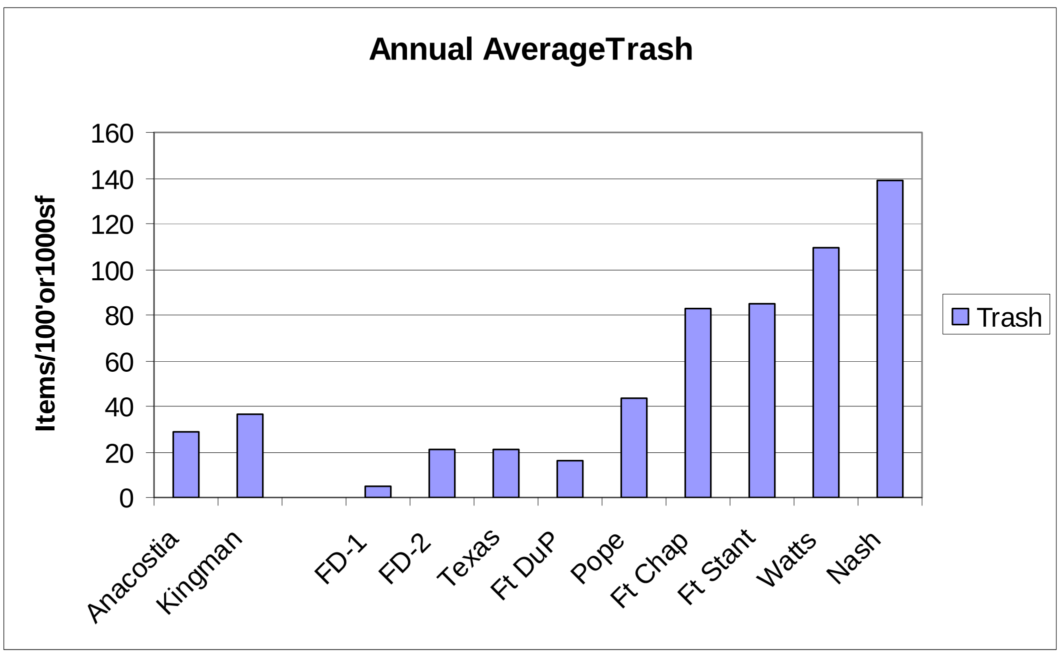
Cups showed the same decrease in the fall, as did the food wrappers and bottles and cans (Figure 3.2.63). It would seem that there was a general decrease in the amount of food and beverage litter.

Figure 3.2.63
Streams – Seasonal Cups



The average annual average trash levels of each stream are shown in Figure 3.2.64. The two Fort Davis tributaries, Texas Avenue and Fort Dupont, are relatively clean streams. The worst streams are Fort Chaplin, Fort Stanton, Watts Branch and Nash Run. The data for the Anacostia River and Kingman Lake only represent the intertidal zone and only one side of the river.

Figure 3.2.64
Annual Average Trash



Glass

All streams have a Designated Use of Class B in the DC Water Quality Standards. This means the streams should be suitable for wading. The presence of broken glass is an impairment of that use because of the hazards to injury. Glass is not a natural component of the streams and, therefore, falls into the category of trash. However, there was no known method of accurately counting the hundreds of thousands of pieces of broken glass. During the monitoring, an estimate was taken from each stream segment of the amount of visible glass piece per square foot of stream channel. This estimate is only of the glass visible on the surface. It was noticed that the glass was usually only found in the sand and gravel bars and was not found in fine-grained muddy and silty bottoms. The hydraulic characteristics of glass must be similar to pea gravel.

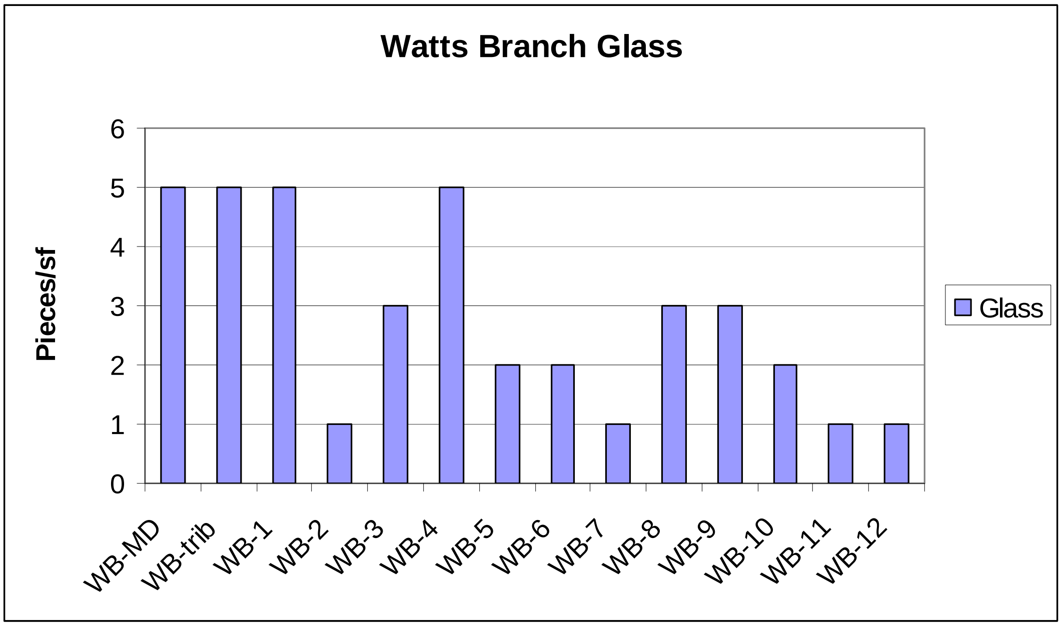
The scientific validity of the data is debatable, but it gives a qualitative understanding of the issue that affects the aesthetic value and the recreational use of the stream, and, most importantly, it is a form of litter. Much of the glass is colored green or brown. The discrepancy between the ratio of beer can counts and beer bottle counts on the land versus those in the stream can be explained by the fact that the glass represents the missing glass bottles. Table 3.2.1 below shows the pieces of glass per square foot of stream bottom.

Table 3.2.1
Pieces of glass per square foot of stream bottom

Watts Branch	
WB-MD	5
WB-trib	5
WB-1. Southern – 61 St	5
WB-2. 61St - 58 St	1
WB-3. 58 St – 55 St	3
WB-4. 55 St – Division Ave	5
WB-5. Division Ave – 50 St	2
WB-6. 50 St – 48 St	2
WB-7. 48 St – 44 St	1
WB-8. 44 St – Hunt Pl	3
WB-9. Hunt Pl – Kenilworth Ave	3
WB-10. Kenilworth Ave – Footbridge	2
WB-11. Footbridge – 1000'	1
WB-12. Station 11 – Tributary	1
Fort Stanton	
FS-1 Mainstem	1
FS-2 North Trib	1
FS-3 South Trib	3
Nash Run	
NR-1. I-295 – Pipe	1
NR-2. Pipe – Anacostia Ave	1
Popes Branch	
PB-1. 35 St – Branch Ave	0
PB-2. Branch Ave – Minnesota Ave	0
PB-3. Minnesota Ave – Fairlawn Ave	0
Fort Dupont	
FDp-2. Footbridge –	3
FDp-3. Segment 3 – Tributary Junction	1
FDp-3a. Trib Junction – ~Ft Davis Dr	0
FDp-4. Trib Junction – ~Ft Davis Dr	0
FDp-5. Ft Davis Dr – meadow	0
FDp-5a. Lower Tributary	0
FDp-6. Meadow – Path	0
FDp-7. Path – Minnesota Ave	1
FDp-8. Minnesota Ave – Railroad	1
Fort Chaplin	
FC-1. Headwater – 1000'	1
FC-2. Segment 1 – C St	2
Fort Davis-1	1
Fort Davis-2	0
Texas Ave Mainstem	1
Texas Ave Trib	0

A stream segment 1000 feet long and 10 feet wide with a glass count of 5 pieces per square foot would have 50,000 pieces of visible glass. Looking at the distribution of glass in Watts Branch, (Figure 3.2.65), it shows that, as the stream gradient lessens, the amount of glass decreases. There is no estimate of the amount that is not visible.

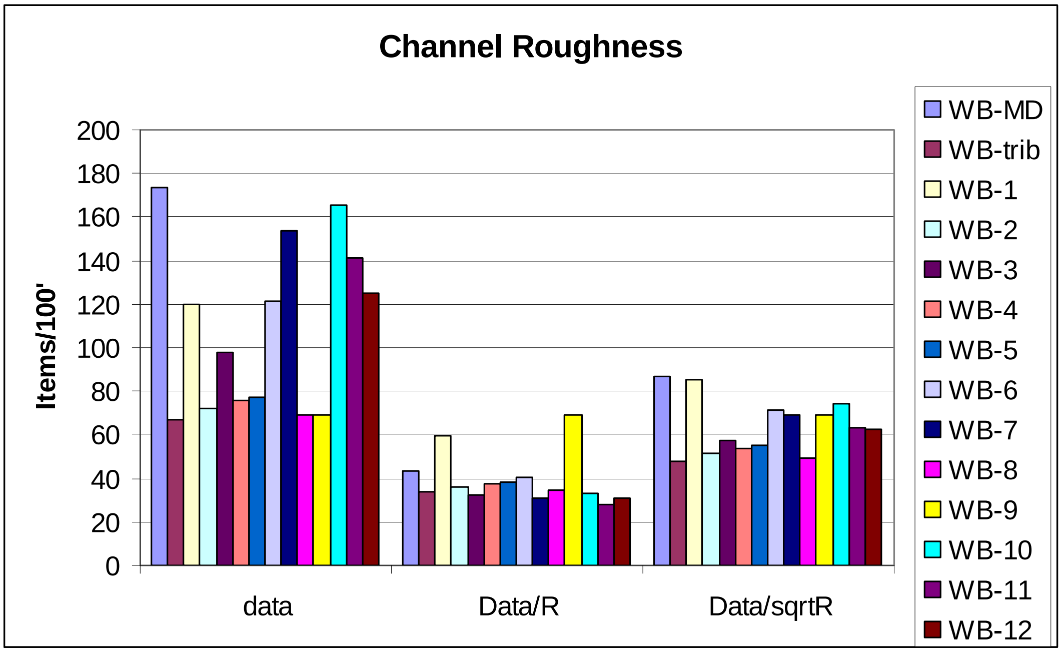
Figure 3.2.65
Watts Branch – Glass



Channel roughness.

Each stream segment had the channel rated from 1 to 5 to provide an estimate of the likelihood of a piece of trash being retained or snagged. This was simply an experimental indexing technique to try to better understand the effects of the stream morphology on the trash counts. Figure 3.2.66 shows the segments of Watts Branch. The first group of bars on the left ("data") is the raw data in pieces of trash per 100 feet. The second group of bars in the middle ("Data/R") depicts the first group divided by the channel rating factor for each segment. The last group of bars on the right ("Data/sqrtR") shows the first group divided by the square root of the channel rating factor for each segment. Using the square root minimized the judgment of the rater and makes a more accurate indicator. It appears that there is some fundamental relationship between the trash retained and the "roughness" of the channel.

Figure 3.2.66
Channel Roughness



Logjams and natural trash straining blockages were also inventoried but did not provide a good index even though they do trap a lot of trash (Figure 3.2.67).

Figure 3.2.67
Trash in logjam

Even the beaver had to put up with trash when constructing his dam on Watts Branch.

Figure 3.2.68
Trash in Watts Branch beaver dam

Paper Products

Because the absence of paper items in the stream was so pronounced, it was decided to investigate the durability of paper in water. It was believed that the sanitary engineering jar test procedure would be appropriate. A paper bag such as would be received with a single beer can and a white paper receipt were placed in a jar of water and observed.

The glue on a paper bag dissolved within ten minutes, and the bag opened up and became a sheet of brown paper. Within 30 minutes the structural cohesiveness of the paper was weakened to the point that it could not be lifted from the water without tearing.

After one hour the jar was shaken for two minutes and observed. The bag and receipt were reduced to pieces of about two inches square or less as shown in Figure 3.2.69.

Figure 3.2.69
Jar Test -one hour

The jar was allowed a quiescent period of one more hour and shaken for two minutes again. The paper separated into even smaller pieces as shown in Figure 3.2.70.

Figure 3.2.70
Jar Test two hours

It is concluded that a paper bag lying in the gutter of a road will not survive the rainfall and being transported down the concrete curb and gutter and falling into the catch basin. It will be macerated with other trash, sticks and sand. Then, from the catch basin, it travels down the concrete sewer to where empties into the stream. A plastic bag was subjected to the jar test and showed no changes. It is concluded that only the plastic bags will survive such a high energy transport along the curb, into the catch basin, and down the sewer into the stream.

Weight

The weight of a small plastic bag is about a tenth of an ounce. There were about 14,000 plastic bags counted in the streams the last quarterly survey. This is a weight of 87.5 pounds. Four tires without wheels would weigh more than all of the plastic bags combined, but the aesthetic blight caused by four tires is very small compared to that caused by the plastic bags.

3.3 Land Use Data Interpretation

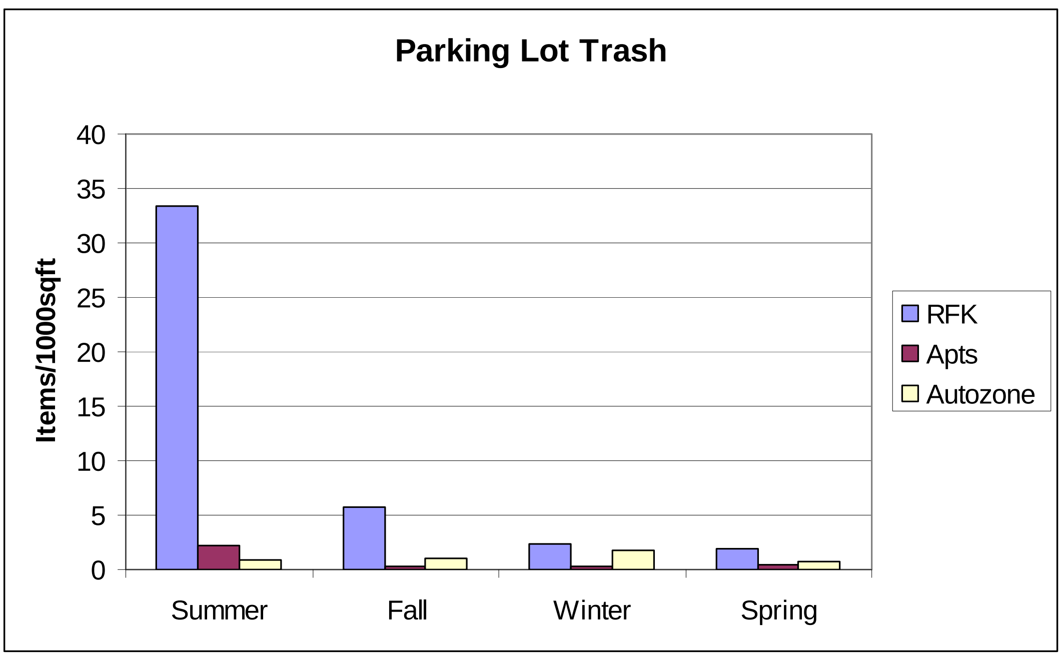
Introduction

There were twenty-five land use transects surveyed quarterly. Of these, there were ten streets, three bridges, three parking lots, a bus stop, two schools, and six recreational areas. Detailed counts of trash were made using the same categories as for the streams.

Parking Lots

Three different parking lots were surveyed. One was the Robert F. Kennedy (RFK) stadium parking lot and that transect was the grass strip between the parking lot and the bike path. The auto parts parking lot was surveyed because of the tremendous amount of un-validated information concerning the runoff from those types of parking lots. The third parking lot was located in a high density residential complex.

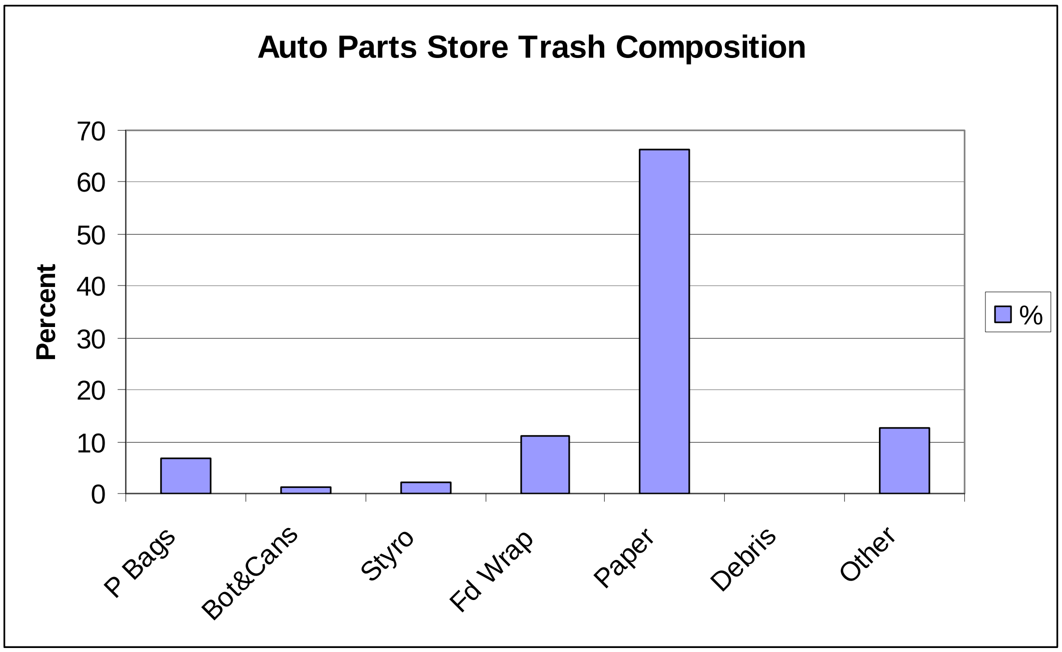
Figure 3.3.1
Parking Lot Trash



The transect at the RFK stadium parking lot had 135 snack wrappers counted the first quarter but this level dropped to 17 in the fall and then down to only one and back up to 5 during the last survey. Exactly why there was such a large amount during the first survey is unknown but may be connected to the recent construction of the bike path. Perhaps a temporary construction fence had trapped the snack wrappers and after the fence was removed, the transect was surveyed before the site was cleaned up by the maintenance staff. The other anomaly at RFK was the persistent amounts of “Home Food Packaging”. Items such as sardine and Vienna sausage cans were very high compared to any other transect surveyed. It should be noted that RFK parking lot is used for the Farmers Market on weekends and during the week it is used as a staging area for the massive Benning Road reconstruction project.

The auto parts store parking lot had about 1 piece of trash per 1000 square feet.

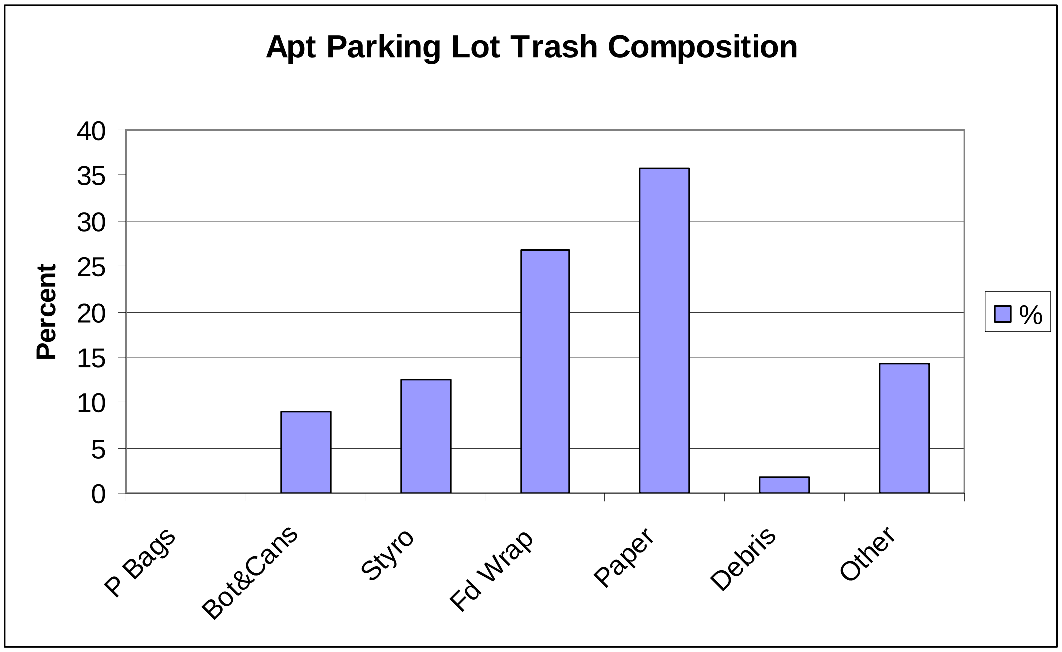
Figure 3.3.2
Auto Parts Store Trash Composition



Two items of interest are that the debris level is zero (which means that there were no actual auto parts) and the other category contains 10% auto part containers such as an oil can or a part packaging although very few fluid containers were actually counted, there simply was not a category called “auto parts packaging” on the survey form. Such stores have policies prohibiting changing oil in their parking lot, but often people will add a quart of oil or transmission fluid and usually they will put the empty container in a trash can. Being as there were very few oil cans/bottles found in the streams and very few in the parking lot there is no evidence to support the myth of streams clogged with used oil containers and that they are coming from these establishments.

The apartment complex parking lot was relatively clean. About eighty percent of the paper products are napkins. This transect has a screened in garbage dumpster for the residents and there is a portion of the total trash that is associated with the dumpster. This phenomenon was observed repeatedly in the study that the act of disposing of garbage creates litter (usually by the resident). Very few plastic bags were found in the three parking lots.

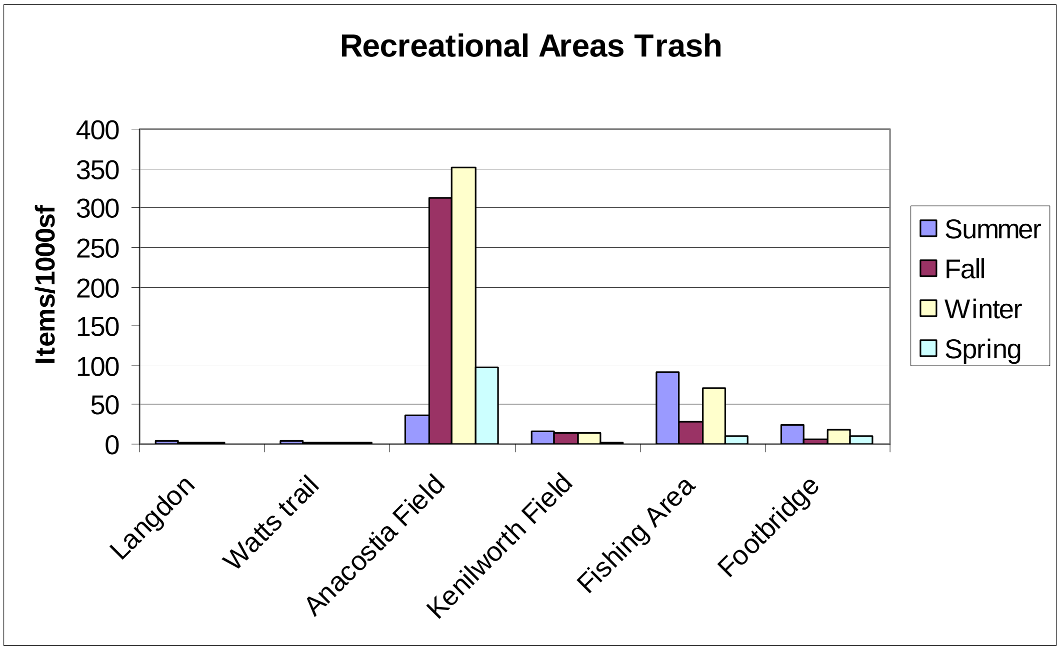
Figure 3.3.3
Apartment Parking Lot Trash Composition



Recreational Areas

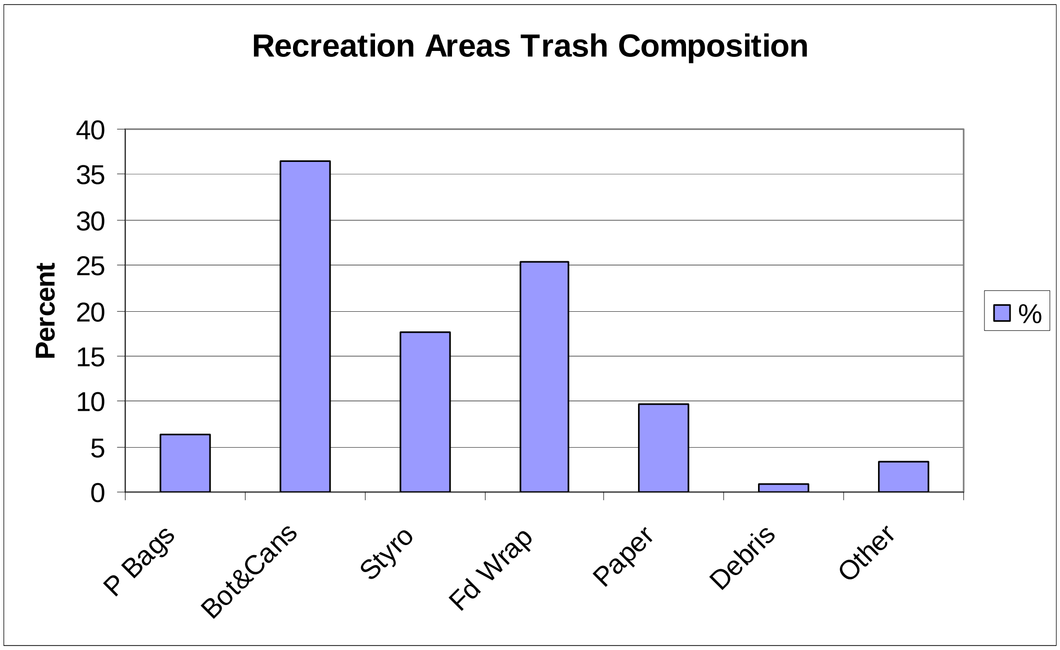
Six recreational areas were surveyed of which three were athletic fields. This included the actual field itself for Langdon Park and the "No Mow" buffer zones behind the spectator sideline areas for the soccer fields in Kenilworth Park and Anacostia Park. It was enlightening to find what was in the buffer zones. A hiker biker path in Watts Branch was surveyed in two places. The presence of men drinking beer early in the morning at the Watts Branch Foot Bridge at the end of Eads Street is an indication of why the foot bridge has a lot of trash while the bike path elsewhere has very low levels. The fishing area in Kenilworth Park was surveyed. Because the National Park Service has crews that manually pick up the trash from the mowed areas it is impractical to survey a recreational field itself that is on NPS property unless the survey is done immediately after it is used. The crews do not pick up trash in the buffer zones and the buffer zone integrate trash over time.

Figure 3.3.4
Recreational Areas Trash



Langdon Field and the Watts Branch bike trail had levels of under 5 pieces of trash per 1000 square feet. The buffer zone at the Anacostia Soccer field had trash levels that increased with time and then immediately before the fourth quarter survey the NPS mowed the buffer zone which removed a lot of trash. Kenilworth Soccer Field and the Kenilworth Fishing area had moderately high levels of trash until the AWS Earth Day cleanup which is held in this area and then they got cleaned up by the volunteers. The foot bridge across Watts Branch showed a similar decrease in trash levels.

Figure 3.3.5
Recreation Areas Trash Composition

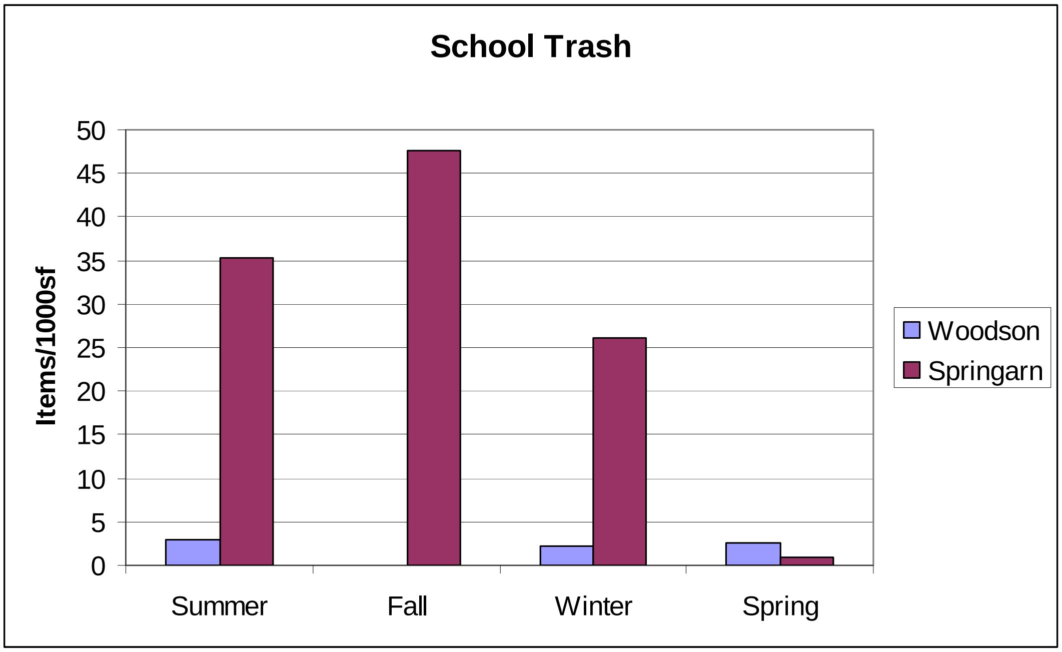


The high level of bottles and cans, Styrofoam containers and snack wrappers is associated with outdoor recreation. Some of the Styrofoam containers were fishing bait containers for night crawlers. About half the drink containers were beer bottles and cans. There is very little debris associated with these areas.

Schools

Two schools were surveyed (Figure 3.3.6). The transect at Woodson High School was on the school grounds where the maintenance staff would have clear responsibility for trash removal. At Springarn High School, the transect was chosen to be across the road from the school and on public space. The Springarn transect was bordered by the Langston Golf Course chain link fence which is very effective for capturing trash.

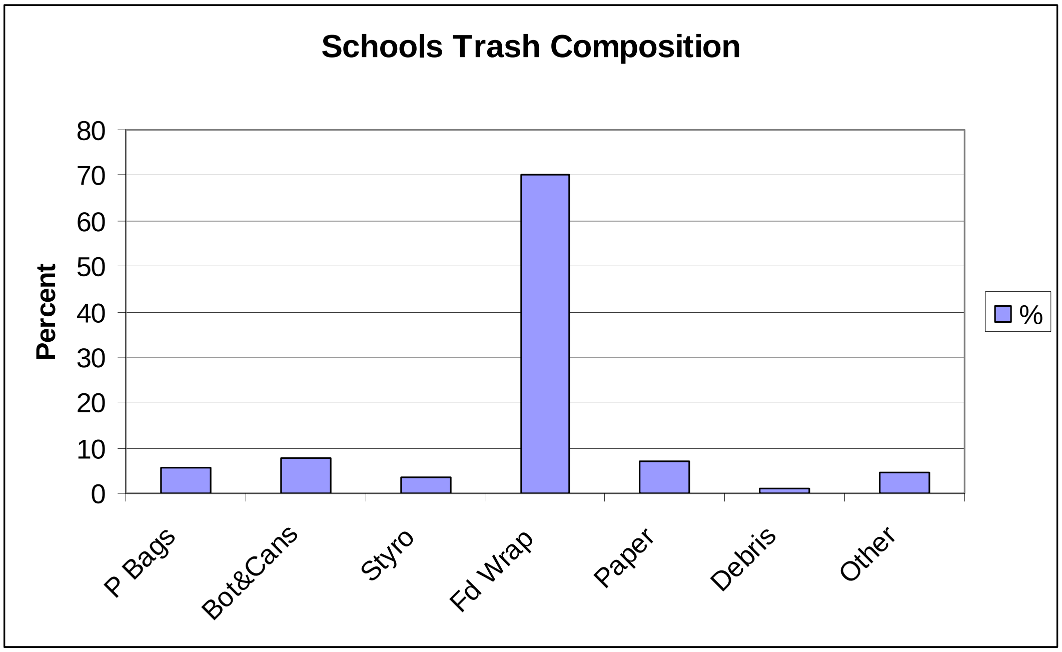
Figure 3.3.6
School Trash



The significant decrease of trash in the transect across the street from Springarn High School may have been due to Earth Day Cleanup activities or it may have been due to the beginning of the grass mowing season. Some people pick up the trash before mowing and other people cut it up with the mower. Being as the survey does not count pieces of trash less than one inch square, the trash shredded by a mower is not counted. Both practices were observed frequently during the study.

The question of what kinds of trash are found at and near a school has been debated for some time. Prior studies have shown that it is part of this group of people who contribute to the general littering problem. Answering that question was a basic purpose of selecting these transects.

Figure 3.3.7
School Trash Composition



Seventy percent of the trash was food wrappers. Unfortunately, their choices of food are not very healthy ones.

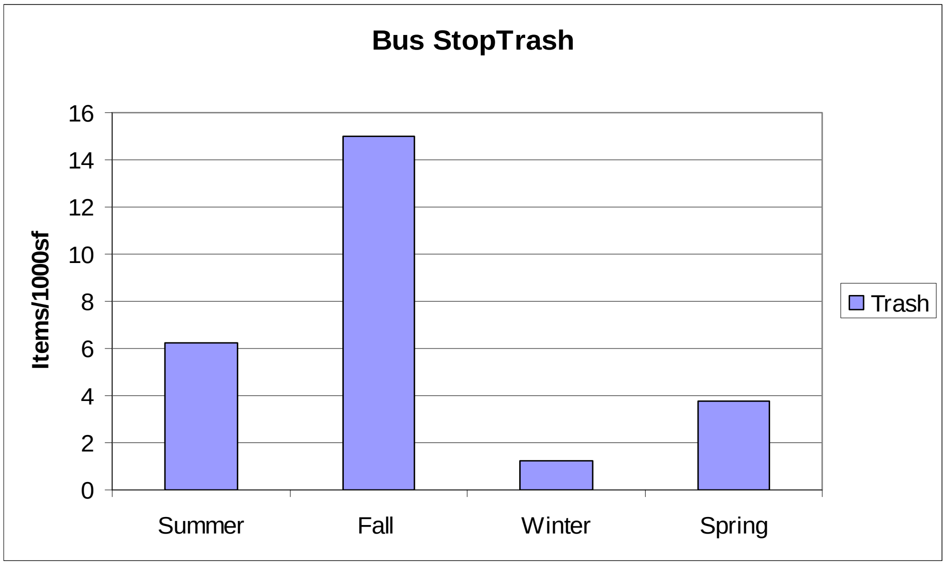
Transportation Facilities

Three major bridges over the Anacostia River were surveyed, one set of bus tops (both sides of Good Hope Road) and ten commercial and residential streets.

<u>Good Hope Road Bus Stop</u>

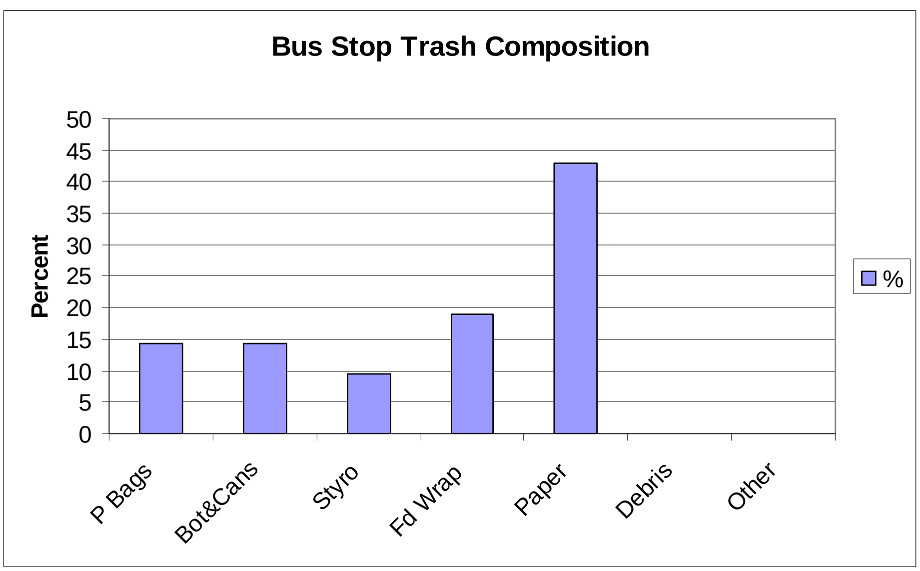
These two bus stops are well maintained, covered facilities with trash cans on both sides of the road. Metro has an Adopt a Stop program and it appears that this is one of them. Someone sweeps it and carefully puts the sweepings in the trash can. This was observed on two occasions and on one occasion the person was observed cleaning up the trash while the team was trying to survey the amount of trash. This phenomenon of trying to count trash while people were trying to pick it up occurred frequently. No attempt was made to adjust the count because of the cleanup. The person was very conscientious and only once was any appreciable amount of trash found.

Figure 3.3.8
Bus Stop Trash



It was assumed that bus stops would be a major source of trash to the waterways; but, this study does not support that. Paper products such as cigarette packaging and napkins are the prevalent items (Figure 3.3.9).

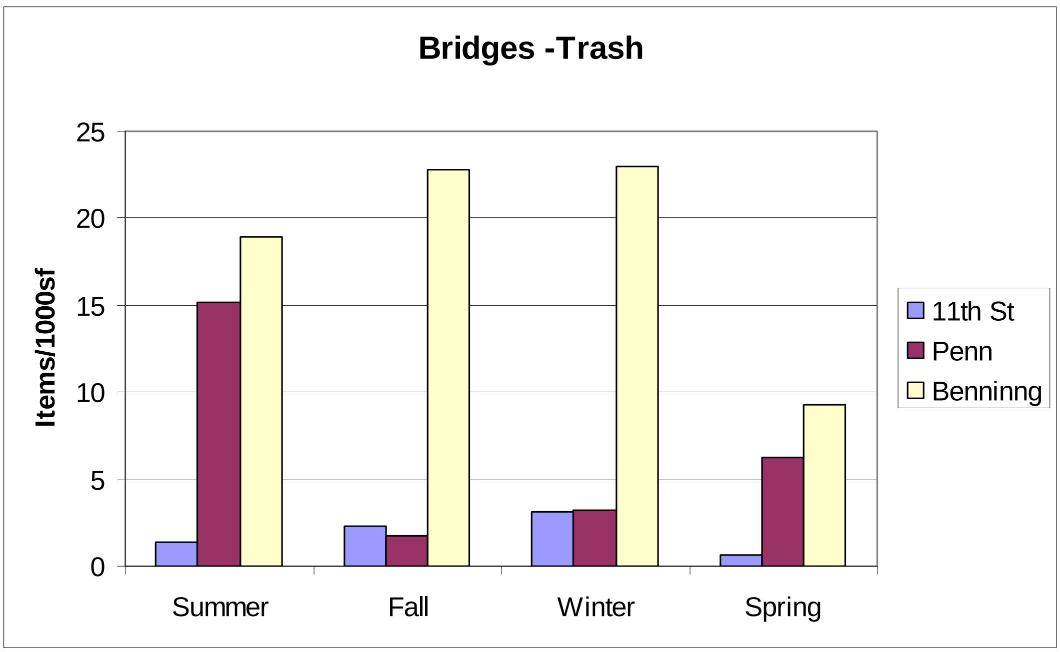
Figure 3.3.9
Bus Stop Trash Composition



Bridges

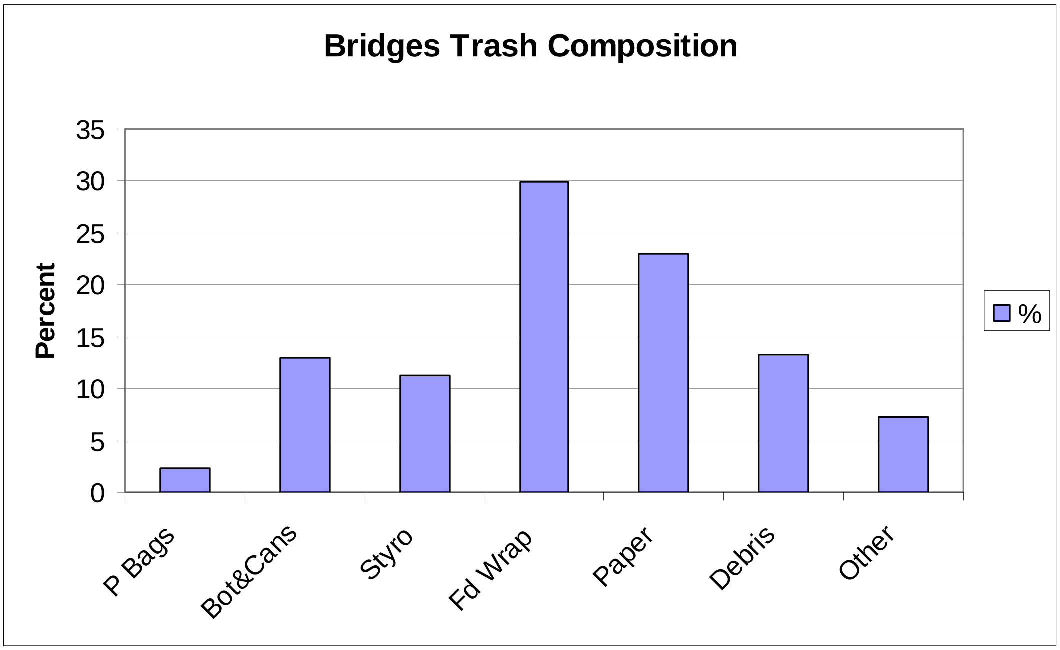
The bridges were surveyed by walking along the pedestrian walkway and counting the trash. Obviously there are two sides of a bridge but each survey counted the upstream side of the bridge. In order to try to normalize the data to an area concept, the length of the bridge surveyed was multiplied time 10 feet which is the approximately the area that the trash actually occupies. To convert to a lineal concept the term "Items/1000 square feet" simply becomes "Items/100 feet".

Figure 3.3.10
Bridges - Trash



The level of trash on the three bridges varies greatly; but, the Benning Road Bridge has significantly more thrash than the other two and the 11^{th} Street Bridge is pretty clean. There is no apparent seasonal pattern (Figure 3.3.10).

Figure 3.3.11
Bridges Trash Composition



It is interesting that the amount of snack wrappers is high, as it appears a lot of people eat and drive. About 7% of the items were cups and if you add that to the bottles and cans then you come up with equal amounts of eating items and drinking items. One third of the bottles and cans were alcohol related. Half of the paper products were napkins and one quarter were smoking related. Two thirds of the debris was small broken pieces of automobiles, less than one square foot in size. A significant amount of clothing was counted.

Streets

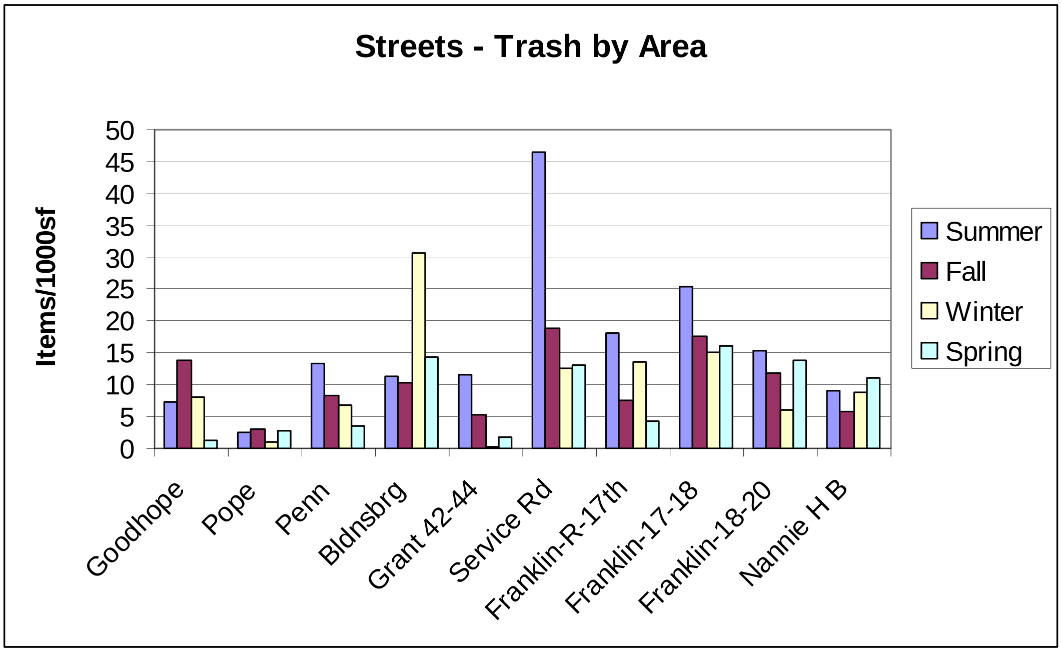
Ten streets were surveyed. The three blocks of Franklin Street were selected to see if one could demonstrate that residential streets had lower levels of trash as one moved away from the commercial corridor. This street selected did not demonstrate that this is true, although there is other data that supports the concept.

The effect of normalizing the data by the area, versus normalizing it by length, is to make the data for the 17-18 block of Franklin Street comparable to the 18-20 block and similar to Nannie Helen Burroughs. Unfortunately, the windshield survey data discussed later in the chapter has no measurement of width and cannot be normalized by area.

For the purposes of the landuse analysis, the areal data is superior, but for the windshield data, the length analysis will be used.

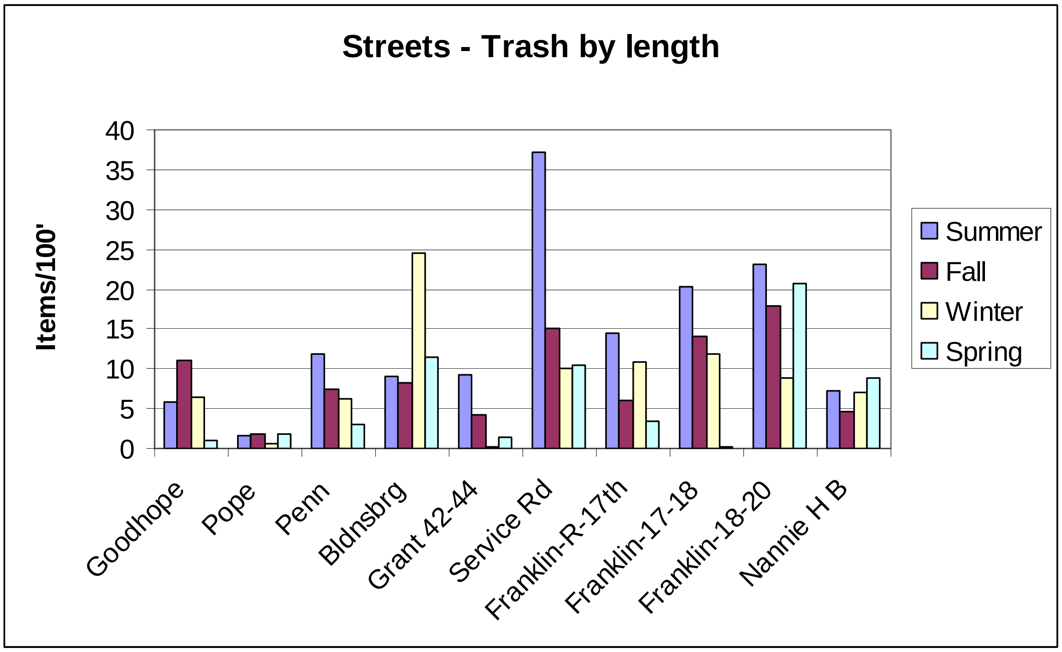
A clean street has less than five pieces of trash per 1000 square feet and a trashy street has over ten.

Figure 3.3.12
Streets – Trash by Area



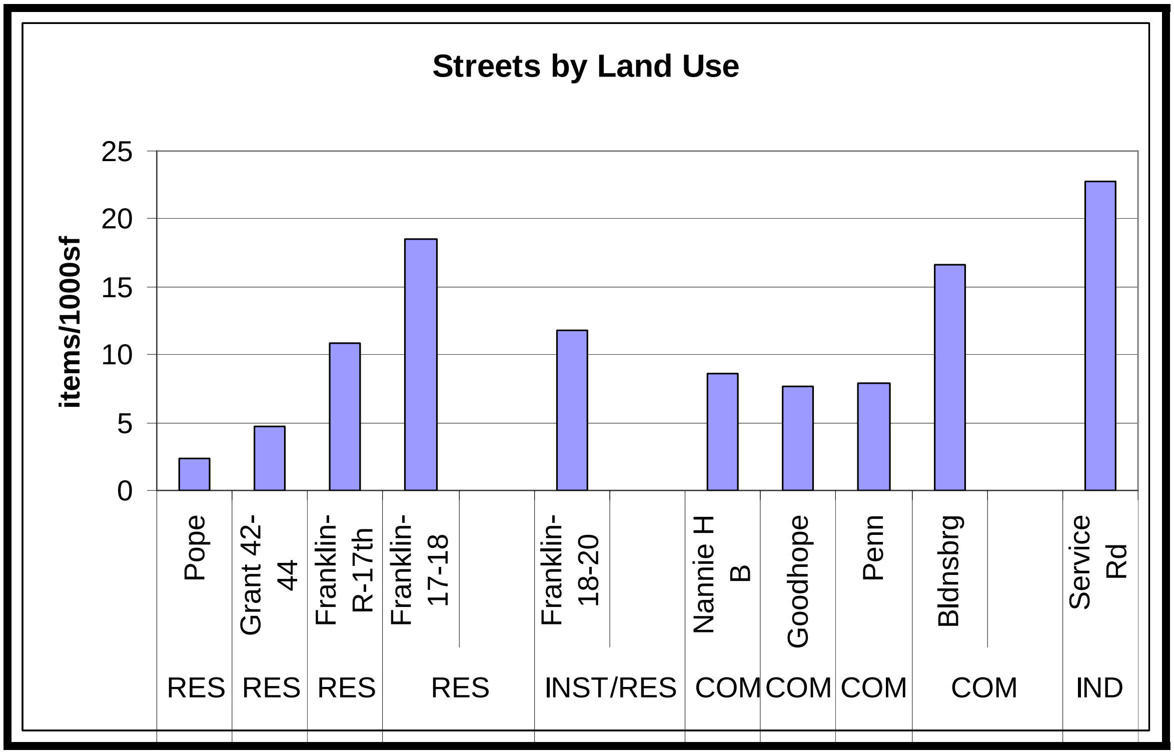
Looking at trash per 100 feet causes the 18th to 20th block of Franklin Street to have higher levels of trash relative to using an area type measurement. This is because there are a lot of trash items on the far side of the sidewalk which is a hill and captures trash.

Figure 3.3.13
Streets – Trash by length



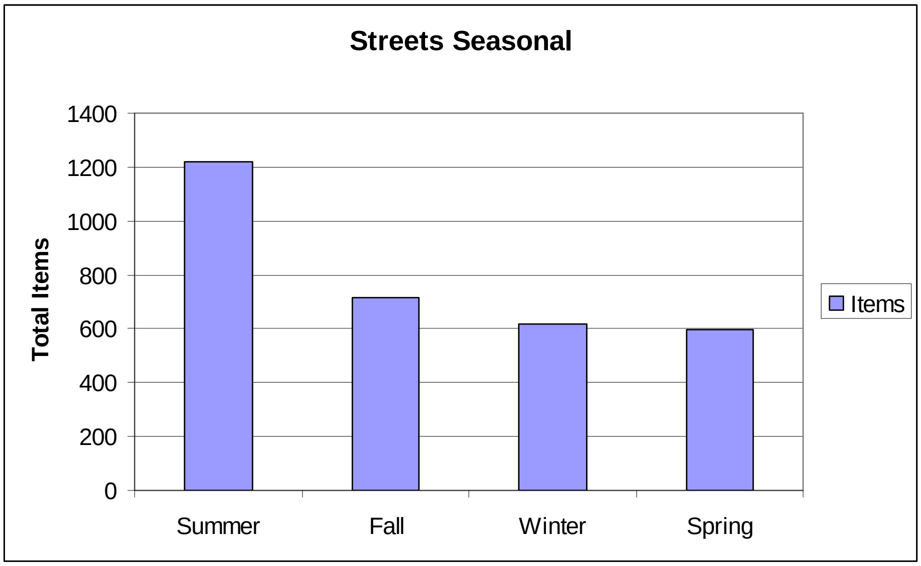
In the figure below (Figure 3.3.14), the first four streets are residential, Franklin Street from18th-20th Streets is adjacent to a school and is about 25 percent residential use and 75 percent institutional, Nannie Helen Burroughs Avenue through Bladensburg are commercial streets and the I- 295 service road is a light industrial land use. Landuse does not seem to have a significant effect on the levels of trash with the notable exception of the I-295 service Road. However, other industrial streets were counted and the industrial streets where the front door is to the sidewalk are relatively clean and the industrial streets which are fronted by chain link fences are relatively dirty. In other words, there are light industries that take pride in the appearance of the front of their facility. V Street is a good example of a clean industrial street even though the street could certain use a good repair by DDOT. W Street has all of the buildings hidden behind fences and is very trashy. It should be similarly noted that Franklin Street from 18-20th Streets is orphaned from the school and there are no doors nor entrance on that side, so apparently the maintenance staff do not take care of it. It is also across the street from Langdon Park. The average trash level per 1,000 square feet for the four seasons by use category are: residential = 9.1, institutional = 11.8, commercial = 10.2 and light industrial = 22.8.

Figure 3.3.14
Street by Use



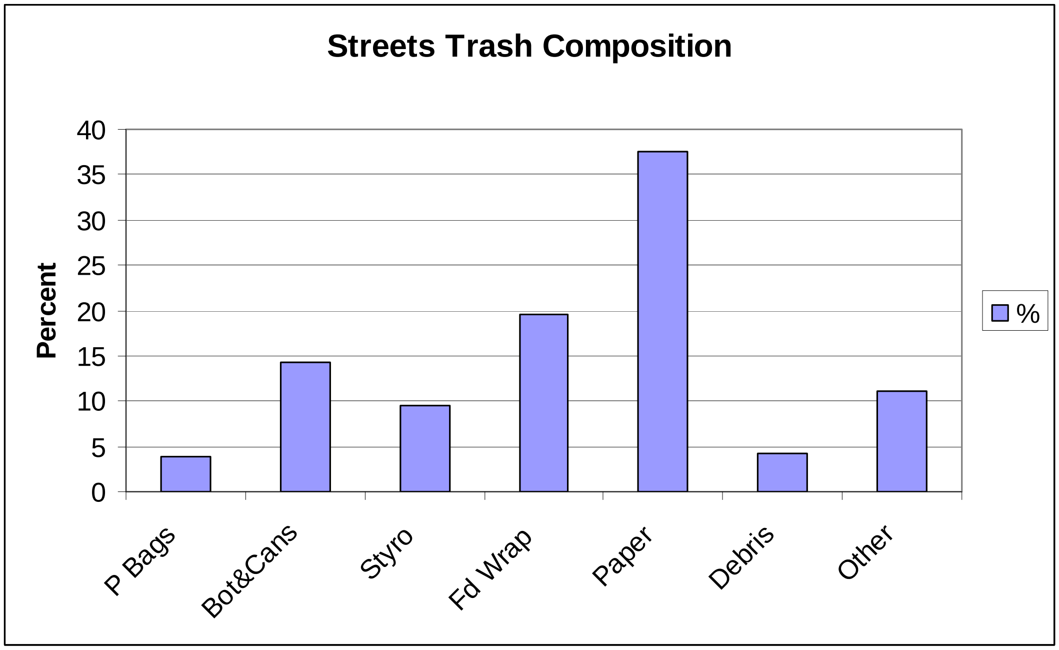
The amount of trash on the streets in the summer was very high (Figure 3.3.15). It was a dry summer with little rain before the survey. One should remember that the streams had very low levels of trash in the summer and then once the rains began in October trash levels in the streams increased to very high levels.

Figure 3.3.15
Streets - Seasonal



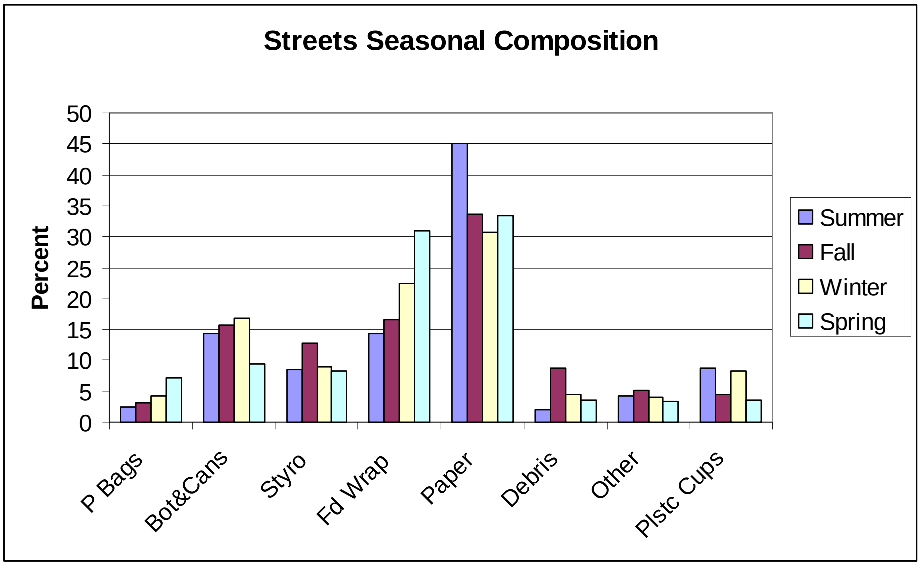
The trash composition is dominated by paper items of which about half are napkins. A part of the paper items are bus transfer slips from the bus stops on these streets. Paper products are not found in the streams in any significant numbers. The debris items are mostly automobile pieces larger than one inch. The “Other” category is dominated by plastic cups. The relationship between snack wrappers and bottles and cans is similar to other land uses. About a third of the bottles and cans are alcohol related.

Figure 3.3.16
Streets Trash Composition



Plastic cups are displayed in this to this particular graph (Figure 3.3.17) because they are a larger percentage of the items surveyed than normal.

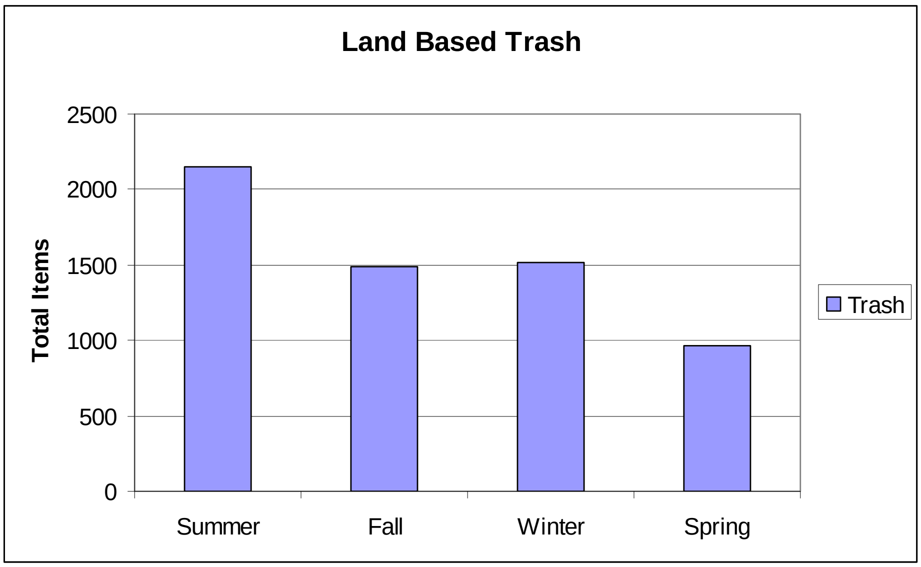
Figure 3.3.17
Streets Seasonal Composition



Total Annual Composition

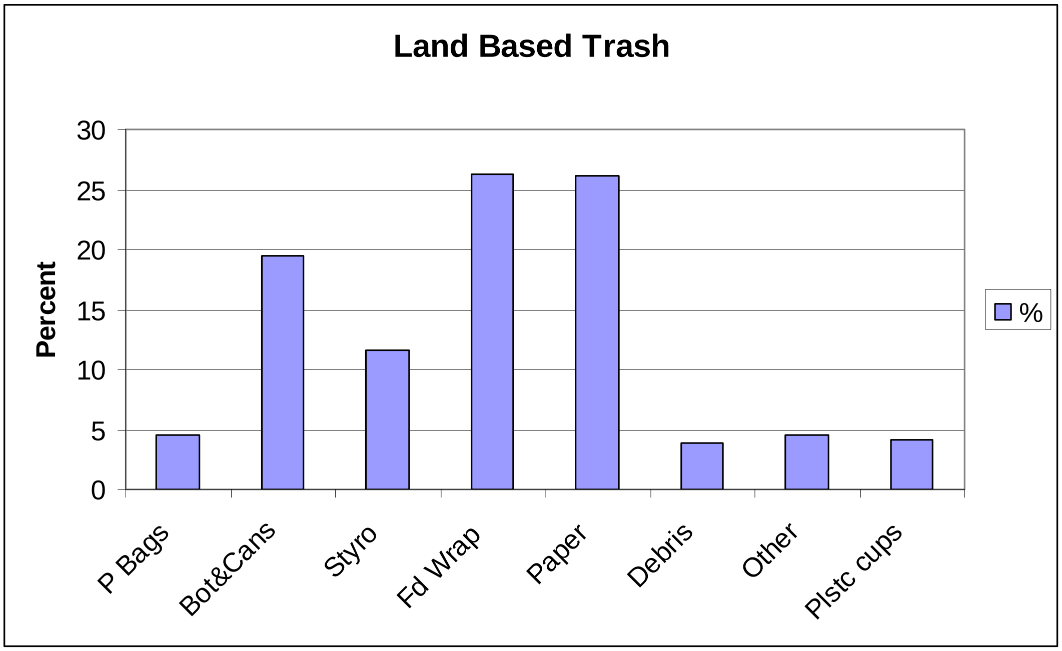
It is interesting to note that from the beginning of the survey to the end that over half of the trash on the streets is no longer present. It is also noted that the trash in the streams seemed to has increased.

Figure 3.3.18
Land Based Trash



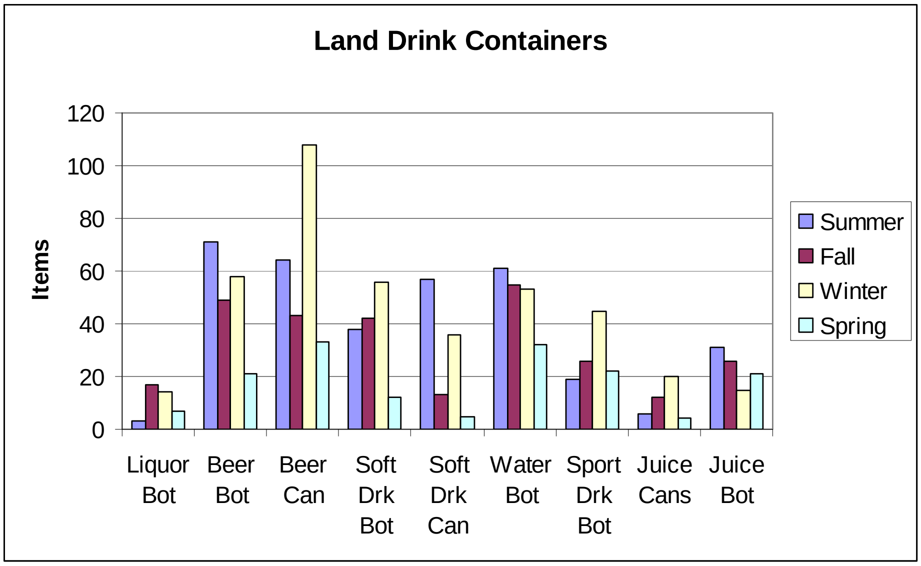
The land based trash is dominated by four categories but paper items have replaced the plastic bags as one of the four. Paper was not found in the streams but is a large component of land based trash (Figure 3.3.19).

Figure 3.3.19
Land Based Trash



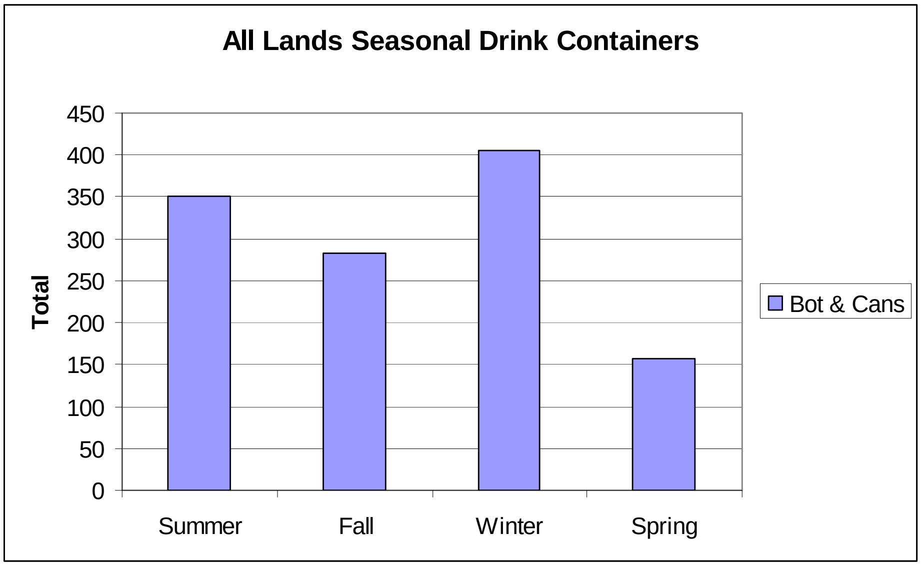
The drink containers are almost uniformly distributed except for liquor bottles and juice cans (Figure 3.3.20). The equal number of beer bottles and cans on the land is greatly different from what was found in the streams where there were seven times more cans than bottles. As was previously mentioned, it is believed that the bottles do not survive the trip down the gutter and through the storm sewer without shattering and producing pieces of glass.

Figure 3.3.20
Land – Drink Containers



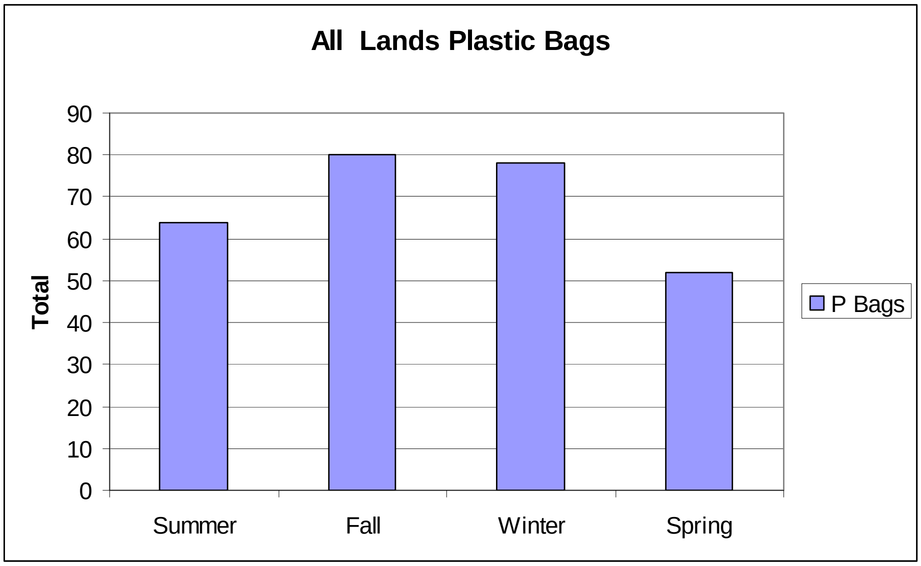
There were a lot of drink containers in the transects that were cleaned up by AWS on Earth Day and the data shows the beneficial aspect of those cleanups

Figure 3.3.21
All Lands – Seasonal Drink Containers



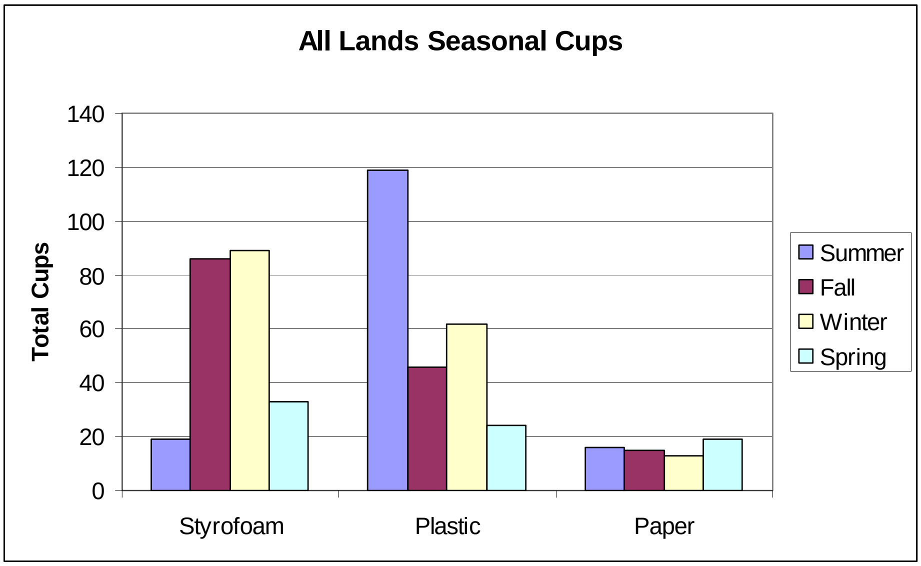
Very few plastic bags were found in the land based transects and there were less in the spring survey.

Figure 3.3.22
All Lands – Plastic Bags



Cups also got cleaned up on Earth Day.

Figure 3.3.23
All Lands – Seasonal Cups



Trash Collection Days

The question arose during the survey period concerning the effects of trash collection by the Department of Public Works (DPW) on the amount of trash on the street. It was decided to try to determine if it was a significant problem in the drainage basin that required investigation. Pope Street is a residential street with no alley and trash is collected from supercans and the blue wheeled recycle containers from in front of the houses. Pope Street is a clean well cared for neighborhood and it was believed that any increase would be obvious. It is also a regular transect station so there is a history of data on it. The street was surveyed early in the morning after the trash cans were set out for collection, but before DPW arrived. It was then surveyed about an hour after DPW collected the trash and the recyclable material. The difference in trash was exactly one piece and it is certain that that piece was present but not counted in the morning survey because it was under the supercan and hidden from view. So there was no increase in trash from the DPW crew; however, as previously stated the act of setting the trash out seems to cause trash. Also, this was a very calm and windless day. If the study had been done on a day with 10-20 mph wind gusts, then perhaps things might have been different.

On a second day while conducting other studies, the survey team followed a DPW trash truck for about ten blocks and they did not lose a single piece of trash. Once again this was a windless day; but, they were very efficient.

While only observational information exists, placing trash in plastic bags or open topped containers seems to create a lot of loss to the streets. This was observed repeatedly, that improper setting trash out on the curb tore the bags or allowed animals to tear open the bags and create a nuisance.

3.4 WINDSHIELD SURVEY DATA ANALYSIS

Introduction

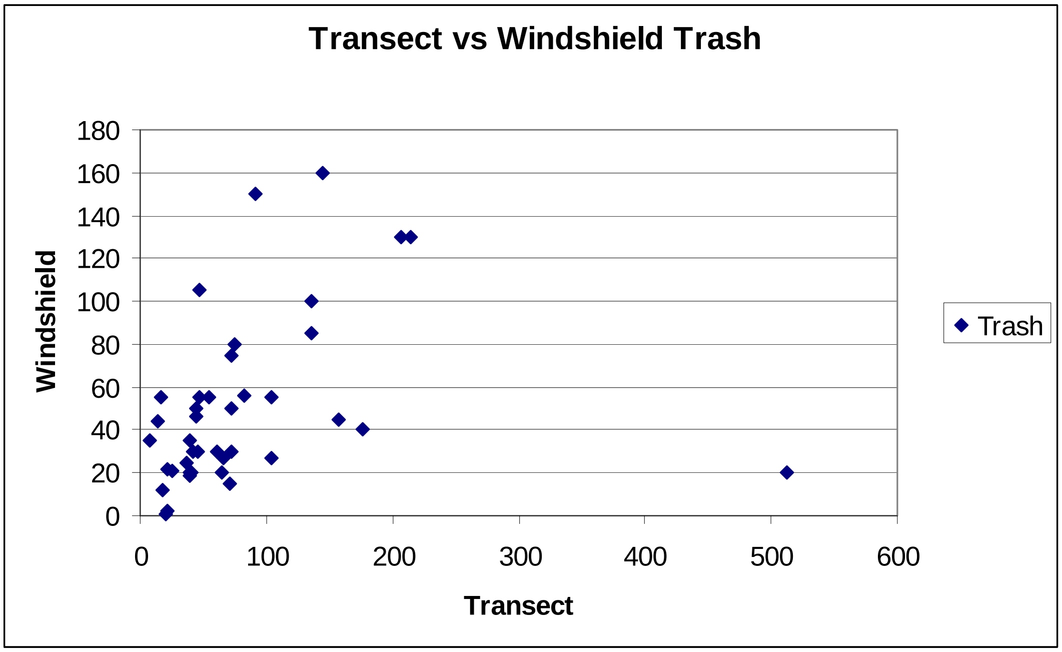
The streets in the study area were driven once a quarter and a gross count of the amount of trash on one side of each block was made. This method allowed for the trash to be counted from about ten feet out into the street up to the curb, and then to about ten feet on past the curb. If there was a fence, wall or mow line, then that was used as the far edge of the count. Because chain link fences, mow lines, and walls collect trash, this methodology causes counts on certain types of streetscapes to be very high. However, it is noted that if a property owner cleans up their property, these places will not be harboring trash. Consequently, if they are neglected, they can contain hundreds and hundreds of pieces of trash. It was very rare for every street in a drainage basin to get surveyed, but the third and fourth quarter surveys probably accounted for 95-98% of the streets in each basin. Some complicating factors encountered were that, often, streets that exist on maps are not present on the ground, and street names differ from those listed on maps. Street signs are also not properly aligned or are missing altogether. Reliability of the data is actually very good considering the technique used.
In order to evaluate blocks which might be contributing excessive trash to streams, the data was analyzed for “Hot Streets”. The streets that had very high average annual counts of trash are listed for each drainage basin. An average value for a block is about 25-30 pieces of trash. Three categories are used for those streets with higher than average amounts of trash. The streets blocks having more than 50 pieces of trash, but less than 75, are in Category 1. Those blocks with 75 to 99 pieces of trash are in Category 2 and all streets over 100 pieces of trash are in Category 3. An average block is about 500 feet long so the streets were checked to make sure that the high counts are not caused by it being an excessively long block.

The average length of a block as used in the windshield survey was 501 feet long in the Watts Branch watershed.

Windshield Data Calibration

The windshield data is based upon what can be seen from a moving vehicle. Factors such as parked cars, excess leaves in the gutter and high weeds will cause the trash counts to be low. The trash counts of the streets from the detailed land use survey were paired with the data for the corresponding street block in the windshield survey in order to obtain an estimate of the accuracy of the windshield counts. Figure 3.4.1 shows the paired data for the four quarterly surveys.

Figure 3.4.1
Transect vs. Windshield Trash



Each data point is the result of one land use street transect and the same block for the same quarter data from the windshield survey.   Regression analysis indicates that the windshield survey counts 85.4 % of the actual trash. The correlation coefficient is 0.64. This was obtained by excising the count of 512 versus 20 because a street crew was seen that cleaned up this trash. Given the number of factors affecting the amount of trash on a street with counts being several days apart, the results are amazingly accurate. Trash on one side of the street can be doubled to obtain trash on both sides of the street and then adjusted by using 85.4% and get a very reasonable estimate of the total amount of trash. The information can be used to estimate total amounts of the different types of trash in a basin.

Kingman Lake MS4

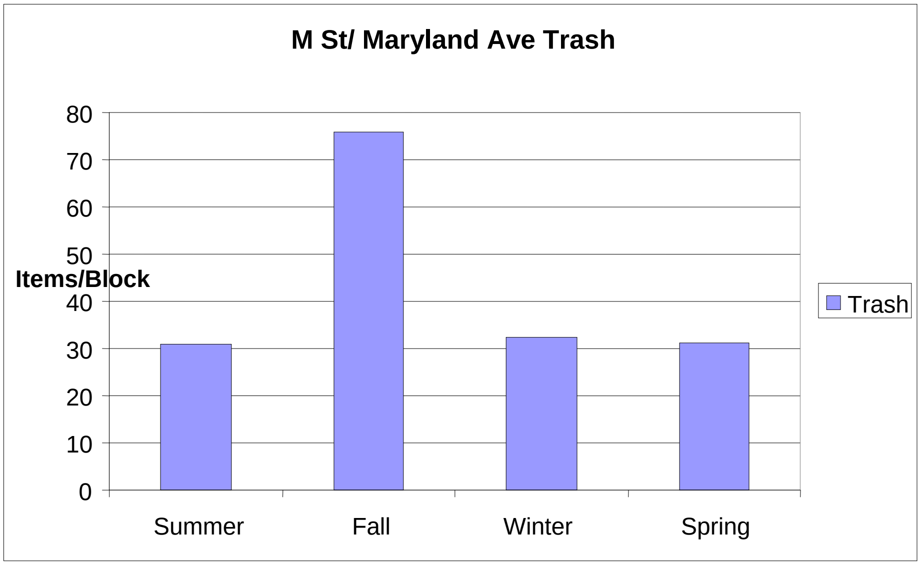
The Kingman Lake drainage basin is composed of three components: 1) the Maryland and M street area; 2) the Benning Road area; and 3) the RFK drainage MS4s.

The streets were segregated by land use, and average values of trash per block versus trash per 100 feet were compared set at normal block length in the area.

Land Use	Trash/block	Trash/100’
Commercial	57.6	11.1
Institutional	23.4	5.1
Single Family	33.2	5.9
Multi-family Res.	42.6	7.2

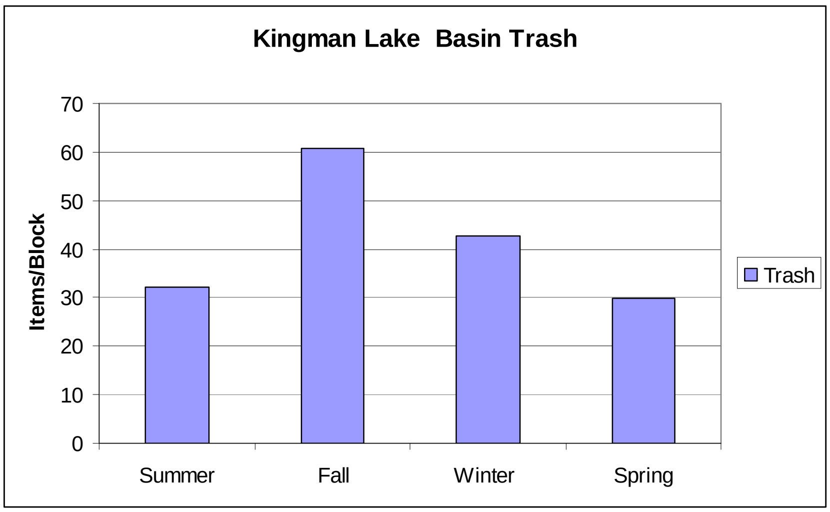
The small area of Maryland and M Streets is interesting because it is an isolated MS4 and potentially has a small stream that could be rehabilitated. There was significantly more trash in the fall than in the other seasons (Figure 3.4.2).

Figure 3.4.2
M St/ Maryland Ave Trash



The same seasonal pattern applies to the whole Kingman Lake basin (Figure 3.4.3).

Figure 3.4.3
Kingman Lake – Basin Trash



The annual average of each block was summed to find the total amount of trash on the streets at any time. Because that number represents only one side of each block, the number is doubled and then is adjusted by the 85.4 % accuracy factor. This does not include alleys, parking lots, etc. If there were streets not surveyed, then they are not included in the number.

Windshield Trash One Side of Street = 1,720
Estimated Basin Total = 4,047
Acres = 230
Street Trash/acre = 17.6

Table 3.4.1 lists the "Hot Street" in the Kingman Lake drainage using the three categories. There were no blocks with counts in Category 1. Many of the streets with high levels of trash are those that are closest to the commercial street, Benning Road.

Table 3.4.1
Kingman Lake Hot Streets

RFK	Street	Block	Count	Street	Block	Count
1.(50-74)	2(75-99)			3.(100+)		
	25th	E-Benning	96	23Pl	Benning-E	145
	Oklahoma	E-Benning	92	Benning	Bridge-26	225
	M	Maryland-21pl	70			
	M	21 pl-21 St	83			
	M	21-Summit	98			

Hickey Run MS4

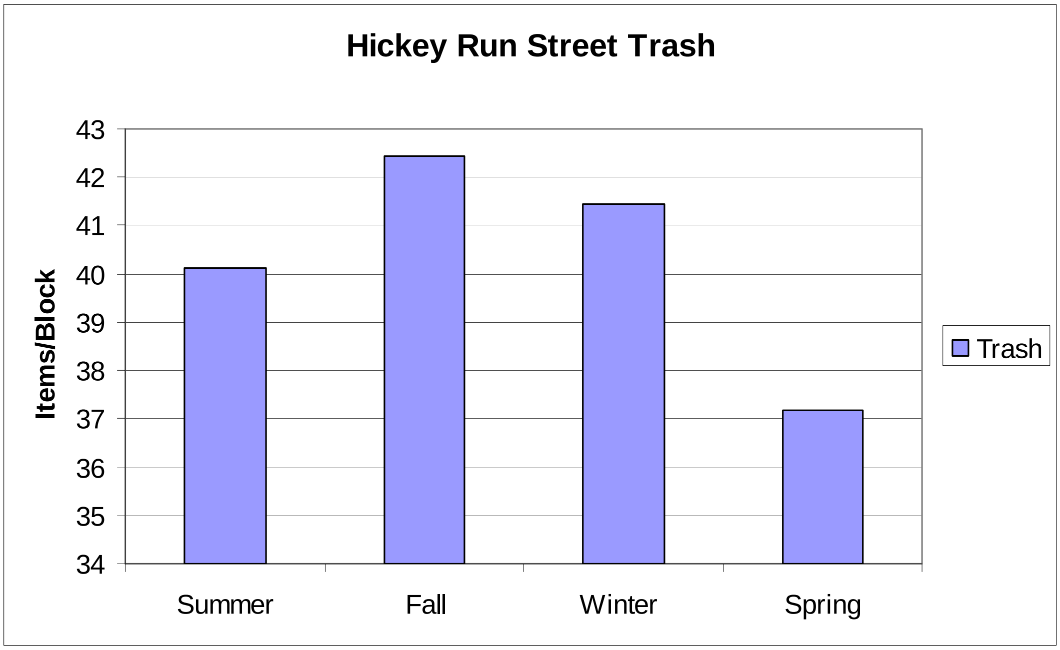
This basin features several very long commercial streets, which provides an opportunity to get estimates of trash per length of a commercial street.

Street	Items/100'	Items/block
New York Avenue - SDA- 9th	11.81551	136
Bladensburg – SDA – R	5.895309	29.04
Rhode Island Ave. – SDA –Metro underpass	5.09567	33.2

The sub-division of single family residences located off Bladensburg Road bounded by R St, 24th St and S St., had a trash level of 0.46 items/100" or about 2 pieces per block.

Trash levels in the basin were significantly lower in the spring (Figure 3.4.4).

Figure 3.4.4
Hickey Run – Street Trash



Total Trash One Side of Street = 6530
Estimated Basin Total = 15,293
Acres = 848
Street Trash/acre = 18.0

Hickey Run has several commuter streets that travel through commercial and light industrial areas and these had blocks with high levels of trash. The prevalence of chain link fences which trap and hold trash influenced the counts significantly.

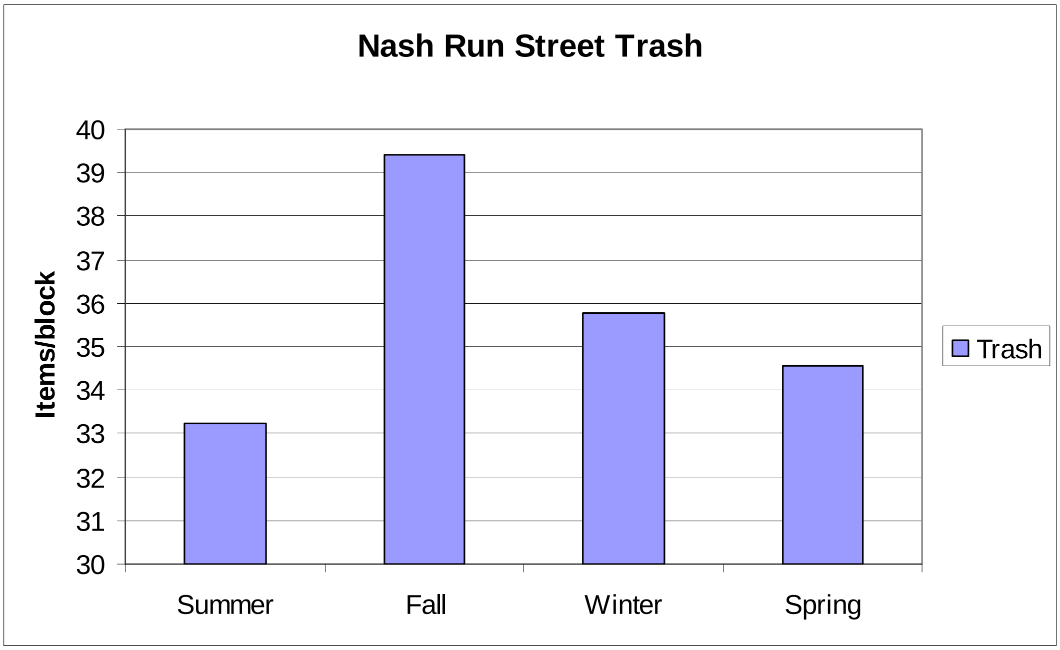
Table 3.4.2
Hickey Run – Hot Streets

Hickey Run	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)Street			2.(75-99)			3.(100+)		
South Dakota	Vista-Bladensburg	57.5	Rhode Island Ave	17-15	78.75	South Dakota	V-New York	108.75
Bladensburg	28-26	58.75	Evarts	RIA-17	93.75	New York Ave	SD-Bladensburg	237
Franklin	18-20	71.25	W St	16-Montana	75.75	New York Ave	Wva-16	205
Evarts	18-20	59.25	25 Pl	Blad-End	83.75	New York Ave	16-Fenwick	212.5
Evarts	22-24	58.25	W Va	Fenwick-16	80	New York Ave	Fen-Kendal	182.5
Evarts	24-26	65	W Va	16-NYA	86.25	Vista	26-SDA	167.5
Evarts	28-end	50	17 St	W VA-Montana	87.5	Montana	18th-NYA	191.25
Hamlin	18-20	70.75				24 Pl	Blad-End	237.5
22nd	Douglas -Channing	56.25				Montana	W Va- Bldnsbrg	233.75
18th Pl		55						
Channing	22-24	50						
Adams St	31-33	61.7						

Nash Run

The levels of trash on the streets in Nash Run drainage basin were high and fairly consistent (Figure 3.4.5).

Figure 3.4.5
Nash Run – Street Trash



The levels of trash on several of the very long residential streets were converted to items per 100 feet. Small variations of average block length will have small effects on the data.

Single family residential Streets	Items/100'	Items/block
Meade	6.2	18.5
Nash	7.5	17.2
Lee	4.8	15.6

The residential values can be compared to Sheriff Road, a mixed use corridor which has 9.5 Items/100' and 34.2 Items/block, and also to Eastern Avenue, which has 9.2 Items/100' and 48.3 items/block

Total Trash One Side of Street = 3815
Estimated Basin Total = 8,976
Acres = 320
Street Trash/acre = 28.1

Hot Streets

Many of the streets listed in Table 3.4.3 are those intersecting Sheriff Road, a mixed use street.

Table 3.4.3
Hot Streets

Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
Quarles	49th-Eastern	68	Polk	Anacostia - end	88	Service Rd	NHB-Crosswalk	270
Douglas	Kenilworth-45	51	Eastern	Nash-Meade	75	Service Rd	Crosswalk-Polk	110
	45-Anacostia	70	Sheriff Rd	51 St - Eastern	85			
Ord	Anacostia-44	61	45pl	Sheriff-Lee	90			
Eastern	Minnesota-B vr	68	48St	Sheriff-Lee	78			
	Bvr Hgts.-50	61	48Pl	Sheriff-Lee	77			
Kenilworth	Ord-Douglas	58						
Kane Pl	47 Pl- 48 St	63						
Sheriff Rd	49pl-50pl	51						
	50St - 51St	60						
45 St	Sheriff-Lee	63						
	Lee-Meade	50						
48st	Lee-Meade	70						
	Nash-Minn	55						

Watts Branch

The winter level of trash is nearly 30 percent less than the other seasons. During the survey it became clear that a lot of trash was simply gone. It was then discovered that there was a crew from the Dept. of Public Works cleaning up the wet leaves from the curbs, and this were very effective in removing trash. Most of the basin was surveyed before they had cleaned it up but they still had done enough to noticeably affect the amount of trash available to be counted. The same issue was encountered during the summer survey when the I-295 service roads were cleaned up, causing localized data in both Watts and Nash to be affected. It is also notable that the amount of trash in Watts Branch increased.

Figure 3.4.6
Watts Branch – Street Trash

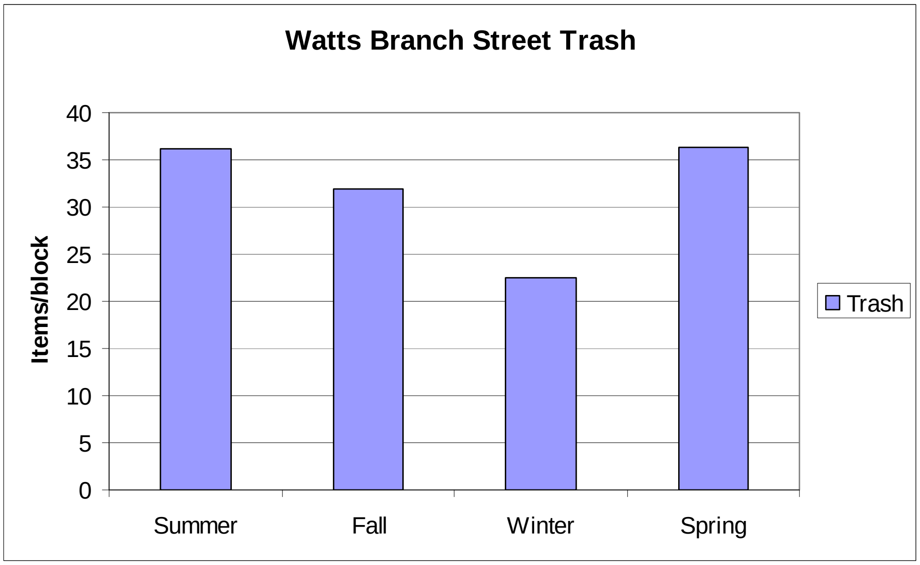
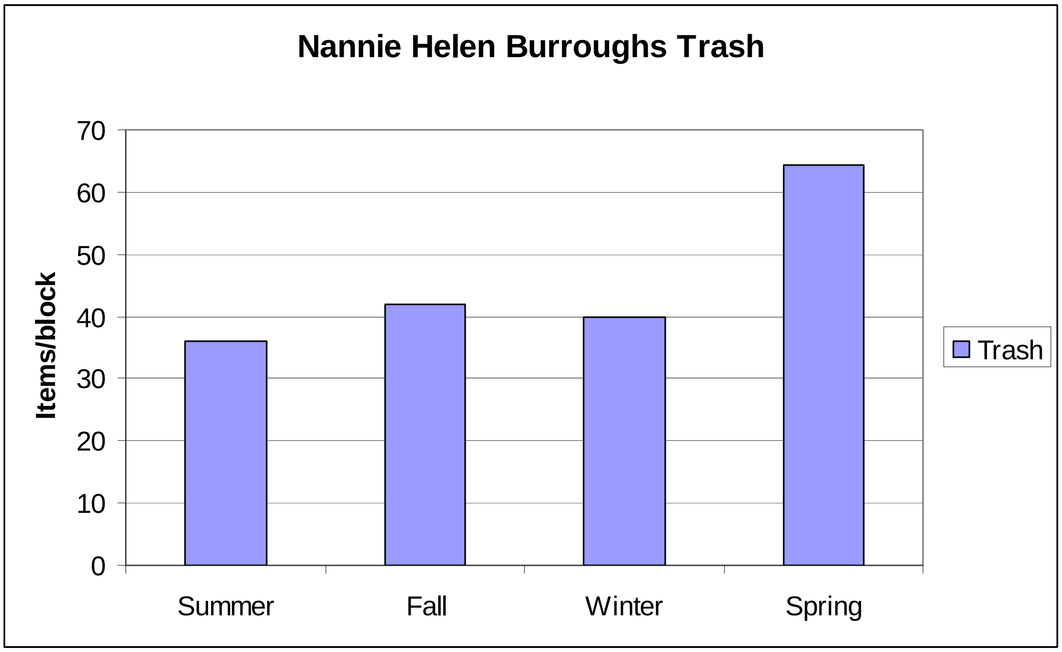


Figure 3.4.7
DPW crew removing leaves and trash from curb in Watts Branch sub-watershed

Figure 3.4.8
Street sweeper

The spring survey of the streets in the Watts Branch sewershed began on the Tuesday after the Memorial Day three-day weekend. The Memorial Day weekend had very pleasant weather for outdoor activities. Nannie Helen Burroughs was the first street surveyed in the spring survey after Memorial Day. There is about a 50% increase in the accumulation of trash from a three day weekend as shown in Figure 3.4.9.

Figure 3.4.9
Nannie Helen Burroughs – Trash



The post Memorial Day weekend trash levels increased from 6.7 items/100' to 10.9 items/100 feet.

A few residential streets were analyzed to determine the relationship between trash per block and trash per 100 feet.

Street	Items/100'	Items/block
Blaine	6.2	19.8
Brooks	4.2	16.8
Jay	7.8	32.6

The streets in the Mayfair Terrace area were very clean with trash levels below 2 items/100'. Some of the storm drains from this area drain to a beaver pond connected to Watts Branch.

Total Trash One Side of Street =11,384
Estimated Basin Total = 26,786
Acres = 1,025
Street Trash/acre = 26.1
The primary commercial street in the basin is Nannie Helen Burroughs and it consistently had high levels of trash.

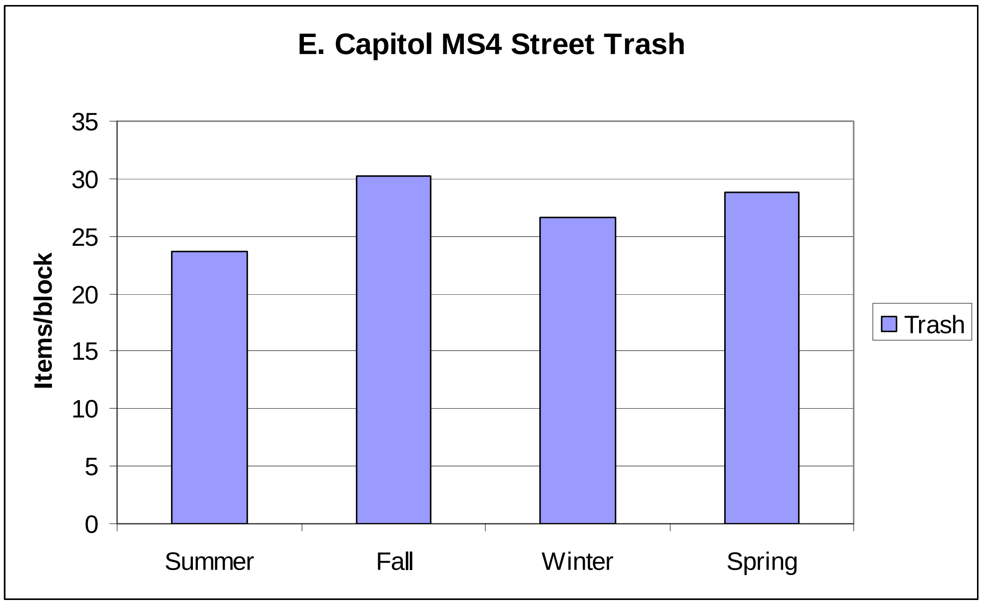
Table 3.4.4
Hot Streets

Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
Clay St	63/Southern-62	58	Minnesota	Sheriff -HNB	93	Dix	47-45	105
Dix	44-42	51	Eads	47-45	85	Edison Pl	42-44	167
Eads	61-60	65	Foote	44-42	85	Gault	Minesota-42	140
Eads	60-59	52	Grant	44-46	88	Gault	44-NHB	101
Eads	58-57st	53	Gault	42-44	98	Hayes	46-48	115
Eads	44-42	60	Jay St	Just-50pl	96		48pl-50pl	103
Foote	48-47	67	Gay	Div-54pl	86	Jay St	Division-Hunt	102
Cloud	Div-53	56	Division	Eads-NHB	94	Southern	58-C	145
Grant	Minesota-42	72	49 St	Jay-Sheriff	90	Southern	58-E Cap	167
Hayes	Division -54pl	51	48 Street	Hayes-Sheriff	98	61 St	E Cap - banks	241
Hunt Pl	42-44	63	N Helen Burr	Eastern-58	78	56 St	Blaine-Clay	121
Hunt Pl	44-46	65	N Helen Burr	44-Minnesota	97	48 Pl	Hayes-Sheriff	178
Hunt Pl	46-48	58				Hayes T/Mayfr/St	Anacostia-Kenilworth	116
Eastern	Foote-Eads	62				N Helen Burr	55-Division	100
Eastern	Eads-Dix	68						
Eastern	Dix-Southern	72						
Southern	63-Eastern	62						
62 St	Clay-Dix	65						
61St	Eads-Dix	56						
61St	Banks-Clay	57						
60 St	Eads-Dix	54						
60 St	Eads-Foote	67						
57 St	Blaine-Clay	52						
56 St	Eads-Foote	53						
55 St	Blaine-Clay	61						
54 St	Clay-Dix	52						
Division	Clay-Cloud	56						
Division	Jay-Just	73						
51 St	Blaine- Clay	51						
50 St	NHB- Hayes	56						
49 Place	Fitch-NHB	56						
49 St	Hayes-Jay	56						
46 St	Hunt - Sheriff	58						
Kenilworth	Irving-Foote	61						
N Helen Burr	56-55	51						
N Helen Burr	Div-50	53						
N Helen Burr	46/Hayes-44st	65						
N Helen Burr	Minn-Kenilwth Trrce	62						

East Capitol MS4 Sewer Shed

Trash levels in this basin were fairly consistent from survey to survey. One anomaly occurred. A new street was built and renamed between the winter survey and spring survey. A prior cul-de-sac was opened up all the way to East Capitol. It is only one block of data out of many blocks of data. There were a couple of other streets in this drainage basin that were opened and closed for construction activities during the survey.

Figure 3.4.10
E. Capitol MS4 Street Trash



Benning Road had 5.9 Items/100' and 40 Items/block, while East Capitol Street had 2.8

Items/100' and 20.5 Items/block.
Total Trash One Side of Street = 7,398
Estimated Basin Total = 17,407
Acres = approx. 1007
Street Trash/acre = 17.3

Benning Road, as well as quite a few of the streets intersecting it, had high levels of trash (Table 3.4.5).

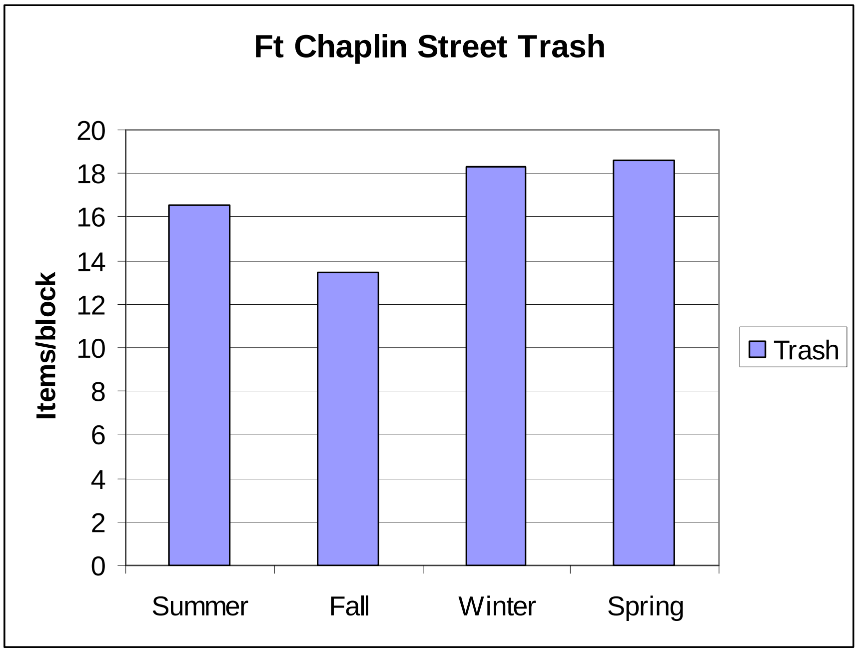
Table 3.4.5
Hot Streets

Street	Block	Count	Street	Block	Count	Street	Block	Count
1. (50-74)			2. (75-99)			3. (100+)		
Minnesota	E Cap-B	50	Minn	Hugh-Benning	85	F St	46th	183
Ridge	E Capitol/Minn	67	B St	Texas	78	Hannah Pl	Benning-46	106
Central	51st	55	G St	Benning	87	Hillside Rd	46th	100
A St.	49th	50	Benning Rd	Southern-H	98	Southern	D-C	156
Texas	C	60	51st St	Southern -H	78	36th	Ames-Clay	120
C St	Texas	54	Astor	53-Central	96			
C St	49th	60	Eads	34-36	96			
Call Pl	50th-52	54	35th	Ames-Clay	84			
Queens Stroll Pl	53rd	59						
Hannah Pl	end- 51st	53						
Hannah P	51-Benning	68						
Benning Rd	Hanna	58						
Benning Rd	E	50						
Benning Rd	Ecap-44th	63						
Benning Rd	39	58						
Benning Rd	34th	52						
53rd	E cap-Central	52						
Astor	50-51	73						
Astor	51-53	71						
Anacostia Ave	Benning-Dix	58						
45th St	Benning-Blaine	55						
Brooks	42-44	59						
Blaine	Burns-40	55						
Ames	Minn-35	55						
Southern	Bowen	50						

Fort Chaplin Tributary

Trash showed very little seasonal variation in this basin and levels are below 20 pieces per block (Figure 3.4.11).

Figure 3.4.11
Ft. Chaplin – Street Trash



Total Trash One Side of Street = 1,096
Estimated Basin Total = 2,579
Acres = 151
Street Trash/acre = 17.1

This is a very clean drainage basin which is principally residential with a couple of schools present. The majority of the homes are very well maintained and the yards are well tended. For example, Burns Street has an average trash value of 12.0 items per block and 2.3 items per 100'. There is one block that has a lot of weeds and the weeds capture a lot of trash.

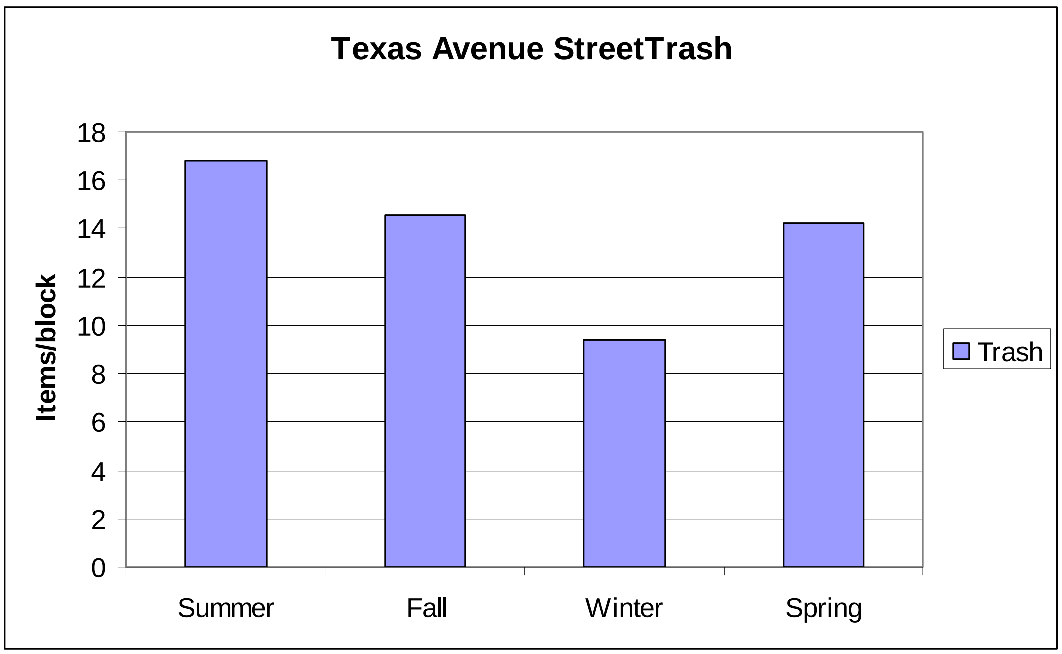
Table 3.4.6
Hot Streets

Street	Block	Count
1.(50-74)		
D	Ridge-Burns	65

Texas Avenue Tributary

Trash levels on the streets draining to Texas Avenue tributary are relatively clean except for one small area of Texas Avenue and 28th and 29th Streets.

Figure 3.4.12
Texas Avenue – Street Trash



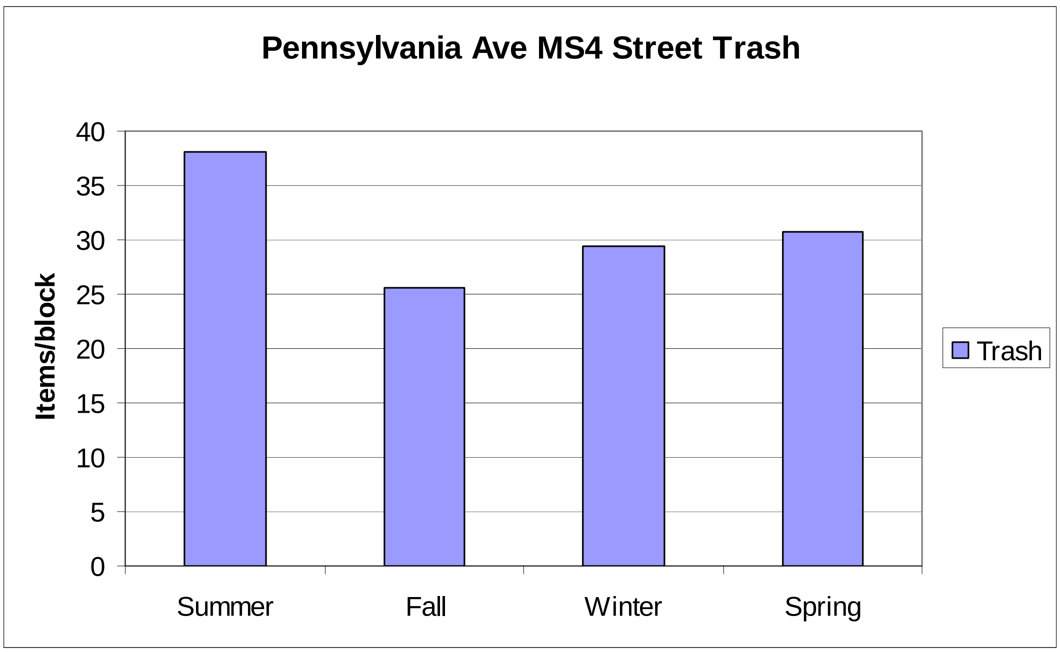
Total Trash One Side of Street = 502
Estimated Basin Total = 1,181
Acres = 103
Street Trash/acre = 11.5

There were no" hot streets," but that is an artifact of the methods used. The windshield survey did not have a constant route, thus the side of a street which was counted was not consistent.

Pennsylvania Avenue MS4 Sewershed Below Texas Avenue Tributary

A couple of special studies were conducted in this sewershed because of the nature of Pennsylvania Avenue. Pennsylvania Avenue from Fairlawn to Alabama Avenue is a combination of commercial, residential, open space and institutional. It has an average of 33 items per block and 5.2 items per 100'. Pennsylvania Avenue from 31st Street to Branch Avenue on the west side is open space, and the mow line collects a lot of trash.

Figure 3.4.13
Pennsylvania Ave MS4 – Street Trash



Total Trash One Side of Street = 1,994
Estimated Basin Total = 4,692
Acres = approx. 181
Street Trash/acre = 25.9

Hot Streets

There are a cluster of streets below Minnesota Avenue that have high trash levels (Table 3.4.7).

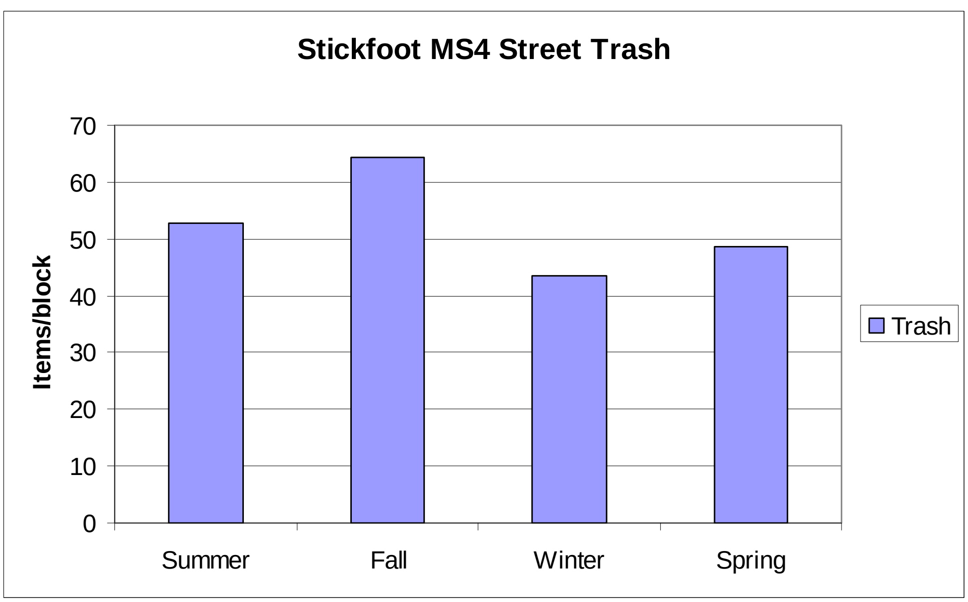
Table 3.4.7
Hot Streets

Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)		
Pennsylvania Ave	Fairlawn-Minn	55	Pennsylvania Ave	31-Branch	91
Young St	Fairlawn-22	59	25 St	Park - Minnesota	92
22nd St	Fairlawn-Minnesota	73			
28th	R - Q	53			
30th	R-Pennsylvania	53			
Texas Avenue	28Pl-29 St	51			

Stickfoot MS4 Sewer Shed

There is an astronomical amount of trash in this sewer shed. One reason is that there is a lot of undeveloped land present and the trash on it is not cleaned up (Figure 3.4.14).

Figure 3.4.14
Stickfoot MS4 Street Trash



Total Trash One Side of Street = 3,364
Estimated Basin Total = 7,915
Acres = 230
Street Trash/acre = 34.4

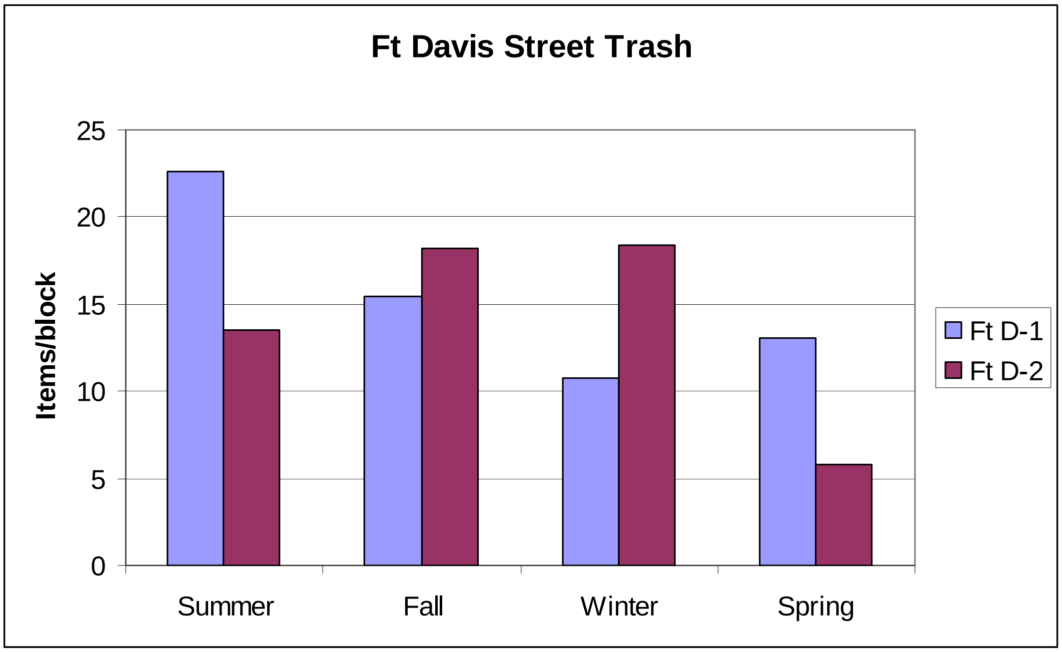
Table 3.4.8
Hot Streets

Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
25th St/Ala	Suitland-Irving	51	Knox Pl		78	Raynolds	Langston Pl-Br	111
Chicago	MLK-RR	52	Morris Rd	Hunter-West	80	Morris Rd	West-MLK	146
Talbert	Shannon-MLK	66	Howard Rd	Firth Sterling-MLK	95	Pomeroy	Sheridan	330
Howard Rd	MLK-Bowen	72	Sheridan	Howard	80	Stanton	Sheridan-Pomeroy	160
	West-Hunter	60	Stanton	Suitland - Evans	82		Bruce-Suitland	162
Sheridan	Pomeroy-Stanton	55						
Sayles Pl	Bowen-Howard	53						
Stanton	Evans-Pomeroy	51						
Shannon Pl	Talb-End	65						
Mtn View	Morris-Talbert	57						
Ainger Pl	Langston-25	50						

Fort Davis Tributaries

These are clean streets with low levels of trash. The levels dropped significantly in the spring (Figure 3.4.15).

Figure 3.4.15
Ft. Davis – Street Trash



Total Trash One Side of Street Ft Davis-1 = 247
Estimated Basin Total = 581
Acres = 51
Street Trash/acre = 11.4

Total Trash One Side of Street Ft Davis-2= 167
Estimated Basin Total = 393
Acres = 24
Street Trash/acre = 16.4

Total Trash One Side of Street Ft Davis MS4 = 1309
Estimated Basin Total = 3,080
Acres = 158
Street Trash/acre = 19.5

Hot Streets for FD-1, FD-2 and FD MS4

Table 3.4.9
Ft. Davis - Hot Streets

Street	Block	Count
1.(50-74)		
Minnesota	N-Penn	54
28th St	Penn-Minn	73
Branch	Alabama-U	55

Naylor MS4

This MS4 drainage area is chiefly residential with moderate levels of trash (Figure 3.4.16).

Figure 3.4.16
Naylor MS4 – Street Trash

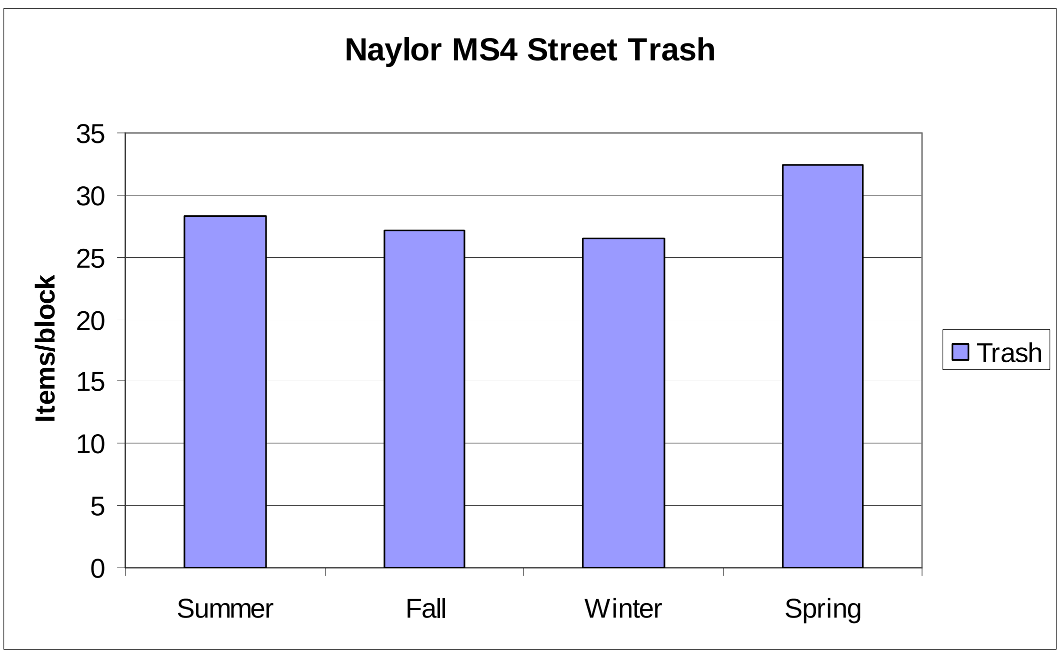


Table 3.4.10
Naylor MS4 – Hot Street

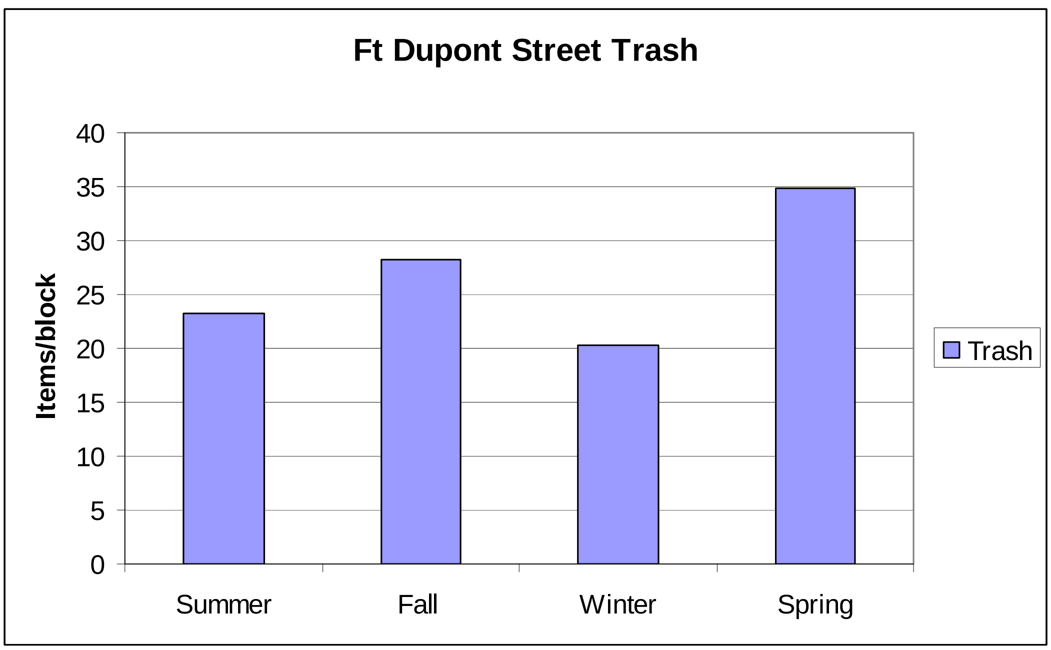
Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
Naylor	Altamont-Good Hope	63	17th	Q-R	91	Naylor	Fairlawn-Minnesota	125
Street	**Block**	**Count**	**Street**	**Block**	**Count**	**Street**	**Block**	**Count**
R	16-Minnes	58						
Q	Minn-18	58						
18th	R-Q	61						

Total Trash One Side of Street = 1,309
Estimated Basin Total = 3,080
Acres = 230
Street Trash/acre = 13.4

Fort Dupont

While there are not many streets in this drainage basin, those present are concentrated either at the top or at the bottom of the basin, and have moderate levels of trash (Figure 3.4.17).

Figure 3.4.17
Ft. Dupont – Street Trash



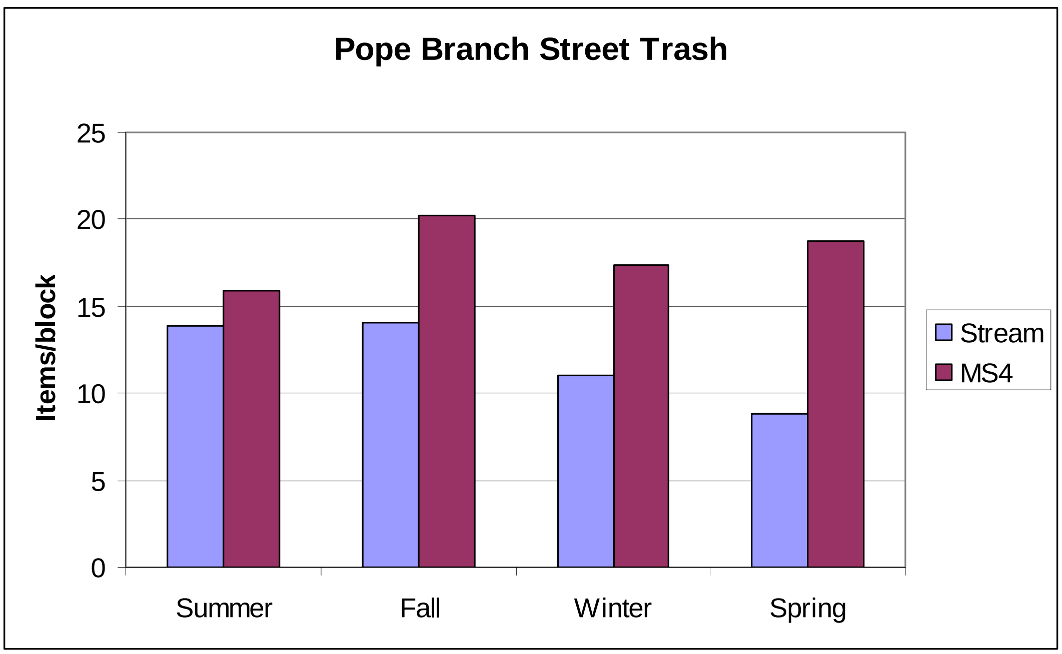
Total Trash One Side of Street = 501
Estimated Basin Total = 1,178
Acres = 99
Street Trash/acre = 11.9

There were no Hot Streets.

Pope Branch

Similar to several other sub-watersheds, some of the streets in the Pope Branch sub-watershed drain into storm sewers which discharge into the free flowing, open stream, and other streets drain through storm sewers into a buried pipe through which Pope Branch flows (MS4). These two sets of streets are segregated for this basin (Figure 3.4.18).

Figure 3.4.18
Pope Branch – Street Trash



It is clear that the streets in the buried MS4 pipe below Minnesota Avenue have higher levels of trash than those up in the free flowing stream basin.

Total Trash One Side of Street tributary to the stream itself = 734
Estimated Basin Total = 1,727
Acres = 149
Street Trash/acre = 11.6

Total Trash One Side of Street tributary to MS4 system = 487
Estimated Basin Total = 1,146
Acres = 45
Street Trash/acre = 25.5

Table 3.4.11
Hot Streets - Stream

Street	Block	Count
1.(50-74)		
Anacostia Rd	Minnesota	56
Nelson	Minnesota-Anacostia	47
Ft Davis Drive	Penn-Mass	64
2.(75-99)		
Nelson	Minnesota-Fairlawn	81

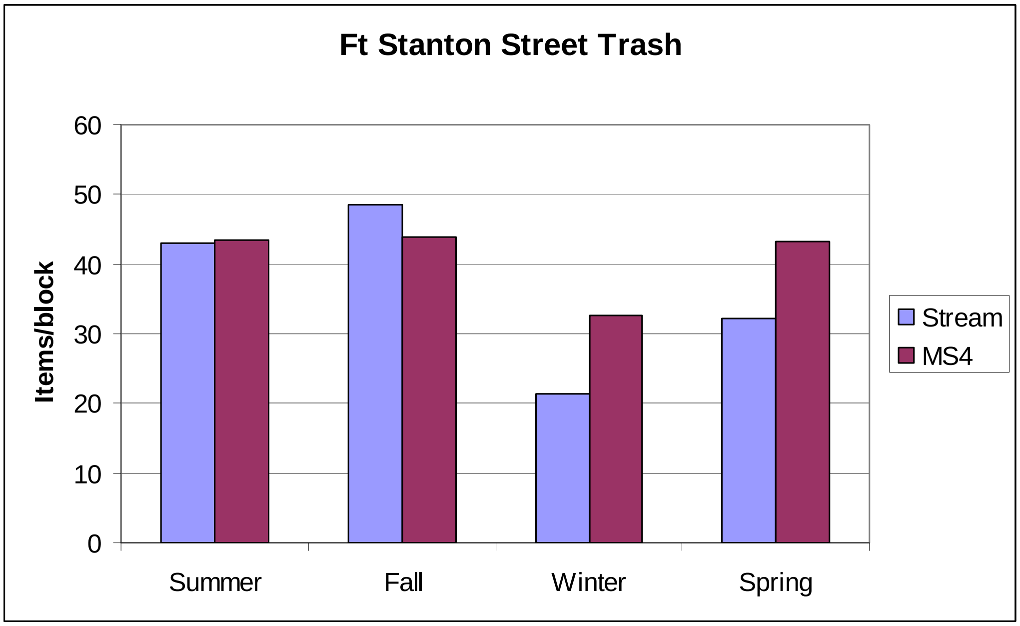
Table 3.4.12
Hot Streets -MS4

Street	Block	Count
1.(50-74)		
Circle		56

Ft. Stanton

The MS4 system that drains to the stream has high trash levels comparable to the MS4 system below the stream (Figure 3.4.19)

Figure 3.4.19
Ft. Stanton – Street Trash



Total Trash One Side of Street tributary to the stream itself = 363
Estimated Basin Total = 854
Acres = 62
Street Trash/acre = 13.7

Total Trash One Side of Street tributary to MS4 system = 1169
Estimated Basin Total = 2,751
Acres = 155
Street Trash/acre = 17.7

Table 3.4.13
Hot Streets - Stream

Street	Block	Count
1.(50-74)		
Erie St	Bruce- 17	50
25th St	Ala-Wagner	69
25th St	Wagner-Good Hope	70

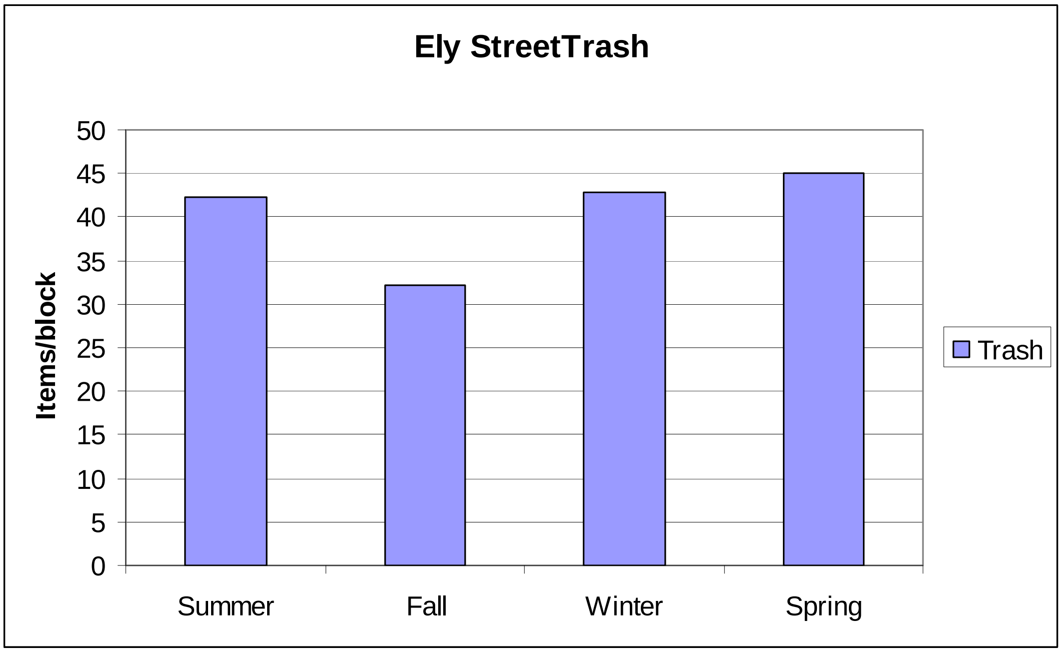
Table 3.4.14
Hot Streets –MS4

Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
Good Hope	22-Altamnt	70	Fendall	Good Hope	88	Good Hope	17- Minn.	124
Good Hope	24-25	54						
18th	Good Hope-T	53						
18th	end-V	50						
18th	V-U	55						
V	16-18	65						

Ely MS4

This small drainage basin has very high levels of trash due to three very dirty streets (Figure 3.4.20).

Figure 3.4.20
Ely Street – Trash



Total Trash One Side of Street tributary to Ely MS4 = 1703
Estimated Basin Total = 4,007
Acres = 160
Street Trash/acre = 25.0

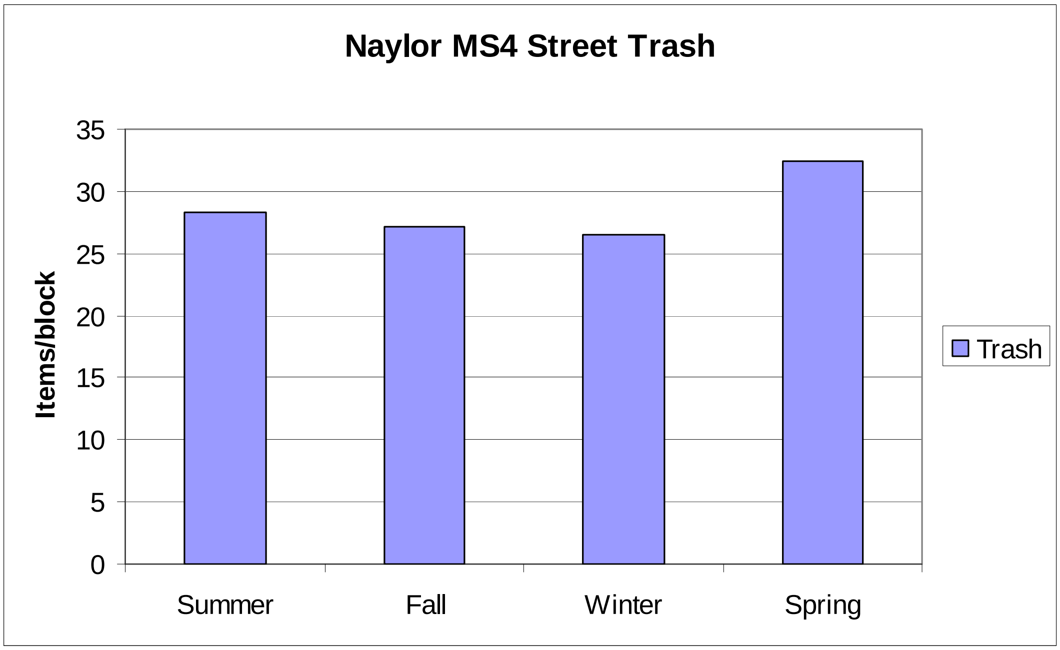
Table 3.4.15
Ely Street – Hot Streets

Street	Block	Count	Street	Block	Count
1.(50-74)			3. (100+)		
Ely Pl	Anacostia-37th St	53	Anacostia R	Ely -B	223
D	33rd-Minn	53	37th Pl	Ely -B	223
B St	34-end	73	Dubois Pl	37th-Ely	144
33rd St	D-Ely	63			

Naylor MS4

This basin is chiefly residential with moderate levels of trash (Figure 3.4.21).

Figure 3.4.21
Naylor MS4 – Street Trash



Total Trash One Side of Street = 1,309
Estimated Basin Total = 3,080
Acres = 230
Street Trash/acre = 13.4

Table 3.4.16
Naylor Street - Hot Street

Street	Block	Count	Street	Block	Count	Street	Block	Count
1.(50-74)			2.(75-99)			3.(100+)		
Naylor	Altamont-Good H	63	17th	Q-R	91	Naylor	Fairlawn-Minnesota	125
R	16-Minnes	58						
Q	Minn-18	58						
18th	R-Q	61						

Special Studies

Rainfall Effects

During the second quarter of monitoring, a precipitation event occurred that prompted the gathering of additional data. This was the first time in the monitoring effort that data collection was interrupted by rainfall. The windshield survey was the part of the monitoring effort that was interrupted. It was decided to re-survey four long street segments after the rainfall that had been surveyed the day before the rain. The rainfall was 2.05 inches and was relatively uniformly distributed over a 12 hour period with brief high intensity periods. The streets surveyed were as follows:

1. Pennsylvania Avenue from Fairlawn to Alabama Avenue – predominantly a commercial land use
2. Fairlawn Avenue from Pennsylvania to M Place- a multi family and single family, commercial land use.
3. Q Street SE from Naylor to 30th Street – single family residences
4. R Street SE from Naylor to 30th Street – single family residences

The results were surprising considering the magnitude of the rainfall. Pennsylvania Avenue showed a 9 % reduction in trash, while Q Street showed a 52 % increase, R Street showed a 170 % increase and Fairlawn showed a 38% increase in trash. These results are, on face value, extremely strange until grouped by vehicle parking practices. Pennsylvania Avenue has very little on-street parking, and therefore, windshield survey trash counts are relatively consistent because visibility of trash is not obscured by parked vehicles. Conversely, Fairlawn Avenue, which is close to a major bus route, appears to have a lot of commuter parking, and is very difficult to survey accurately on week days due to the many parked cars. The residential streets of Q and R also had a noted reduction of parked vehicles on Saturday, allowing for better visibility and higher counts. It was noticed during the first quarter windshield survey that there were large numbers of cars parked at residences during the week days, and that the accuracy of the windshield survey was going to be lower than expected. The use of public transportation to get to work is commendable, but it does create issues with accuracy of trash counting. The absence of vehicles on a Saturday can be explained by the use of the vehicle to run errands which are not as easily done with public transportation.

It is concluded that measuring the movement of trash off the street to the storm sewer during rain storms using the windshield survey method is confounded by land use and sociological factors of automobile use on week days versus week ends. It is also concluded that the windshield survey must be performed during the same part of the week in order to be consistent. As a tool to assess transport to the stream, the windshield survey would need to be modified to only count trash on impervious surfaces draining directly to the gutter.

After this rainstorm, there was a noticeable, but un-quantified reduction of leaves in the street gutters. There was also a noted, but un-quantified reduction of trash in the street gutters at the bottoms of the hills but not at the top. There was not a noticeable reduction of trash on vegetated surfaces. Only the hard surfaces appeared to have lost trash during the rain. This suggests that for moderate rains, any mechanism that captures trash in the gutter is effective. It also suggests that a rainstorm mobilizes about 10 % of the trash that is counted during a windshield survey, and that it is from the gutters at bottom of the hills where there is sufficient depth and velocity of flow to suspend the trash and allow it to move.

Figure 3.4.22
Rainfall Effects on Penn Ave – Street Trash

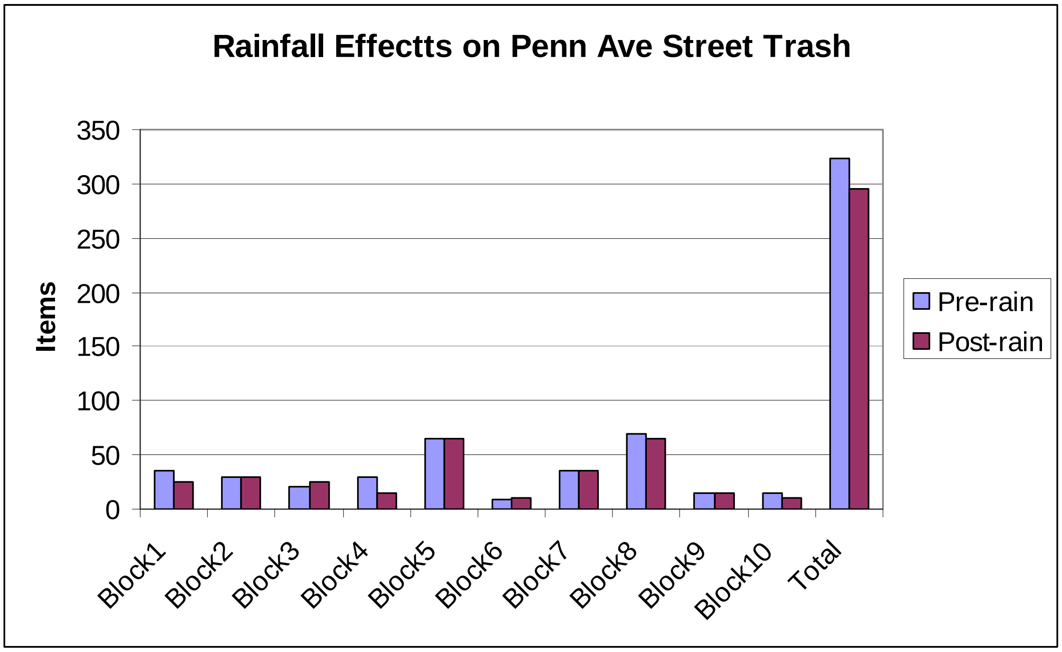
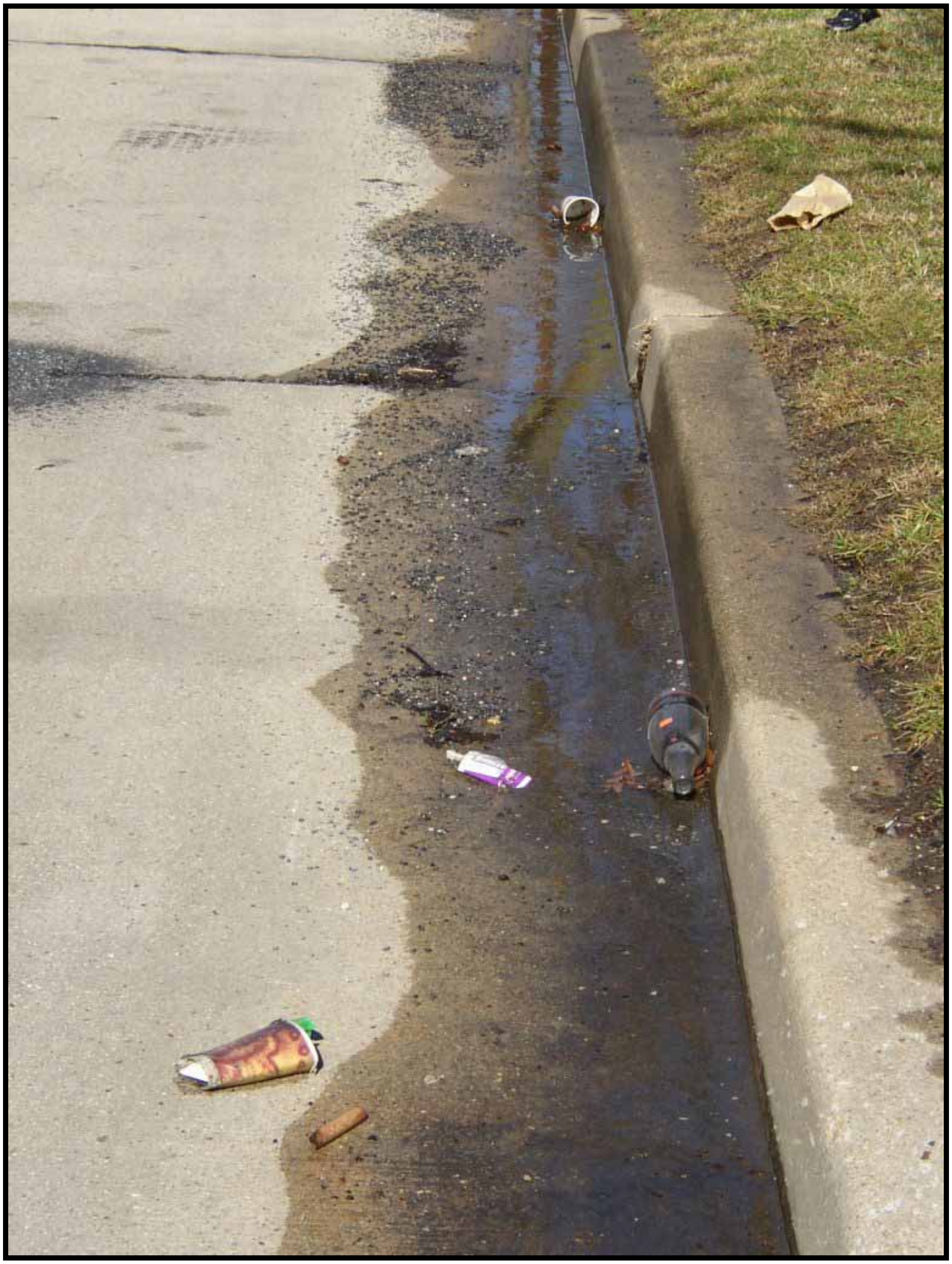


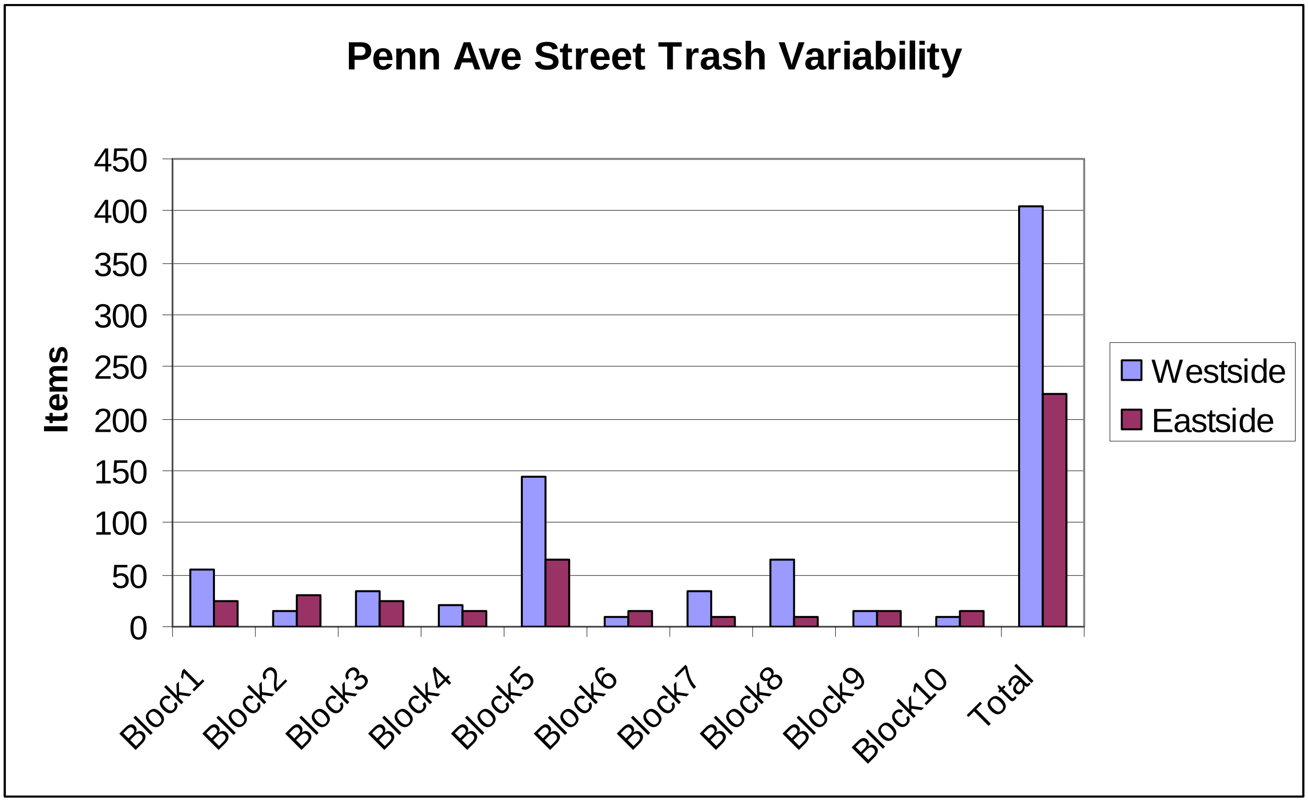
Figure 3.4.23
Trash



Variability of Opposite Sides of the Street

It was decided to investigate the variability involved with surveying one side of the street versus surveying the other side of the street. Consequently, Pennsylvania Avenue was surveyed on each side after the rainfall event. The west side has more parkland which is not cleaned up in the winter, and it has twice as much trash as the more developed east side of the street. This is a very common issue when land uses differ on the opposite sides of a street (Figure 3.4.24).

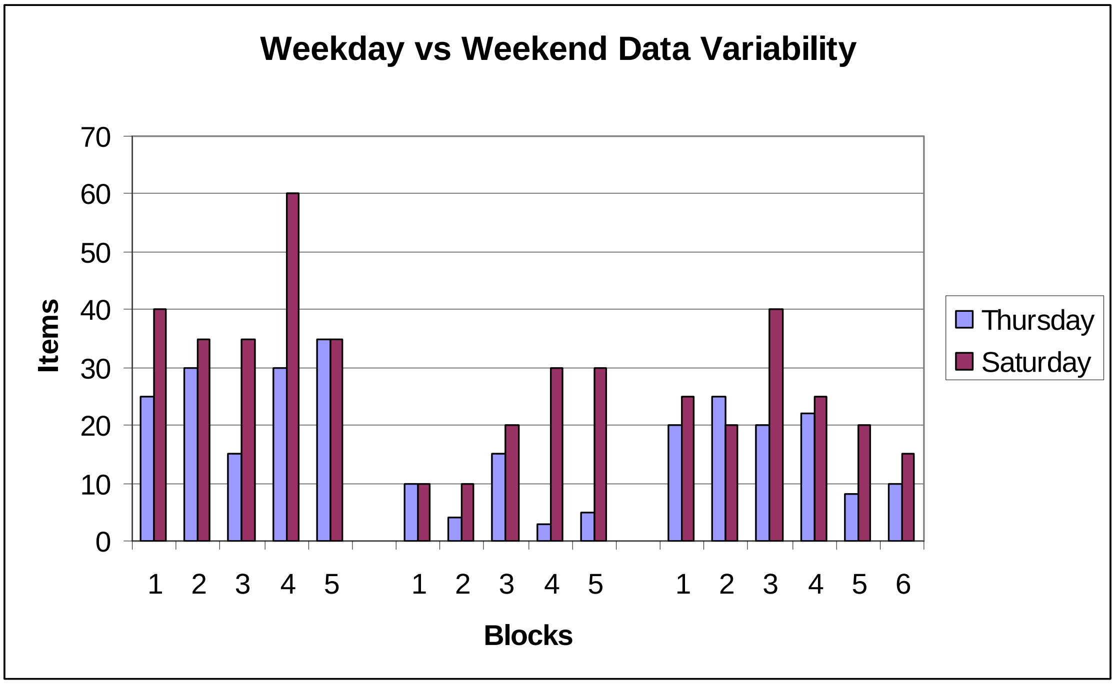
Figure 3.4.24
Penn Ave Street – Trash Variability



Weekday versus Weekend

Based upon the rainfall survey results, it was decided to look at the results of trash counts from weekday observations versus weekend observations. The results were surprising. It appears that a lot of vehicles parked along the streets are not moved during the weekday and that public transportation is used. On weekends, these vehicles are used. This was the reverse of the initial assumptions, which postulated that more cars would be used during the weekday, than on the weekend. Therefore, on weekends when fewer cars are parked, more trash is visible (Figure 3.4.25).

Figure 3.4.25
Weekday vs. Weekend – Data Variability

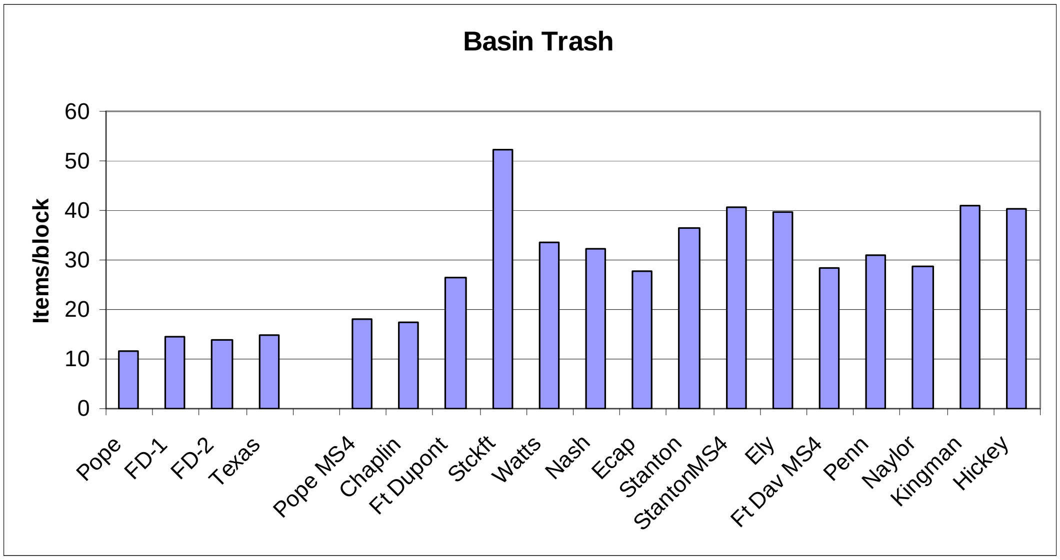


Based upon the streets selected, there was 60% more trash observed on a weekend. This information conflicts with the detailed transect counts which says that the windshield surveys account for 85% of the trash. A more controlled experiment needs to be conducted to understand these data. The only thing for certain is that there was definitely a lot more trash on Saturday and fewer cars.

Summary

There are basins which have cleaner streets as compared to other areas (Figure 3.4.26).

Figure 3.4.26
Basin Trash

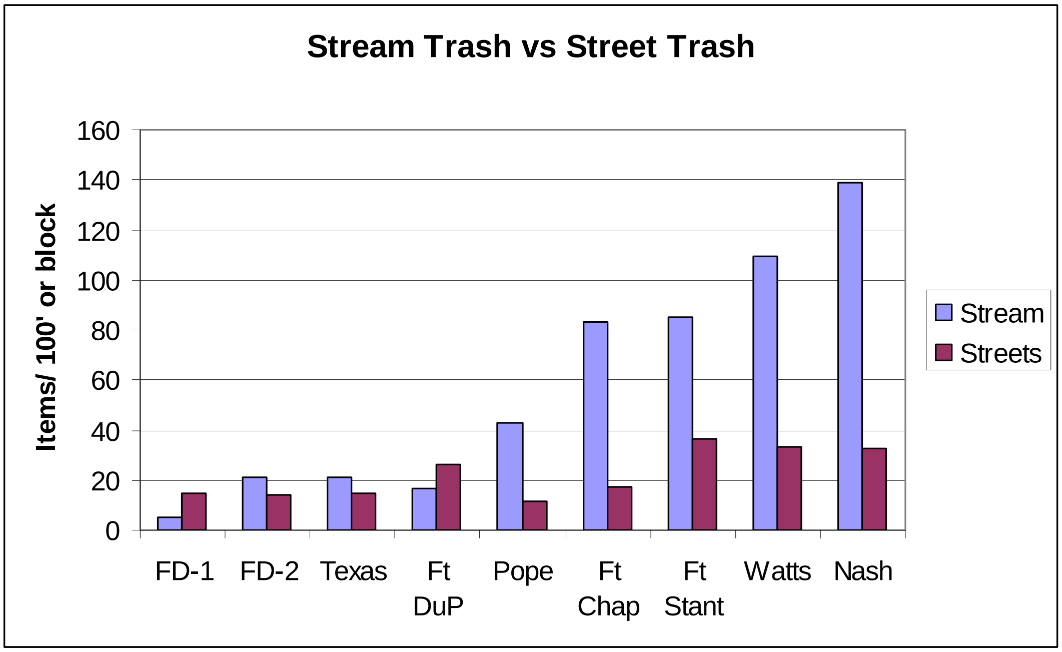


As shown in Figure 3.4.26, the upper drainage basins of the two Ft. Davis tributaries, Texas Avenue Tributary and Pope Branch have trash levels below 15 items/block. Lower Pope and Ft. Chaplin have a similar level.

The streets in the Stickfoot drainage basin have exceptionally high levels of trash per block. One reason is that the terrain of the drainage basin is very steep. A significant portion of the land there is vacant, undeveloped land. Trash accumulates along the roads, and there is no occupant to pick it up. Many of the undeveloped streets are longer than normal blocks, but that fact does not solely explain the high levels of trash that persist in the area. There are some very clean parts of the neighborhood but they cannot balance out the severe levels of trash elsewhere.

The basins of Nash Run, Watts Branch, East Capitol MS4, Fort Stanton, Ely, Lower Texas Avenue MS4, and Pennsylvania Avenue MS4 all have high levels of trash per block. Comparing the average level of trash on the streets with the average level of trash in the associated stream produces some interesting results but does not account for many other factors (Figure 3.4.27).

Figure 3.4.27
Stream Trash vs. Street Trash



3.5 DATA SUMMARY

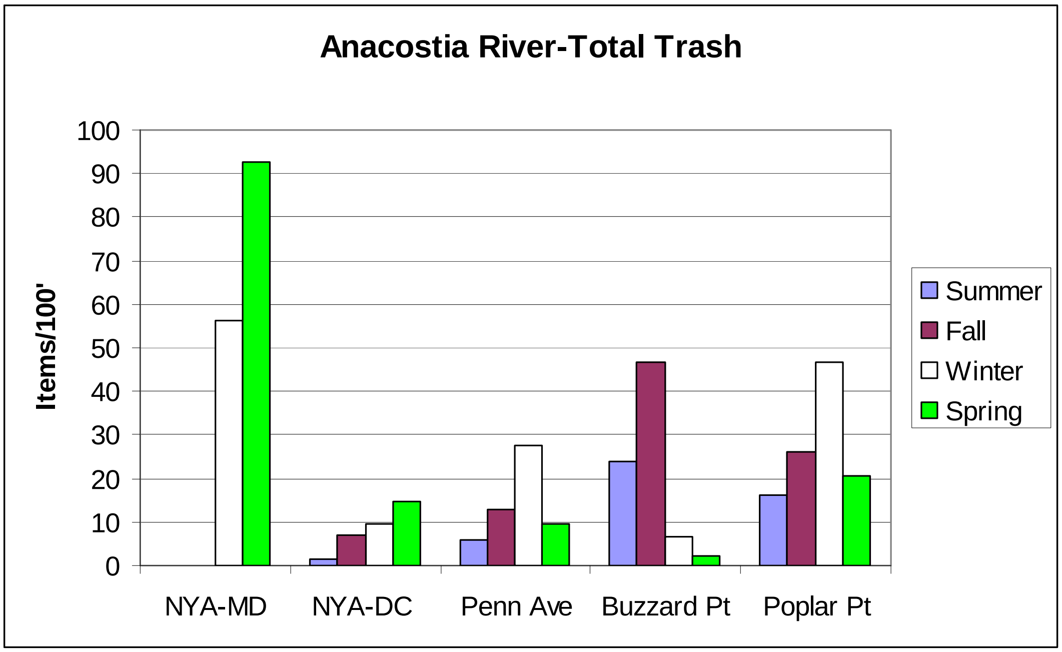
Introduction

The preceding sections compared data by the type of monitoring performed to collect it. The relationships between the different types of data provide some insight into the nature of the problem with trash in the streams and river. The issue still to be addressed in the future is how does the trash move from the land to the stream and what transformations occur in that process.

Anacostia River and Tributaries

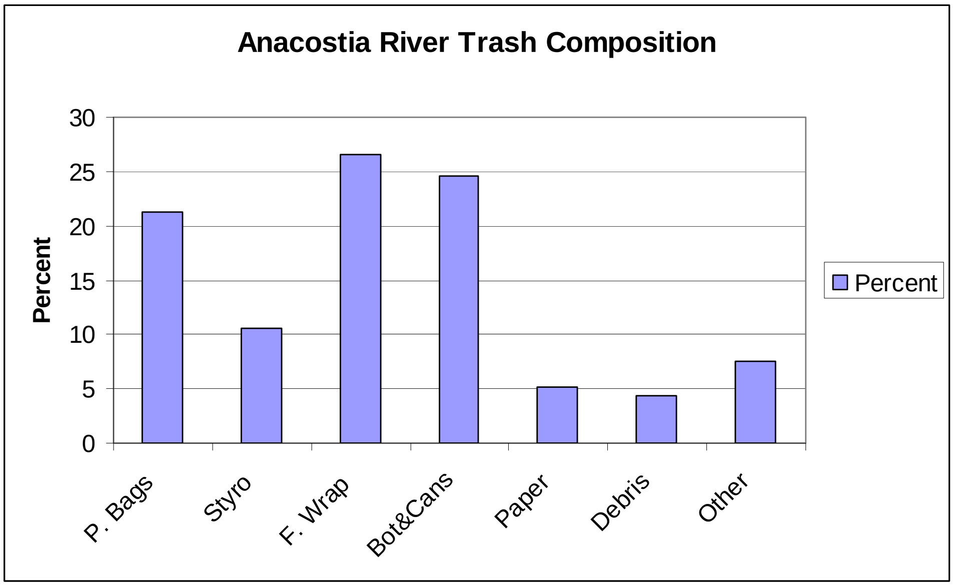
In the main stem Anacostia River trash was surveyed from above the District line down to where it joins the Potomac River. The quantity of trash is governed by the potential of the area to trap and collect trash. Mudflats, riprap slope and tidal pools behind broken seawalls will collect large amounts of trash.

Figure 3.5.1
Anacostia River – Total Trash



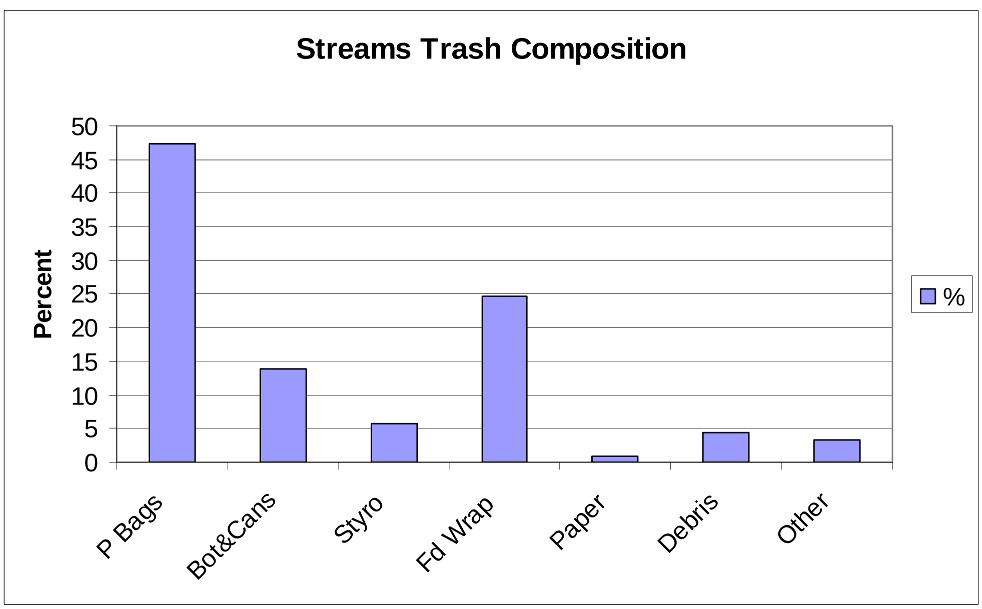
The largest categories of trash are plastic bags, Styrofoam products, snack wrappers and bottles and cans. They compose nearly 85 percent of the items (Figure 3.5.2).

Figure 3.5.2
Anacostia River – Trash Composition



In the tributary streams, the plastic bags dominate all other categories (Figure 3.5.3). This appears to be related to the amount of brush and vegetation that will snag the bags. Bottles and cans, Styrofoam and snack wrappers are prevalent. Paper products do not exist in the streams except in very localized areas.

Figure 3.5.3
Streams – Trash Composition

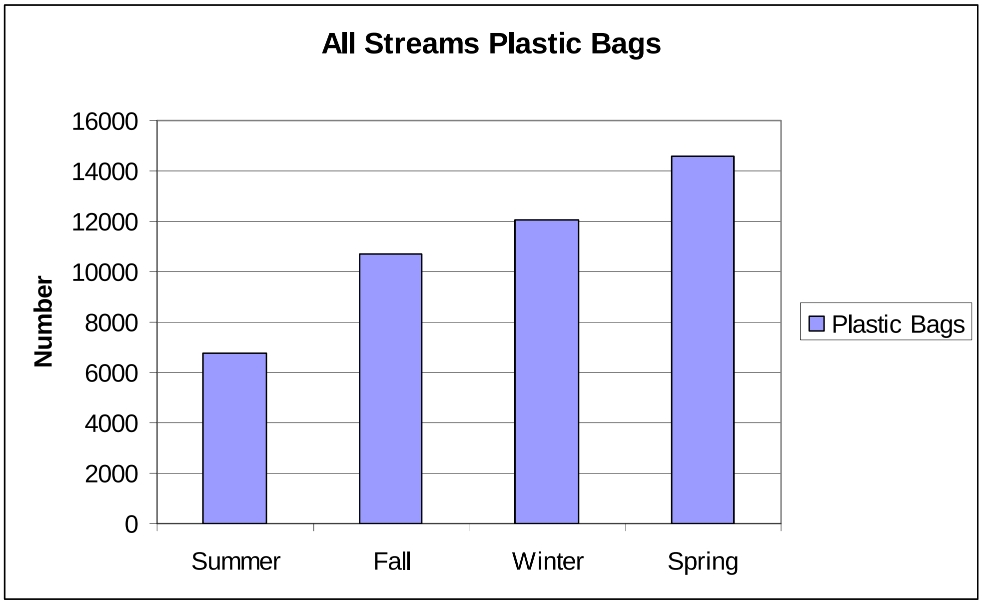


Below is an example of some paper that was counted in Watts Branch (Figure 3.5.4). It originated from the homeless drug users that frequent the area (one can also see a plastic bottle and cup sat upright by the individual and a Styrofoam plate). The other source of paper was the paper bags from beer singles. They were found usually within throwing distance of a bridge. Paper clamshells food containers were a rarity in the streams.

Figure 3.5.4
Example of some paper that was counted in Watts Branch

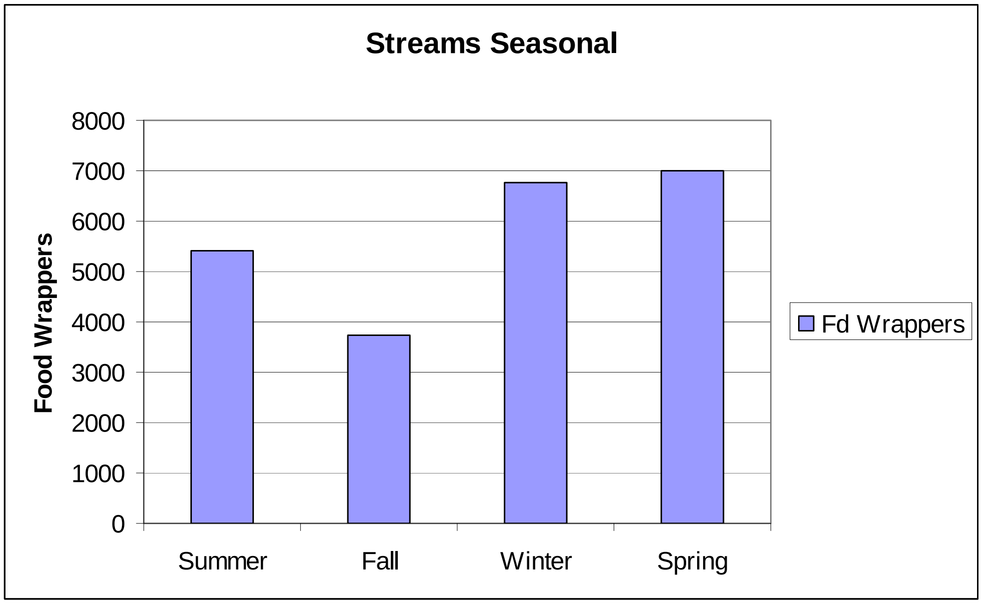
Plastic Bags in the streams doubled over the one year survey period. It is unclear whether this continues on a long term basis (Figure 3.5.5).

Figure 3.5.5
All Streams – Plastic Bags



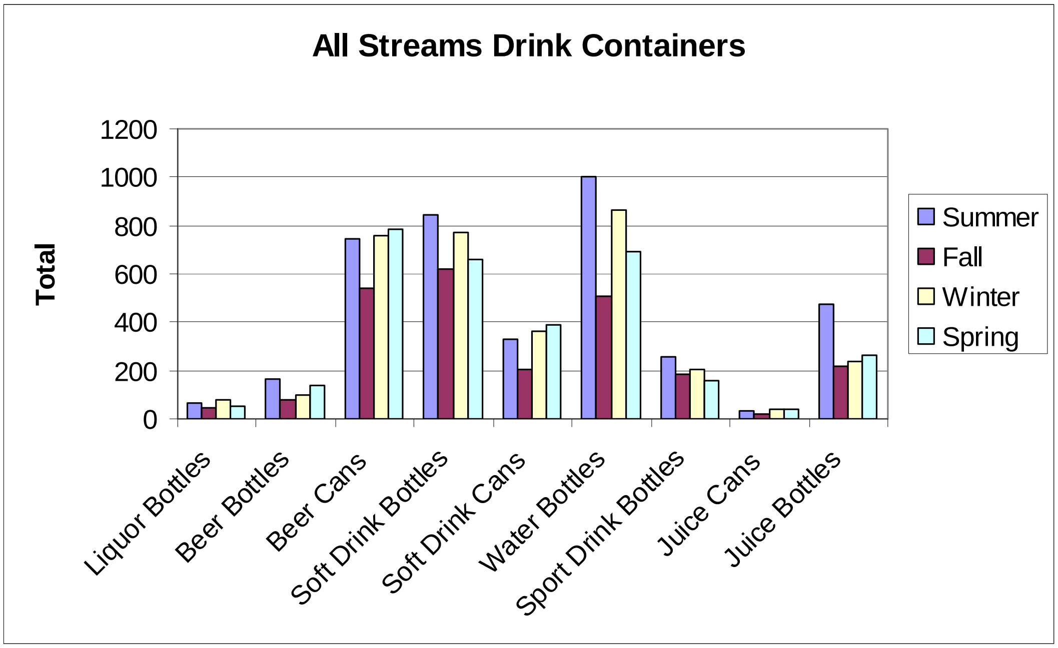
The food wrappers increased over the period but it may just be seasonal (Figure 3.5.6). As was noted, the survey in the fall was halted because of the large amount of the stream that was covered with leaves and it was felt that the survey might be undercounting these types of items.

Figure 3.5.6
Streams – Seasonal



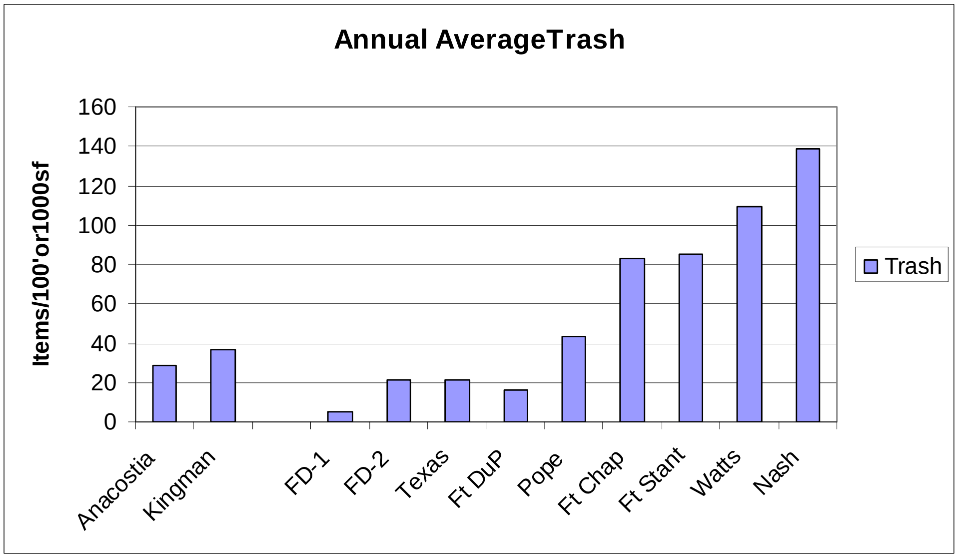
There were not many glass bottles counted. Even though the cans often sink, they can still be seen and identified. Plastic bottles float until they get enough sand and dirt inside to overcome their buoyancy (Figure 3.5.7).

Figure 3.5.7
All Streams – Drink Containers



The Anacostia River and Kingman Lake have about the same amount of trash per visible intertidal area (Figure 3.5.8). There were several streams that had trash levels of about 20 pieces per 100 feet or less. Pope Branch is an intermediately affected stream and Ft Chaplin, Ft Stanton, Watts Branch and Nash Run are heavily impacted by trash.

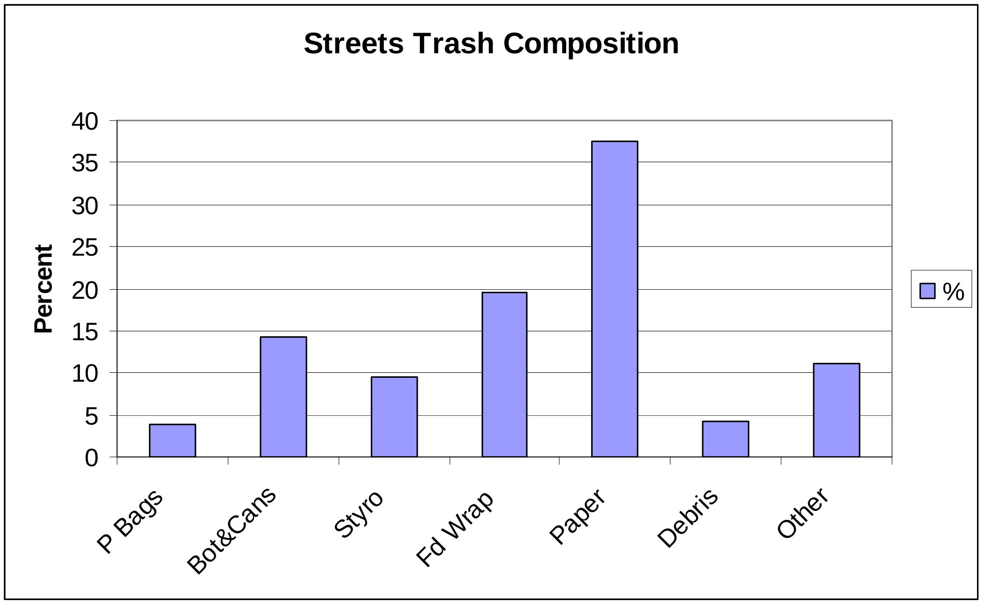
Figure 3.5.8
Annual Average Trash



Landuse Survey

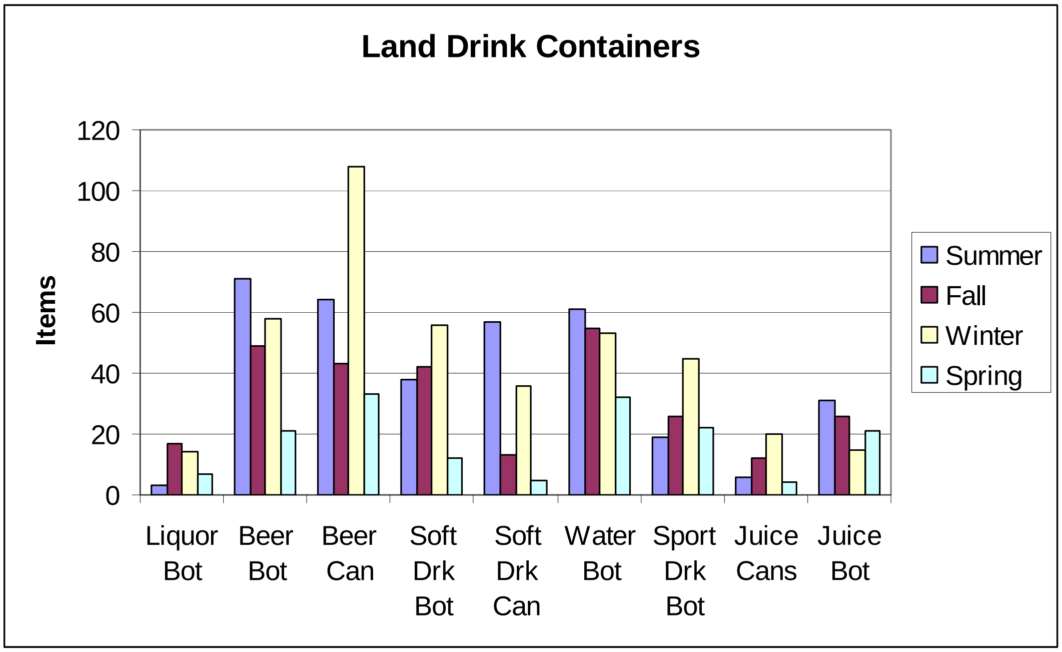
Ten streets were surveyed. The surveyed streets represented residential, commercial, and industrial land use. The trash was dominated by paper products (Figure 3.5.9).

Figure 3.5.9
Streets – Trash Composition



Recreational areas were also surveyed. The buffer zones at soccer fields and the fishing area had a lot of trash. There was roughly the same number of glass beer bottles as beer cans (Figure 3.5.10). Buffer zones do a good job of trapping trash. The trash deteriorates the original purpose of the buffer zone which is for wildlife habitat.

Figure 3.5.10
Land – Drink Containers

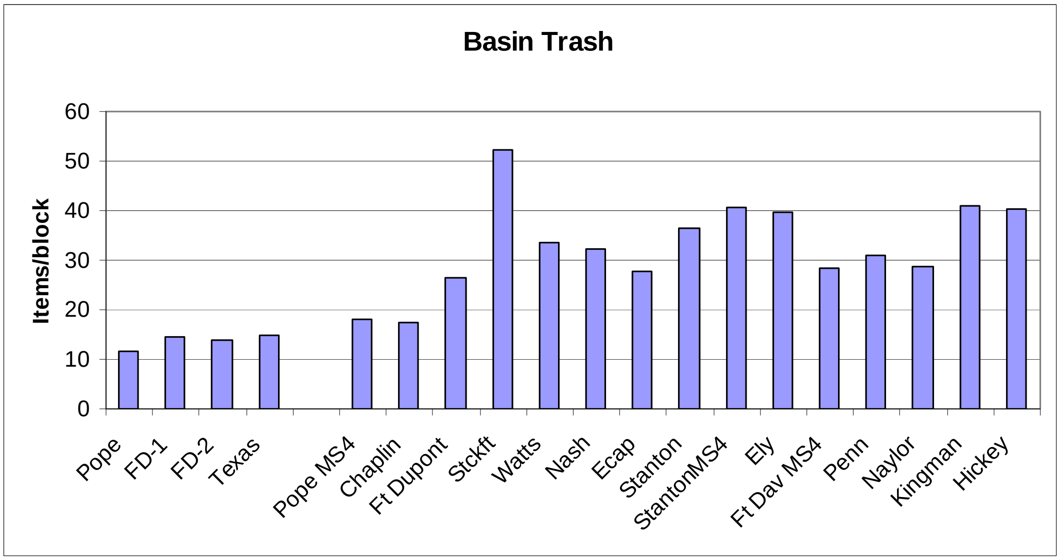


Windshield Survey

A windshield survey was conducted of each stream and Municipal Separate Storm Sewer System (MS4) drainage basin quarterly and trash was counted per block. The windshield count achieved an 85 percent accuracy when compared to detailed transect counts on the same streets.

Some basins have cleaner streets than others, but it appears that there are about 30 items per block on average (Figure 3.5.11). In general, the residential streets had less trash than commercial streets.

Figure 3.5.11
Basin Trash

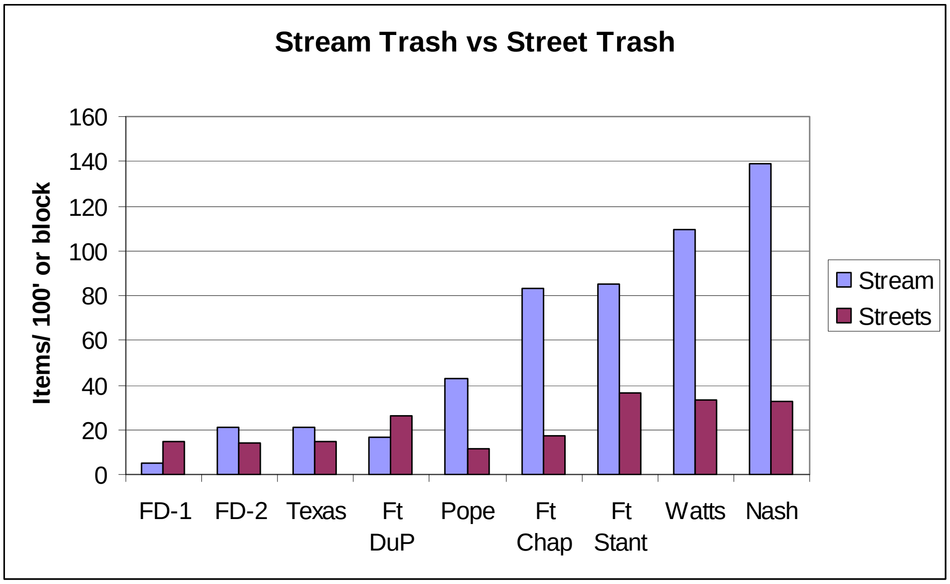


Relationships

Many different analyses were performed on the relationships between the amount of trash in a stream and the amount of trash on the streets (Figure 3.5.12). It is difficult to develop a simple relationship because the streams are all different lengths. The fact that many of the streams originate or end in pipes contributes to difference in lengths.

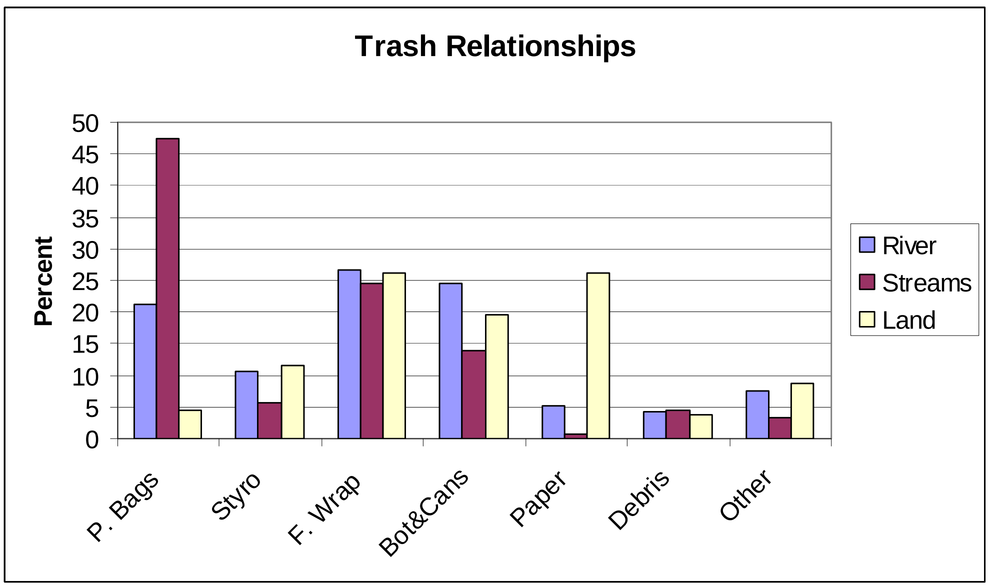
The channel roughness affects whether plastic bags and food wrappers are snagged and bottles are trapped. Data was converted to trash per acre in the drainage basin and then compared to average stream trash levels but this did not provide any additional insight. “Items per block” from the windshield survey is good an “indicator” of trash levels in a stream.

Figure 3.5.12
Stream Trash vs Street Trash



The types of trash from the river were compared to the types found in the streams and on the land (Figure 3.5.13).

Figure 3.5.13
Trash Relationships



The data suggests a relationship between plastic bags and snack items and drink items. This would suggest that a person purchases a drink and a snack such as chips and that the bag becomes litter, the drink container or cup becomes litter and the snack wrapper becomes litter. Paper products such as napkins and paper bags are common on the land but are seldom found in stream channels. Debris is constant. There is very little trash that does not have a relationship to eating or drinking. The ratio of bottles and cans would be more uniform but the bottles tend to be broken in the streams and there is a lot of glass fragments present.

Interstate Transport

The Anacostia River and Watts Branch were surveyed in Maryland. The Maryland stations had more trash than the downstream DC stations (Figure 3.5.14). The Anacostia station was a mudflat in the tidal area and on the DC side of the river the storm water inputs went through best management practices (BMPS) and had trash removed while on the Maryland side Lower Beaverdam Creek entered and delivered trash.

The Maryland station on Watts Branch (WB-MD) had very high levels of trash compared to the nearby downstream stations in DC (Figure 3.5.14). The amount of debris in the Maryland segment was over 30 items per 100 feet of stream channel.

Figure 3.5.14
Watts Branch – Average Annual Debris