

Small Watersheds Analysis

for Geographic Roadway Runoff (GRRIP I) Project
Buzzards Bay Communities

SRPEDD Region

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SMALL WATERSHEDS ANALYSIS – Buzzards Bay Communities

Background

Communities throughout Massachusetts are being required to develop Phase II Strategies to identify their community roadway drainage systems through a combination of GPS and G.I.S. mapping. In addition to mapping the drainage systems within municipalities, federal and state stormwater management agencies are also recommending that G.I.S. be used to map access both structural and non-structural stormwater facilities within significant floodplain communities. This level of analysis can reveal a point source of pollution and its contribution to the health /degradation of a watershed/floodplain system.

The Massachusetts Highway Department has previously funded the GRRIP (Geographic Roadway Runoff Inventory) Program. GRIPP has identified the environmentally sensitive areas of a town that are most vulnerable to roadway runoff. MassHighway's District 5 office, town engineers, town highway departments and town conservation offices have favorably received the GRIPP project, and are familiar with the technology.

It is the goal of the project staff to use the information generated by the Small Watershed Analysis Project to assist the Highway Departments of SRPEDD's municipal members to comply with certain sections of the Phase II Stormwater Regulations (being implemented by March of 2003) as well as certain sections of MEMA's Hazard Mitigation Planning Program.

The Impervious Cover Model

The planning staff analyzed the small watersheds through a model that uses percent of impervious cover to recommend certain watershed management actions. This model is described in the "Rapid Watershed Planning Handbook" from the Center for Watershed Protection, published in 1998. The handbook was produced through a Cooperative Agreement with The U.S. Environmental Protection Agency as an adaptation of the National Urban Runoff Study undertaken by EPA in 1981. The percent of impervious cover in the watersheds was determined using the Mass. GIS Watershed Tools, that also was adapted from the EPA runoff study.

The Mass. GIS Watershed Tools describes surface runoff to streams and makes no accounting for such things as groundwater contribution to nutrient loads. Percentage of imperviousness is assigned to each of the twenty-one land use codes considered by Mass GIS in standard land use analysis. Values for imperviousness were originally based upon literature and were later revised based upon interpretation of half-meter ortho photos (for the imperviousness of the area under land use polygons).

According to the model presented in Rapid Watershed Planning Handbook, there are certain points where stream quality changes and certain elements are lost from stream systems, based on the percentage of impervious surface within a watershed. Most notably, **at above 10% impervious cover**, sensitive stream elements are lost from the system, and **at 25 – 30% impervious cover**, stream quality indicators tend to shift into the poor category. These indicators include aquatic diversity, habitat quality and water quality. The model classifies streams into one of three categories: **sensitive** (0 – 10% impervious), **impacted** (11 – 25% impervious), and **non - supporting** (greater than 25% impervious), each with unique characteristics. From these stream categories certain management recommendations can be identified based on an extensive review of existing studies. The recommendations also discuss a fourth category known as a restorable stream. In a restorable stream, there is sufficient potential to make a meaningful improvement in hydrologic regime and water quality, and, "aquifer protection" for watersheds where surface water has a strong interaction with groundwater and where this groundwater is the drinking water source. The majority of the small watersheds analyzed within the Buzzards Bay Watershed fell within the **sensitive** range.

Model Limitations

The estimates of nutrient loading and the analysis of impervious surface derived for a subwatershed through the Mass GIS watershed tool can provide valuable insights for future land use and mitigation planning; the model provides both “simple truths and profound clues” in this respect.

Impervious cover calculations give one clue among many about the current state of the subwatershed in terms of development, hydrologic regime, runoff and other water quality indicators. Water quality and quantity degradation is not limited to impervious cover, and depending on distribution and management practices, impervious cover can have a greater or lesser effect on water quality. It is important to look closely at the quality of the pervious areas as well for their storage and/or runoff capacity and general habitat or buffering capability. For example, lawns and ball fields generally have a high chemical input and larger runoff coefficient than a meadow, forest, or stream buffer.

Other clues come from familiarity with the type and distribution of land uses in a subwatershed. For example, a watershed may have low impervious cover, but may suffer from water quality degradation due to nutrient input and/or bacteria from agriculture, farming, golf courses, or septic systems. Residential and recreational development can also have serious effects on the biological integrity and habitat quality of stream corridors.

The impervious area calculations used here were performed using coefficients for different land use categories and were based on land use allocation from MA GIS data. The Mass GIS watershed tool assumes no nonpoint source mitigation factors such as in stream assimilation and no best management practices (BMP's) being put in place. Local zoning and non-zoning development standards can lower the amount of impervious cover in a watershed and how effectively the runoff is treated can lower the impact of impervious cover. This model is also best used on small subwatershed no larger than 10 square miles for most streams.

As with any model, this analysis only predicts average behavior of a group of stream indicators over a range of impervious covers. Direct observation over time and ground-truthing of a subwatershed area that has undergone computer analysis will provide more accurate data from which to form the basis for the most practicable mitigation alternatives. However, these basic estimates, in conjunction with other resources such as the Rapid Watershed Handbook and the familiarity of the planners, public works staff and conservation staff with the area, can be used to devise effective strategies to help restore impaired waters and promote responsible land use planning.

While growth in certain areas is inevitable and a reduction in corresponding impervious surface improbable, how we address the potential impacts of nonpoint sources of pollution in pre-development planning will be the key in maintaining or improving the relative health of our waterways and waterbodies.

Watershed Protection Tools

The Center for Watershed Protection outlines eight tools for watershed protection. These Tools are applied in different ways depending on the subwatershed management category. The tools are:

1. Watershed Planning-developing land use patterns based on future land use change. Used to redirect development, preserve sensitive areas, or maintain and reduce impervious cover. Generally accomplished through zoning, urban growth boundaries or other planning tools.
2. Land Conservation-protection critical habitats, corridors, recharge areas, historical areas or protecting against specific hazards to the water resources. Accomplished through land acquisition, conservation easements, setbacks, stewardship or developing greenways.
3. Aquatic Buffers-developing or maintaining a buffer network and determining restoration or stewardship goals for buffer areas.
4. Better Site Design-foresting better site designs at the development level. These strategies include cluster subdivisions, green parking lots, rooftop runoff management and changing zoning codes for limited street width.

5. Erosion and Sediment Control-developing practices to protect aquatic habitat, reduce sediment loads and maintain conservation areas and buffers.
6. Stormwater Best Management Practices-developing objectives for stormwater that will maintain groundwater recharge, reduce pollutant loads, protect stream channels, and prevent and mitigation flooding. This includes selecting BMP's and deciding to manage (flooding, pollution, etc.).
7. Non-Stormwater Discharge-including monitoring and inspecting systems, identifying and eliminating illicit connections, dealing with combined sewer overflows, NPDES permits and other runoff problems.
8. Watershed Stewardship Programs-promoting greater watershed stewardship by fostering public participation, advocacy, education and monitoring.

GRRIP I Watershed Analysis Project in the towns of Acushnet, MA.

Report of Land Use Statistics

Cropland:	29.4	00.9%	Land use Summary:		
Pasture:	234.6	07.4%	Agriculture:	264.0	08.4%
Forest:	1357.2	43.0%	Forest:	1357.2	43.0%
Wetland:	160.7	05.1%	Wetlands:	160.7	05.1%
Mining:	36.8	01.2%	Open land:	673.6	21.3%
Open Land:	149.4	04.7%	Residential:	410.7	13.0%
Recreation:	159.5	05.1%	Commercial:	35.2	01.1%
Spectator:	00.0	00.0%	Industrial:	36.9	01.2%
Water Based:	04.8	00.2%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	219.3	06.9%
Res. < 1/4:	09.9	00.3%	Total Area	3157.5	
Res. 1/4-1/2:	125.1	04.0%			
Res. > 1/2:	275.6	08.7%			
Salt Wetland:	00.0	00.0%			
Commercial:	35.2	01.1%			
Industrial:	00.1	00.0%			
Open Urban:	30.4	01.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	219.3	06.9%			
Woody Perennial:	329.6	10.4%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 3157.5

Estimate of the Area of Impervious Cover

The impervious area is 110.0 acres

This makes the percentage of imperviousness 3.5%
Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load = 10536.9 pounds
Average Annual Phosphorus Load = 1402.3 pounds
Average Annual Suspended Solids Load = 329346.6 pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events. THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of CARVER/Watershed 1

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	410.5	26.4%	Forest:	410.5	26.4%
Wetland:	78.8	05.1%	Wetlands:	78.8	05.1%
Mining:	00.0	00.0%	Open land:	486.3	31.3%
Open Land:	09.5	00.6%	Residential:	210.9	13.6%
Recreation:	03.2	00.2%	Commercial:	02.6	00.2%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.7	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	363.1	23.4%
Res. < 1/4:	00.0	00.0%	Total Area	1552.2	
Res. 1/4-1/2:	53.7	03.5%			
Res. > 1/2:	157.2	10.1%			
Salt Wetland:	00.0	00.0%			
Commercial:	02.6	00.2%			
Industrial:	00.0	00.0%			
Open Urban:	03.3	00.2%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	363.1	23.4%			
Woody Perennial:	469.6	30.3%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 1552.2

Estimate of the Area of Impervious Cover

The impervious area is 38.4 acres

This makes the **percentage of imperviousness 2.5%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	4145.1	pounds
Average Annual Phosphorus Load =	647.4	pounds
Average Annual Suspended Solids Load =	132927.4	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events. THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of CARVER/Watershed 2

Report of Land Use Statistics

Cropland:	24.3	03.2%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	24.3	03.2%
Forest:	303.6	40.0%	Forest:	303.6	40.0%
Wetland:	12.0	01.6%	Wetlands:	12.0	01.6%
Mining:	00.0	00.0%	Open land:	176.1	23.2%
Open Land:	44.1	05.8%	Residential:	193.9	25.5%
Recreation:	04.8	00.6%	Commercial:	34.2	04.5%
Spectator:	00.0	00.0%	Industrial:	05.3	00.7%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	10.3	01.4%
Res. < 1/4:	13.7	01.8%	Total Area	759.7	
Res. 1/4-1/2:	66.9	08.8%			
Res. > 1/2:	113.3	14.9%			
Salt Wetland:	00.0	00.0%			
Commercial:	34.2	04.5%			
Industrial:	00.0	00.0%			
Open Urban:	08.6	01.1%			
Transport:	00.0	00.0%			
Waste Disposal:	05.3	00.7%			
Water:	10.3	01.4%			
Woody Perennial:	118.6	15.6%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 759.7

Estimate of the Area of Impervious Cover

The impervious area is 63.9 acres

This makes the **percentage of imperviousness 8.4%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	3105.0	pounds
Average Annual Phosphorus Load =	465.9	pounds
Average Annual Suspended Solids Load =	122851.2	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events. THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of DARTMOUTH/Watershed 1

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	33.0	09.2%	Agriculture:	33.0	09.2%
Forest:	132.4	37.0%	Forest:	132.4	37.0%
Wetland:	02.0	00.6%	Wetlands:	04.6	01.3%
Mining:	00.0	00.0%	Open land:	15.6	04.4%
Open Land:	00.0	00.0%	Residential:	161.3	45.1%
Recreation:	12.0	03.3%	Commercial:	08.5	02.4%
Spectator:	00.0	00.0%	Industrial:	02.3	00.6%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	02.7	00.7%	Water:	00.0	00.0%
Res. < 1/4:	00.0	00.0%	Total Area	357.7	
Res. 1/4-1/2:	156.3	43.7%			
Res. > 1/2:	02.4	00.7%			
Salt Wetland:	02.6	00.7%			
Commercial:	08.5	02.4%			
Industrial:	00.0	00.0%			
Open Urban:	01.0	00.3%			
Transport:	00.0	00.0%			
Waste Disposal:	02.3	00.6%			
Water:	00.0	00.0%			
Woody Perennial:	02.6	00.7%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 357.7

Estimate of the Area of Impervious Cover

The impervious area is 32.3 acres

This makes the **percentage of imperviousness 9.0%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	2215.1	pounds
Average Annual Phosphorus Load =	366.9	pounds
Average Annual Suspended Solids Load =	91217.7	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of DARTMOUTH/Watershed 2

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	250.5	68.7%	Forest:	250.5	68.7%
Wetland:	11.6	03.2%	Wetlands:	11.6	03.2%
Mining:	00.0	00.0%	Open land:	00.2	00.1%
Open Land:	00.2	00.1%	Residential:	70.8	19.4%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	02.3	00.6%
Multi-Family:	00.0	00.0%	Water:	29.1	08.0%
Res. < 1/4:	00.0	00.0%	Total Area	364.6	
Res. 1/4-1/2:	48.8	13.4%			
Res. > 1/2:	22.1	06.0%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.0	00.0%			
Industrial:	00.0	00.0%			
Open Urban:	00.0	00.0%			
Transport:	02.3	00.6%			
Waste Disposal:	00.0	00.0%			
Water:	29.1	08.0%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 364.6

Estimate of the Area of Impervious Cover

The impervious area is 13.2 acres

This makes the **percentage of imperviousness 3.6%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	1449.0	pounds
Average Annual Phosphorus Load =	177.1	pounds
Average Annual Suspended Solids Load =	41215.3	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of Fairhaven, MA.

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	22.7	18.1%	Forest:	22.7	18.1%
Wetland:	00.0	00.0%	Wetlands:	27.6	22.0%
Mining:	00.0	00.0%	Open land:	20.0	16.0%
Open Land:	14.0	11.2%	Residential:	50.8	40.6%
Recreation:	00.0	00.0%	Commercial:	04.2	03.3%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	01.8	01.5%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	00.0	00.0%
Res. < 1/4:	19.3	15.4%	Total Area	125.2	
Res. 1/4-1/2:	21.1	16.9%			
Res. > 1/2:	10.3	08.3%			
Salt Wetland:	27.6	22.0%			
Commercial:	04.2	03.3%			
Industrial:	00.0	00.0%			
Open Urban:	00.0	00.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	00.0	00.0%			
Woody Perennial:	04.2	03.3%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 125.2

Estimate of the Area of Impervious Cover

The impervious area is 19.3 acres

This makes the percentage of imperviousness 15.4%

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	747.2	pounds
Average Annual Phosphorus Load =	117.9	pounds
Average Annual Suspended Solids Load =	29490.0	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of FALL RIVER/WATERSHED 1

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	414.9	88.6%	Forest:	414.9	88.6%
Wetland:	37.6	08.0%	Wetlands:	37.6	08.0%
Mining:	00.0	00.0%	Open land:	09.9	02.1%
Open Land:	09.9	02.1%	Residential:	00.0	00.0%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	05.9	01.3%
Res. < 1/4:	00.0	00.0%	Total Area	468.3	
Res. 1/4-1/2:	00.0	00.0%			
Res. > 1/2:	00.0	00.0%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.0	00.0%			
Industrial:	00.0	00.0%			
Open Urban:	00.0	00.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	05.9	01.3%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 468.3

Estimate of the Area of Impervious Cover

The impervious area is 4.7 acres

This makes the **percentage of imperviousness 1.0%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	1251.2	pounds
Average Annual Phosphorus Load =	51.3	pounds
Average Annual Suspended Solids Load =	11224.5	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of FALL RIVER/WATERSHED 2

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	217.0	91.4%	Forest:	217.0	91.4%
Wetland:	01.7	00.7%	Wetlands:	01.7	00.7%
Mining:	00.0	00.0%	Open land:	02.4	01.0%
Open Land:	02.4	01.0%	Residential:	03.9	01.6%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	12.5	05.3%
Res. < 1/4:	00.0	00.0%	Total Area	237.5	
Res. 1/4-1/2:	00.0	00.0%			
Res. > 1/2:	03.9	01.6%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.0	00.0%			
Industrial:	00.0	00.0%			
Open Urban:	00.0	00.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	12.5	05.3%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 237.5

Estimate of the Area of Impervious Cover

The impervious area is 2.7 acres

This makes the **percentage of imperviousness 1.1%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	634.3	pounds
Average Annual Phosphorus Load =	35.2	pounds
Average Annual Suspended Solids Load =	7304.1	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of LAKEVILLE/FREETOWN

Report of Land Use Statistics

Cropland:	11.0	01.3%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	11.0	01.3%
Forest:	507.5	61.0%	Forest:	507.5	61.0%
Wetland:	13.1	01.6%	Wetlands:	13.1	01.6%
Mining:	00.0	00.0%	Open land:	53.0	06.4%
Open Land:	15.5	01.9%	Residential:	231.0	27.8%
Recreation:	18.2	02.2%	Commercial:	14.4	01.7%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	01.1	00.1%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	02.0	00.2%
Res. < 1/4:	00.0	00.0%	Total Area	832.0	
Res. 1/4-1/2:	143.8	17.3%			
Res. > 1/2:	87.2	10.5%			
Salt Wetland:	00.0	00.0%			
Commercial:	14.4	01.7%			
Industrial:	00.0	00.0%			
Open Urban:	14.7	01.8%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	02.0	00.2%			
Woody Perennial:	03.5	00.4%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 832.0

Estimate of the Area of Impervious Cover

The impervious area is 46.4 acres

This makes the **percentage of imperviousness 5.6%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	3819.0	pounds
Average Annual Phosphorus Load =	518.6	pounds
Average Annual Suspended Solids Load =	130889.5	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of LAKEVILLE/ROCHESTER

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	238.8	91.4%	Forest:	238.8	91.4%
Wetland:	06.2	02.4%	Wetlands:	06.2	02.4%
Mining:	00.0	00.0%	Open land:	02.7	01.0%
Open Land:	01.1	00.4%	Residential:	07.3	02.8%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	06.3	02.4%
Res. < 1/4:	00.0	00.0%	Total Area	261.3	
Res. 1/4-1/2:	00.0	00.0%			
Res. > 1/2:	07.3	02.8%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.0	00.0%			
Industrial:	00.0	00.0%			
Open Urban:	01.6	00.6%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	06.3	02.4%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 261.3

Estimate of the Area of Impervious Cover

The impervious area is 3.3 acres

This makes the percentage of imperviousness 1.3%

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	726.7	pounds
Average Annual Phosphorus Load =	40.8	pounds
Average Annual Suspended Solids Load =	8926.8	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons.

NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of MARION/Watershed 1

Report of Land Use Statistics

Cropland:	01.5	00.2%	Land use Summary:		
Pasture:	00.6	00.1%	Agriculture:	02.1	00.3%
Forest:	436.5	66.4%	Forest:	436.5	66.4%
Wetland:	18.0	02.7%	Wetlands:	18.0	02.7%
Mining:	00.0	00.0%	Open land:	105.6	16.1%
Open Land:	07.4	01.1%	Residential:	94.6	14.4%
Recreation:	00.0	00.0%	Commercial:	00.4	00.1%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	00.0	00.0%
Res. < 1/4:	00.0	00.0%	Total Area	657.2	
Res. 1/4-1/2:	36.7	05.6%			
Res. > 1/2:	57.9	08.8%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.4	00.1%			
Industrial:	00.0	00.0%			
Open Urban:	02.0	00.3%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	00.0	00.0%			
Woody Perennial:	96.2	14.6%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 657.2

Estimate of the Area of Impervious Cover

The impervious area is 16.5 acres

This makes the **percentage of imperviousness 2.5%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	2047.2	pounds
Average Annual Phosphorus Load =	208.7	pounds
Average Annual Suspended Solids Load =	48698.2	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of MARION/Watershed 2

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	03.0	01.6%	Agriculture:	03.0	01.6%
Forest:	83.8	45.4%	Forest:	83.8	45.4%
Wetland:	14.1	07.6%	Wetlands:	20.6	11.1%
Mining:	00.0	00.0%	Open land:	06.0	03.3%
Open Land:	04.3	02.4%	Residential:	48.5	26.3%
Recreation:	00.0	00.0%	Commercial:	21.1	11.4%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	01.6	00.9%
Res. < 1/4:	00.0	00.0%	Total Area	184.6	
Res. 1/4-1/2:	13.3	07.2%			
Res. > 1/2:	35.2	19.1%			
Salt Wetland:	06.5	03.5%			
Commercial:	21.1	11.4%			
Industrial:	00.0	00.0%			
Open Urban:	01.7	00.9%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	01.6	00.9%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 184.6

Estimate of the Area of Impervious Cover

The impervious area is 25.4 acres

This makes the **percentage of imperviousness 13.8%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	924.4	pounds
Average Annual Phosphorus Load =	132.5	pounds
Average Annual Suspended Solids Load =	34868.0	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of Mattapoisett

Report of Land Use Statistics

Cropland:	75.2	07.1%	Land use Summary:		
Pasture:	15.8	01.5%	Agriculture:	91.1	08.6%
Forest:	487.9	46.3%	Forest:	487.9	46.3%
Wetland:	27.7	02.6%	Wetlands:	76.5	07.3%
Mining:	00.0	00.0%	Open land:	140.7	13.4%
Open Land:	69.0	06.6%	Residential:	201.9	19.2%
Recreation:	55.7	05.3%	Commercial:	22.5	02.1%
Spectator:	00.0	00.0%	Industrial:	03.1	00.3%
Water Based:	00.6	00.1%	Transport:	29.4	02.8%
Multi-Family:	00.0	00.0%	Water:	00.0	00.0%
Res. < 1/4:	02.0	00.2%	Total Area	1053.0	
Res. 1/4-1/2:	46.1	04.4%			
Res. > 1/2:	153.8	14.6%			
Salt Wetland:	48.8	04.6%			
Commercial:	22.5	02.1%			
Industrial:	03.1	00.3%			
Open Urban:	15.1	01.4%			
Transport:	29.4	02.8%			
Waste Disposal:	00.0	00.0%			
Water:	00.0	00.0%			
Woody Perennial:	00.3	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 1053.0

Estimate of the Area of Impervious Cover

The impervious area is 75.6 acres

This makes the **percentage of imperviousness 7.2%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	4528.8	pounds
Average Annual Phosphorus Load =	642.8	pounds
Average Annual Suspended Solids Load =	182813.5	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of Middleborough, MA.

Report of Land Use Statistics

Cropland:	52.5	02.1%	Land use Summary:		
Pasture:	42.9	01.7%	Agriculture:	95.4	03.9%
Forest:	827.1	33.7%	Forest:	827.1	33.7%
Wetland:	160.7	06.5%	Wetlands:	160.7	06.5%
Mining:	75.9	03.1%	Open land:	255.5	10.4%
Open Land:	81.1	03.3%	Residential:	767.7	31.3%
Recreation:	65.8	02.7%	Commercial:	129.5	05.3%
Spectator:	00.0	00.0%	Industrial:	155.8	06.3%
Water Based:	00.0	00.0%	Transport:	49.7	02.0%
Multi-Family:	09.7	00.4%	Water:	13.0	00.5%
Res. < 1/4:	307.0	12.5%	Total Area	2454.4	
Res. 1/4-1/2:	225.5	09.2%			
Res. > 1/2:	225.5	09.2%			
Salt Wetland:	00.0	00.0%			
Commercial:	129.5	05.3%			
Industrial:	75.4	03.1%			
Open Urban:	108.6	04.4%			
Transport:	49.7	02.0%			
Waste Disposal:	04.5	00.2%			
Water:	13.0	00.5%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 2454.4

Estimate of the Area of Impervious Cover

The impervious area is 460.0 acres

This makes the percentage of imperviousness 18.7%

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	14628.8	pounds
Average Annual Phosphorus Load =	2380.5	pounds
Average Annual Suspended Solids Load =	640336.4	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season. Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events. THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the towns of New Bedford

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	57.8	23.5%	Forest:	57.8	23.5%
Wetland:	00.0	00.0%	Wetlands:	00.0	00.0%
Mining:	00.0	00.0%	Open land:	36.9	15.0%
Open Land:	10.3	04.2%	Residential:	113.3	46.0%
Recreation:	00.0	00.0%	Commercial:	02.9	01.2%
Spectator:	00.0	00.0%	Industrial:	00.1	00.0%
Water Based:	00.0	00.0%	Transport:	00.6	00.3%
Multi-Family:	00.0	00.0%	Water:	34.7	14.1%
Res. < 1/4:	00.0	00.0%	Total Area	246.3	
Res. 1/4-1/2:	112.1	45.5%			
Res. > 1/2:	01.2	00.5%			
Salt Wetland:	00.0	00.0%			
Commercial:	02.9	01.2%			
Industrial:	00.1	00.0%			
Open Urban:	26.6	10.8%			
Transport:	00.6	00.3%			
Waste Disposal:	00.0	00.0%			
Water:	34.7	14.1%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 246.3

Estimate of the Area of Impervious Cover

The impervious area is 19.2 acres

This makes the percentage of imperviousness 7.8%

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	1547.1	pounds
Average Annual Phosphorus Load =	268.5	pounds
Average Annual Suspended Solids Load =	67078.4	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of ROCHESTER

Report of Land Use Statistics

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	00.0	00.0%
Forest:	50.2	35.6%	Forest:	50.2	35.6%
Wetland:	00.3	00.2%	Wetlands:	00.3	00.2%
Mining:	00.0	00.0%	Open land:	76.4	54.1%
Open Land:	05.7	04.1%	Residential:	10.3	07.3%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	02.7	01.9%
Water Based:	01.1	00.8%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	01.3	00.9%
Res. < 1/4:	00.0	00.0%	Total Area	141.2	
Res. 1/4-1/2:	00.0	00.0%			
Res. > 1/2:	10.3	07.3%			
Salt Wetland:	00.0	00.0%			
Commercial:	00.0	00.0%			
Industrial:	02.7	01.9%			
Open Urban:	00.0	00.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	01.3	00.9%			
Woody Perennial:	69.5	49.3%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 141.2

Estimate of the Area of Impervious Cover

The impervious area is 4.4 acres

This makes the **percentage of imperviousness 3.1%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	253.0	pounds
Average Annual Phosphorus Load =	27.3	pounds
Average Annual Suspended Solids Load =	6386.3	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of WAREHAM

Estimate of Land Uses

Cropland:	00.0	00.0%	Land use Summary:		
Pasture:	08.6	01.2%	Agriculture:	08.6	01.2%
Forest:	307.0	44.4%	Forest:	307.0	44.4%
Wetland:	15.7	02.3%	Wetlands:	89.7	13.0%
Mining:	00.0	00.0%	Open land:	39.4	05.7%
Open Land:	09.6	01.4%	Residential:	201.5	29.2%
Recreation:	06.0	00.9%	Commercial:	29.0	04.2%
Spectator:	00.0	00.0%	Industrial:	01.4	00.2%
Water Based:	00.0	00.0%	Transport:	04.1	00.6%
Multi-Family:	08.4	01.2%	Water:	10.1	01.5%
Res. < 1/4:	07.0	01.0%	Total Area	690.7	
Res. 1/4-1/2:	152.2	22.0%			
Res. > 1/2:	33.9	04.9%			
Salt Wetland:	74.1	10.7%			
Commercial:	29.0	04.2%			
Industrial:	01.4	00.2%			
Open Urban:	12.4	01.8%			
Transport:	04.1	00.6%			
Waste Disposal:	00.0	00.0%			
Water:	10.1	01.5%			
Woody Perennial:	11.5	01.7%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 690.7

Estimate of the Area of Impervious Cover

The impervious area is 68.7 acres

This makes the percentage of imperviousness 9.9%

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	3614.1	pounds
Average Annual Phosphorus Load =	518.4	pounds
Average Annual Suspended Solids Load =	132438.0	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of WESTPORT/WATERSHED 1

Report of Land Use Statistics

Cropland:	42.2	08.9%	Land use Summary:		
Pasture:	27.4	05.8%	Agriculture:	69.6	14.7%
Forest:	205.1	43.4%	Forest:	205.1	43.4%
Wetland:	00.0	00.0%	Wetlands:	00.0	00.0%
Mining:	05.6	01.2%	Open land:	56.1	11.9%
Open Land:	14.5	03.1%	Residential:	132.0	27.9%
Recreation:	09.9	02.1%	Commercial:	04.1	00.9%
Spectator:	00.0	00.0%	Industrial:	05.6	01.2%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	00.0	00.0%
Res. < 1/4:	00.0	00.0%	Total Area	472.4	
Res. 1/4-1/2:	62.3	13.2%			
Res. > 1/2:	69.7	14.8%			
Salt Wetland:	00.0	00.0%			
Commercial:	04.1	00.9%			
Industrial:	00.0	00.0%			
Open Urban:	31.7	06.7%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	00.0	00.0%			
Woody Perennial:	00.0	00.0%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 472.4

Estimate of the Area of Impervious Cover

The impervious area is 22.2 acres

This makes the **percentage of imperviousness 4.7%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	2203.8	pounds
Average Annual Phosphorus Load =	332.9	pounds
Average Annual Suspended Solids Load =	91425.3	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.

GRRIP I Watershed Analysis Project in the town of WESTPORT/WATERSHED 2

Report of Land Use Statistics

Cropland:	137.5	63.0%	Land use Summary:		
Pasture:	00.0	00.0%	Agriculture:	137.5	63.0%
Forest:	46.1	21.1%	Forest:	46.1	21.1%
Wetland:	01.0	00.5%	Wetlands:	07.5	03.4%
Mining:	00.0	00.0%	Open land:	05.9	02.7%
Open Land:	05.1	02.3%	Residential:	20.4	09.4%
Recreation:	00.0	00.0%	Commercial:	00.0	00.0%
Spectator:	00.0	00.0%	Industrial:	00.0	00.0%
Water Based:	00.0	00.0%	Transport:	00.0	00.0%
Multi-Family:	00.0	00.0%	Water:	00.9	00.4%
Res. < 1/4:	00.0	00.0%	Total Area	218.3	
Res. 1/4-1/2:	00.0	00.0%			
Res. > 1/2:	20.4	09.4%			
Salt Wetland:	06.5	03.0%			
Commercial:	00.0	00.0%			
Industrial:	00.0	00.0%			
Open Urban:	00.0	00.0%			
Transport:	00.0	00.0%			
Waste Disposal:	00.0	00.0%			
Water:	00.9	00.4%			
Woody Perennial:	00.8	00.4%			
No Change:	00.0	00.0%			

Total area in acres for all land uses = 218.3

Estimate of the Area of Impervious Cover

The impervious area is 4.0 acres

This makes the **percentage of imperviousness 1.8%**

Please note this is an estimate based on a combination of literature and limited verification comparing the land use map to ortho photos. If absolute accuracy is desired calibration to a specific area is required.

Estimate of annual Nonpoint Source Pollution Loads

Estimated Nonpoint Source Pollution loads based on Landuse

Average Annual Nitrogen Load =	777.9	pounds
Average Annual Phosphorus Load =	127.8	pounds
Average Annual Suspended Solids Load =	65054.1	pounds

These Estimates are based on the Watershed Management Model. They are estimates of the amount of contamination generated by the distribution of land use in an average year. Real loads vary greatly from year to year and season to season.

Observed loads tend to be much lower than these estimates for two reasons. NO mitigating factors are considered. No in stream assimilation, No BMPs. The larger the area, the more natural assimilation should take place. Also few observations are made during the most dramatic storm events. Thus observed loadings tend to be biased away from nonpoint source events.

THESE RESULTS SHOULD BE USED TO COMPARE AREAS OF SIMILAR SIZE AND PHYSIOGRAPHY.