

# Quality of Runoff Water in the Soil Exposed to Fire in Guánica Dry Forest Reserve



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This investigation has its purpose to determinate if the soil of Guánica Dry Forest that is exposed to fire affects the quality of runoff water. In addition to making a characterization of burned scrubland soil in a xeric environment.

## Introduction:

Guánica Dry Forest Reserve is an United Nations Biosphere Reserve. It's located in the south part of the Archipelago of Puerto Rico. Encompasses over 400 hectares (9,500 acres) and has different associations of vegetation. One of these is Dry Scrubs that include dry limestone scrubs with melon cactuses (*Melocactus intortus*), Spanish dildo cactuses (*Cephalocereus royerii*), úcar trees (*Bucida buceras*), almácigo trees (*Burcera simaruba*), zarcilla (*Leucaena leucocephala*), aleli (*Plumeria alba*) and grass. You can see lizards, beetles, millipedes, ants and a variety of birds. Rain falls unevenly throughout the year. The driest times come from December to April. Unfortunately, a portion of this natural protected area was affected by anthropogenic fire. This fact is very dangerous for the ecological stability, to conserve endangered species in the forest and for the ecosystem. It is our responsibility to protect and conserve this important ecosystem for future generations. With this research we can provide a description of the habitat after the fire and its effect in the soil and runoff water quality.

## Problem:

Does the soil inside Guánica Dry Forest that is exposed to fire vary the quality of runoff water than soil in areas not exposed to fire?

## Hypothesis:

- The burned soils in the scrubland of the Guánica Dry Forest will vary the quality of runoff water.
- The quality of runoff water and the soil characterization will vary in a burned soil and in non-burned soils within the scrubland of the Guánica Dry Forest.

## Materials and Methods:



### Field Methods

Measured soil temperature, humidity and compaction. Collected nine samples in total of burned and non-burned soil. Placed three plastic bottles in non-burned area and three plastic bottles in burned area for runoff collection.

### Laboratory Methods

Tested water samples (rain, burned area runoff, non-burned area runoff) for pH, Nitrate, Phosphate and Turbidity. Sieved 500g of each soil sample, determined grain characteristics and tested N-P-K.



## Sieved Sample Weight and Characterization

SAMPLE 1	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	22.7
	10	18.2
	35	268.3
	60	32.2
	120	87.4
	230	49.3
	-	21.9

SAMPLE 2	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	49.7
	10	38.0
	35	155.0
	60	83.4
	120	131.9
	230	42
	-	12.5

SAMPLE 3	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	14.2
	10	18.4
	35	85
	60	132.4
	120	191.3
	230	41.7
	-	17

SAMPLE 4	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	37.4
	10	27.9
	35	88.9
	60	55.6
	120	199.0
	230	65.2
	-	26.0

SAMPLE 5	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	12.3
	10	27.2
	35	214.5
	60	64.8
	120	120.3
	230	46.6
	-	14.3

SAMPLE 6	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	7.4
	10	7.7
	35	65.2
	60	21.1
	120	220.1
	230	121.1
	-	57.4

SAMPLE 7	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	59.2
	10	19.6
	35	107.8
	60	51.6
	120	192.5
	230	47.3
	-	14.8

SAMPLE 8	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	23.3
	10	23.3
	35	84.4
	60	111.5
	120	171.2
	230	57.8
	-	28.5

SAMPLE 9	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	49.2
	10	23.2
	35	124.2
	60	63.3
	120	176.6
	230	47.7
	-	16

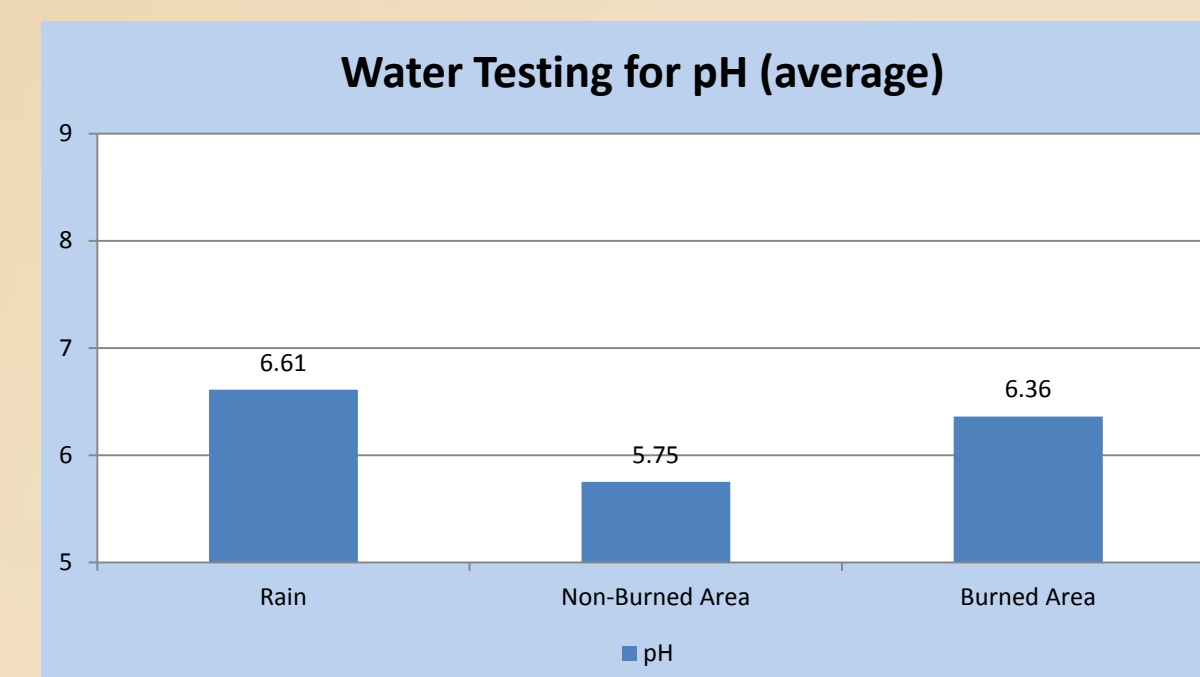
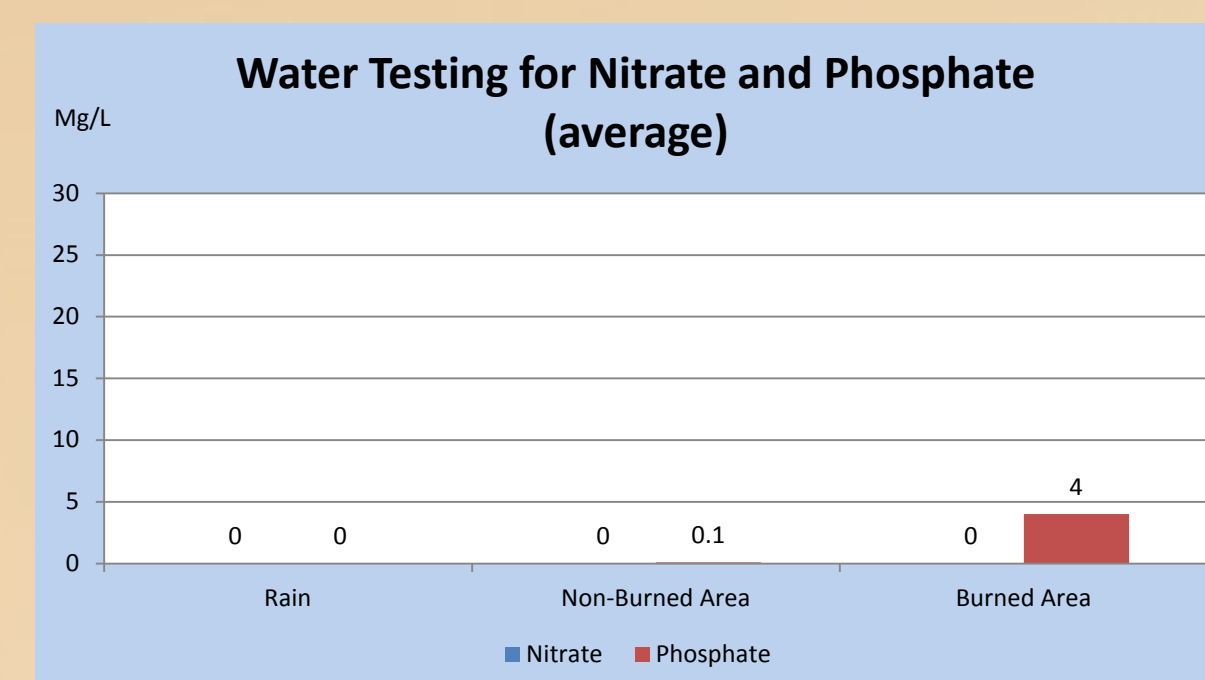
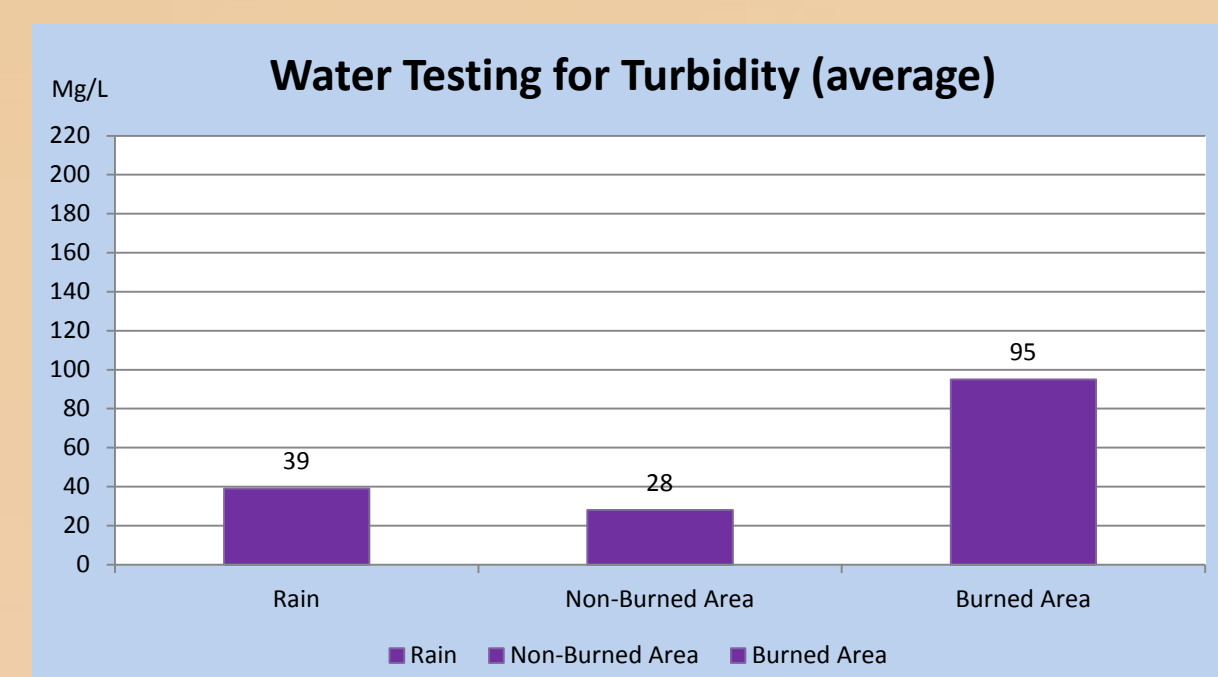
CONTROL	DISTRIBUTION	
	MESH	WEIGHT (G)
	5	129.6
	10	131.2
	35	230.7
	60	7.0
	120	1.5
	230	-
	-	-

### Observations

- SAMPLE 1:** Organic material (roots, seashells, dead worms)
- SAMPLE 2:** Organic material (roots, rocks, seashells, leaves), broken glass, ashes, soil changes color (burned)
- SAMPLE 3:** Organic material (roots, rocks, seashells), ashes, soil changes color
- SAMPLE 4:** Organic material (roots, rocks, seashells), broken glass, soil changes color
- SAMPLE 5:** Organic material (roots, rocks, seashells), broken glass
- SAMPLE 6:** Organic material (roots, rocks, seashells, burned sticks)
- SAMPLE 7:** Organic material (roots, rocks, seashells), soil changes to red-ish color
- SAMPLE 8:** Organic material (roots, rocks, seashells), ashes
- SAMPLE 9:** Organic material (roots, rocks, seashells), coal, soil changes to grey-ish color
- CONTROL:** Organic material (roots, rocks, seashells, leaves)

### Soil Color (Globe Program Chart)

- SAMPLE 1:** 10YR 2/1, 7.5YR 2.5/1
- SAMPLE 2:** 10YR 2/1, 7.5YR 2.5/1
- SAMPLE 3:** 7.5YR 2.5/3, 7.5YR 3/4
- SAMPLE 4:** 10YR 2/2, 10YR 2/1
- SAMPLE 5:** 7.5YR 2.5/1, 10YR 2/1
- SAMPLE 6:** 10YR 2/1, 10YR 2/2
- SAMPLE 7:** 7.5YR 2.5/3, 7.5YR 3/4
- SAMPLE 8:** 10YR 2/2, 7.5YR 3.5/3
- SAMPLE 9:** 10YR 2/1, 10YR 2/2
- CONTROL:** 10YR 4/4, 10YR 4/3



N-P-K SOIL TESTING									
	Nitrogen			Phosphorus			Potassium		
	L= 40 lb A/6" soil			L= 8 lb A/6" soil			L= 40 lb A/6" soil		
	M= 160 lb A/6" soil			M= 20 lb A/6" soil			M= 60 lb A/6" soil		
	H= 320 lb A/6" soil			H= 64 lb A/6" soil			H= 160 lb A/6" soil		
SAMPLE	1	2	3	4	5	6	7	8	9
NITROGEN (N)	L	L	L	L	L	L	L	L	L
PHOSPHORUS (P)	L	M	M	M	M	M	M	M	M
POTASSIUM (K)	M	H	H	H	H	H	H	M	H

### SOIL PROPERTIES (AVERAGE)

TEST	B	N-B
HUMIDITY	0%	0%
TEMPERATURE	36° C	26° C
COMPACTION	0.33 kg/cm <sup>2</sup>	1.04 kg/cm <sup>2</sup>



## Data Analysis and Results:

- Water testing for turbidity indicates a higher level in the burned area sample as well as the levels of phosphate that indicate 4 mg/L in a scale of 10.
- Nitrate isn't present in any of the water samples tested and pH levels don't have any significant differences nor abnormal consequences.
- The N-P-K soil testing for nine burned areas and the control variable (non-burned area) present same soil fertilization and therefore no differences.
- Soil properties indicate a difference of 10° C between burned (higher temperature) and non-burned area. Humidity isn't present in neither and soil compaction is higher in non-burned area.

## Conclusion:

Based on critical analysis of data obtained in this research we conclude that the hypothesis is rejected. The burned soils in the scrubland of the Guánica Dry Forest will not vary the quality of runoff water and the quality of runoff water and the soil characterization will not vary in a burned soil and in non-burned soil within the scrubland of the Guánica Dry Forest.

## References

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