# "Converting Badlands to Good-lands"

## A watershed Management Technique for reducing sedimentation at the Talakhaya Watershed in Rota, CNMI


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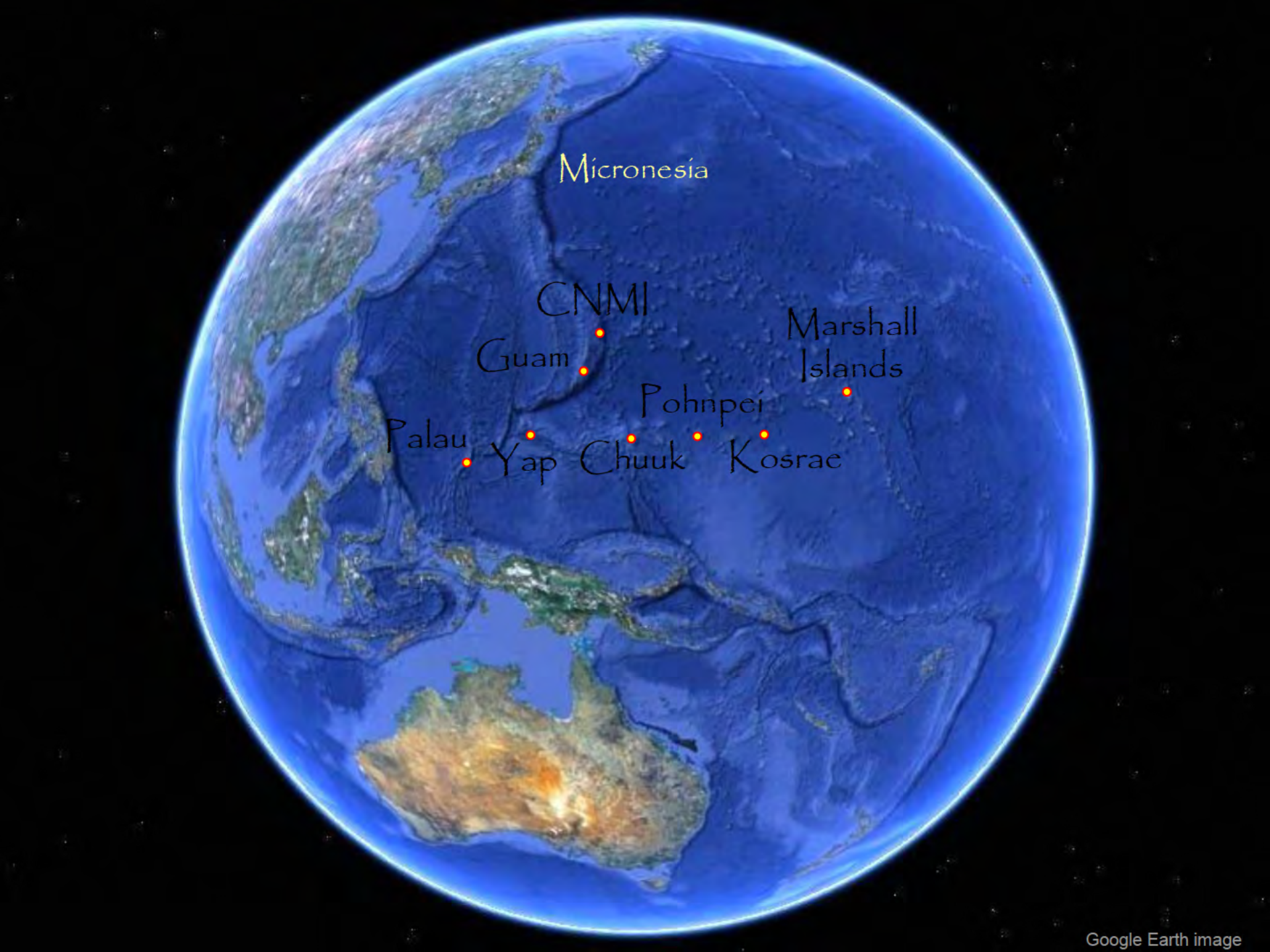
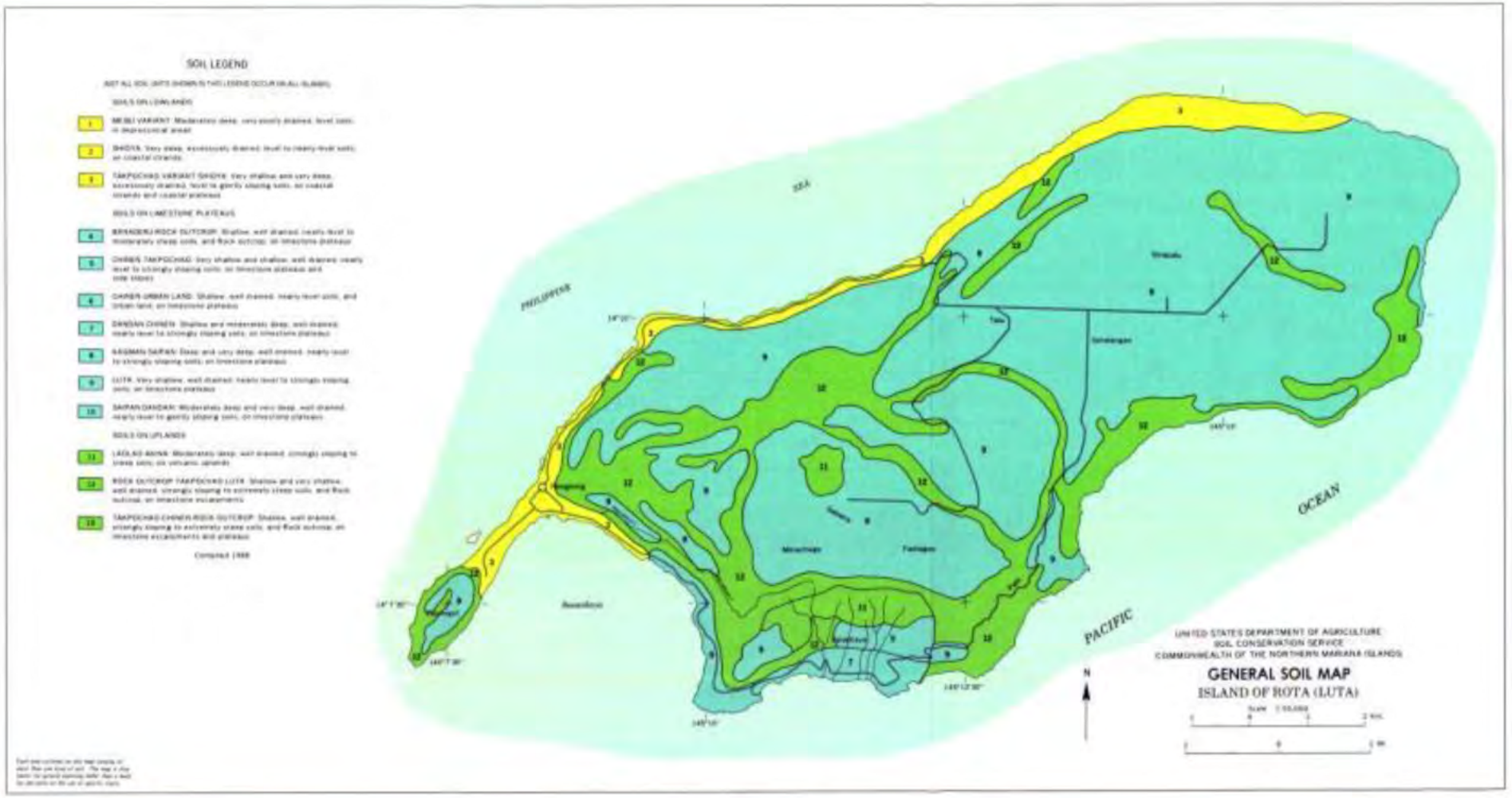
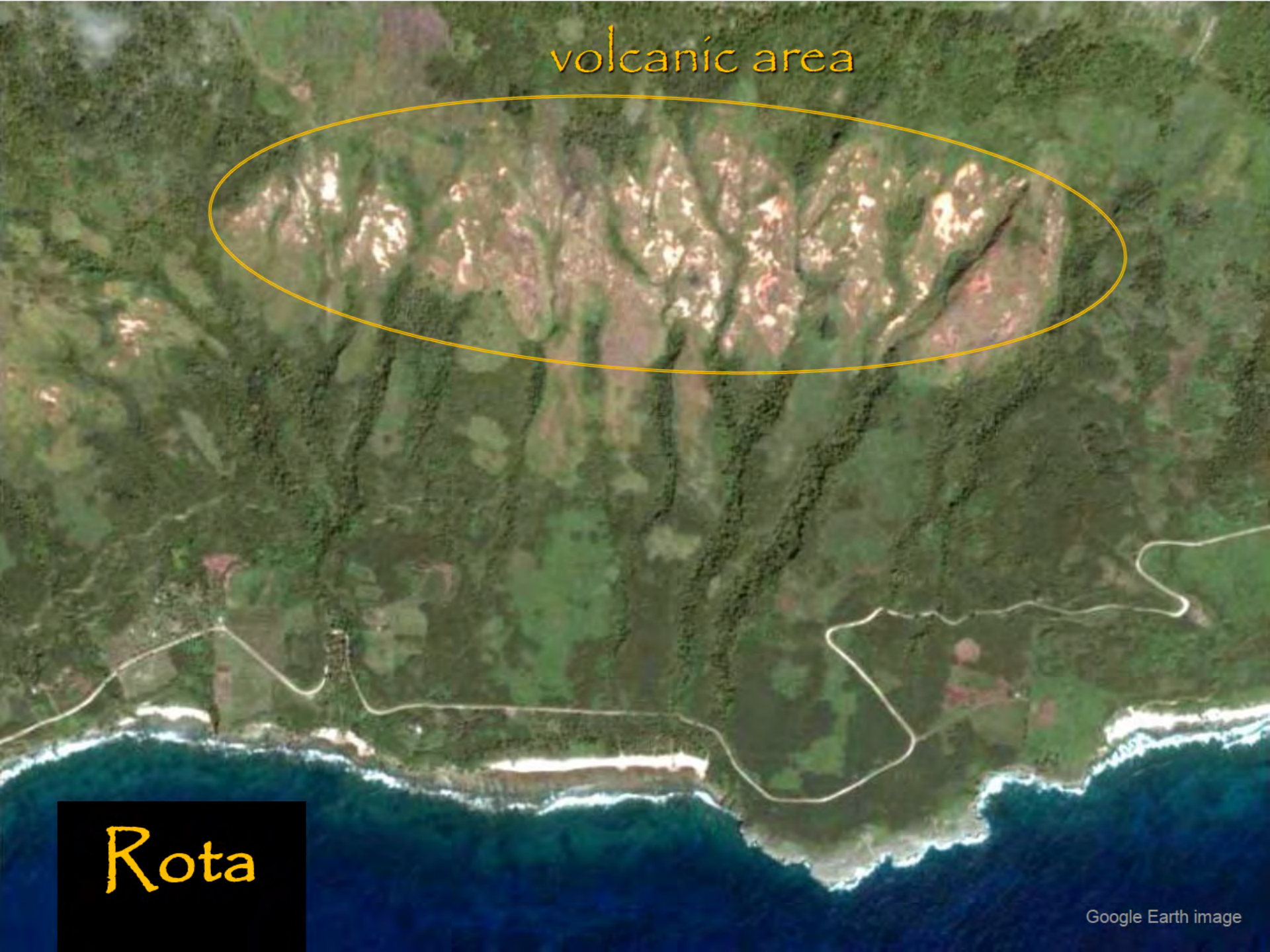
# Where is Rota?


Micronesia
CNMI
Guam
Marshall
Islands
Pohnpei
Palau
Yap
Chuuk
Kosrae
Google Earth image

# Rota Soil




USDA Soil Conservation Service, 1988. Island of Rota (Luta) General Soil Map.


volcanic area
Rota
Google Earth image

# Talakhaya Watershed Map

# Talakhaya Watershed overview

# Selected Badland areas of Talakhaya watershed

# Typical exposed/badland areas at the Talakhaya watershed in Rota, CMNI

# Purpose of the Project

- Talakhaya watershed was identified as a priority area to improve water quality and reduce sedimentation impacting coral reefs.
- The study was designed to quantify the reduction in sediment as a result of the re-vegetation efforts occurring in Talakhaya Watershed.

# Some of the Management practices (i.e. Vetiver grass plantation)

# Carrying Vetiver grass to the planting site

# Hiking far to the planting site

# Still hiking

# Areas where Vetiver grass is being planted at the Talakhaya Watershed in Rota

# Volunteer workers carrying Vetiver grass seedlings to Talakhaya watershed

Areas where Vetiver grass is being planted at the Talakhaya Watershed in Rota

# Volunteer workers carrying Vetiver and equipment  grass seedlings to Talakhaya watershed (cont'd)

# Volunteer workers carrying Vetiver grass seedlings to Talakhaya watershed (at break)

# Picture time (way over the ocean)

# Volunteers at work (finally) planting Vetiver grass seedlings

Vetiver seedlings are mass produced and prepared at the Rota's DLNR and the division of forestry in Rota.

Seedlings and equipments are carried manually to the selected areas of the Talakhaya watershed despite steep slopes and rough Trane leading to the designated sites

# Planting to convert these badlands to good land

# Planting to convert these badlands to good land (cont'd)

# Planting to convert these badlands to good land (cont'd)

# Planting Vetiver grass seedling

# Talakhaya on-going Re-vegetation project

(Dr. Golabi helping a Rota DLNR manager with planting of the Vetiver)

# Hi from Talakhaya Watershed re-vegetation site

# Dr. Golabi showing the local grass with little root with little or no protective ability

# Comparing with Vetiver grass with ability to hold on sediment

# Some of the Results from the re-vegetation efforts so far:

# Remember This:

# Now this

# Look how the Vetiver hedges are planted in each plot at the watershed

# Now this hedge is only 4 months old

# Now This a year later:

(Proud members of the team standing in the areas where Vetiver grass planting is completed)

# Now This is a year later:
# (Proud members of the team standing in the areas where Vetiver grass planting is completed)

# Areas where Vetiver grass is planted which in turn has induced improvement with local vegetation growth

# About six months old Vetiver grass at the Talakhaya Re-vegetation site

Re-vegetation of Badlands with Vetiver Grass and *Acacia*

# A year old Vetiver grass at the Talakhaya Re-vegetation project site:

Note: As shown Vetiver works as barrier to sediment loading down to the streams and shorelines, hence protecting the precious coral from siltation.

# Project Goals

## Year 1

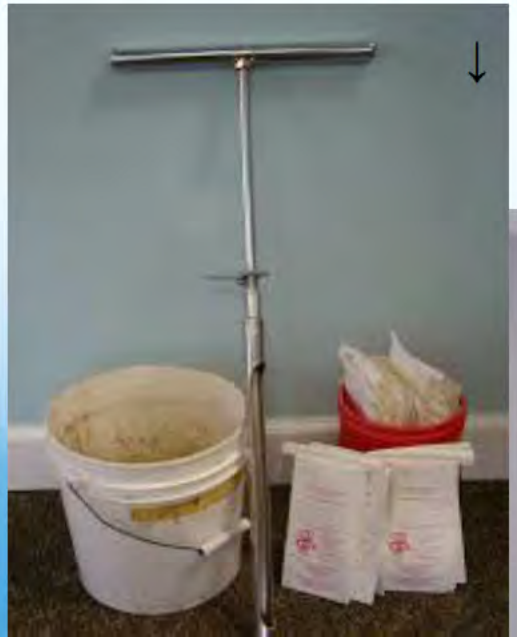
- Site assessment of the watershed
- Obtain permissions and collaborate with community members and local agencies
- Purchase equipment needed
- Install equipment
- Begin sampling/monitoring

## Year 2

- Continue Sampling
- Analyze Data
- Submission of Final Report
- Presentation of Findings to the community and resource agencies

# Monitoring Methodology

- Hydrologic Data Collection
  - Rainfall
  - Stream Level
  - Water Quality
  - Stream Discharge → →
- Soil Sampling tools:



# Soil sampling at the Talakhaya re-vegetation site for analysis

# Soil sampling at the Talakhaya re-vegetation site (cont'd)

# Methodology

Rain Gauge

Water Quality Meter

Level Logger

Flow Meter

Analysis of Beach sediment/deposits

# Stream Study Sites

Treatment categorization at the Talakhaya Watershed Site

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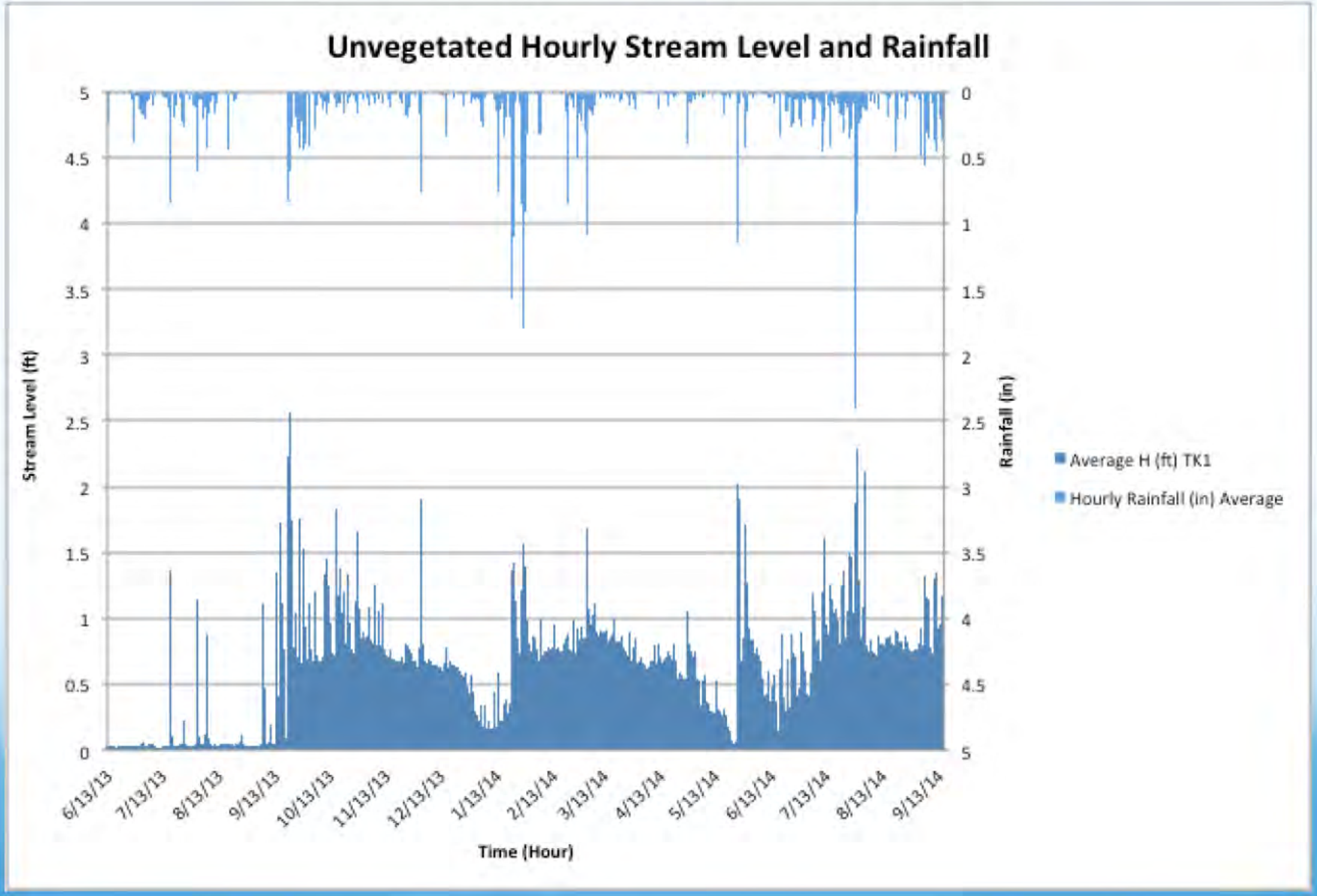
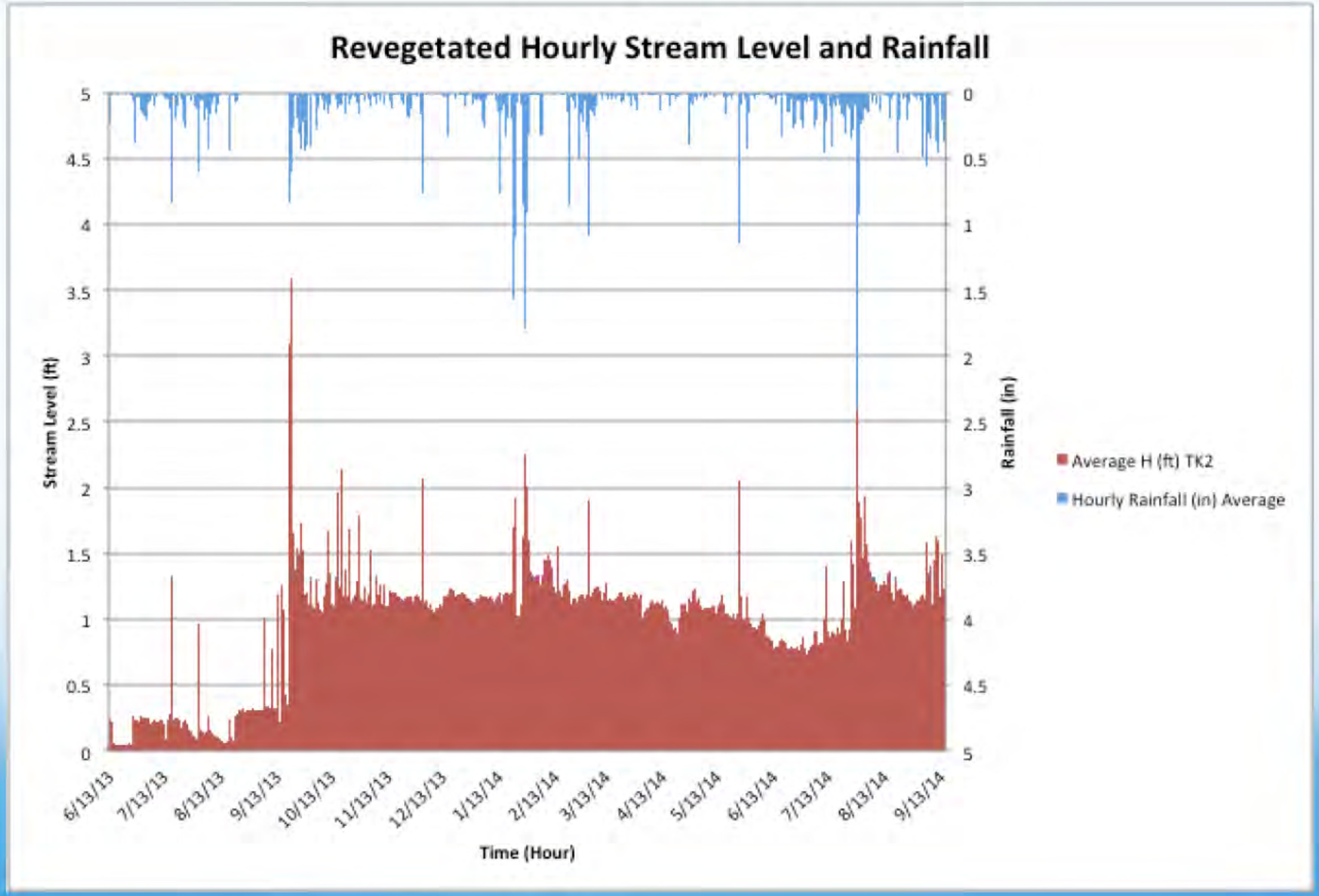
- Unvegetated Project Stream (TK1)
- Re-vegetated Project Stream (TK2 and TK3)
- Natural Vegetation Control Stream (TK4)

# Stream Monitoring Results:

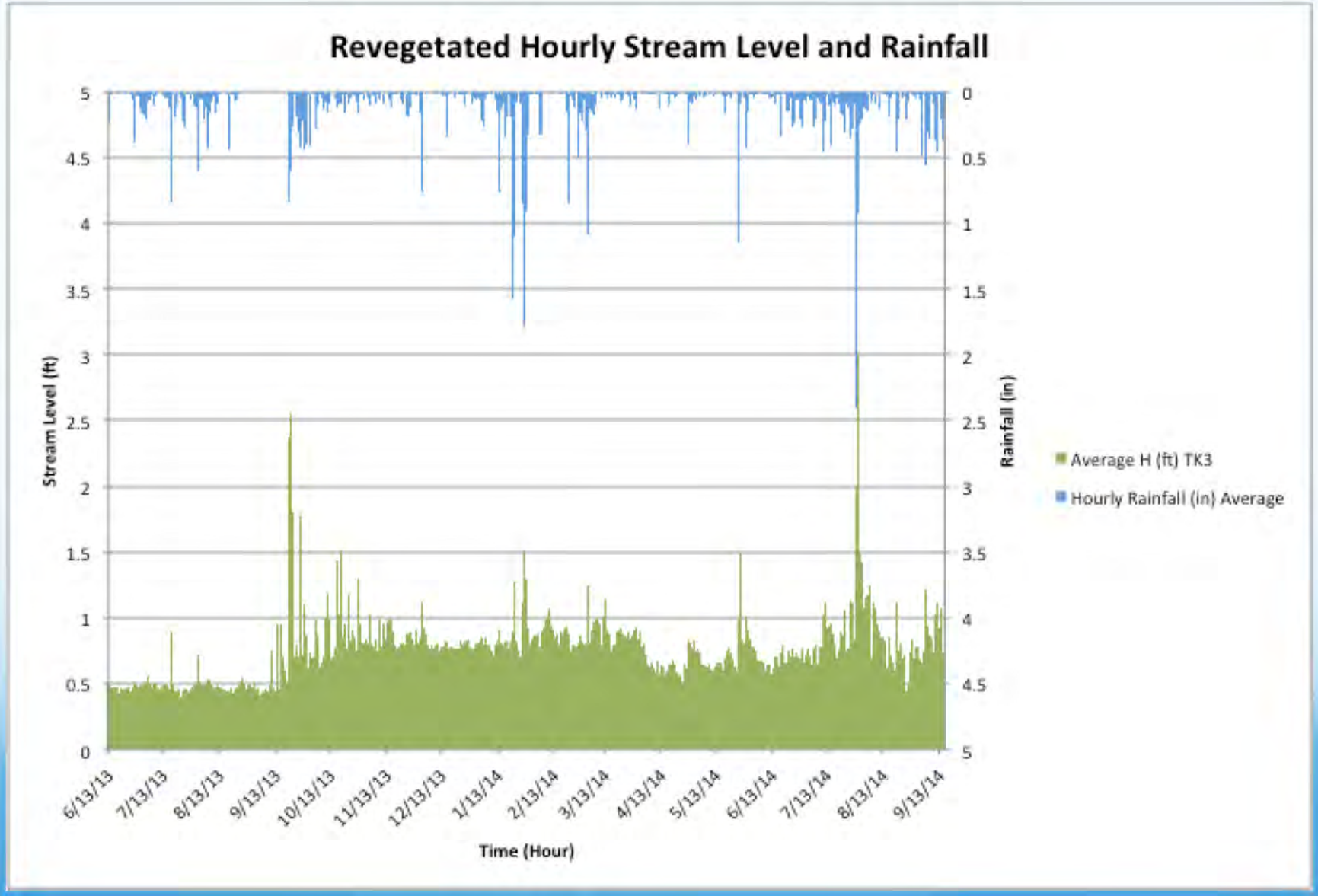
# TK1


Unvegetated Hourly Stream Level and Rainfall
Stream Level (ft)
Rainfall (in)
Time (Hour)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6/13/13
7/13/13
8/13/13
9/13/13
10/13/13
11/13/13
12/13/13
1/13/14
2/13/14
3/13/14
4/13/14
5/13/14
6/13/14
7/13/14
8/13/14
9/13/14
Average H (ft) TK1
Hourly Rainfall (in) Average

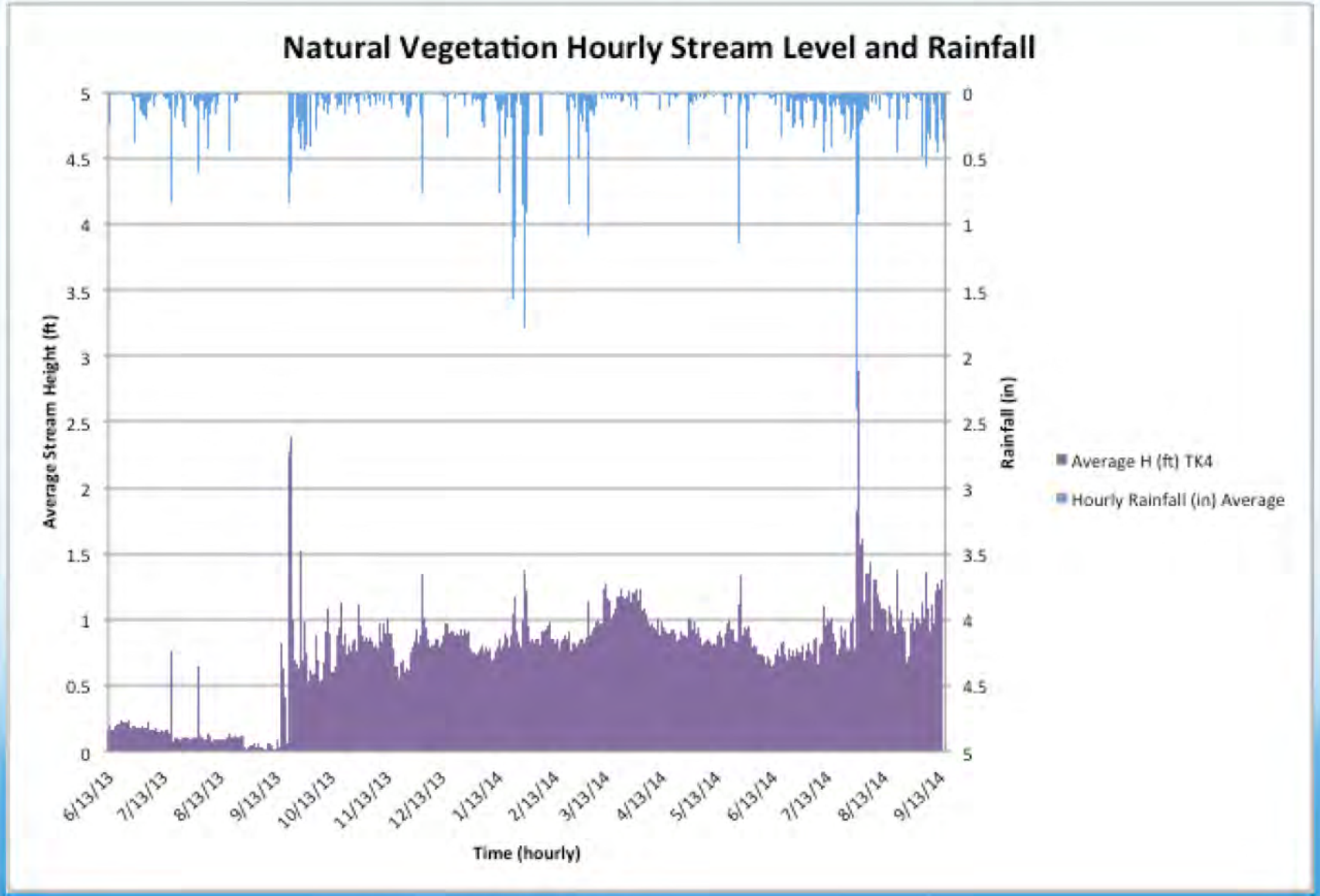
# TK2


Revegetated Hourly Stream Level and Rainfall
Stream Level (ft)
Rainfall (in)
Time (Hour)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6/13/13
7/13/13
8/13/13
9/13/13
10/13/13
11/13/13
12/13/13
1/13/14
2/13/14
3/13/14
4/13/14
5/13/14
6/13/14
7/13/14
8/13/14
9/13/14
Average H (ft) TK2
Hourly Rainfall (in) Average

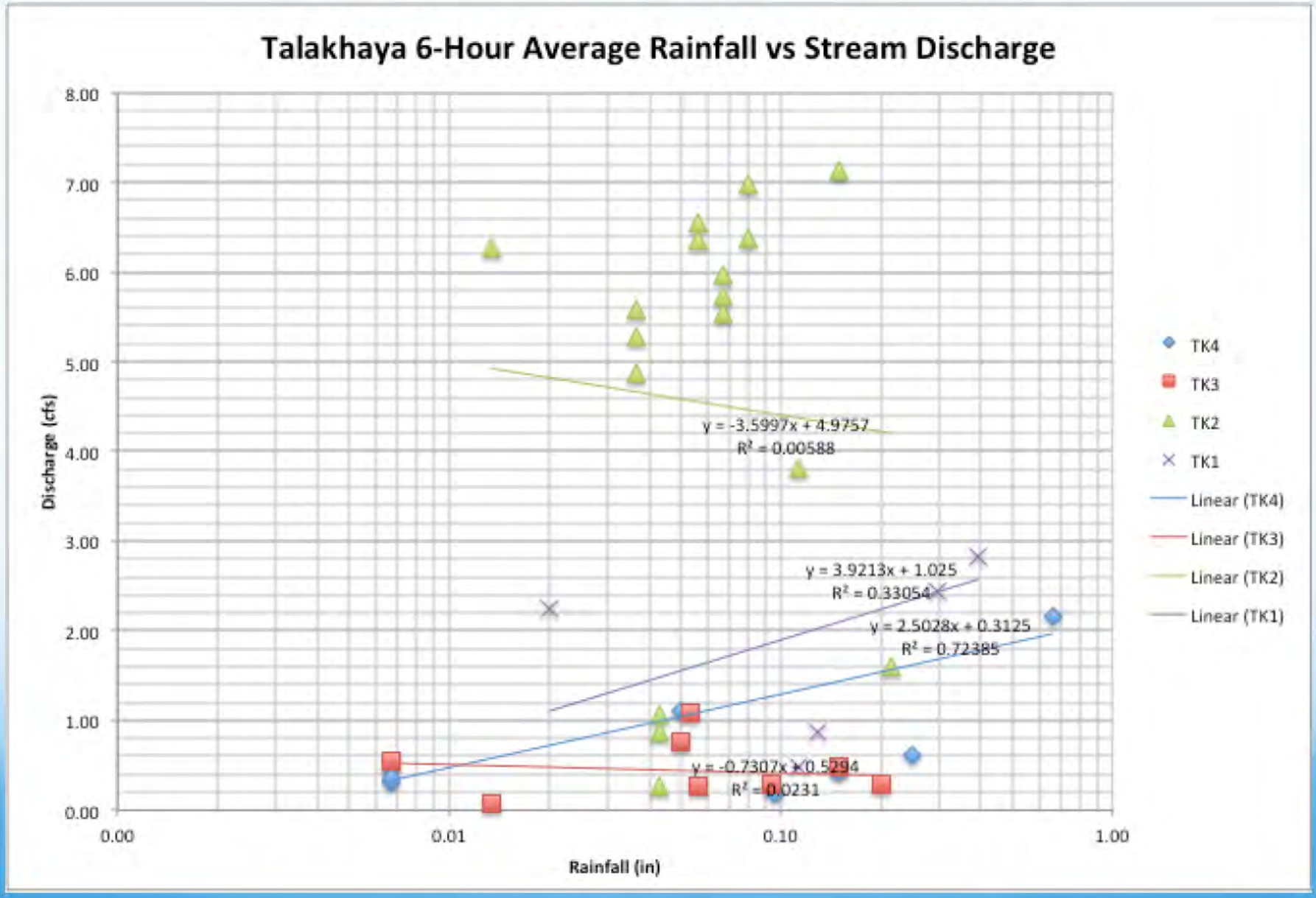
# TK3


Revegetated Hourly Stream Level and Rainfall
Stream Level (ft)
Rainfall (in)
Time (Hour)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6/13/13
7/13/13
8/13/13
9/13/13
10/13/13
11/13/13
12/13/13
1/13/14
2/13/14
3/13/14
4/13/14
5/13/14
6/13/14
7/13/14
8/13/14
9/13/14
Average H (ft) TK3
Hourly Rainfall (in) Average

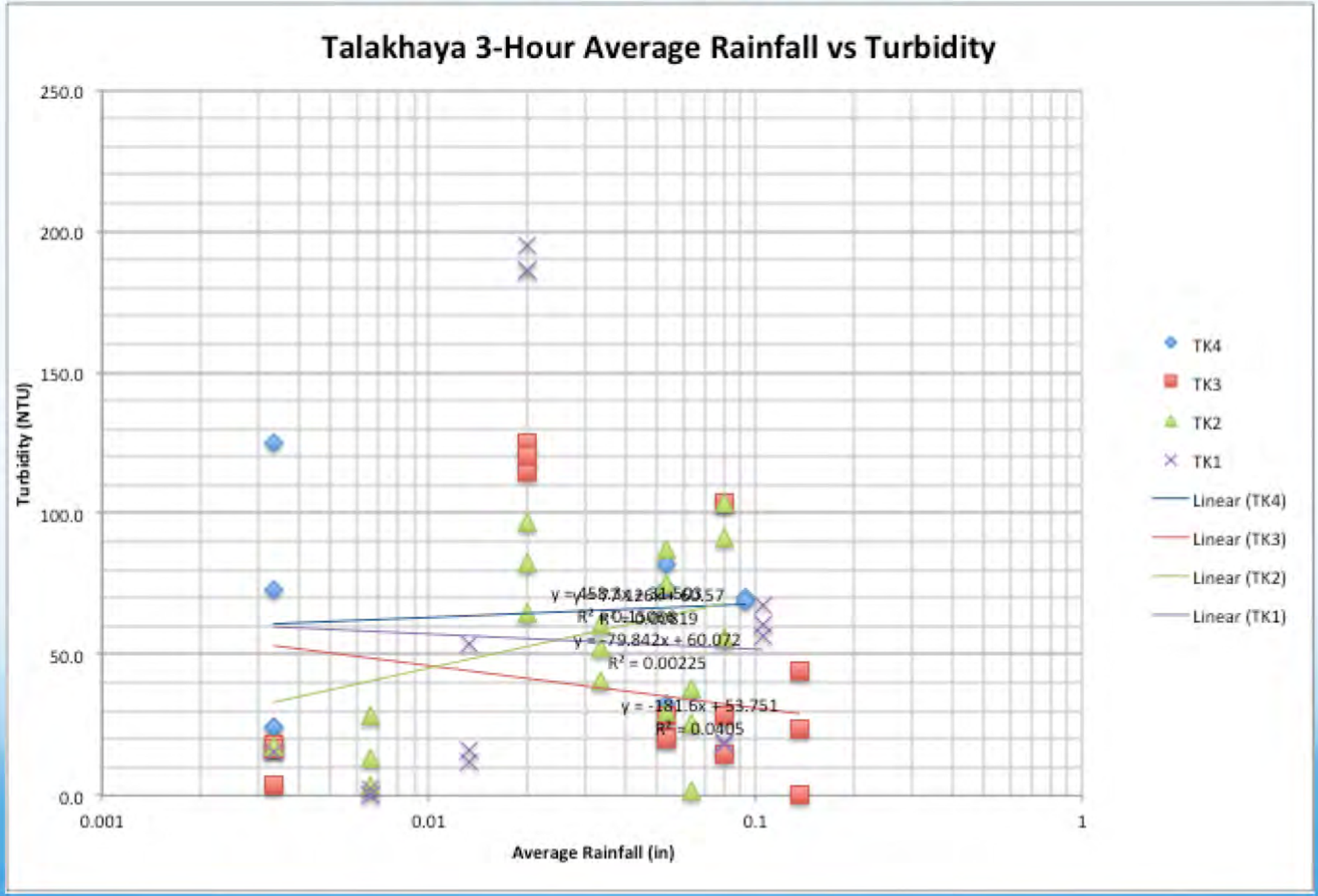
# TK4


Natural Vegetation Hourly Stream Level and Rainfall
Average Stream Height (ft.)
Rainfall (in)
Time (hourly)
Average H (ft) TK4
Hourly Rainfall (in) Average
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
6/13/13
7/13/13
8/13/13
9/13/13
10/13/13
11/13/13
12/13/13
1/13/14
2/13/14
3/13/14
4/13/14
5/13/14
6/13/14
7/13/14
8/13/14
9/13/14

# Stream Comparison



# Stream Comparison



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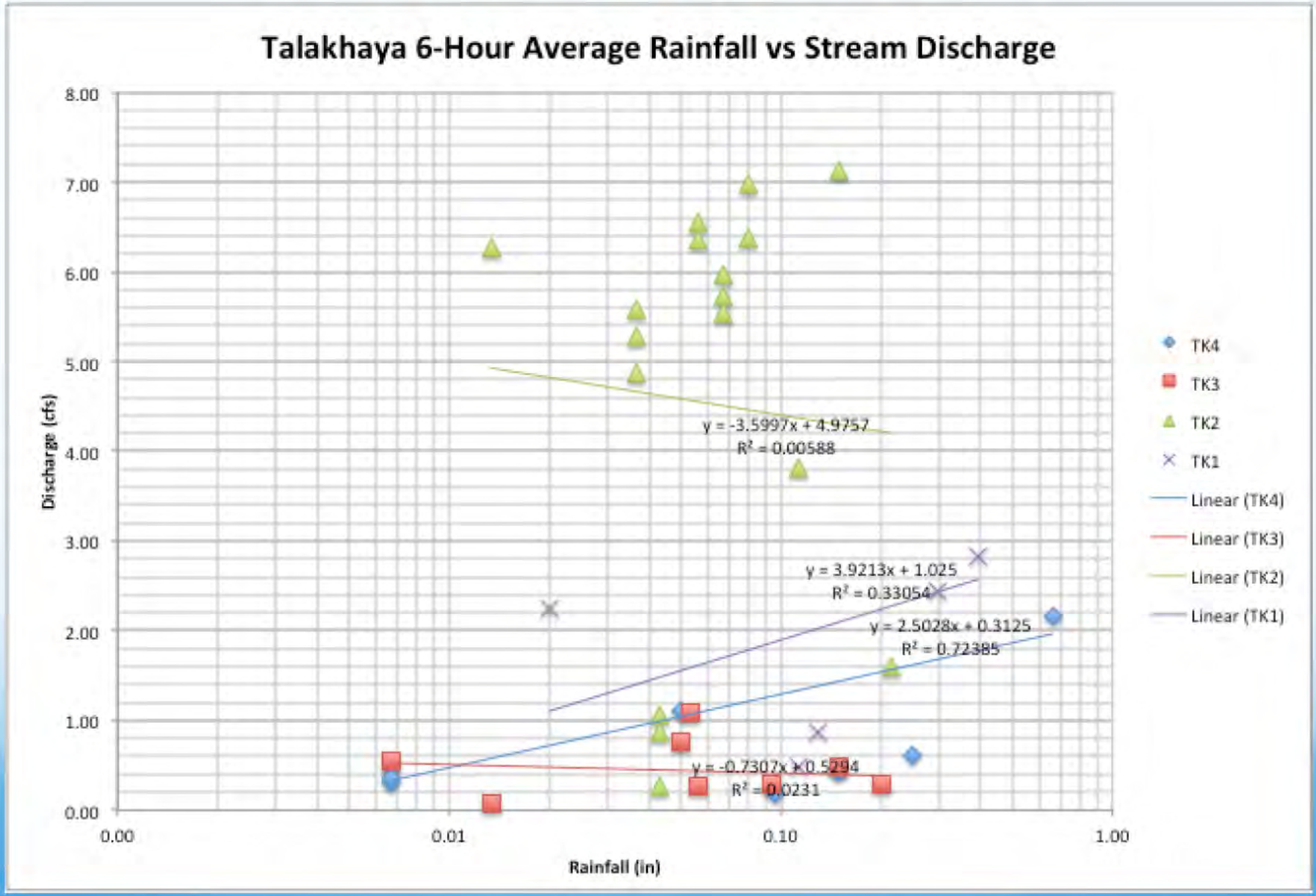

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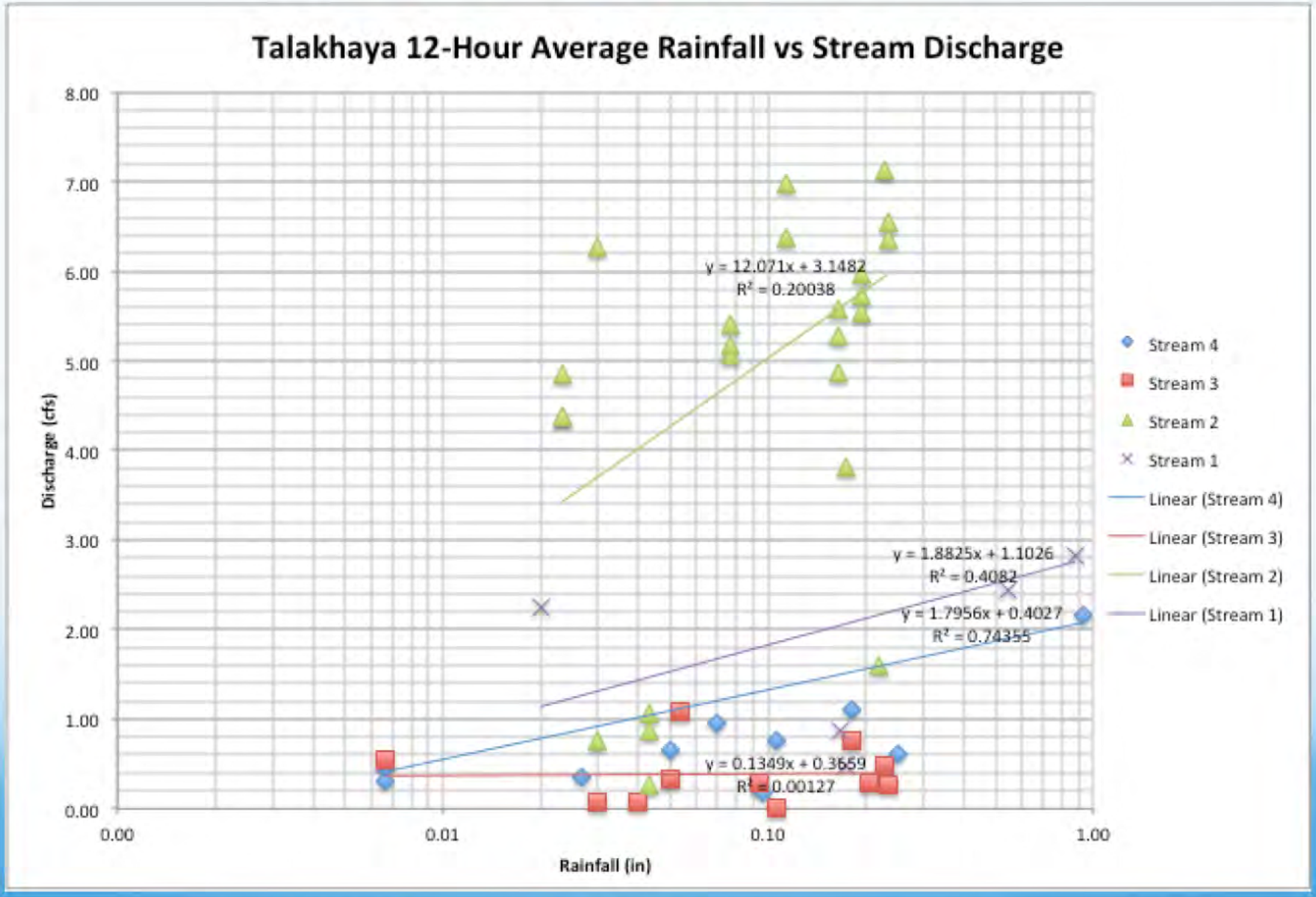
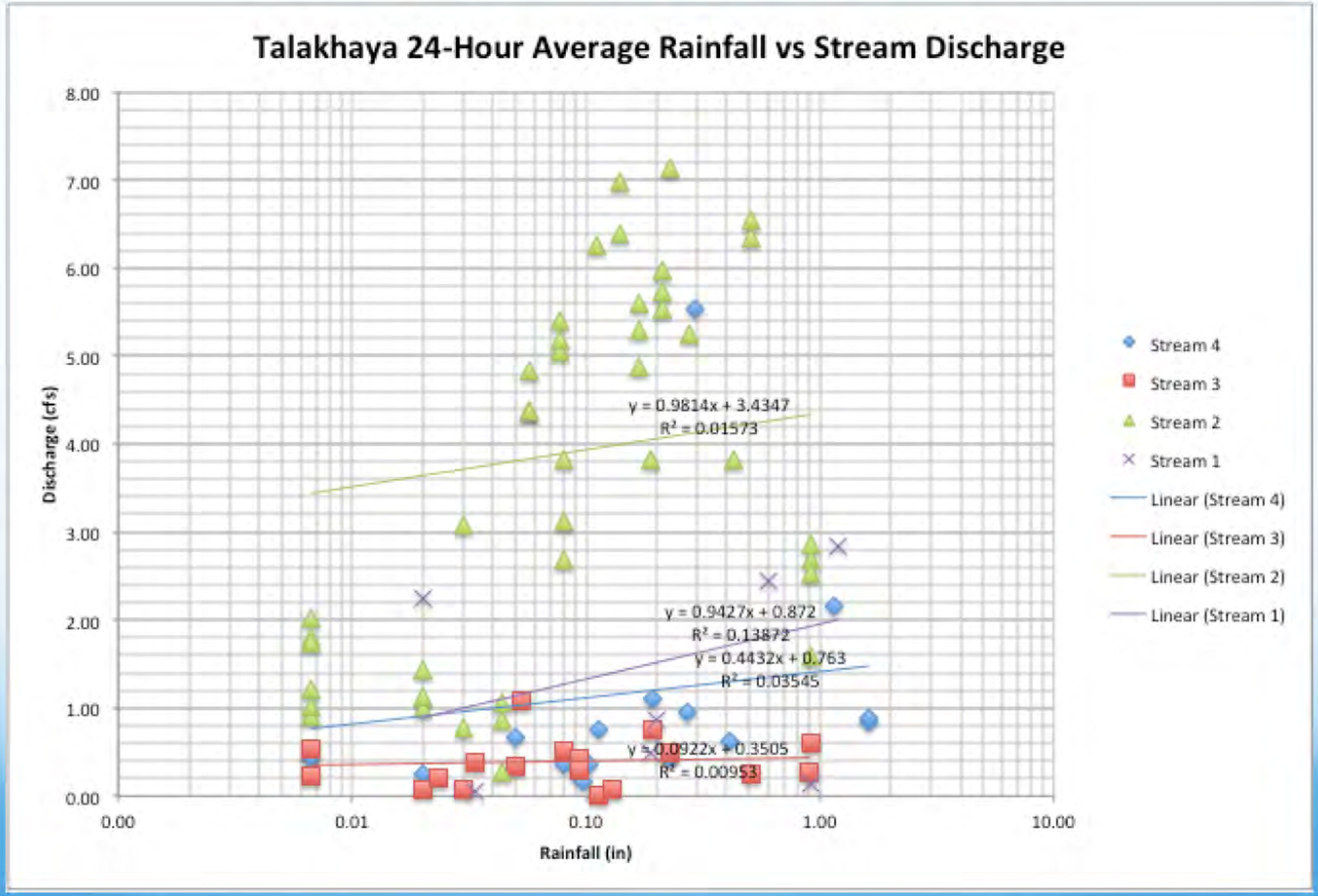


# Stream Comparison



# Educational efforts at the local level

# Educational efforts at the local level (cont'd)

# Recommendations:

It appears that Re-vegetation to include Vetiver grass has had a positive impact on reducing sedimentation however:

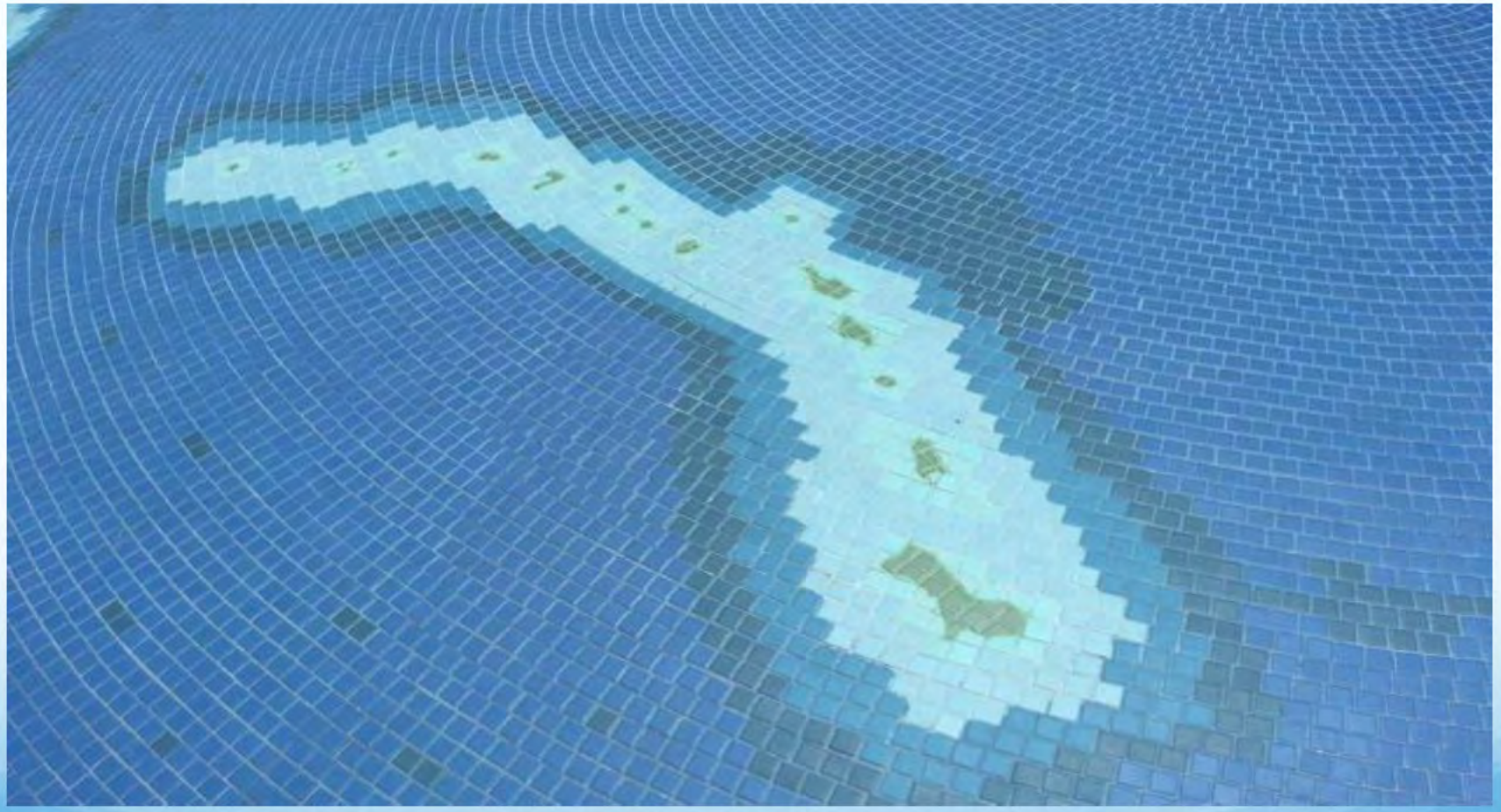
- New growth must have time to establish itself
- More data is required
- Need for increased community awareness

# Enjoy site seeing after a long day hard work

# Enjoy site seeing after a long day hard work (cont'd)

# Thank You!

# Questions?




Team G
Working to Convert
Badlands to Goodlands