



# Evaluating USVI Tools for Protecting Local Watersheds

**A. Kitchell**  
**Center for Watershed Protection**  
**8/14/06**

# Who we are

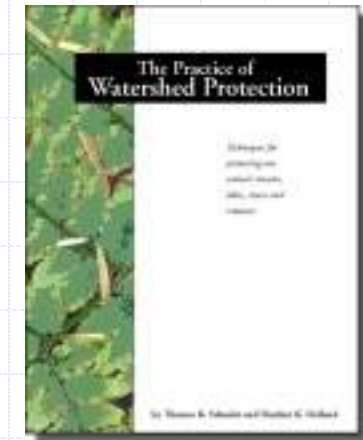


We aren't really tree hugging stormwater geeks...

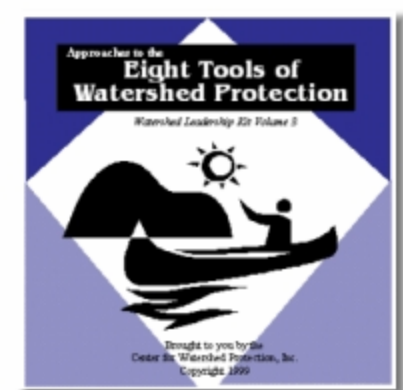
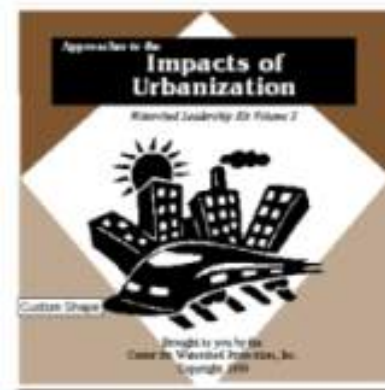
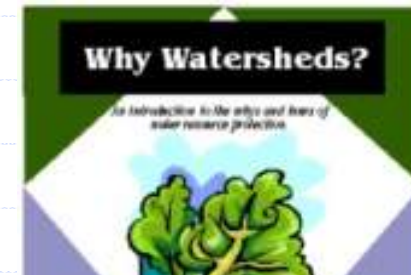
# On-Line Resources



# Publications



# Presentations on CD



www.cwp.org  
www.stormwatercenter.net

# Join Us!



**October 23-26, 2006  
Columbus Ohio Area**



- WI 2006 is a unique learning experience
- WI 2006 will equip watershed professionals with the tools needed to develop comprehensive watershed plans
- WI 2006 will focus on hands-on activities with participants working in small groups throughout the week

# Thanks to...

- ◆ NOAA Coral Program
- ◆ USVI DPNR
  - CZM
  - DEP
  - Permits
- ◆ UVI
- ◆ Coral Bay Community Council



# Objectives of this session

- ◆ Think comprehensively about watershed management
- ◆ Identify existing programmatic and regulatory tools available to support watershed management efforts
- ◆ Identify gaps in your arsenal
- ◆ Brainstorm on how to better integrate current efforts
- ◆ Eat lunch

# What is Watershed Management?

## Assessment

(get to know your watershed)

Mapping/GIS/modeling  
Local needs/capacity audits  
Stakeholder meetings  
Boots on-the-ground

## Planning

(preliminary roadmap)

Consensus on goals/objectives  
Comprehensive projects/actions  
Priorities  
Phasing, budgets, strategies

## Implementation

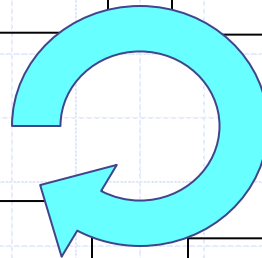
(just do it)

Adopt regs  
Build local programs  
Secure \$  
Install restoration projects  
Education programs

## Evaluation

(is it working?)

Trend & performance monitoring  
Tracking system  
Annual progress reports  
Adjust strategy



# Why USVI is Unique

- ◆ History of significant land use alterations
- ◆ Sensitive near-shore ecosystems
- ◆ 3 different islands  
(culture, staffing, patterns of development)
- ◆ Intra-island rainfall variations
- ◆ Dry guts (few perennial)
- ◆ Steep terrain
- ◆ Erodible soils
- ◆ Limitations on material imports/exports
- ◆ Others...



Photograph by Clarence Taylor, St. Thomas

VIEW OF CHARLOTTE-AMALIA FROM LUCHETTI'S HILL, ST. THOMAS

NOAA



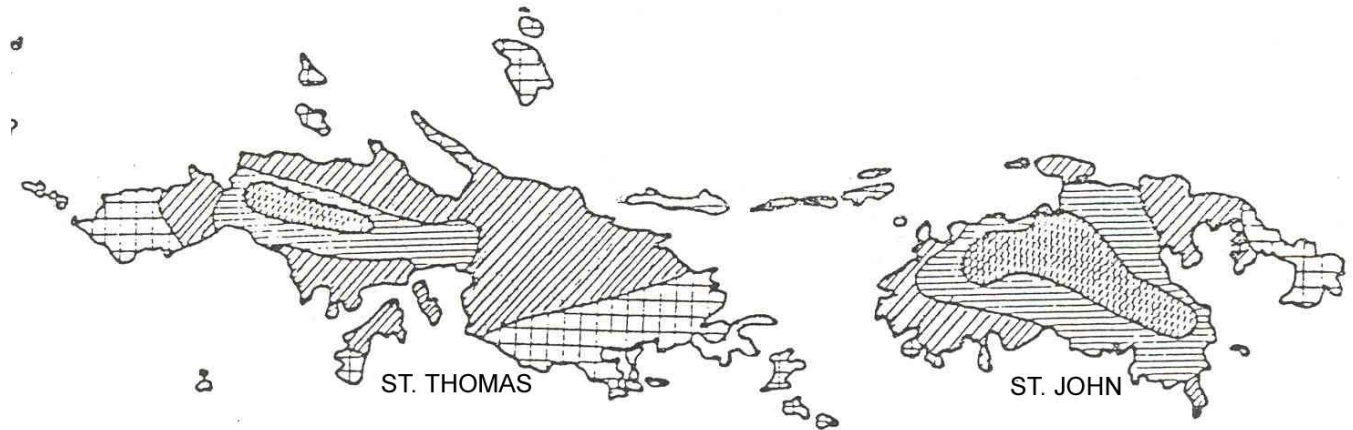


- Heaviest rainfall occurs on the western end of all three islands.

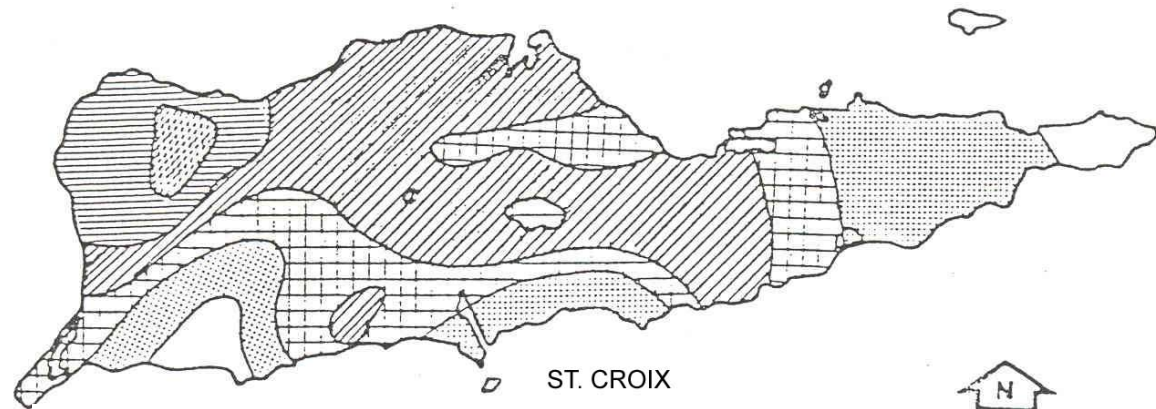
- The wettest months are Aug- Nov; the driest from Jan- Apr

- ET is high due to constant wind and intense sun



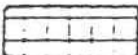



- Dryness and water loss are heightened by steep slopes and shallow rocky soil

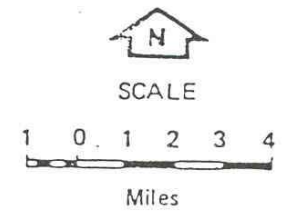


The position of St. Croix relative to St. Thomas and St. John has been shifted north and west to fit drawing.



**LEGEND**

	25" - 30"		40" - 45"
	30" - 35"		45" - 50"
	35" - 40"		50" - 55"



State = VI  
Priority = HIGH

**NOTE:** Click on the underlined Waterbody Name

State	Waterbody Name	Map of Listed Water
VI	<a href="#">BENNER BAY LAGOON MARINA</a>	No Spatial Data
VI	<a href="#">CHRISTIANSTED HARBOR</a>	No Spatial Data
VI	<a href="#">MAGENS BAY</a>	No Spatial Data
VI	<a href="#">MANGROVE LAGOON</a>	No Spatial Data
VI	<a href="#">RED HOOK BAY</a>	No Spatial Data
VI	<a href="#">SALT RIVER BAY</a>	No Spatial Data
VI	<a href="#">SALT RIVER LAGOON, MARINA</a>	No Spatial Data
VI	<a href="#">SALT RIVER LAGOON, SUGAR BAY</a>	No Spatial Data
VI	<a href="#">VESSUP BAY</a>	No Spatial Data

## Causes of Impairment

**NOTE:** Click on the underlined "Causes of Impairment Reported" value to see a listing of those waters with the imp Cause of Impairment Name" to see the detailed state reported impairment names.

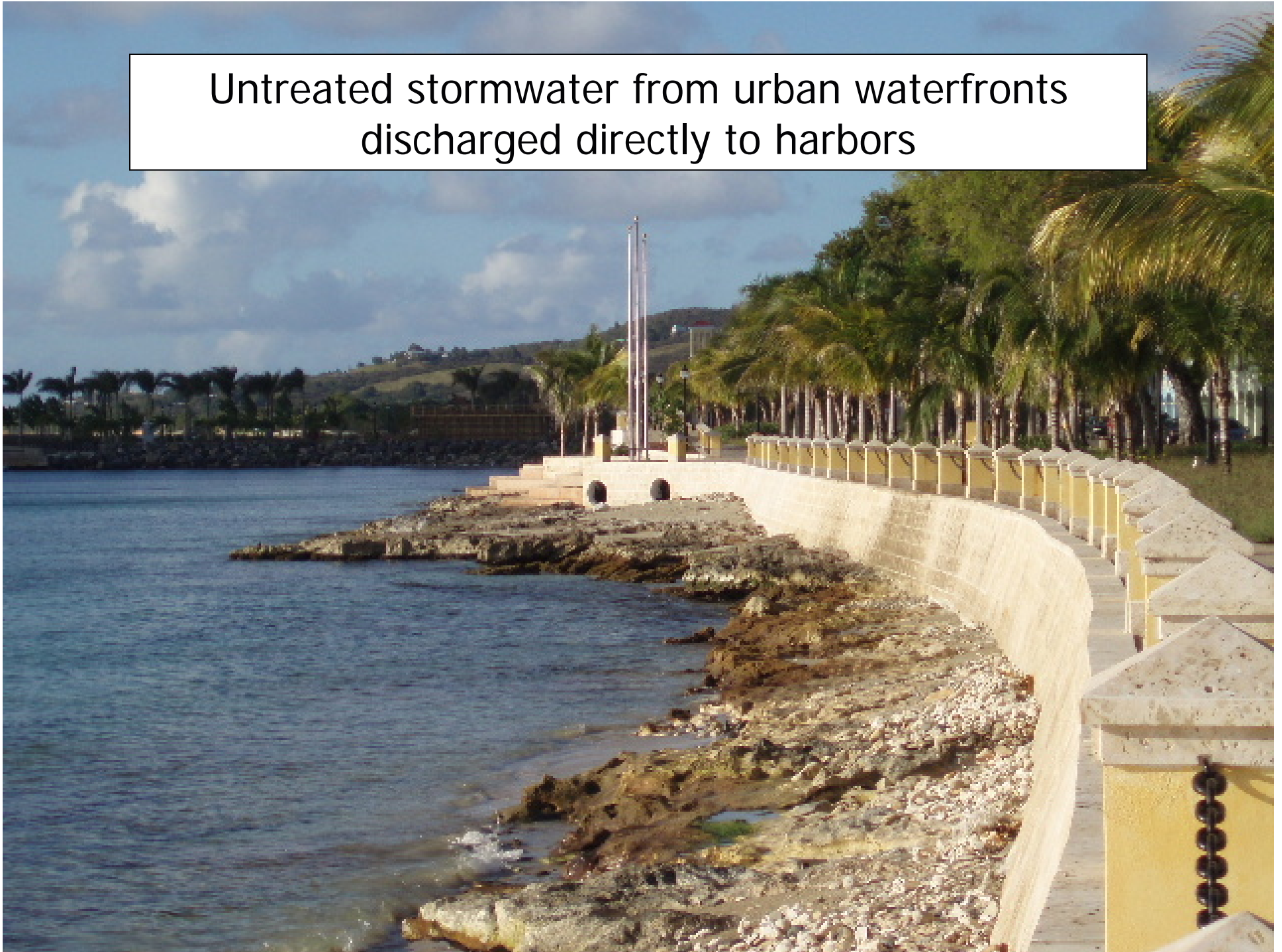
General Cause of Impairment Name	Causes of Impairment Reported
<a href="#">OXYGEN DEPLETION</a>	40
<a href="#">TURBIDITY</a>	16
<a href="#">PH</a>	14
<a href="#">PATHOGENS</a>	9
<a href="#">OIL AND GREASE</a>	3
<a href="#">TOTAL TOXICITY</a>	1

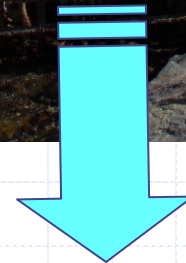
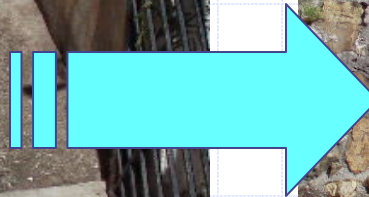
**Total Number of Causes of Impairment Reported: 83**

	SEE INFO COMMENT	2004
	STT-22A RED HOOK BAY, USGS-50263500 VESSUP BAY EAST - RED HOOK POINT TO NORTHERNMOST POINT OF CABRITA POINT, INCLUDING MULLER BAY.	2004
	STC-33A,B,E-J SALT RIVER (COLUMBUS LANDING BEACH) - BOUND BY EMERGENT REEF CREST FRONTING SALT RIVER BAY.	2004
	STC-33A SALT RIVER MARINA, STC-33C SALT RIVER LAGOON, MARINA - SALT RIVER MARINA EMBAYMENT.	2004
	STC-33D SALT RIVER LAGOON, SUGAR BAY -POINT NORTH OF SUGAR BAY TO POINT SOUTH OF SUGAR BAY.	2004
	STT-22B VESSUP BAY, USGS-50263000 VESSUP BAY WEST - VESSUP POINT NW TO NORTH SIDE OF BAY.	2004



Untreated stormwater from urban waterfronts  
discharged directly to harbors







Hotspots delivering contaminated runoff to guts...



Guts collect trash and debris...

This Redhook construction site is representative of island development on steep slopes



Gallows Bay sediment deposition in gut, note gabion stabilization and buffer encroachment





## Sediment visible in Coral Bay



Photo courtesy Coral Bay Community Council



Managing island waste products can be challenging

# Watershed Strategies for Islands

- ◆ Rainfall as a Resource/Runoff as a Waste
- ◆ Rapid, small watershed planning
- ◆ Requires easy to implement solutions
- ◆ Educate & engage public
- ◆ Create locally-based watershed organizations

# The 8 Tools of Watershed Protection



8. Watershed Stewardship



1. Land Use Planning



2. Land Conservation



7. Non-Stormwater Discharges



3. Aquatic Buffers



6. Stormwater Management

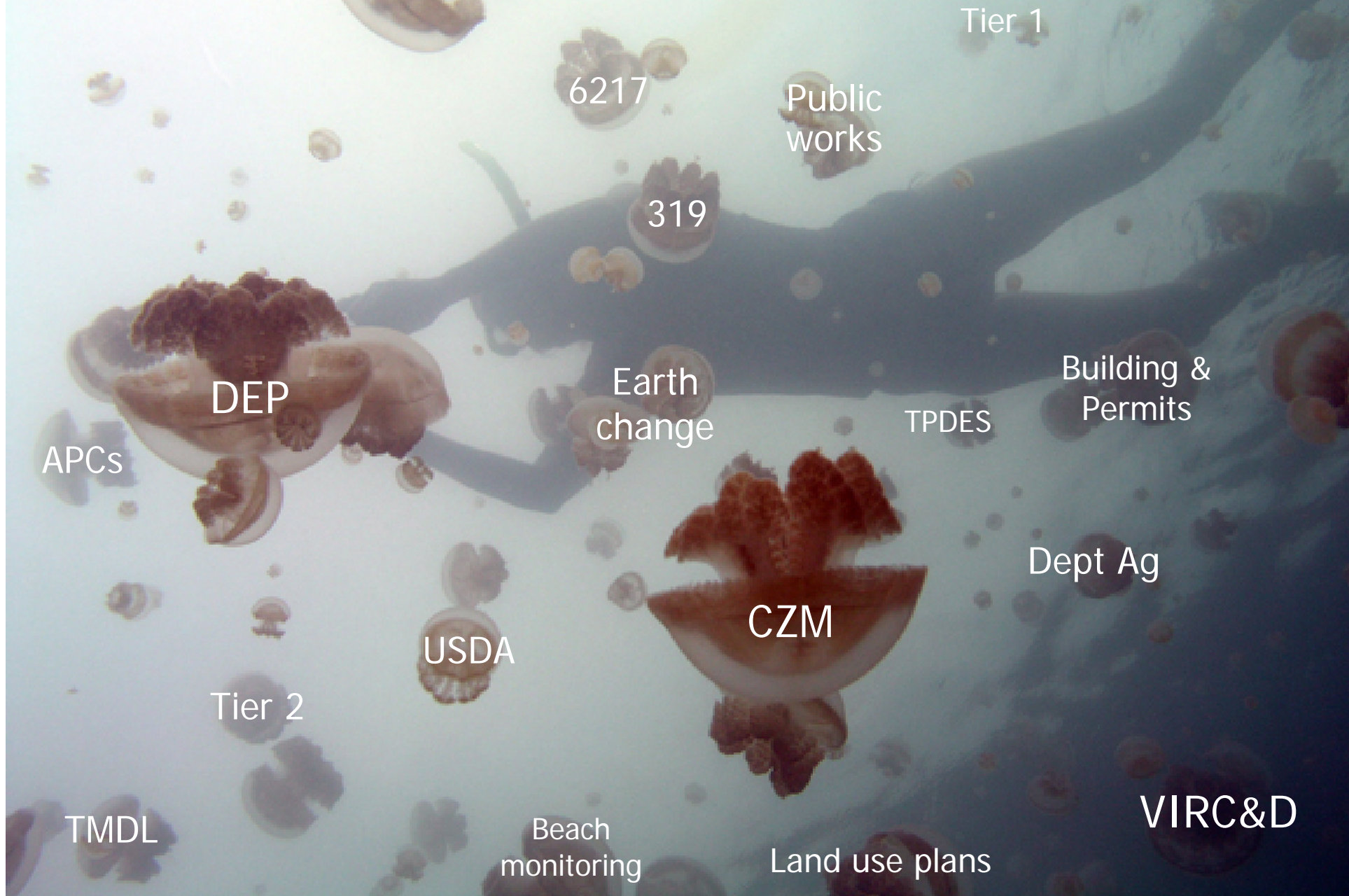


5. Erosion & Sediment Control



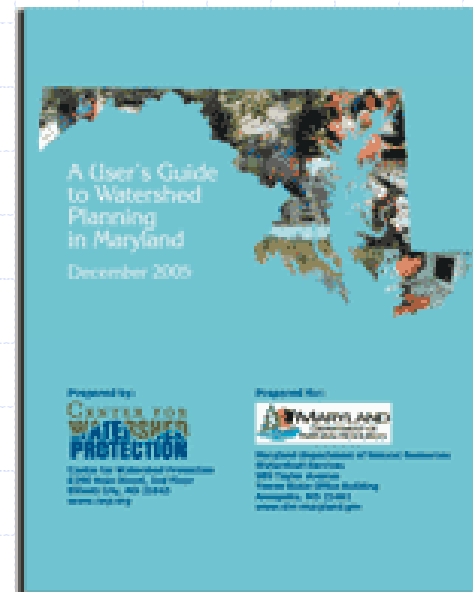
4. Better Site Design

Navigating the regulatory environment can be overwhelming...



# Eight Tools Audit

- ◆ 13-25 detailed questions/tool on local regs. and programs
- ◆ Go thru each of the 8 tools
- ◆ Discuss as a group:
  - (1) local regulatory & programmatic tools available
  - (2) who is the responsible agency,
  - (3) what are existing challenges to implementation, and
  - (4) what is future goal



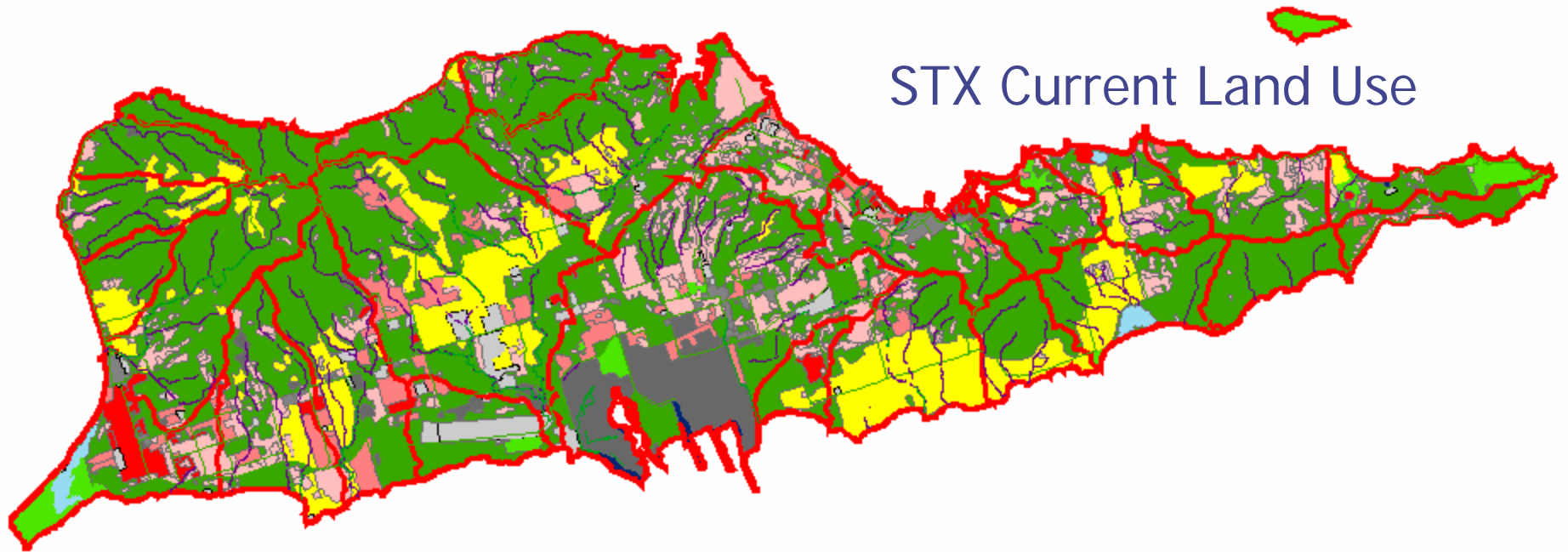
See your handout for reference!



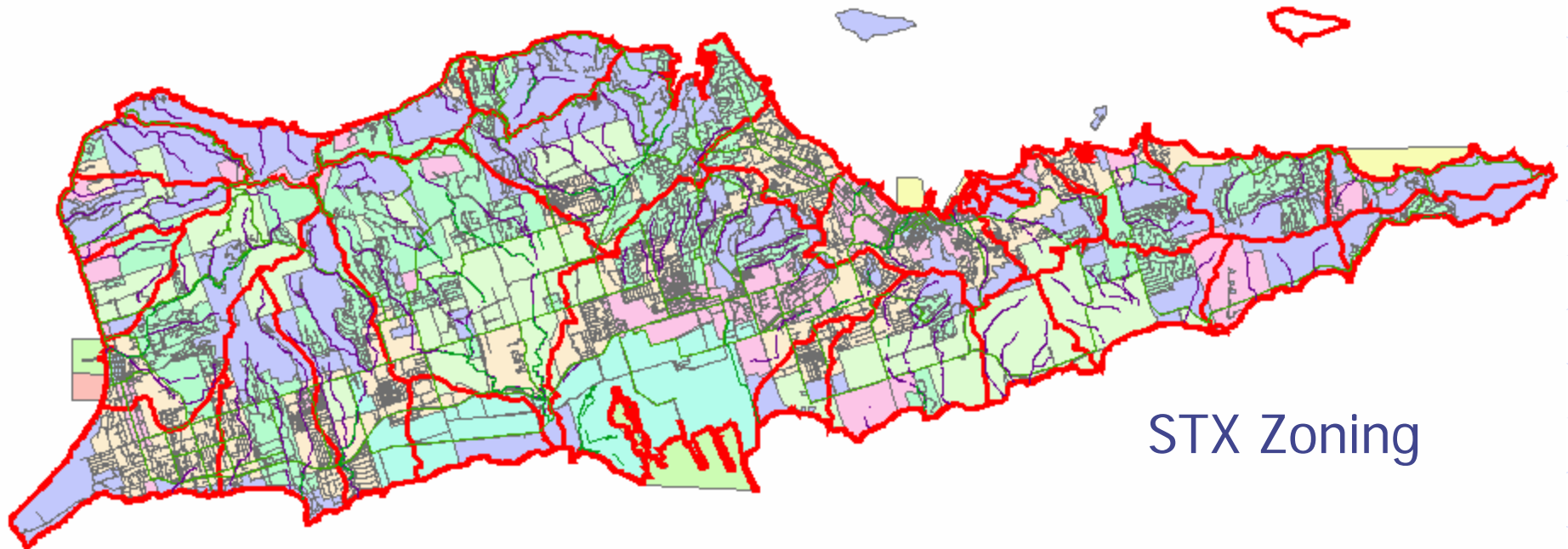
# Tool #1 Land Use Planning

- Addresses degree and location of future development anticipated in a watershed
- Perhaps single most important protection tool
- Hawaii A'hupua'a planning: from the mountain to the sea
- Watershed-based planning that determine development criteria

STX Current Land Use

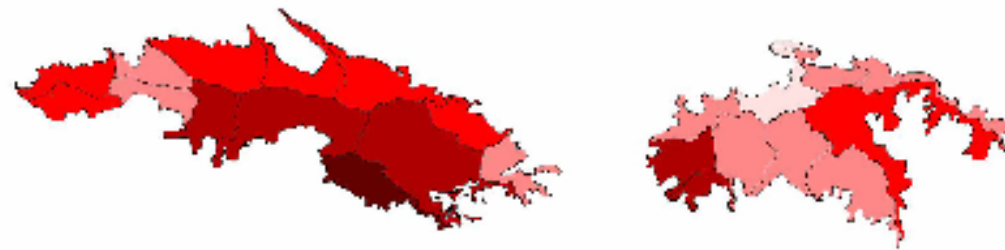


STX Zoning



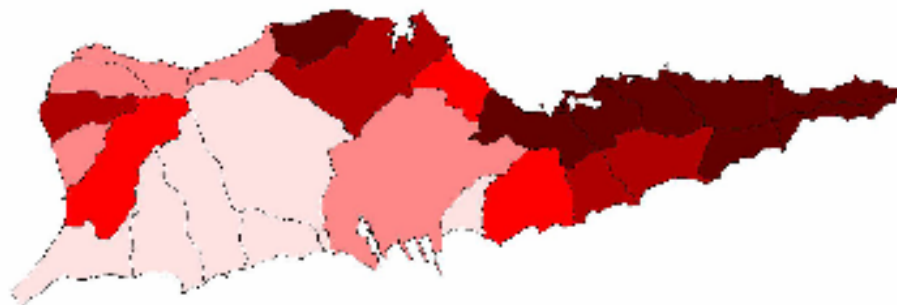
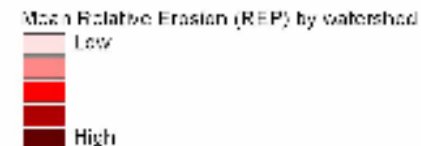


# Relative Erosion Potential (by watershed)



St. Thomas and St. John

We have developed a simple indicator of relative erosion rates from the land, given current land cover. The analysis uses a simplified version of the Revised Universal Soil Loss Equation (USDA, 1989). This incorporates land cover type, slope, a soil erodibility factor (k-factor), and precipitation for the peak rainfall month in order to estimate relative erosion rates for all land areas within a watershed. The mean relative erosion potential (REP) for the watershed is presented.



St. Croix

Source:  
"Relative Erosion Potential" (REP) was developed by WRI and NOAA, 2005, under the Reefs at Risk Project. Watershed boundaries provided by the USVI Department of Planning and Natural Resources (DPNR) and the University of the Virgin Islands (UVI/CDC).

Establish stringent ESC criteria on a watershed basis

# Land Use Planning in USVI

- ◆ What agency(s) is responsible for land use planning?
  - Comprehensive planning?
  - Zoning updates?
- ◆ Do you know which watersheds are expected to grow?
- ◆ Do you have overlay districts?
- ◆ Are watershed-based zoning districts feasible?

See Handout



## Tool #2 Land Conservation

The goal of land protection is to keep the most important and vulnerable parts of the watershed undisturbed

- Critical habitats

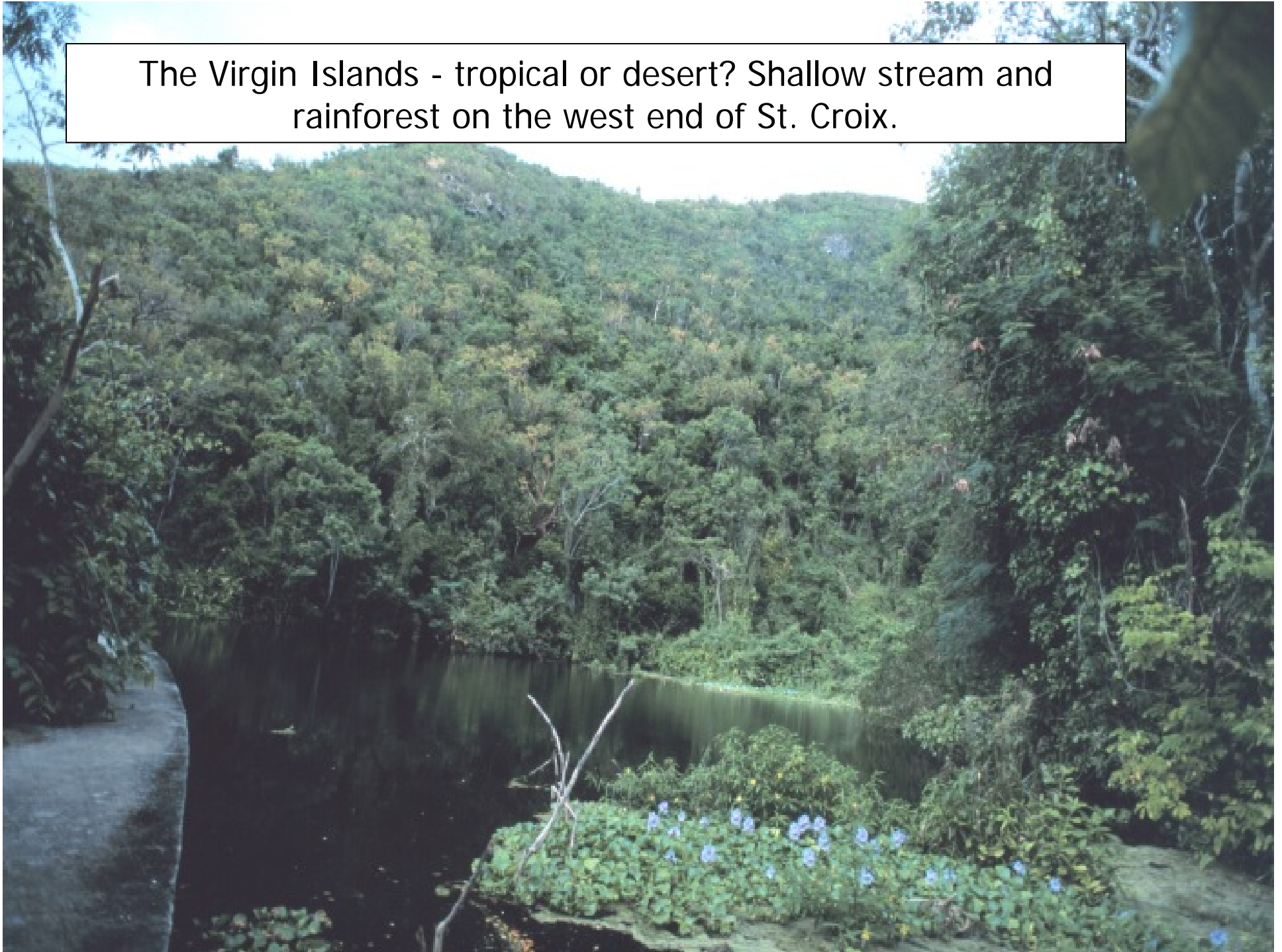
Mangrove swamps, wetlands  
forests, steep slopes, Shorelines

- Hydrologic reserves

tropical forest  
pasture

- Cultural/historic areas

The Virgin Islands - tropical or desert? Shallow stream and rainforest on the west end of St. Croix.





Potential groundwater recharge areas should be protected

- ◆ USVI has over 80 locally endangered plants and animals
- ◆ VI Conservation Data Center
- ◆ Lots of national, territorial, marine parks
- ◆ Can you build in the national park???



## From **HISTORY OF PROTECTED AREA INITIATIVES in the U.S. VIRGIN ISLANDS**

...protected area initiatives in the U.S. Virgin Islands were triggered more by escalating, public-spirited conservation philanthropy than from any visible change in local public policy or commitment of public funds for protecting the "commons"; whether wet or dry, natural or physical, terrestrial or marine.

Edward L. Towle

# Land Conservation in USVI

- ◆ What agency(s) is responsible for managing protected lands?
- ◆ Who can hold conservation easements?
- ◆ Does the territory have a land acquisition program?
- ◆ Are there special areas targeted for protection?
  - Recharge protection areas
  - Agricultural preservation areas
  - Historic preservation
  - RTE species/habitat
  - Steep slopes

See Handout





## Tool #3 Aquatic Buffers

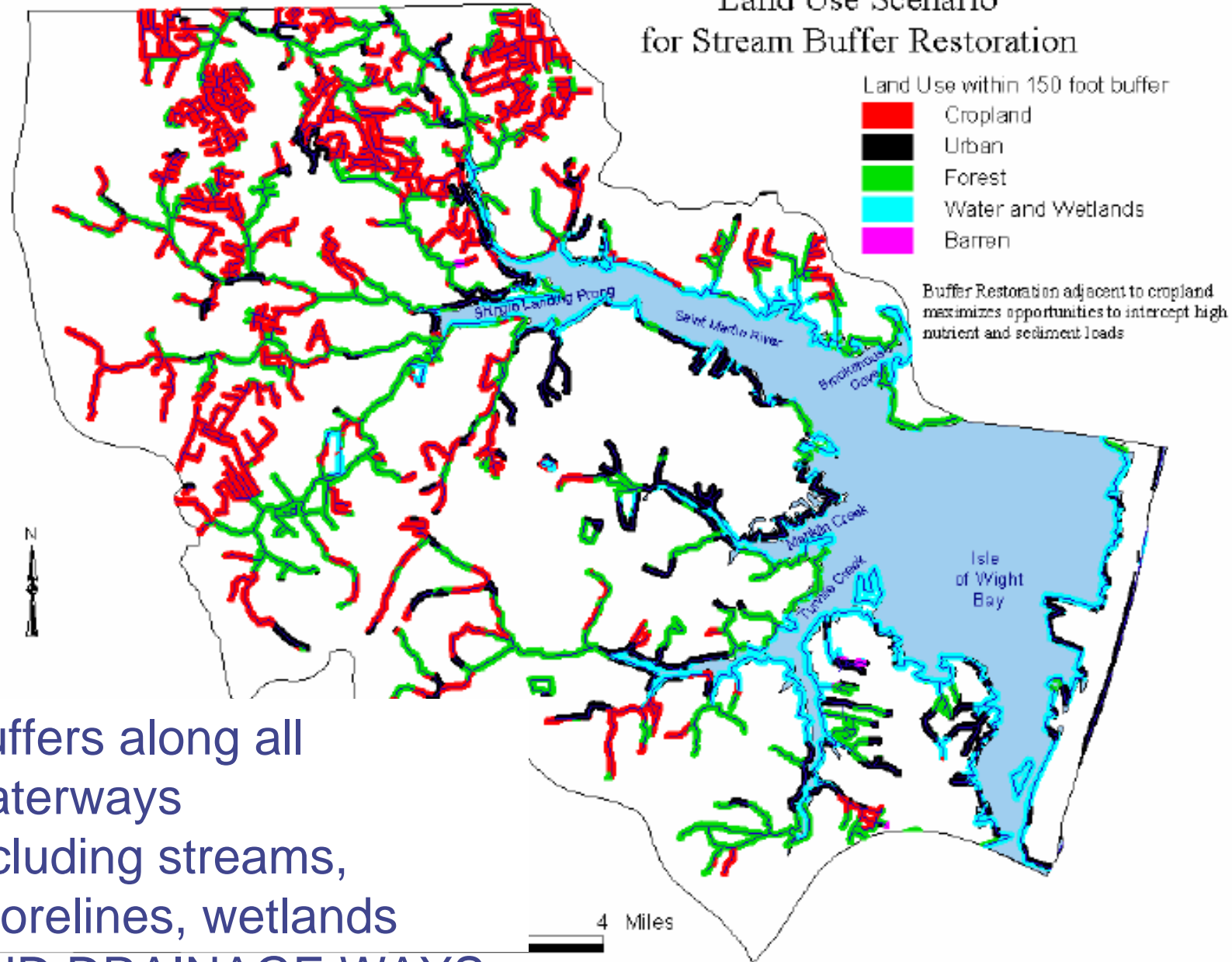
An aquatic buffer is a transition zone between a developed area and a waterbody

### Benefits of Buffers:

- Flood control
- Bank stabilization
- Habitat
- Wetland protection
- Pollutant reduction



## Land Use Scenario for Stream Buffer Restoration



Buffers along all  
waterways  
including streams,  
shorelines, wetlands  
**AND DRAINAGE WAYS**



Guts encroached by roadways, piped, and used for dumping



Extensive channel alteration for storm conveyance



USVI has a 25 ft minimum buffer...





# Aquatic Buffers in USVI

- ◆ What agency(s) is responsible for enforcing existing 25 ft buffer regulation?
- ◆ Does this cover guts, shorelines, and wetlands
- ◆ Are buffers:
  - Delineated on site plans
  - Flagged in the field during construction
  - Clearly noted on plats
- ◆ Are there designated uses, vegetative requirements, or selective clearing guidance?
- ◆ Do you have a “buffer” inventory?

See Handout





## Tool #4 Better Site Design

Better site design reduces impervious cover, conserves natural areas, and provides stormwater treatment



- 
- A photograph of a residential street. In the foreground, a paved road leads towards the background. On the left, there is a large, leafy tree. To the right, a utility pole stands with several power lines extending across the sky. In the background, there are several houses with light-colored walls and dark shutters. The sky is blue with scattered white clouds.
- **Adapt BSD to the USVI**
  - **Focus on**
    - **Disconnect impervious cover**
    - **Road design**
    - **Preserve native cover (Fingerprinting, open space requirements)**



Nice 2-track driveway design...

Rooftop runoff collected in cisterns or raingardens?





Poor stateside design applied to island community



Design landscape features to capture stormwater

# Why Better Site Design?

Reduced Impervious Cover & Turf

+

Preservation of Natural Areas

=

Reduced Pollutant Loading

&

Reduced Stormwater Runoff

# Better Site Design in USVI

- ◆ What agency(s) is responsible for site plan review?
  - Streets
  - Trees
  - Septics
- ◆ Does current code prevent BSD implementation?
- ◆ When were development regs last updated?
- ◆ Is there training for local builders, designers and landscape architects?

See Handout





# Tool #5 Erosion & Sediment Control

Preventing soil erosion during construction is essential for protecting coral reefs



# Key Island ESC

- ◆ Clearing restrictions & fingerprinting
- ◆ Construction sequencing, and phasing
- ◆ Perimeter controls
- ◆ Rapid seeding (native spp.)
- ◆ Drainage way stabilization (especially slopes and dirt roads)
- ◆ Low tech traps & basins
- ◆ Inspection & enforcement



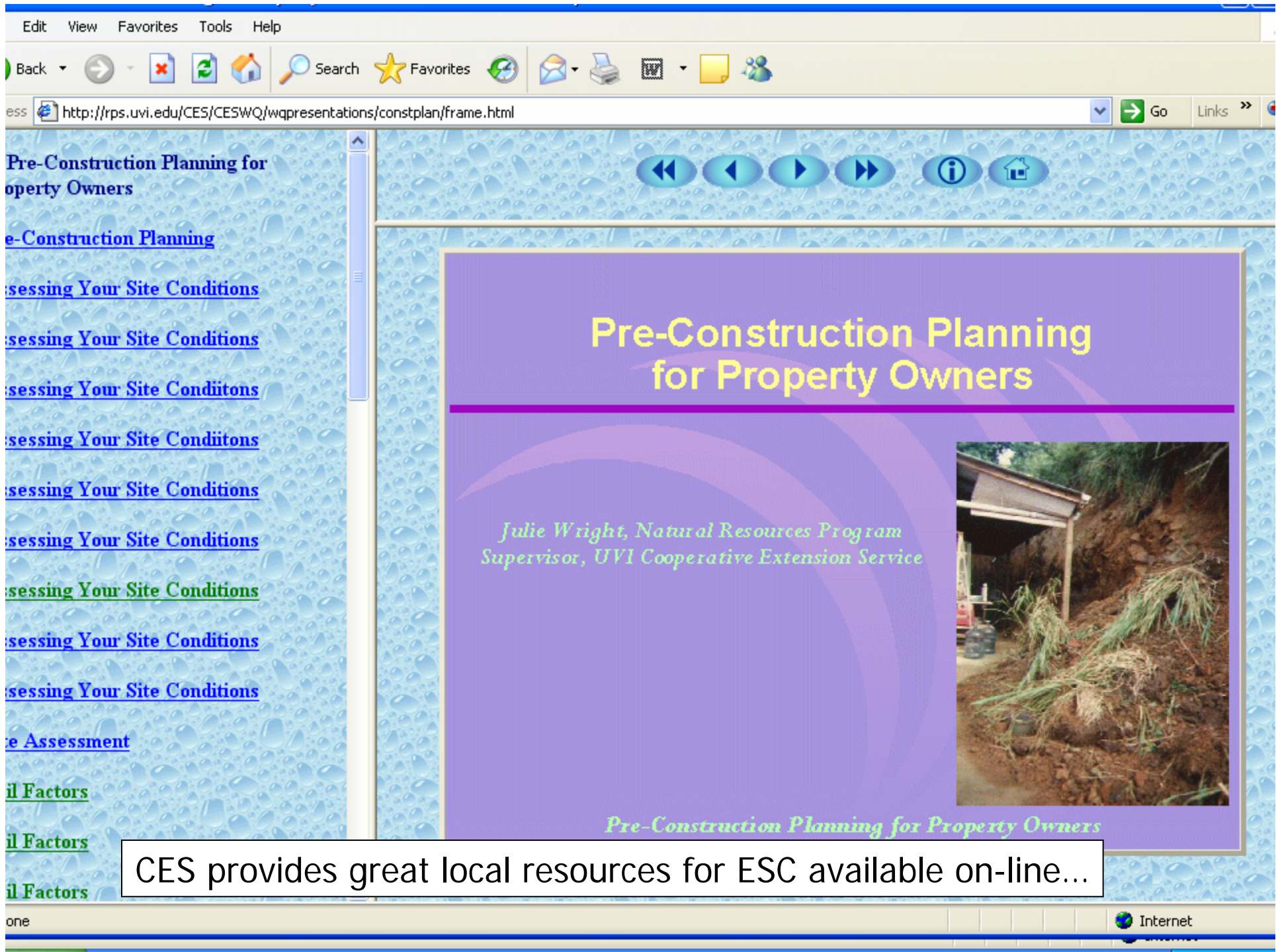


Explosion of single lot steep-sloped construction



Phased clearing and temporary stabilization will become important as larger residential subdivisions are proposed





CES provides great local resources for ESC available on-line...

# USVI demo projects

- ◆ The Virgin Islands Hydroseeding Demonstration Project
- ◆ Grass seed mixtures tested
- ◆ Over 100 individuals trained
- ◆ 2 pumps available for lease once certified



Hydroseeding used to control erosion on slopes during earth change operations.



## ESC in USVI

- ◆ What agency(s) is responsible for reviewing ESC plans, inspection, and enforcement?
- ◆ What disturbance threshold triggers ESC?
- ◆ When were ESC regulations last updated?
- ◆ How frequently are sites inspected?
- ◆ Is there training for local builders, contractors and inspectors?

See Handout





## Tool #6 Stormwater Management

Stormwater is managed by practices that temporarily store runoff and remove pollutants.

Types:

- Ponds
- Wetlands
- Infiltration
- Filtration
- Open Channels



Few examples of structural stormwater practices currently exist on the island...



How do you stabilize an outfall on a sandy beach?



Hey, that could have been a bioretention cell!



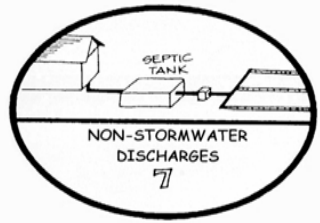
Practices that work stateside may need to be adapted to suit island conditions...



# SW Management in USVI

- ◆ What agency(s) is responsible for reviewing SW plans, inspection, and enforcement?
- ◆ Who is responsible for practice maintenance?
- ◆ How do TPDES and NPDES differ?
- ◆ When were regulations & design manual last updated?
- ◆ Do you have criteria for water quality, recharge, and channel protection?
- ◆ What are your target pollutants of concern?
- ◆ Is there training for local builders, contractors and inspectors?

See Handout



## Tool #7 Non-Stormwater Discharges

Managing direct discharges to waterways or illicit connections to the storm drain system that are **not** storm generated.

◆ Sewer overflows

◆ Septics

(Stricter standards, required maintenance, waterway setbacks, homeowner education)

◆ Marinas

("clean" marina program; marina certification)

◆ Livestock









Surface drainage you don't want to wade in...



Individual discharges are hard to keep up with...

Are washing machine or swimming pool discharges an issue?





Exploring drainage at the Carambola ...

# Failure Rates for Septic Systems

- Failure rates: 5 to 30% nationally

- Even functioning septic systems produce N loads

- Island performance expected to be the same or worse due to risk factors

UVI-CES Water Quality Program - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites

Address <http://rps.uvi.edu/CES/CESWQ/septics.htm> Go Links

NEW YORK NEW JERSEY PUERTO RICO VIRGIN ISLANDS  
Regional Water Quality Coordination Program

CSREES  
Virgin Islands  
Water Quality Program

University of the Virgin Islands  
1962

- Cooperative Extension Service -

About • Calendar • Contacts: Meet Our Award-Winning Staff • Feedback • Regional Coordination Project • Publications

## Septic System Operation & Management

Septic System Operation & Management is part of the UVI-CES VI\*A\*Syst Program. The VI\*A\*Syst Assessment is a tool that can help you conduct a complete environmental assessment of your home, yard, business and/or farm. The VI\*A\*Syst Assessment uses a simple YES or NO checklist of questions about specific topics, such as your septic system. Depending on your answer to the questions, you will be directed to a matching factsheet that will give you more detailed information on the topic. The factsheets will also help you develop an Action Plan to implement practices or change behaviors to protect your family's health, your property values, and the environment. Simple and low cost individual activities go a long way in preventing pollution!

Download the [Septic System \(Household Waste Water Disposal\) Assessment](#) in [Adobe Acrobat](#) format here. You can also download a copy of our [Assessing Your Septic System to Protect Water Quality factsheet](#) for more detailed risk assessment information. Click the Adobe button to download [Adobe Acrobat Reader](#) to view and print our publications.

UVI-CES also offers workshops and presentations for residents and visitors to learn how to manage their septic systems to protect human & environmental health. The [Understanding Your Septic System](#) workshop provides our clients with the following information:

- Septic system function, siting & design,
- Septic system operation & maintenance to prevent failures,
- Failure warning signs, and
- Evaluating and ranking septic systems for pollution potential

Click here to view our [Understanding Your Septic System](#) workshop presentation. Visit our [Water Quality Publications](#) page to download more factsheets and publication on protecting health and water

Water Quality

start Microsoft Outlook We... UVI-CES Water Qual... 8 tools Microsoft PowerPoint ... Internet 8:20 AM

# Non-SW discharges in USVI

- ◆ What agency(s) is responsible for:
  - Sewer maintenance
  - Septic permits and maintenance tracking
  - Illicit discharge investigation
- ◆ Is there a clean marina program (or equivalent)
- ◆ CAFOs?

See Handout



# Tool #8 Watershed Stewardship



**Restoration**



**Maintenance**



**Monitoring**



**Advocacy**





Example USVI restoration projects...





Gabion baskets and geotextile fabric at Carambola gut



Stormwater Retrofit Opportunities



Don't underestimate the maintenance burden...



Watershed advocates in Coral Bay community...



Sharon

Barry

Unsuspecting tourist

# Stewardship in USVI

- ◆ What agency(s) are involved in restoration activities (retrofit, stream restoration, etc)
- ◆ Who provides watershed education services?
- ◆ What agency(s) conduct water quality/biological monitoring?
- ◆ What local watershed groups are in place?

See Handout

# Island watersheds are unique

- Carefully adapt “mainland” solutions
- Minimize impervious cover
- Apply the 8 tools together at small watershed scale
- Use simple techniques, done well.

