Protection of Island Water Resources from Livestock Waste Pollution

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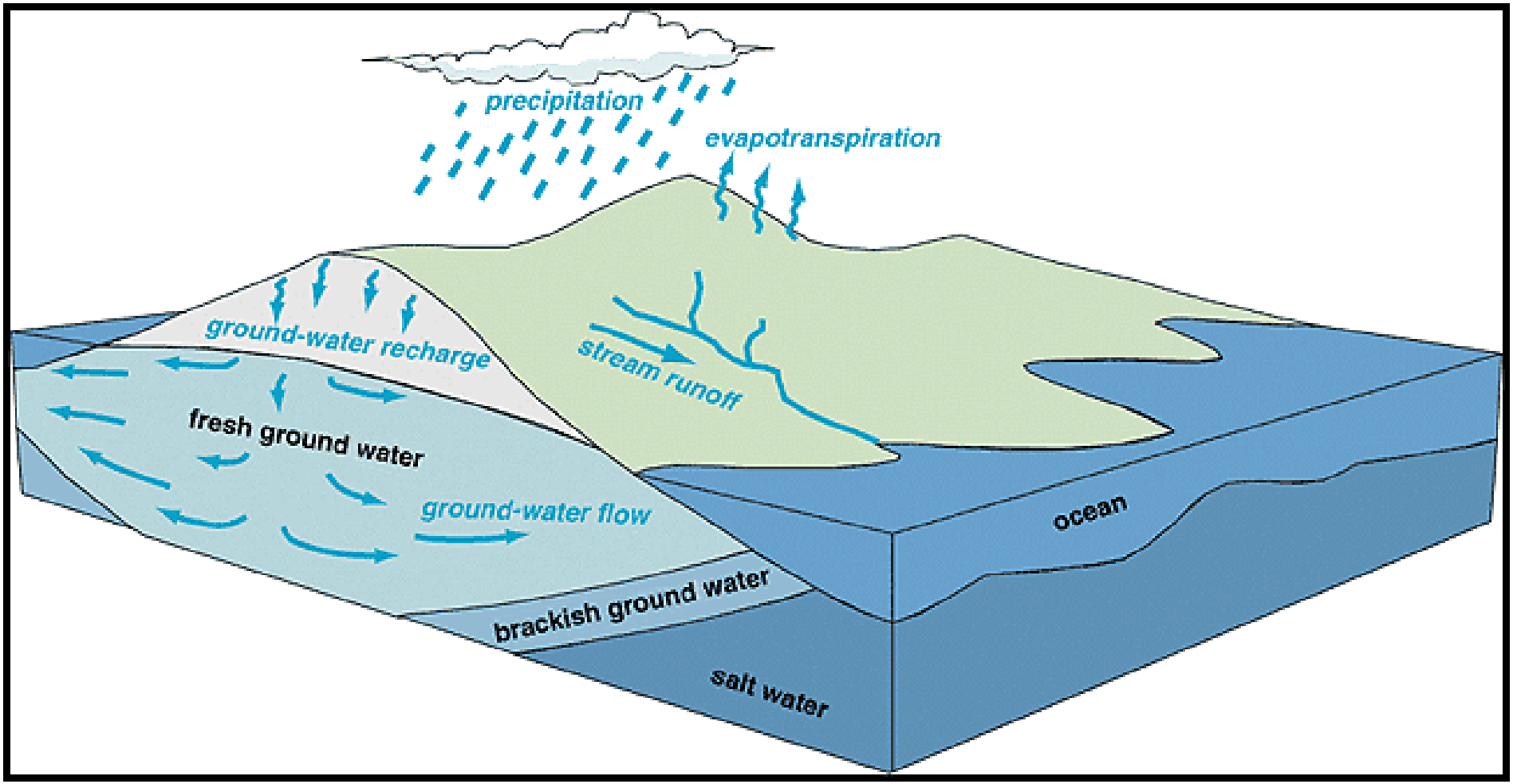
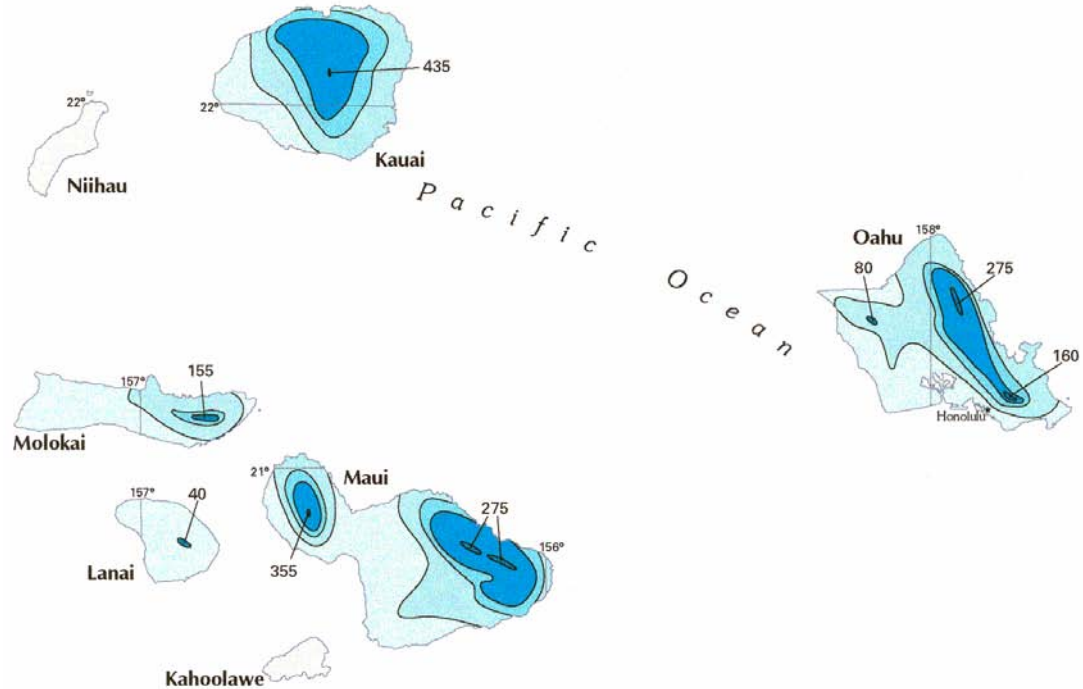
Island Hydrology

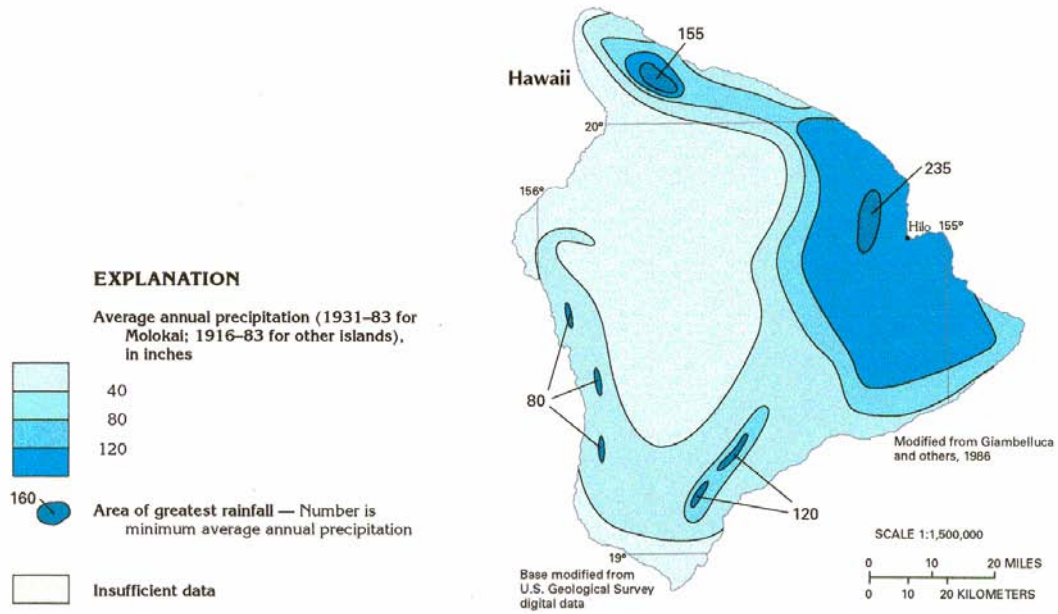


(Source: USGS)

Rainfall Distribution in Hawaii

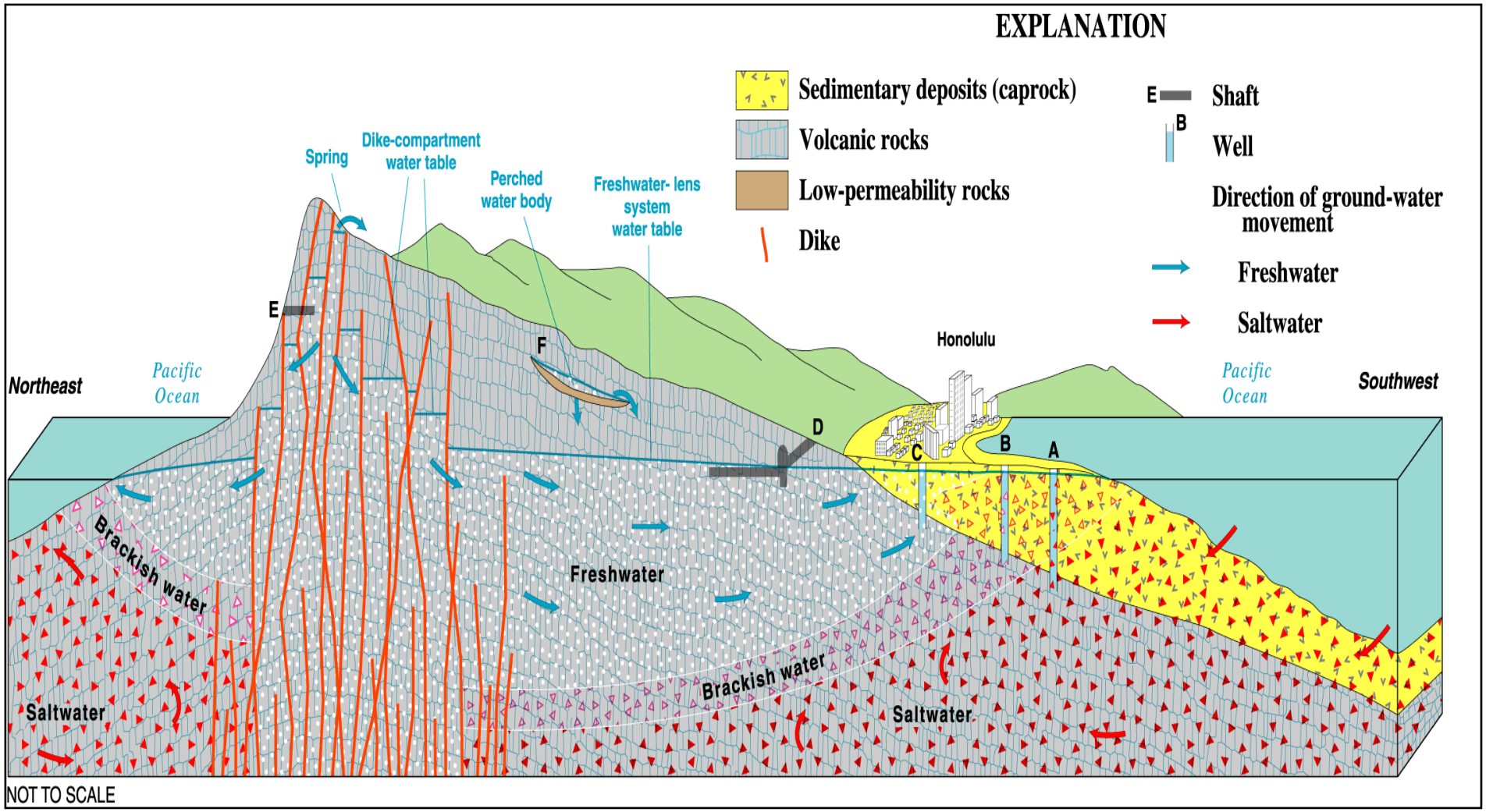
- **Orographic rainfall**
- **Extreme variation over short distances**



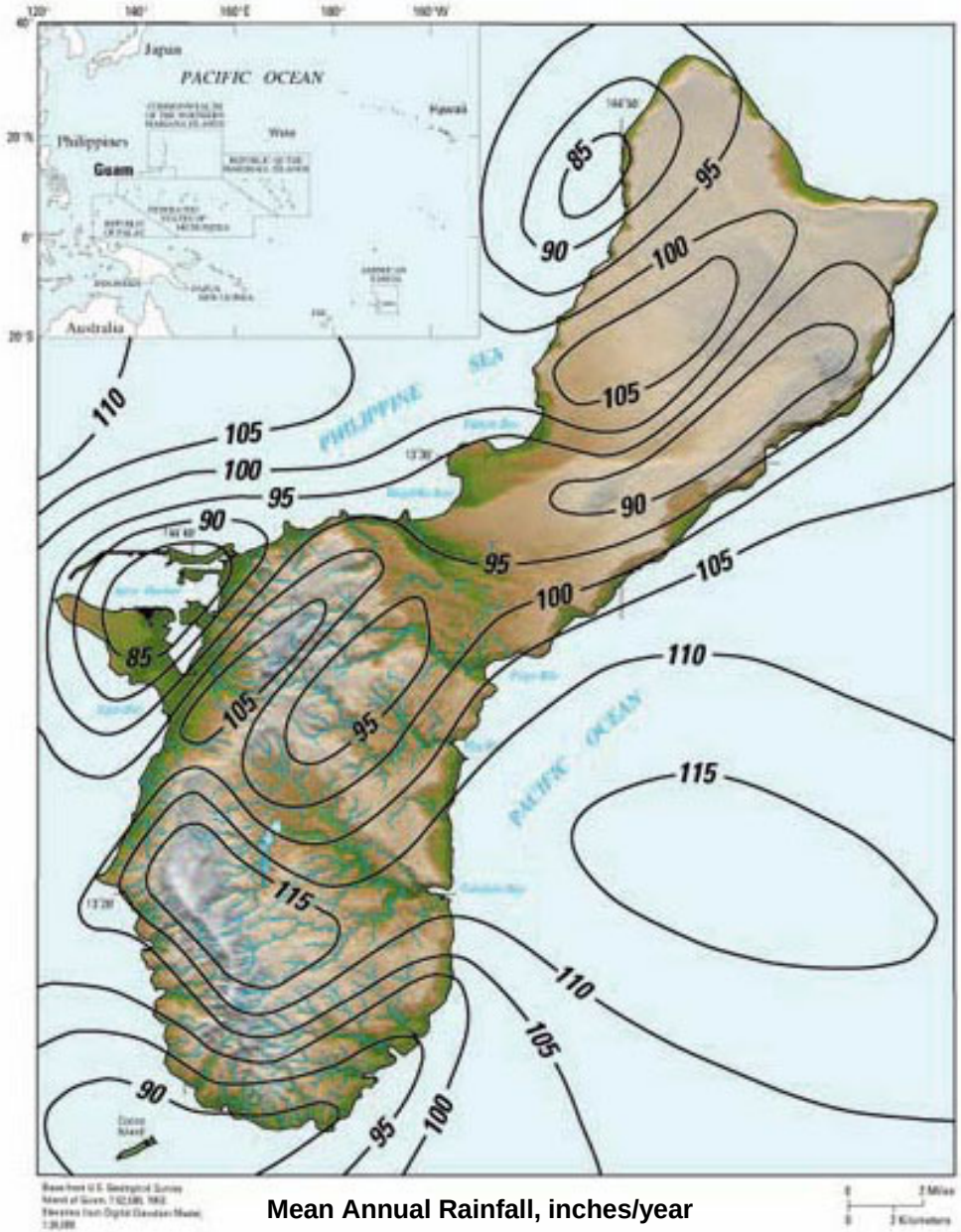


(Source: USGS)

Groundwater in Hawaii

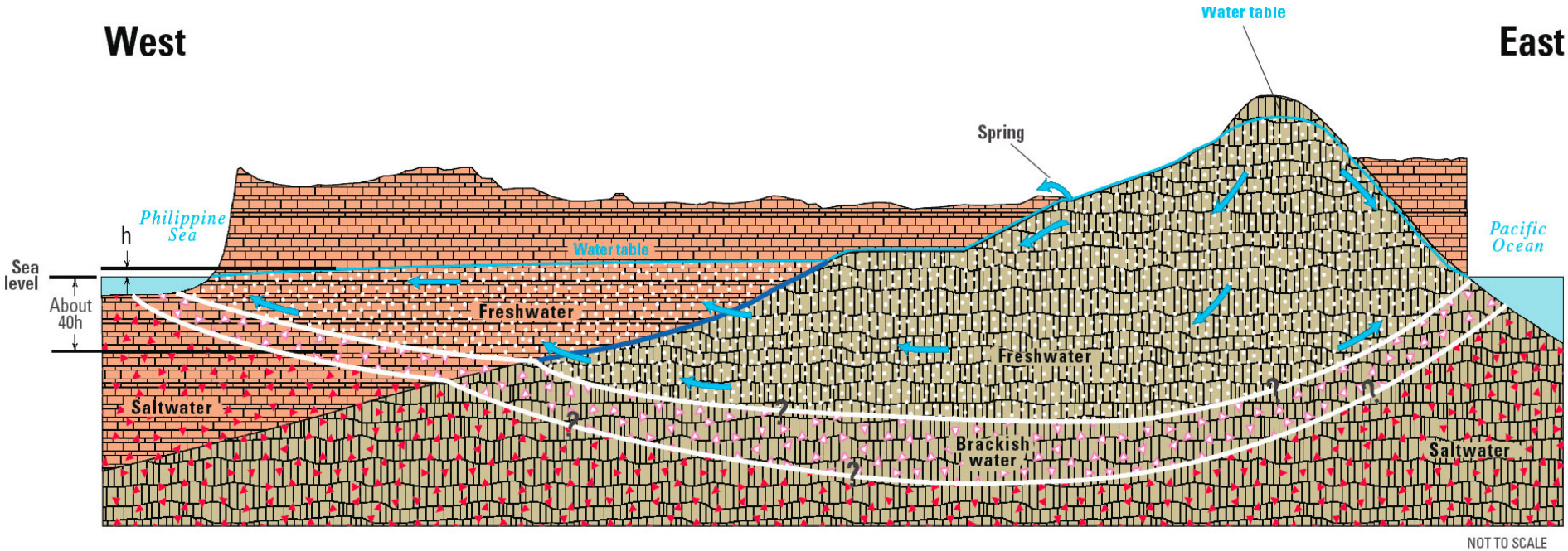


Geohydrology of Guam



Mean Annual Rainfall, inches/year

(Source: USGS)



EXPLANATION

- LIMESTONE
- VOLCANIC ROCKS
- GENERAL DIRECTION OF FRESH GROUND-WATER FLOW
- ZONE WHERE FRESHWATER IN LIMESTONE IS IN DIRECT CONTACT WITH FRESHWATER IN UNDERLYING VOLCANICS (PARA-BASAL)

Geohydrology of Tinian

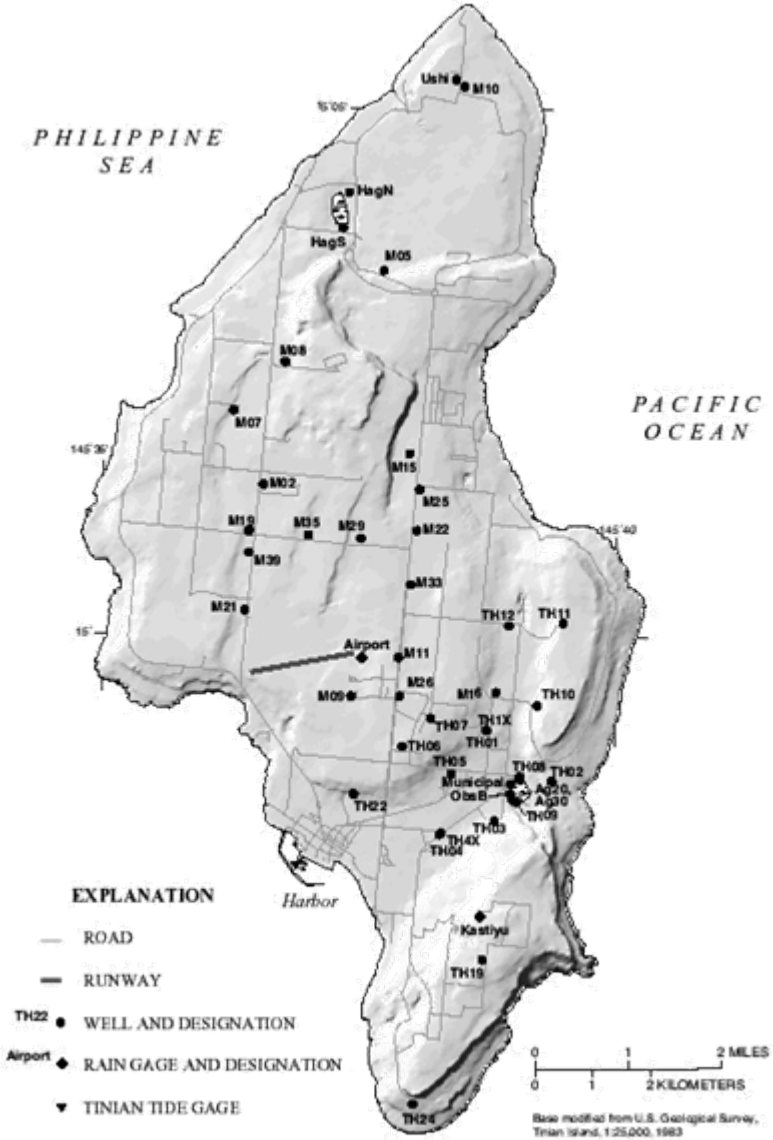
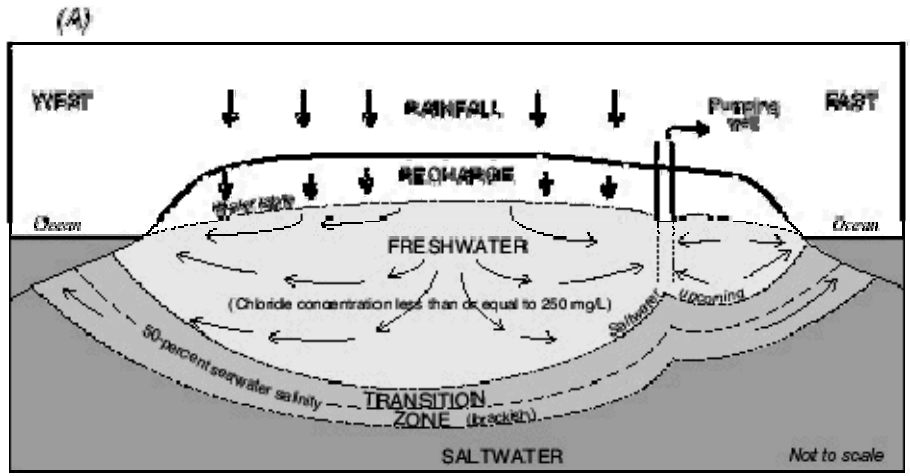


Figure 7. Location of selected wells and rain gages, Tinian.



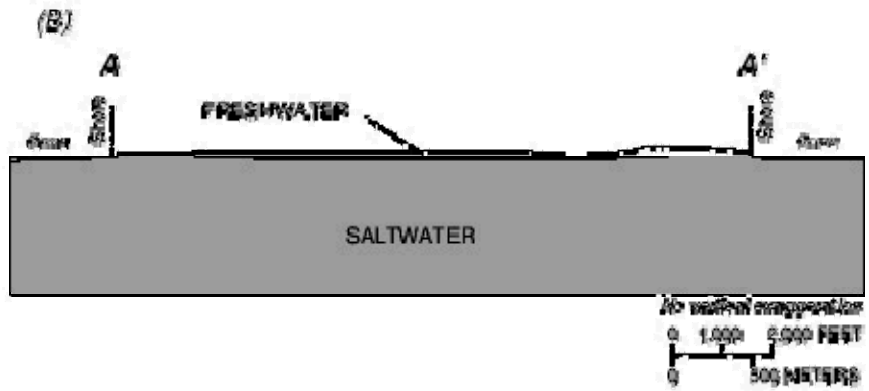


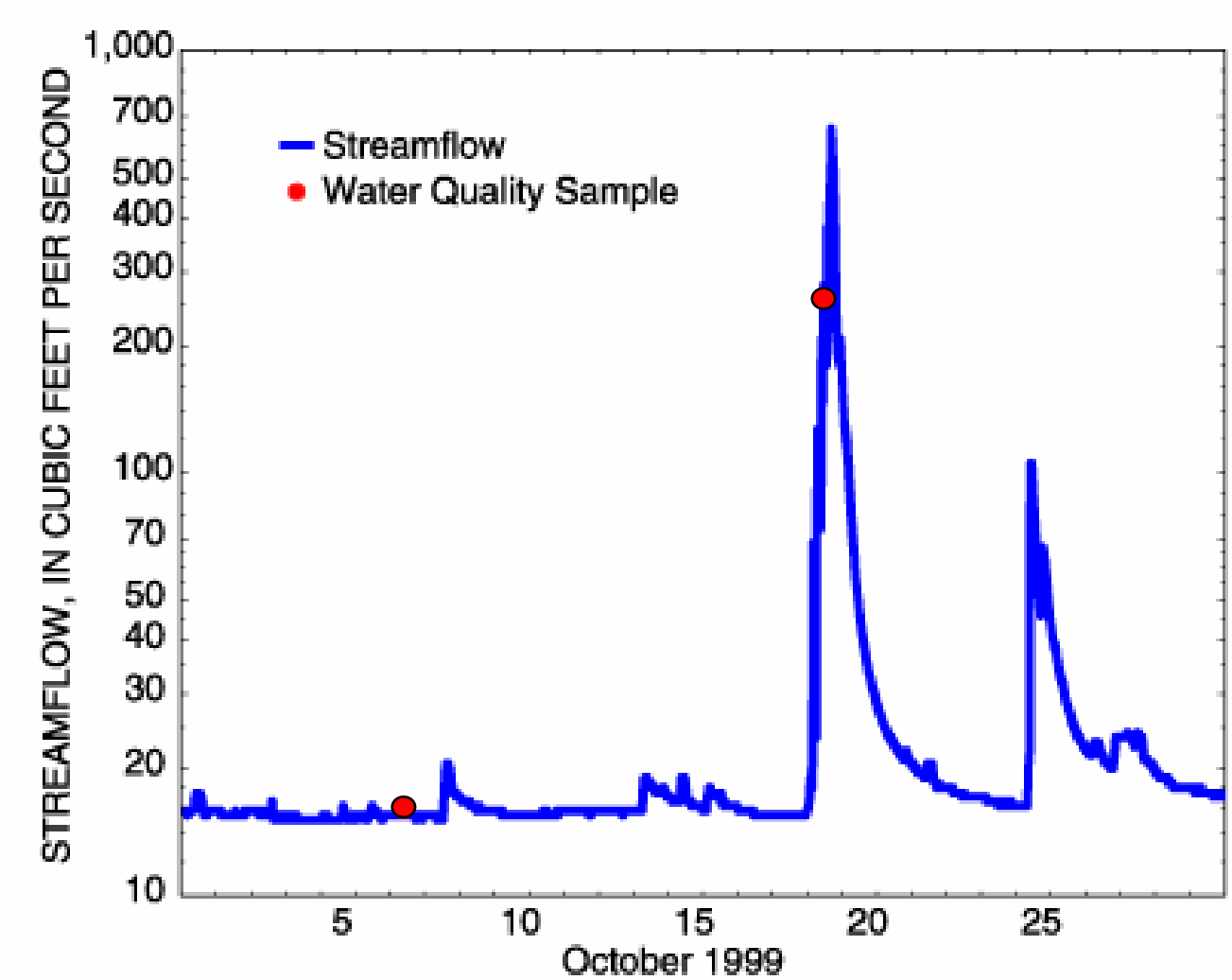
Figure 6. Occurrence of freshwater lens. (A) Schematic diagram of salinity structure and ground-water flow pattern, vertical dimension greatly exaggerated. (B) Tinian freshwater lens, no vertical exaggeration. Line of section shown in figure 1.

(Source: USGS)

Island Streamflow Characteristics

- Streams are short with steep gradients and small drainage areas
- Few streams are perennial over their entire reaches
- Flow is highly variable
  - Low flows maintained by ground-water discharge
  - High flows in response to short-term rainfall events

Rapid runoff with high peak flows

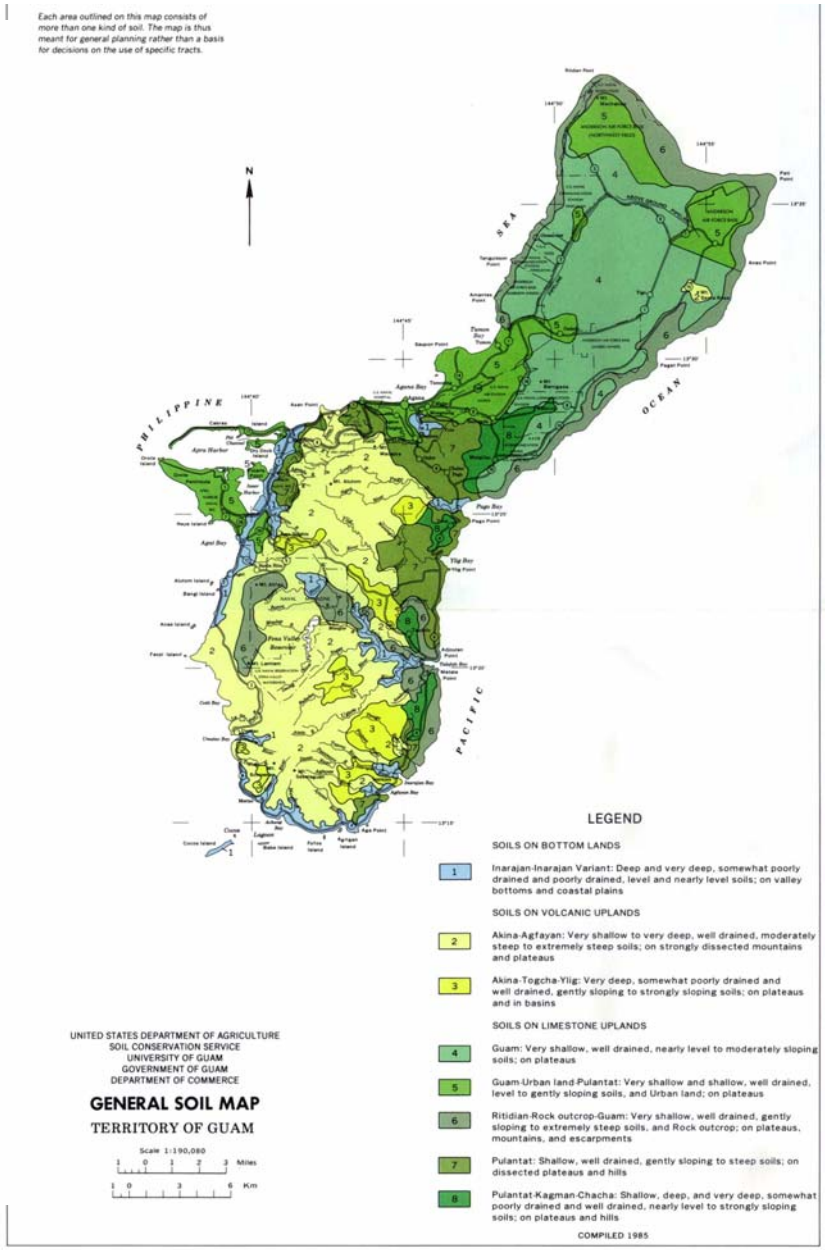


(Source: USGS)

Flooded pasture at Waipa, Hawaii

Geology & Soils of Guam

(Source: USGS)

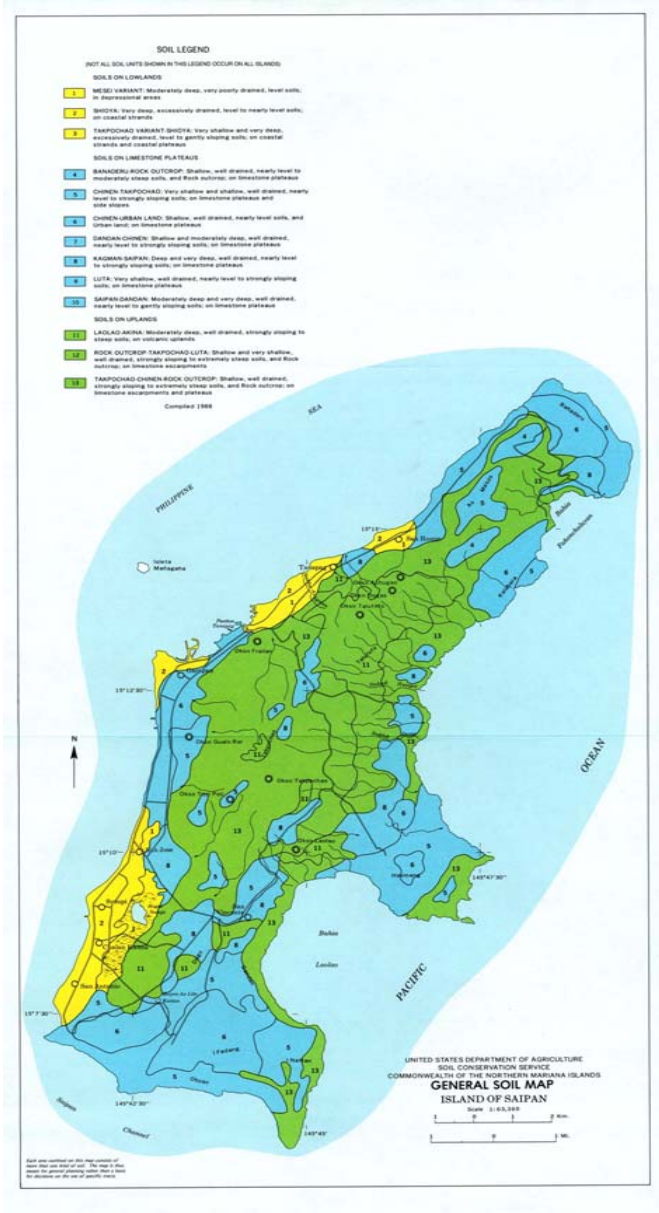


(Source: NRCS)

Geology & Soils of Saipan

Figure 1. Location map and shaded relief of Saipan.

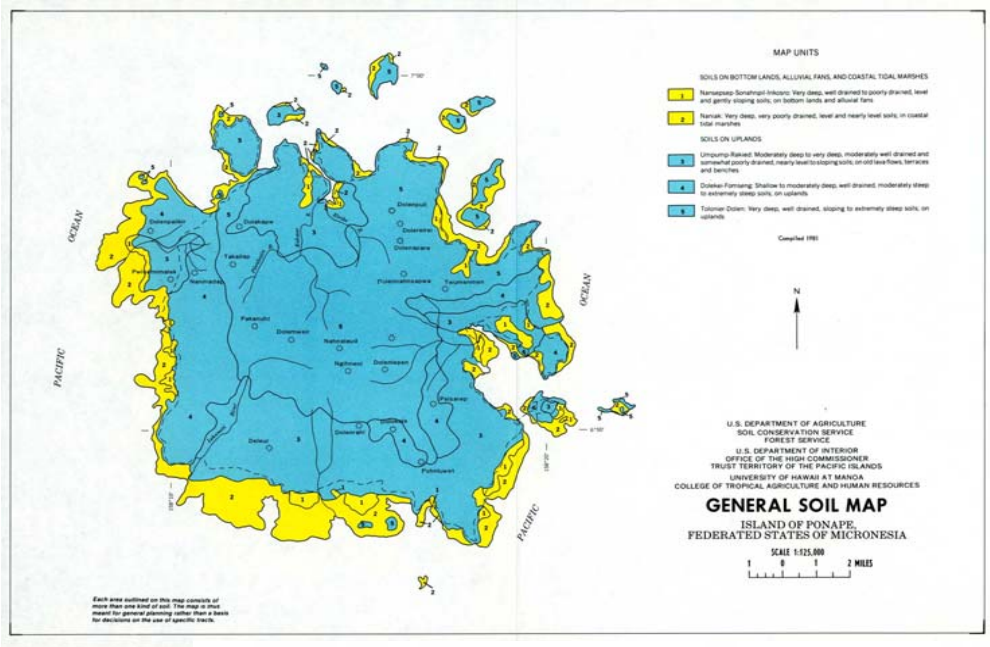
(Source: USGS)

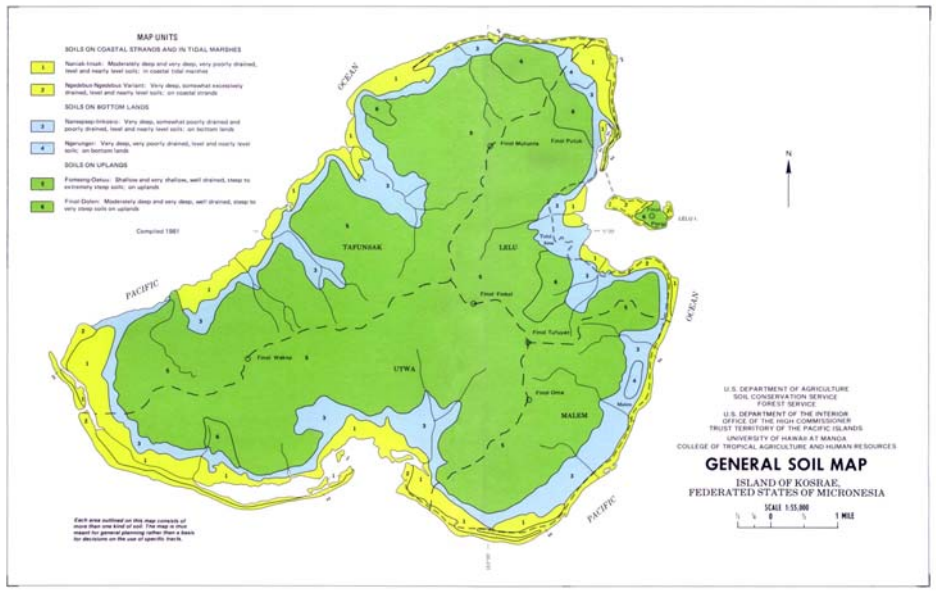


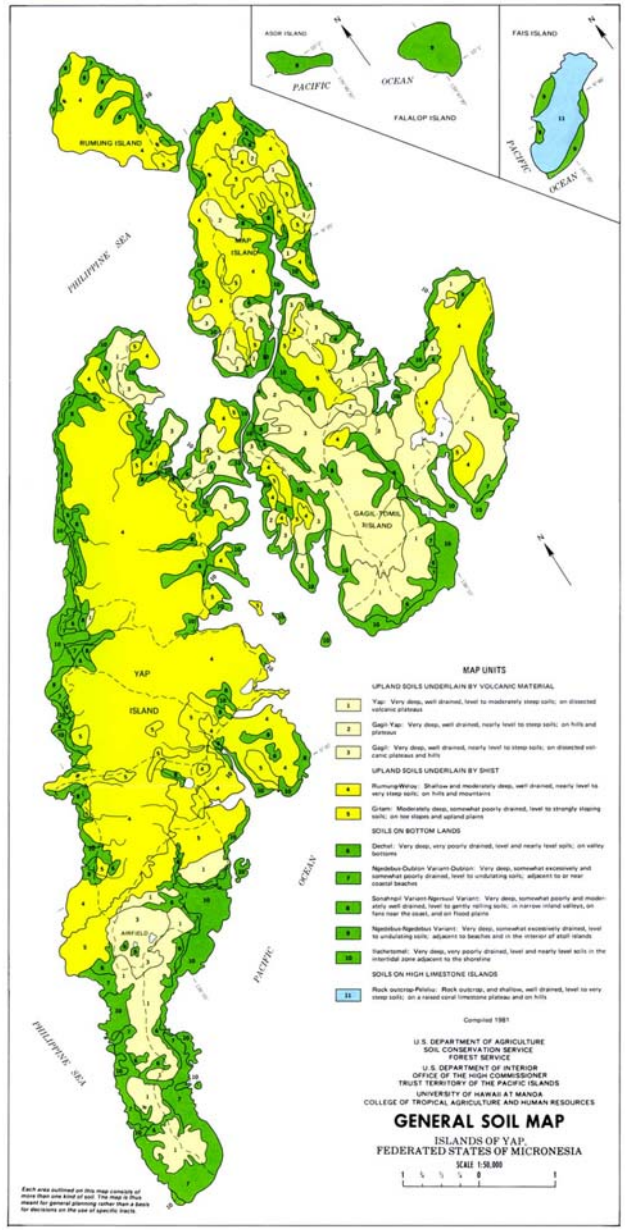
(Source: NRCS)

Limestone Cliffs of Western Tinian, CNMI

Soils of Federated States of Micronesia





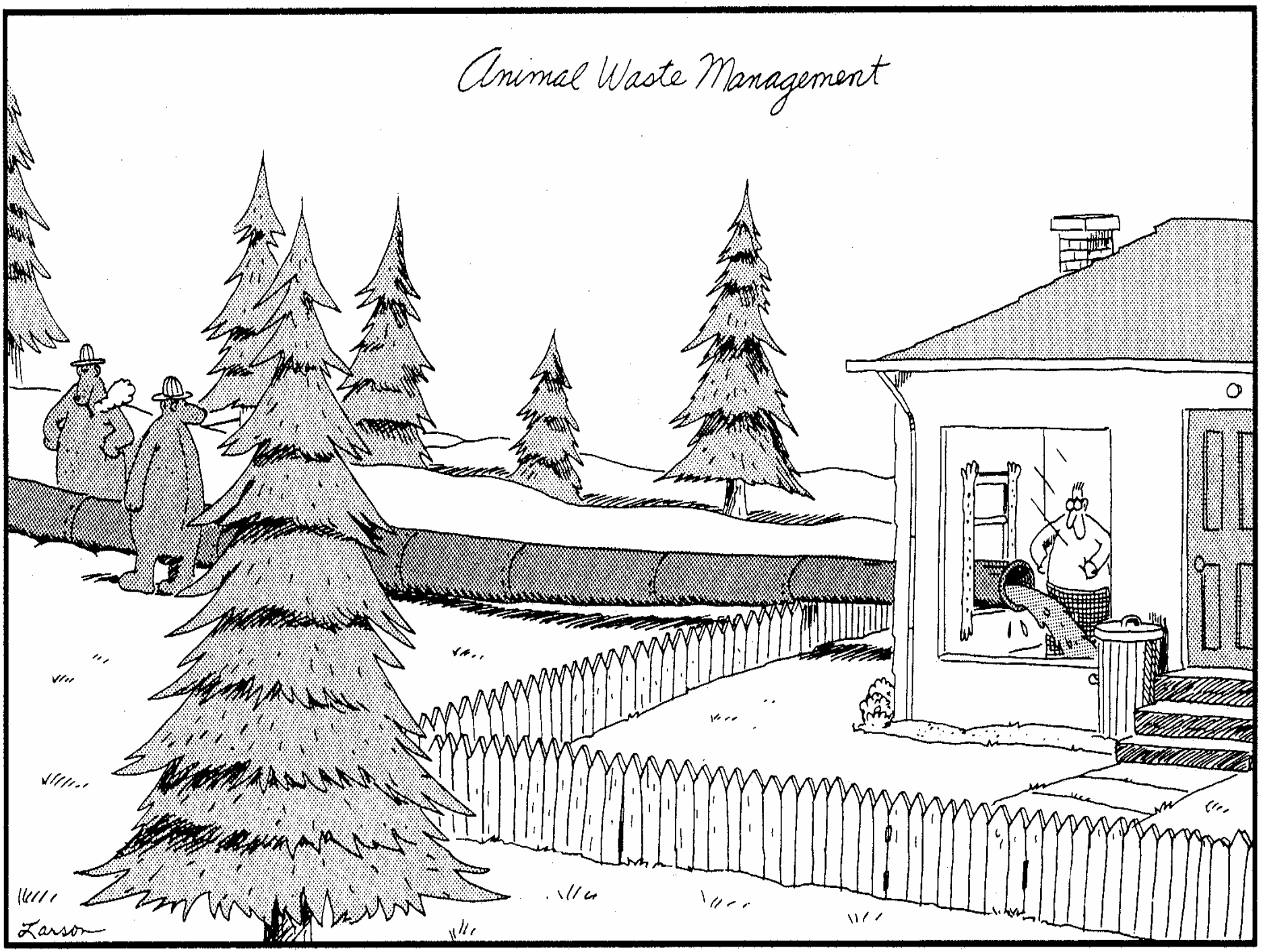


(Source: NRCS)

Soils differ in their properties, behavior and management

Soil = f(pm, cl, o, r, t, . . h)

(Source: NRCS)


Animal Waste Management
Larson

PROBLEMS

Pathways by which Manure Contaminates Water

Pollutant	Pathway
1) Nitrate – N	Leaching & Runoff
2) Ammonium – N	Surface water run off & Aerial deposition
3) Phosphorus	Surface water runoff
4) Pathogens	Surface water runoff
5) Organic Matter	Surface water runoff

Water Quality Contaminants in Manure

Possible Pollutants	Environmental / Health Risk
1) *Nitrate-N*	*Human Health*
2) *Ammonia-N*	*Fish Kills*
3) *Phosphorus*	*Eutrophication*
4) Pathogens	Human Health
5) Organic Matter	Oxygen Depletion

Island Piggery

Effluent Drainage to Field

Overflowing “septic tank”

Alternative Manure Management Practices are needed …

- to avoid environmental degradation of our water resources
- to avoid possible human health & environmental problems
- to take advantage of the nutrients or “fertilizer” value for growing crops

NRCS Natural Resources Conservation Service

A Guide to a

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN

for Livestock Production in Hawaii

September 2003

v. 1.2

The manure manager should select a manure application rate that:

- **Supplies the crop's nutrient needs without buildup of soil nutrients.**
- **Prevents runoff to surface water.**
- **Minimizes percolation to groundwater.**
- **Reduces / eliminates pathogen transmission**

LEPTOSPIROSIS *IN* *AMERICAN SAMOA*

Knowledge is the Key to Prevention and Good Health

Information in the brochure was provided by the Center for Disease Control website at :
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/leptospirosis_g.htm

Information provided in this brochure is not intended as a substitute for consultation with a health–care provider. If you have questions about leptospirosis, please contact the LBJ Tropical Medical Center at 633–2662, or the American Samoa Department of Health at 633–4606.

This brochure was created by the Interagency Piggery Management Council, and published by the American Samoa Community College, with funding from the USDA–CSREES Farm Safety Program.

USDA

Swine Husbandry in American Samoa

In American Samoa, pigs are raised in small pens commonly located along stream banks or wetlands. Pig waste is discharged directly to these bodies of water. Not only can this degrade water quality, but it also poses serious public health risks. One of the most dangerous infectious diseases that can be contracted from contaminated water, and from the piggery itself, is **leptospirosis.**

What is leptospirosis?

Leptospirosis is a bacterial disease transmitted to humans from animals (pigs, cattle, horses, dogs, and rodents).

People become infected through contact with contaminated urine, water, or soil. The bacteria enter the body through skin or mucous membranes (eyes, nose, or mouth), especially if the skin is broken from a cut or scratch. Drinking contaminated water can also cause infection.

Symptoms can occur as early as 2 days or up to 4 weeks after exposure. They include:

Severe headache	**Fever**
Vomiting	**Red Eyes**
Chills	**Muscle aches**
Abdominal pain	**Diarrhea**
Rash	

More severe symptoms include:

Kidney damage
Liver failure
Jaundice (yellow skin and eyes)
Respiratory distress

In rare cases death can occur.

Protect Your Family Prevent Leptospirosis

If you own a piggery, make sure you properly dispose of the pig waste. Contact NRCS at 633–1031 or Land Grant at 699–1394 for more information.

Wear protective clothing (gloves and boots), and thoroughly clean yourself after working with pigs or in your piggery.

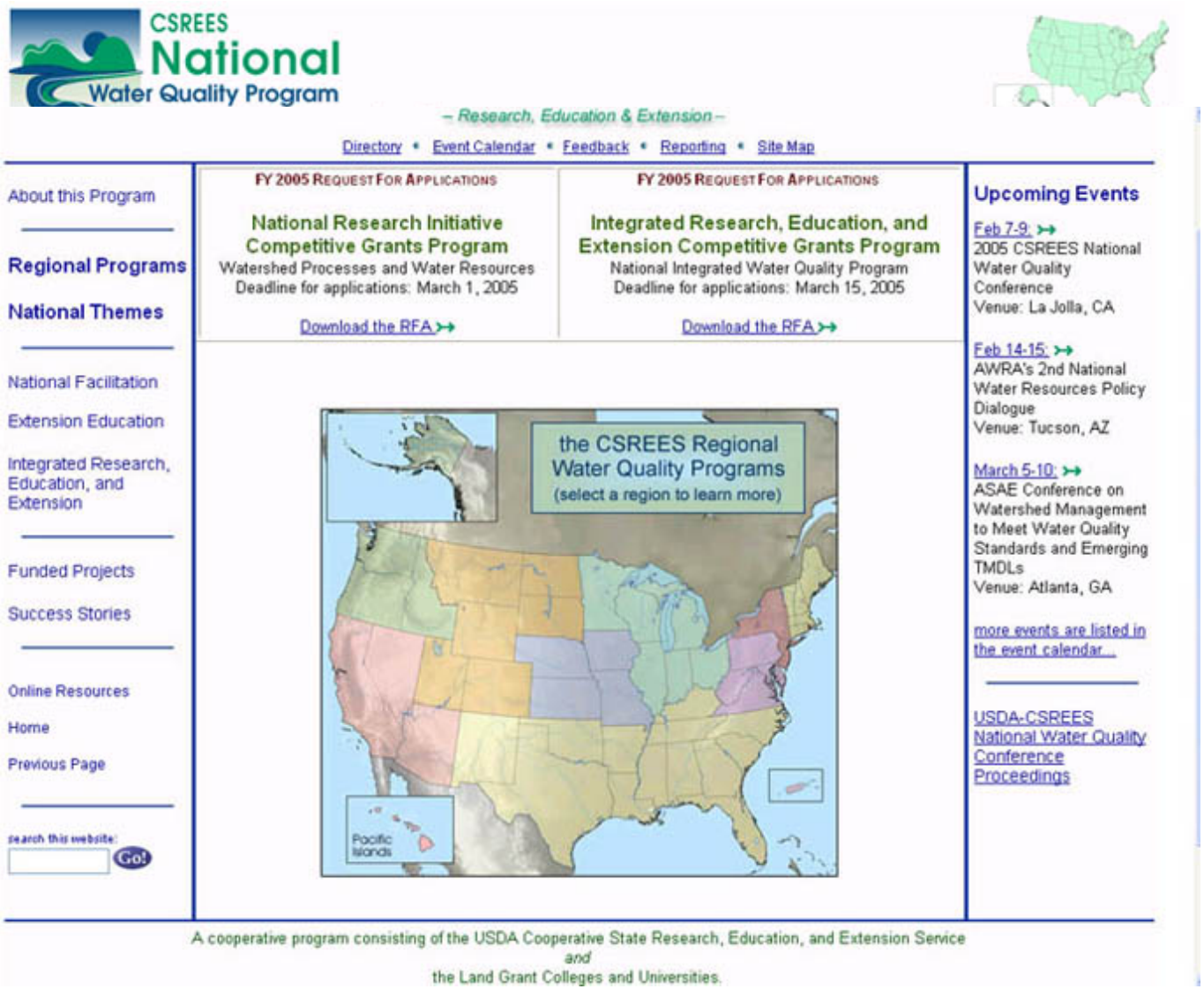
Do not swim or bathe in water that might be contaminated with animal waste.

Vaccinate your pets against leptospirosis. For more information, contact the Veterinary Clinic at the Department of Agriculture at 699–9445.

Seek medical attention should you feel any of these symptoms. Leptospirosis can be treated with antibiotics.

The National Water Quality Program

A Regionally-Based National Network



Building Bridges Across a Vast Region

Livestock Manure Management

Several regional projects have been initiated to promote:

(1) safe application rates of livestock waste,
(2) understanding interactions of nutrients with arid and tropical soils,
(3) adoption of nutrient management plans.

Pacific Dairy Lagoon

EFFLUENT RESEARCH
- GRASS PRODUCTION
- TREATMENT & REUSE
PACIFIC DAIRY
UH COLLEGE OF TROPICAL AGRICULTURE
USDA

An example of a practice being promoted is a portable dry-litter system which eliminates discharges into waterways and integrates composting.

A series of workshops were conducted in July-August 2004 In Guam and CNMI to extend this information to farmers and agencies in the Western Pacific.

Kalangan
Fa’afetai
MAHALO
Ke kmal mesulang
Komoltata
Dunkalu Na Si Yuus Maase