

Protection of Island Water Resources from Livestock Waste Pollution

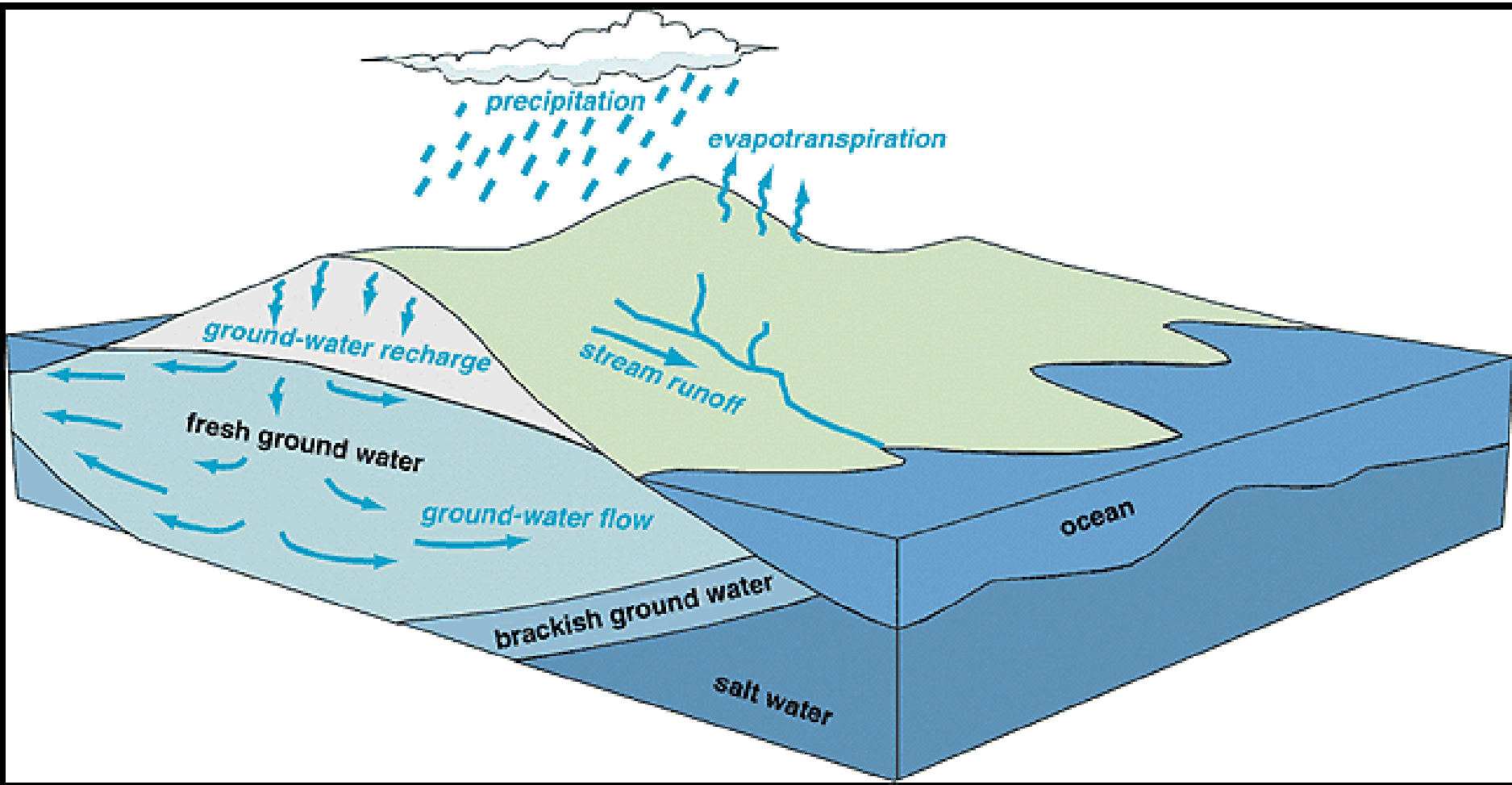


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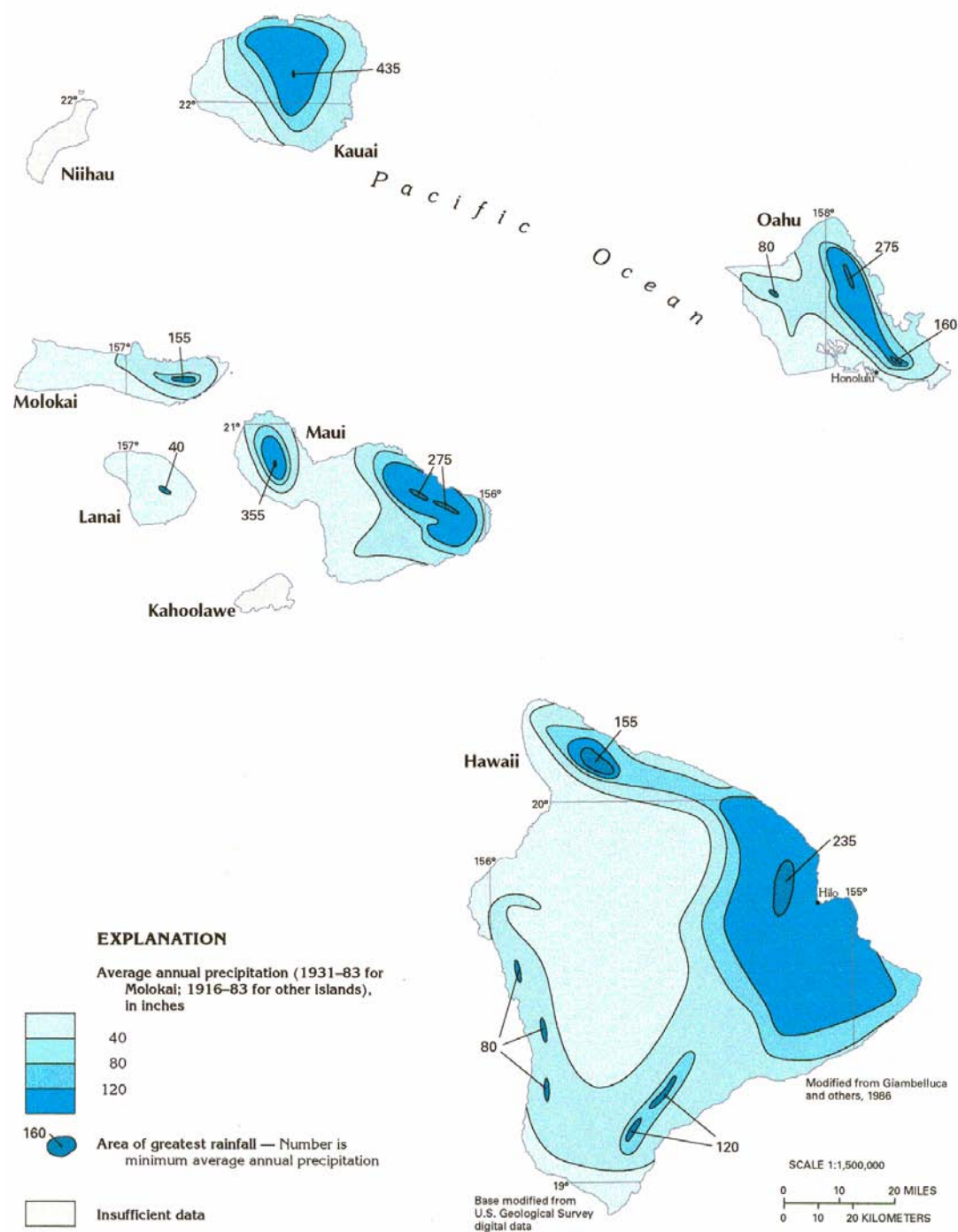
Island Hydrology



(Source: USGS)

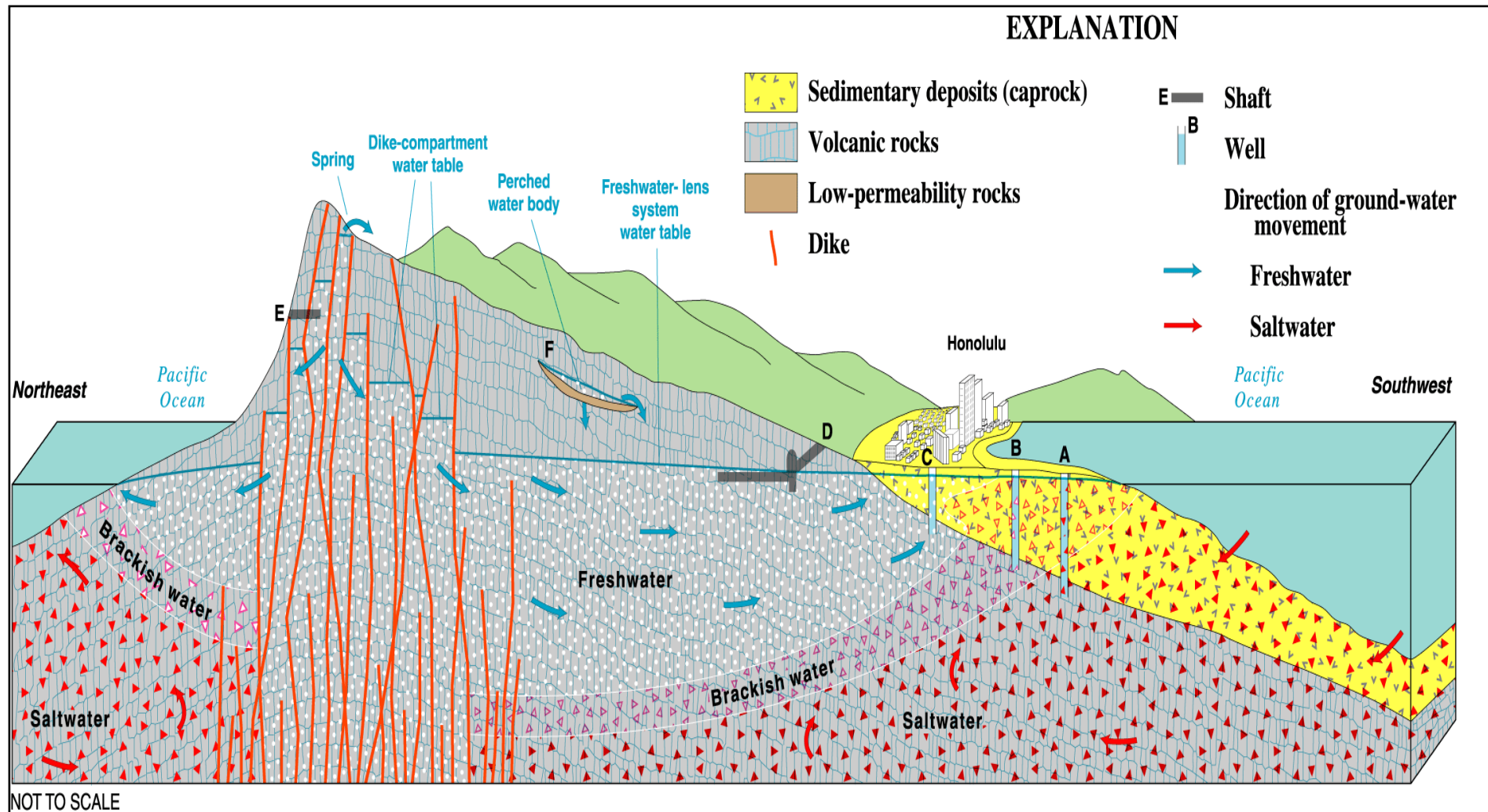
Rainfall Distribution in Hawaii

- Orographic rainfall
- Extreme variation over short distances

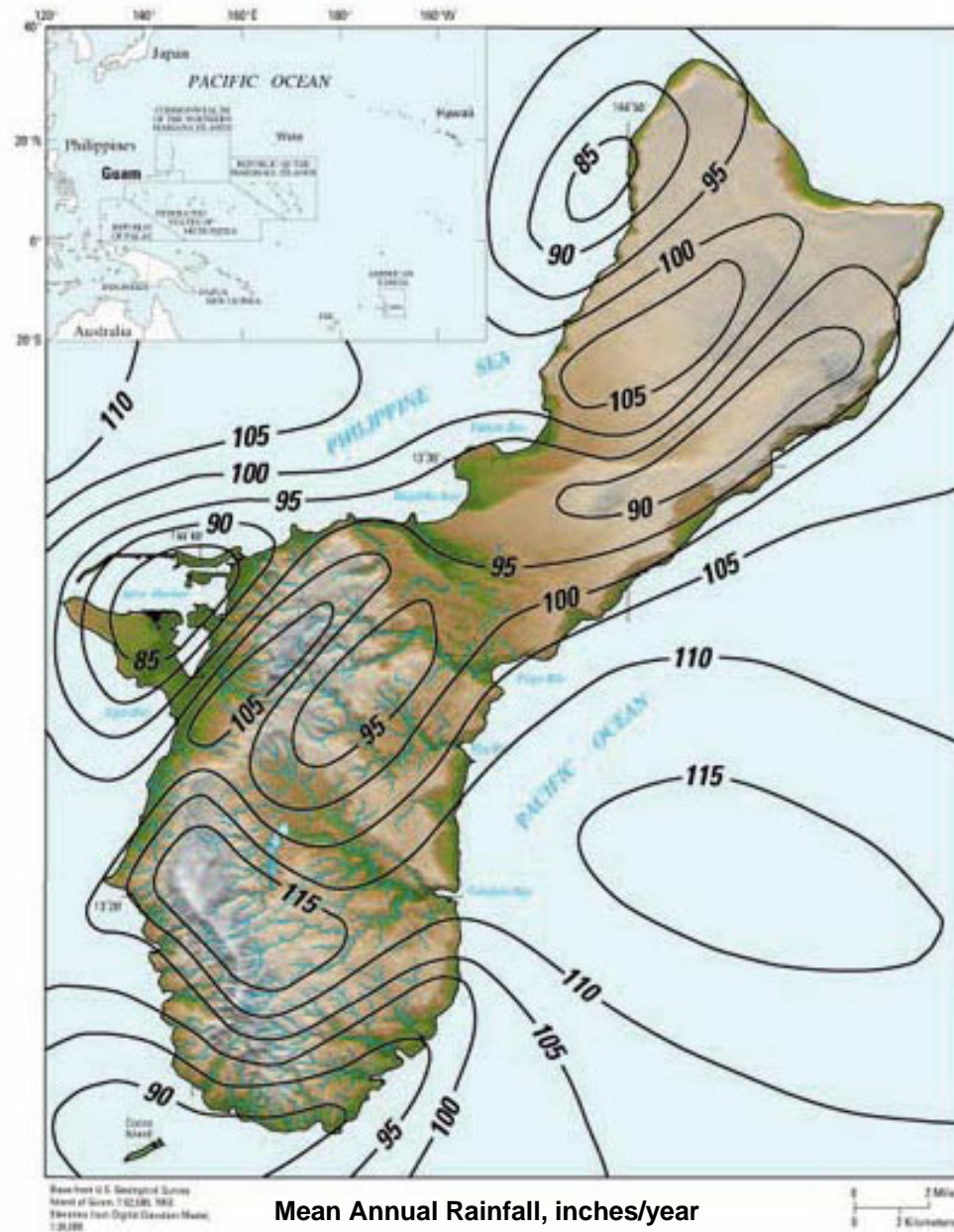


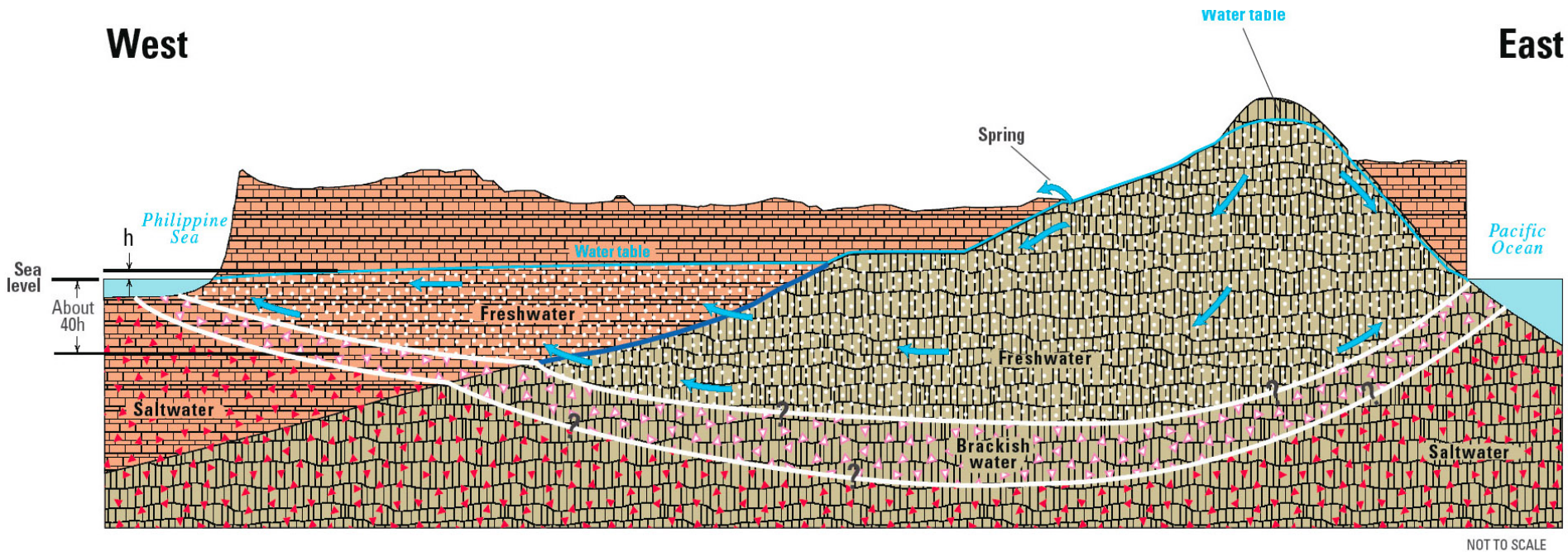
(Source: USGS)

Groundwater in Hawaii







Geohydrology of Guam





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

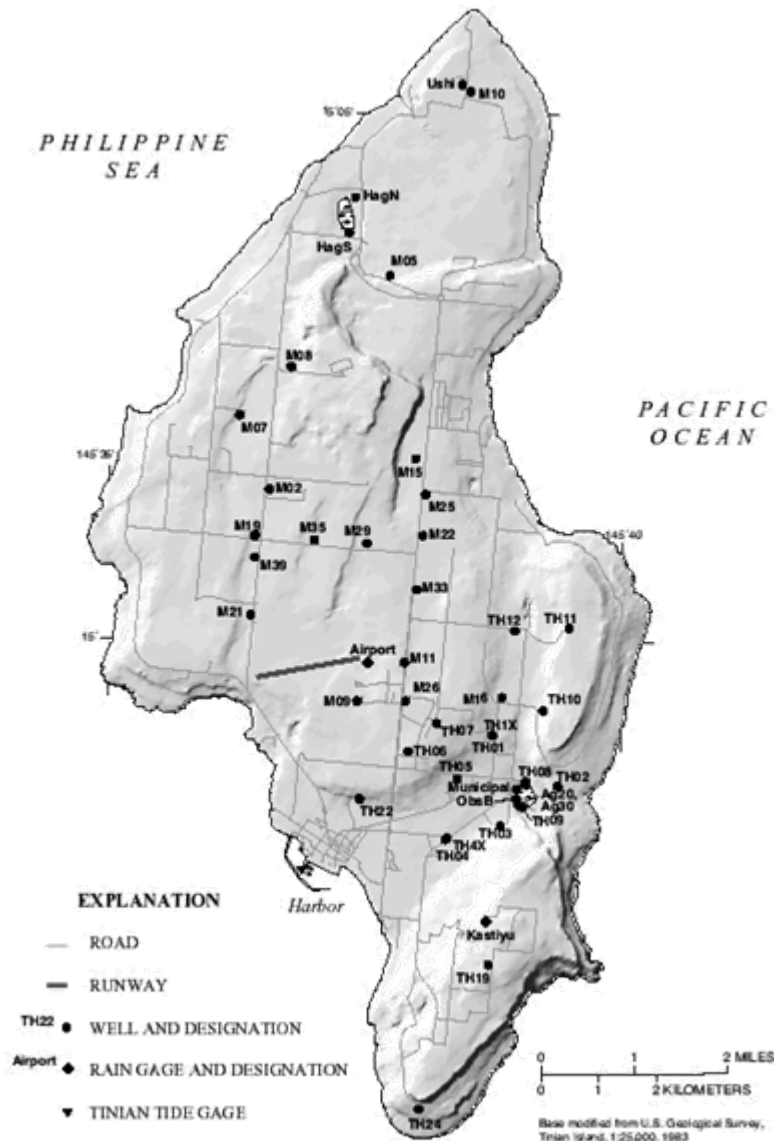


Figure 7. Location of selected wells and rain gages, Tinian.

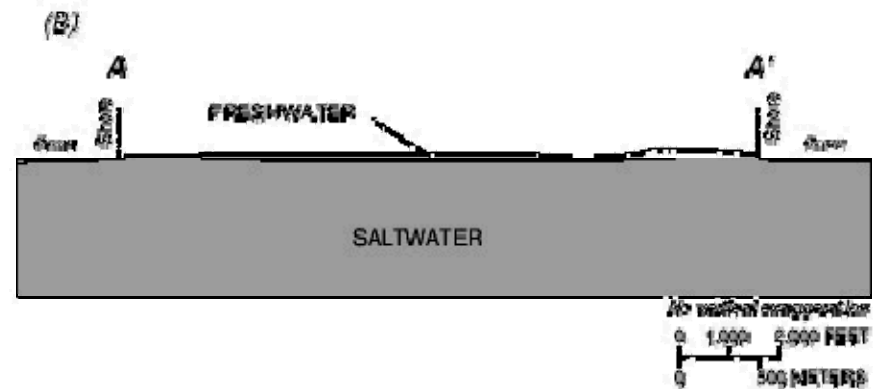
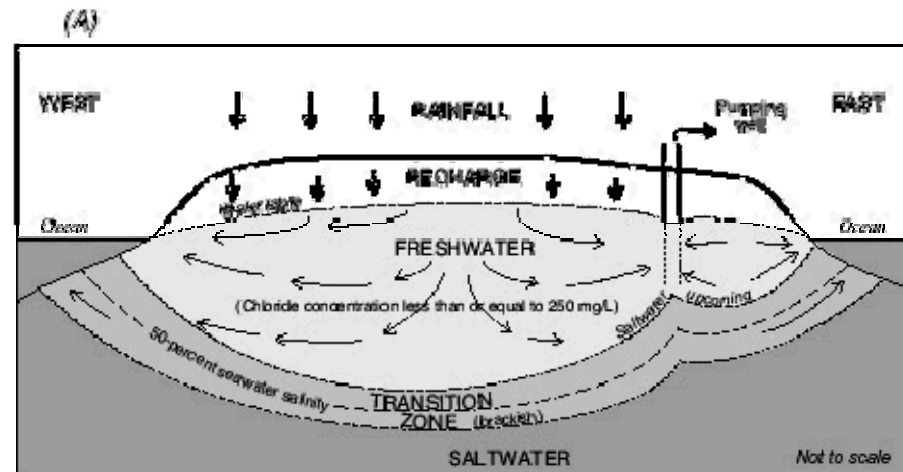


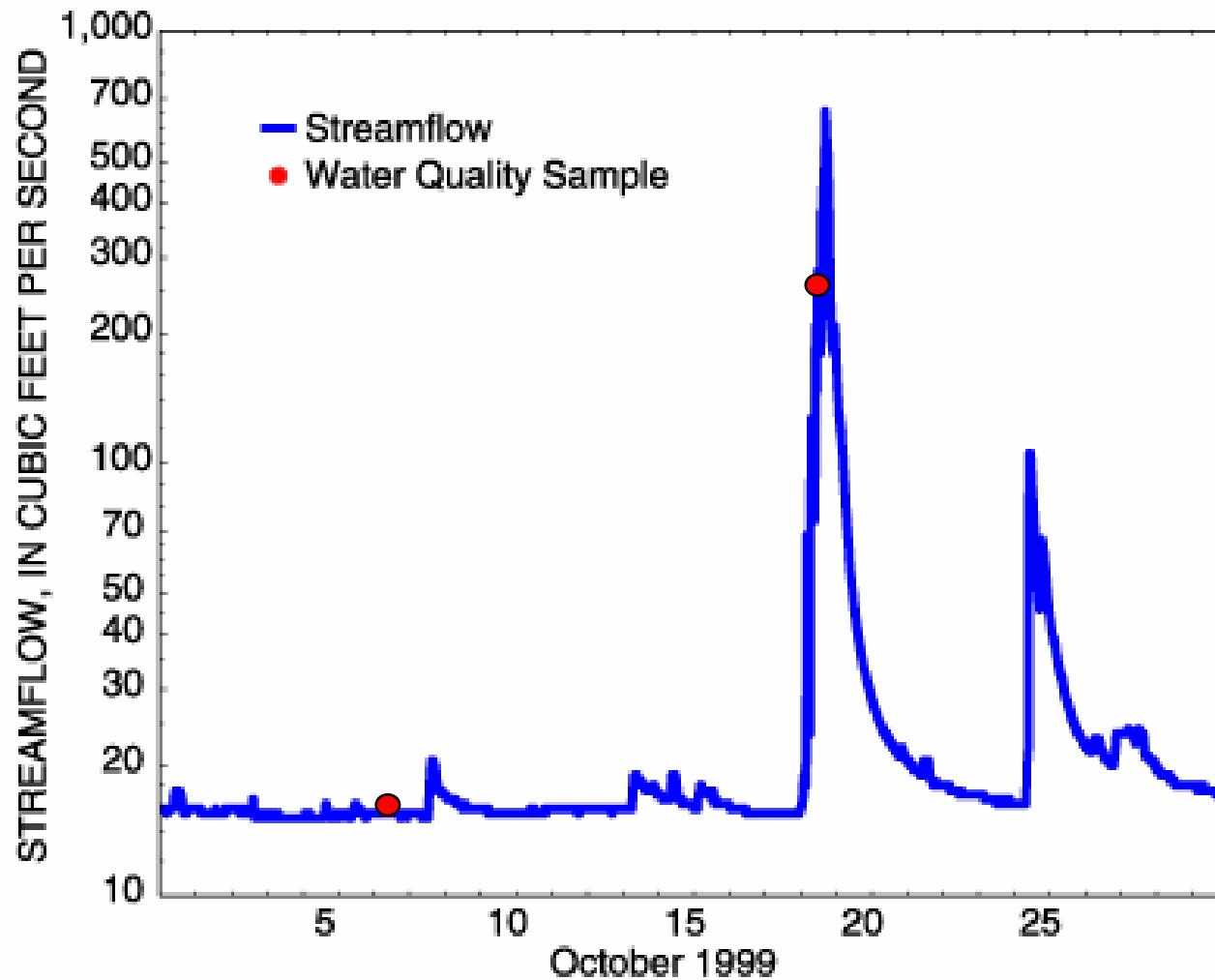
Figure 8. Cross-section of freshwater lens. (A) Schematic diagram of salinity structure and groundwater flow pattern. Vertical dimension greatly exaggerated. (B) Tinian freshwater lens, no vertical exaggeration. Line of section shown in Figure 1.

(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)



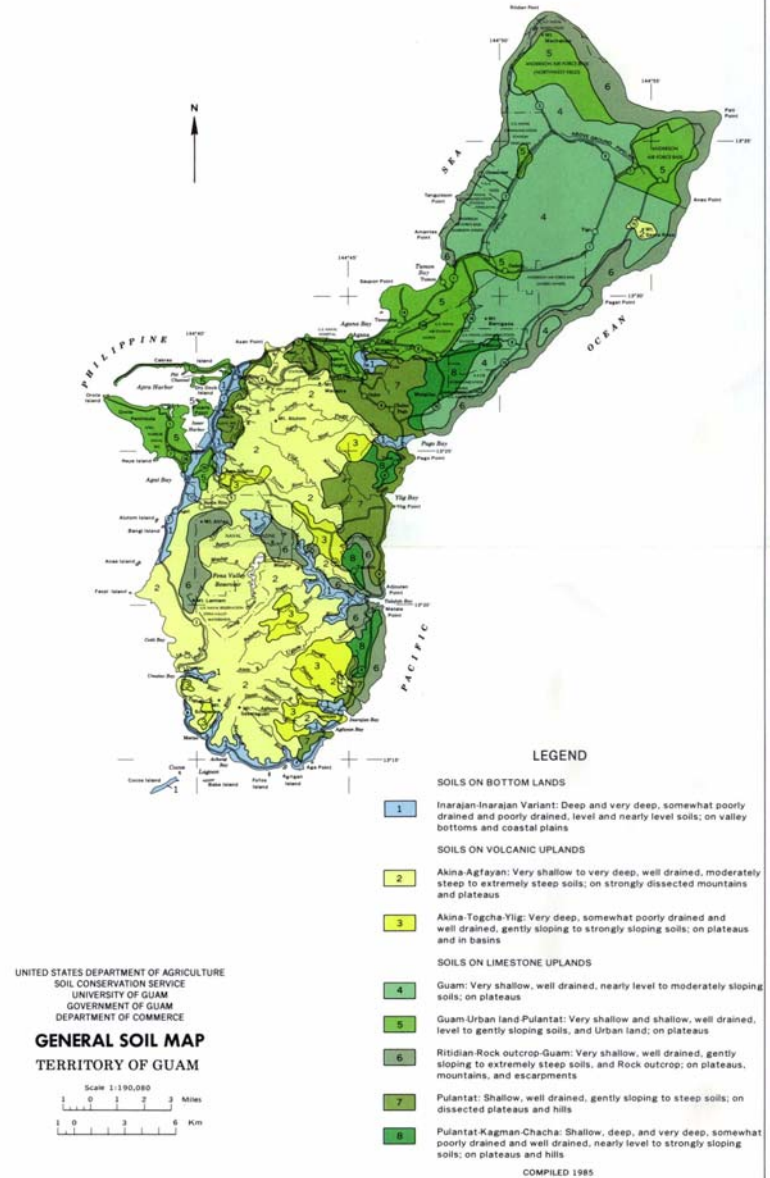
Flooded pasture at Waipa, Hawaii

Geology & Soils of Guam



(Source: USGS)

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



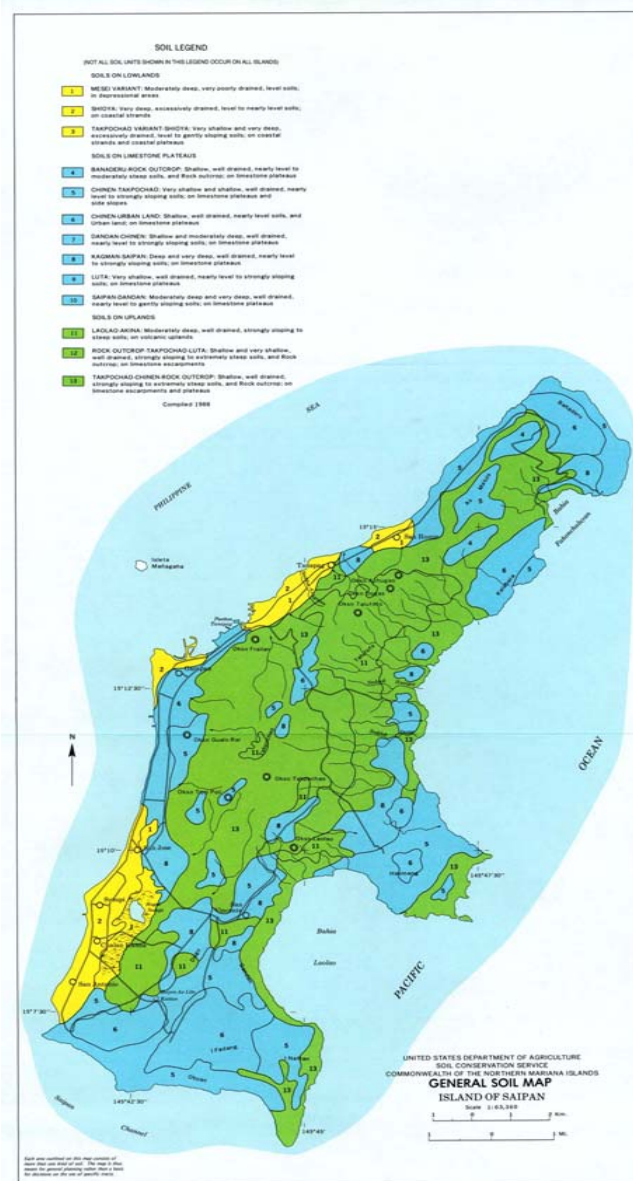
(Source: NRCS)

Geology & Soils of Saipan



Figure 1. Location map and shaded relief of Saipan.

(Source: USGS)



(Source: NRCS)



Limestone Quarry



Surface Soil



Limestone Cliffs of Western Tinian, CNMI

MAP UNITS

SOILS ON BOTTOM LANDS, ALLUVIAL FANS, AND COASTAL TIDAL MARSHES

- 1** Nanapaga-Somnaga Indurite: Very deep, well drained to poorly drained, level and gently sloping soils, on bottom lands and alluvial fans.
- 2** Namak: Very deep, very poorly drained, level and nearly level soils, in coastal tidal marshes.

SOILS ON UPLANDS

- 3** Unimung-Rained: Moderately deep to very deep, moderately well drained and somewhat poorly drained, mealy leavel to sloping soils, on old lava flows, terraces and benches.
- 4** Dikdik-Pomang: Shallow to moderately deep, well drained, moderately deep to extremely steep soils, on uplands.
- 5** Toluvor-Diken: Very deep, well drained, sloping to extremely steep soils, on uplands.

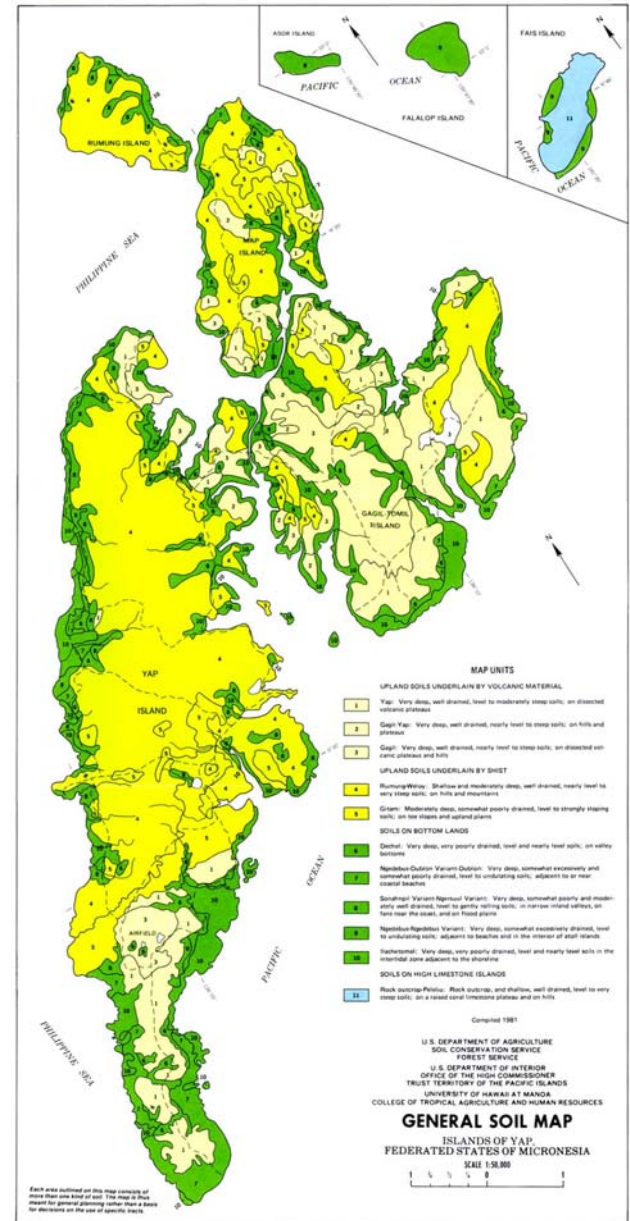
Compiled 1981

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SOIL CONSERVATION SERVICE
FOREST SERVICE
U.S. DEPARTMENT OF INTERIOR
OFFICE OF THE HIGH COMMISSIONER
TRUST TERRITORY OF THE PACIFIC ISLANDS
UNIVERSITY OF HAWAII AT MANOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

GENERAL SOIL MAP
ISLAND OF PONAPE
FEDERATED STATES OF MICRONESIA

SCALE 1:125,000
1 0 1 2 MILES

Each acre outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



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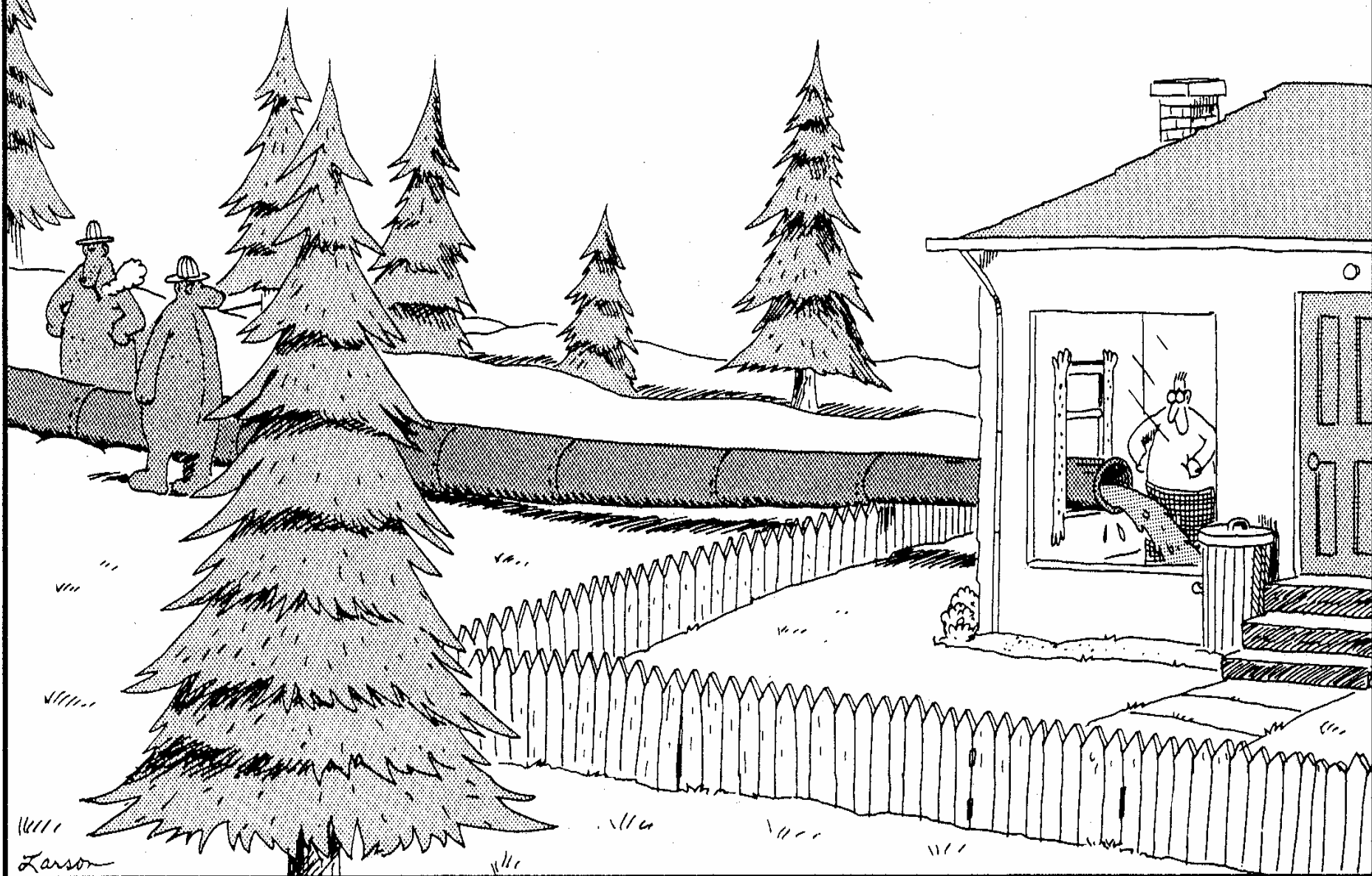
***Soils differ in their
properties, behavior
and management***



Soil = $f(pm, cl, o, r, t, \dots h)$

(Source: NRCS)

Animal Waste Management





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) <i>Nitrate-N</i>	<i>Human Health</i>
2) <i>Ammonia-N</i>	<i>Fish Kills</i>
3) <i>Phosphorus</i>	<i>Eutrophication</i>
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**

A Guide to a
**COMPREHENSIVE
NUTRIENT
MANAGEMENT PLAN**
for Livestock Production
in Hawaii



September 2003

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.



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



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A cooperative program consisting of the USDA Cooperative State Research, Education, and Extension Service
and
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Building Bridges Across a Vast Region







CSREES
Southwest States
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 Regional Water Quality Program
Applying knowledge to improve water quality

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Contact Information for State and Island Coordinators	
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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

