

Emerging Infections

The Earth At Night



I can see your house from here

Public Awareness of Emerging Infections



Courtesy: New Yorker Magazine

Emerging And Re-emerging Infectious Agents

A. Viruses

- SARS (Severe acute respiratory syndrome)
- West Nile
- Influenza
- Eastern Equine Encephalitis
- Hantavirus
- Ebola

B. Bacteria and rickettsiae

- Plague
- E. coli 0157
- Rickettsial pox (Rocky Mountain Spotted Fever)
- Cholera

c. Protozoa

- Malaria
- Cryptosporidium parvum*
- Trypanosomiasis (African)
- Leishmaniasis

Examples of new pathogenic microbes and infectious diseases recognized since 1973

- Rotavirus - 1973
- Parvovirus - 1975
- Cryptosporidium parvum* - 1976
- Ebola virus - 1977
- Legionella pneumophila* - 1977
- Hantaavirus - 1977
- Campylobacter jejuni* - 1977
- Escherichia coli* 0157 - 1982
- Borrelia burgdorferi* - 1982
- Helicobacter pylori* - 1983
- Cyclospora cayatanensis* - 1986
- Hepatitis E - 1988
- Vibrio cholerae* 0139 - 1992



www.fas.org

Medical Ecology Of Infectious Diseases



Medical Ecology: Environmental Disturbance and Disease

E-Seminar 1, The Normal Environment: How Things Got This Way
Taught by Dickson Despommier



http://ci.columbia.edu/ci/eseminars/1111_detail.html
<http://www.medicalecology.org/>

Environmental Disturbance Leads To Emergence Or Establishment Of Infectious Agents

- Dam building
- Traditional Agriculture
- Urbanization
- De-forestation
- Irrigation
- Political unrest and open warfare
- Natural disasters and unusual weather patterns

*The Ecotone**



The Ecotone And Infectious Diseases

Viruses:

- West Nile
- Rabies
- Yellow Fever
- Lassa Fever
- Ebola
- Hanta
- Influenza

Bacteria:

- Cholera
- Lyme Disease

Protozoa:

- Malaria
- Trypanosomiasis

Helminths:

- Schistosomiasis

West Nile Virus

2003

United States - 8,393 cases, 184 deaths

Colorado - 2,477

Nebraska - 1,698

South Dakota - 989

Canada - 845 cases, 10 deaths

Mexico - 4 cases, no reported deaths

Culex pipiens:
The Major Vector For Birds And Humans

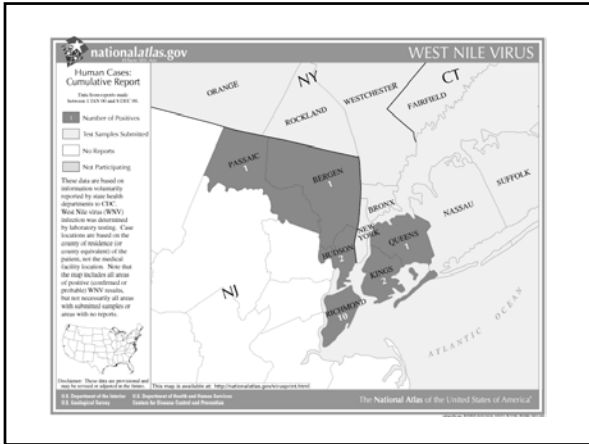


Pollution-loving Mosquito

Ubiquitously found throughout USA

Prefers Birds
But Will Feed
On Humans When
Desperate

During Droughts:
Few Birds, Same
Number of
Humans

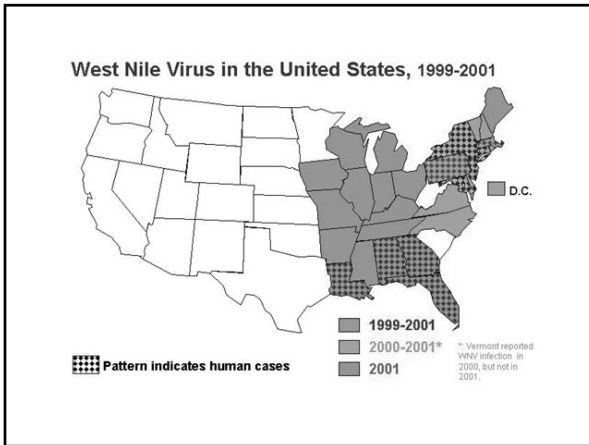


1999

Total Infections: 9,300

Total Cases: 62

Total Deaths: 7

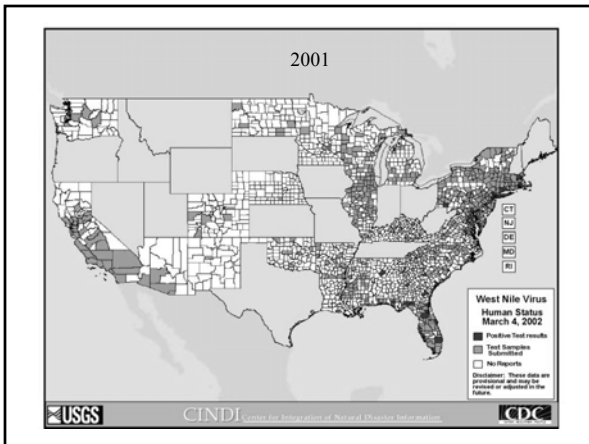


2000

Total Infections: 3,150

Total Cases: 21

Total Deaths: 2

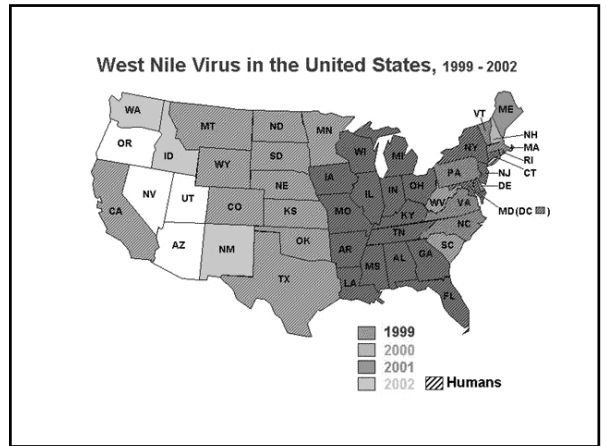
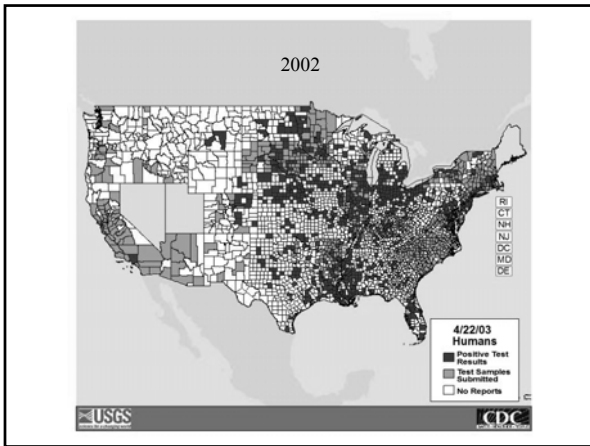


2001

Total Infections: 9,900

Total Cases: 66

Total Deaths: 9

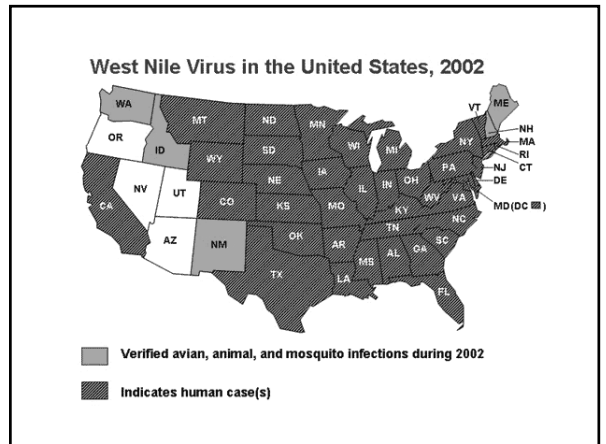


2002

Total Infections: 623,400

Total Cases: 4,156

Total Deaths: 284

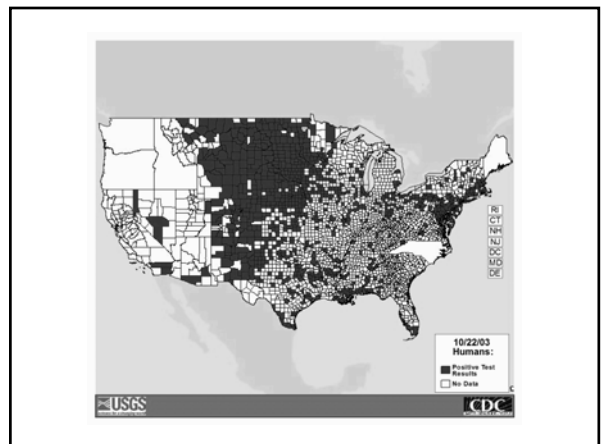


2003

Total Infections: 1, 678,600

Total Cases: 8,393

Total Deaths: 184

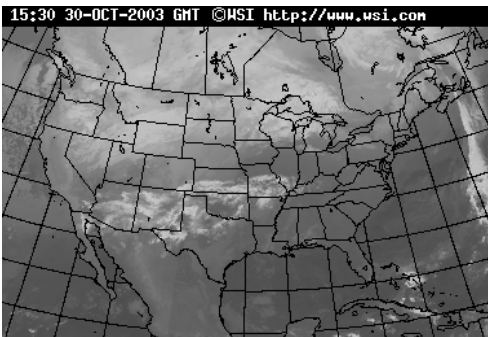


2003

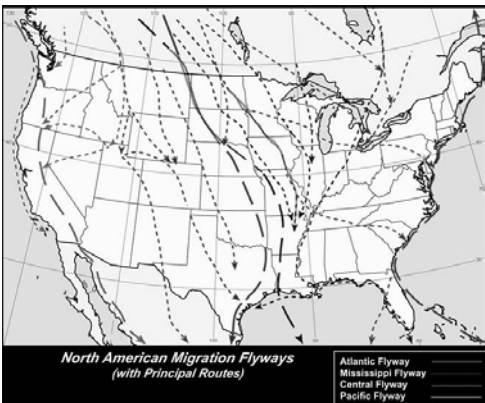
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Why The Rapid Spread West?

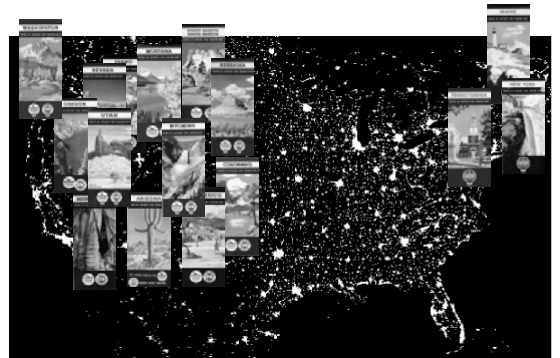
Prevailing Winds Are From West To East



Bird Migrations Are From
North To South And Back



All Major US Highways Run East-West And North South



Roads Are Ecotones

Medical Ecology Of West Nile Virus

Epidemics Occur During:
Chronic Drought
High Summer Temperatures

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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Countries In Which West Nile
Is Endemic*:

Israel
Southern Egypt
South Africa

* All have major deserts

Environmental Disturbance Leads To Emergence Or Establishment Of Infectious Agents

Dam building:

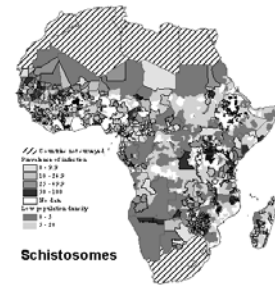
There are currently over 800,000 dams throughout the world, with 75,000 within the USA.

Diseases (mostly tropical) associated with dams:

1. Schistosomiasis
2. Malaria
3. River blindness (Onchocerciasis)



Schistosomiasis In Africa



Courtesy: WHO

Schistosomiasis Was Prevalent Among Ancient Egyptians And Still Is Today



Mummy in Cairo Museum



Lake Nasser and the Aswan High Dam in Egypt

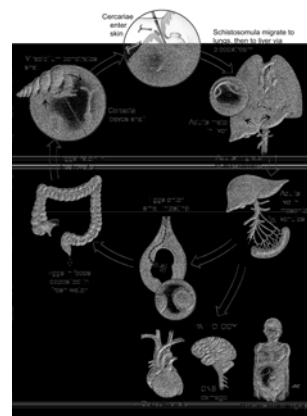


Photo: S. Mosgrave

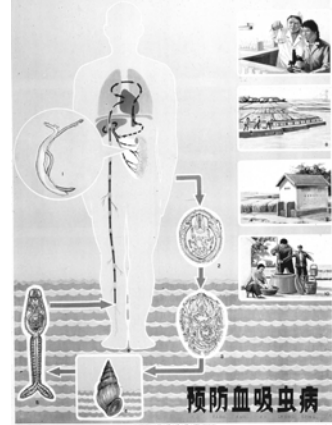
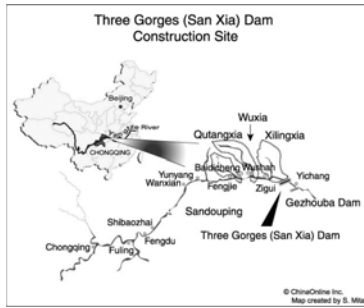
Geographic Distribution of Schistosomiasis



Schistosoma japonicum



The Three Gorges Dam Project In China Will Lead To A Dramatic Increase In The Incidence Of Schistosomiasis



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Irrigation:

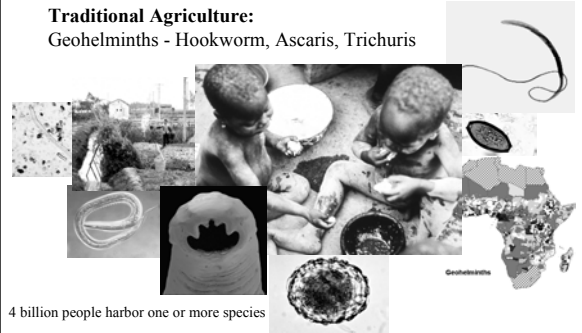
- 1. Schistosomiasis → Snails Africa China
- 2. Malaria* → Mosquito
- 3. Filariasis* → Blackfly

*Vector-borne diseases

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Traditional Agriculture:

Geohelminths - Hookworm, Ascaris, Trichuris



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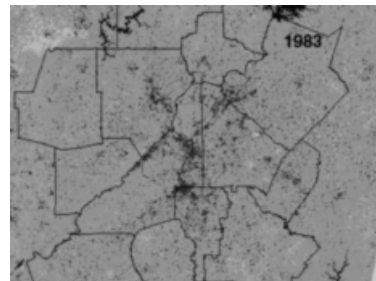
Urbanization: (encroachment into natural systems)

- Rabies
- Upper respiratory viruses
- Lyme Disease
- Arboviruses
- Ebola, Lassa, Hanta
- Plague

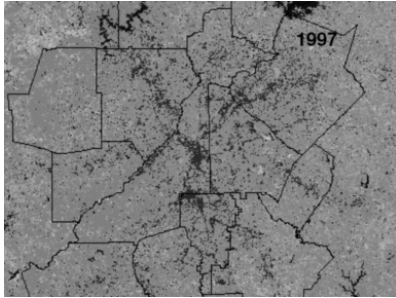


Photo: D. Sharf

Urbanization: Atlanta 1983



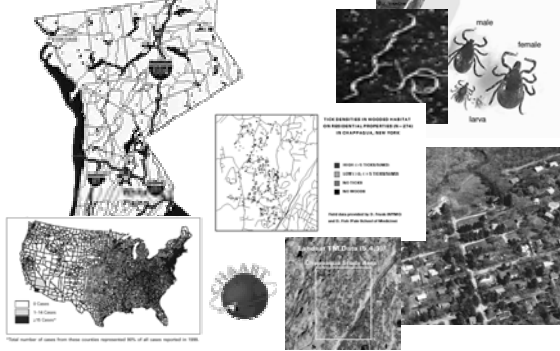
Urbanization: Atlanta 1997



Lyme Disease Maintenance: Urbanization and De-forestation



Westchester County, NY



Environmental Disturbance Leads To Emergence Or Establishment Of Infectious Agents

De-forestation:

Leishmaniasis

Sanajiy

Trypanosomiasis

Kissing Bug

Environmental Disturbance Leads To Emergence Or Establishment Of Infectious Agents

Political unrest and warfare:

Malaria
African Trypanosomiasis
Leishmaniasis
Tuberculosis

Environmental Disturbance Leads To Emergence Or Establishment Of Infectious Agents

Natural disasters and unusual weather patterns:

| | Flood | Drought | Above-average PPT |
|-----------------|-------|---------|-------------------|
| Hanta | | X | X |
| Plague | | X | X |
| West Nile | | X | |
| Schistosomiasis | X | | |

Plague In The USA

