

Use of GIS in a comprehensive vector control program

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FORT WORTH



**PUBLIC HEALTH
EPIDEMIOLOGY**

ESRI

GIS Health Conference

Denver, CO

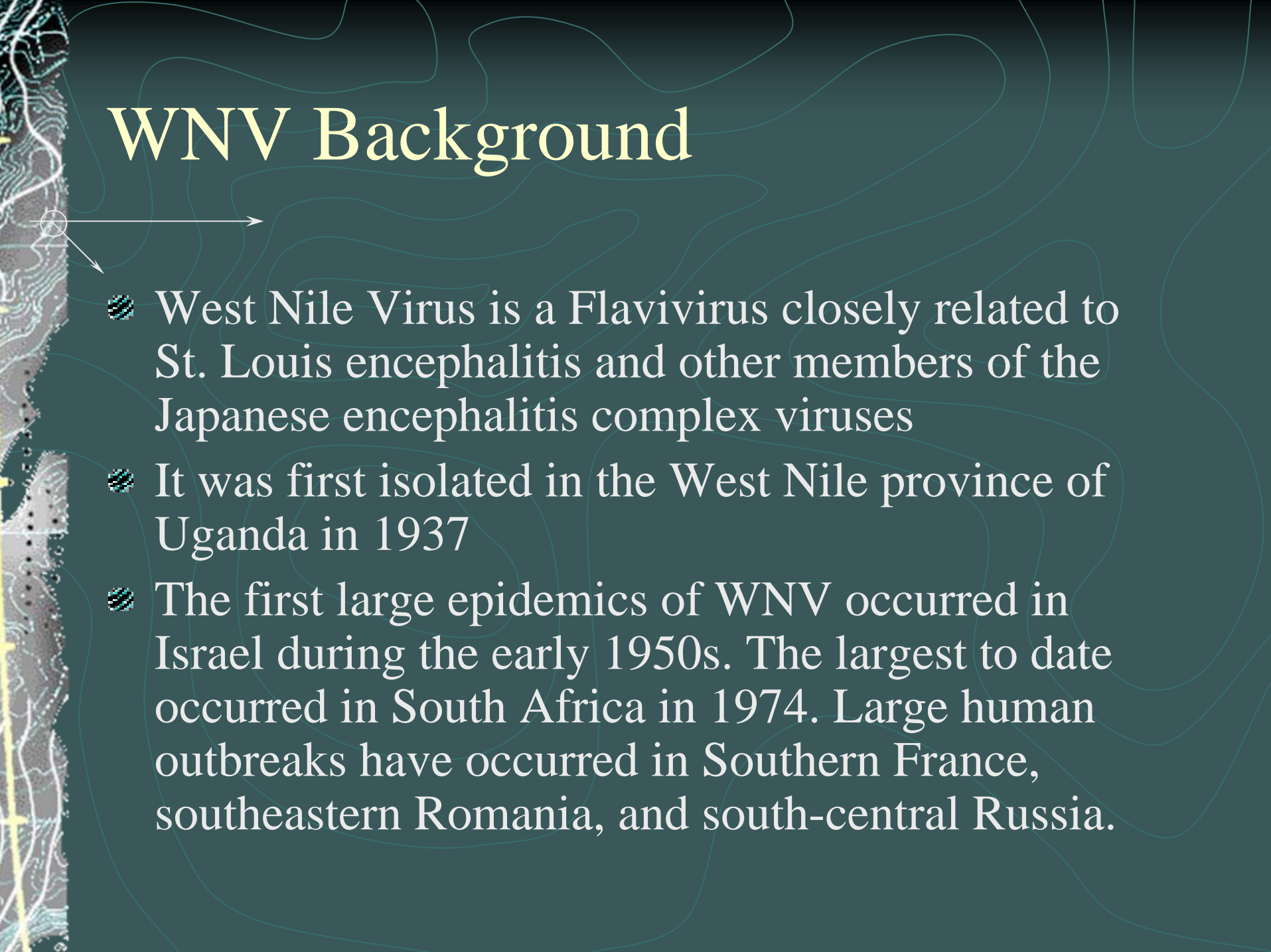
October 2006

WNV Background



- West Nile virus first reported in the U.S. during August 1999 (New York)
- In the U.S. during 2005, there were a total of:
 - 3,000 human cases
 - 119 deaths
- WNV is permanently established in the U.S.

WNV Background

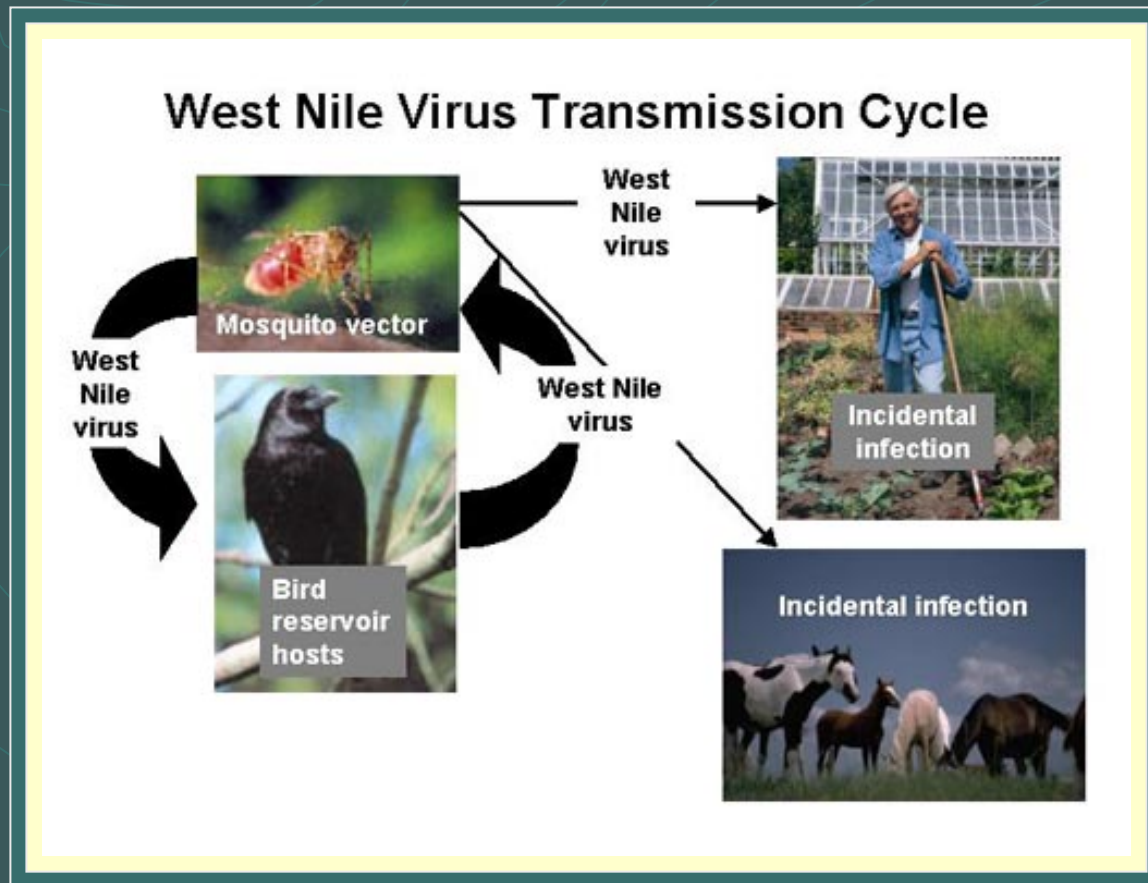
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- West Nile Virus is a Flavivirus closely related to St. Louis encephalitis and other members of the Japanese encephalitis complex viruses
 - It was first isolated in the West Nile province of Uganda in 1937
 - The first large epidemics of WNV occurred in Israel during the early 1950s. The largest to date occurred in South Africa in 1974. Large human outbreaks have occurred in Southern France, southeastern Romania, and south-central Russia.

WNV Background



- The first human case of WNV and positive mosquito pools were reported in Fort Worth during the Fall of 2002 (September/October)
- Prior to this, reports of dead birds and nuisance mosquitoes were being tracked and mapped by the Public Health and Environmental Management Departments

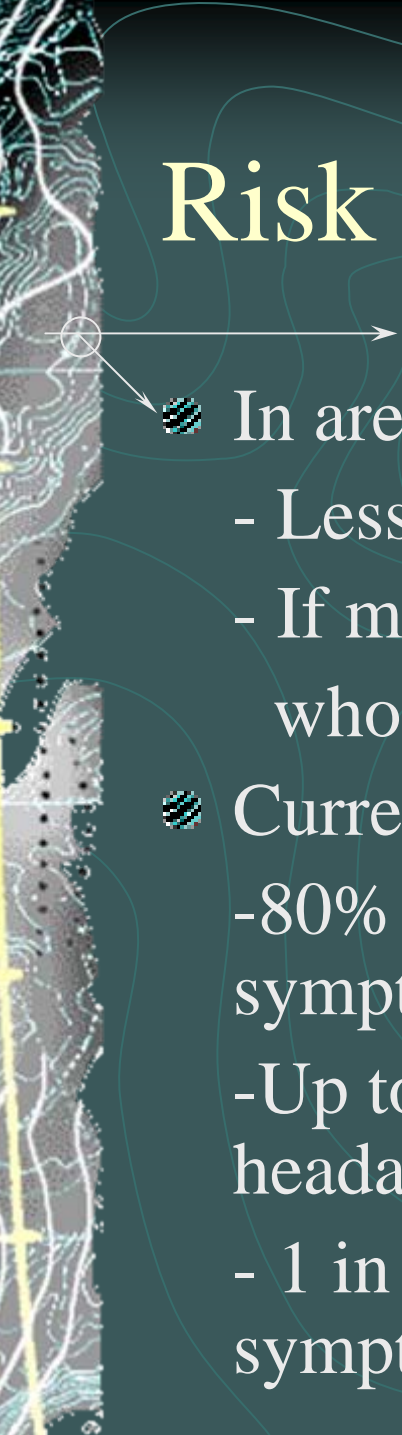
WNV Transmission



WNV Vector



Risk of Infection

- 
- In areas where mosquitoes carry the virus:
 - Less than 1% of mosq. are infected
 - If mosq. is infected, less than 1% of people bitten who get infected will become severely ill
 - Current estimates indicate:
 - 80% of individuals who are infected will have no symptoms
 - Up to 20% will have mild symptoms (fever, headache, flu-like symptoms)
 - 1 in 150 people infected will develop severe symptoms

Mortality Comparison



According to the Centers for Disease Control and Prevention (CDC), there were 8 deaths from West Nile virus in Texas during 2004. Comparing that number with other incidents or conditions puts West Nile in perspective:

- 53,174 deaths due to heart disease
- 33,836 deaths due to cancer
- 5,426 deaths due to diabetes
- 3,808 deaths due to motor vehicle accident
- 3,198 deaths due to influenza/pneumonia
- 1,403 homicides
- 1,044 deaths due to HIV

(source: Texas Department of State Health Services, 2004)

-14.2 average number of individuals struck by lightning in Texas annually
(498 deaths and injuries reported 1959 to 1994- NOAA Technical Memorandum NWS SR-193)

-6 winners of the Texas Lottery in 2004
(source: Texas Lottery Commission)

What are the odds?






Fort Worth Response to WNV

- Comprehensive plan to reduce the risk of illness due to WNV
- Inter-departmental taskforce to address issues
- Reduction of mosq. population through elimination of breeding grounds, application of larvicides
- Sampling and testing of mosq. in cooperation with the North Texas Regional Lab and Tarrant County Public Health Department

Mosquito Surveillance

- 
- Assess the threat of human disease
 - Determine the geographical areas of highest need
 - Assess the need for and timing of intervention events
 - Identify larval habitats that need control measures
 - Monitor the effectiveness of control measures
 - Develop an understanding of transmission cycles and potential vector species

Mosquito Sampling – gravid trap

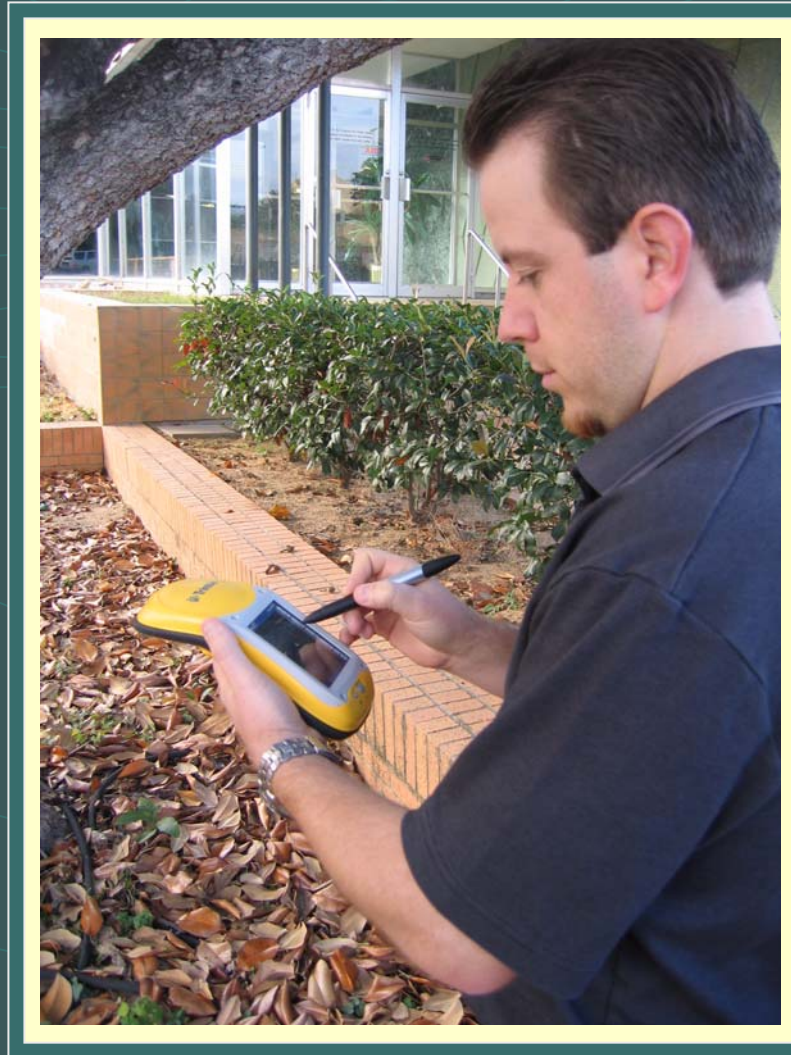


Mosquito Sampling - aspiration

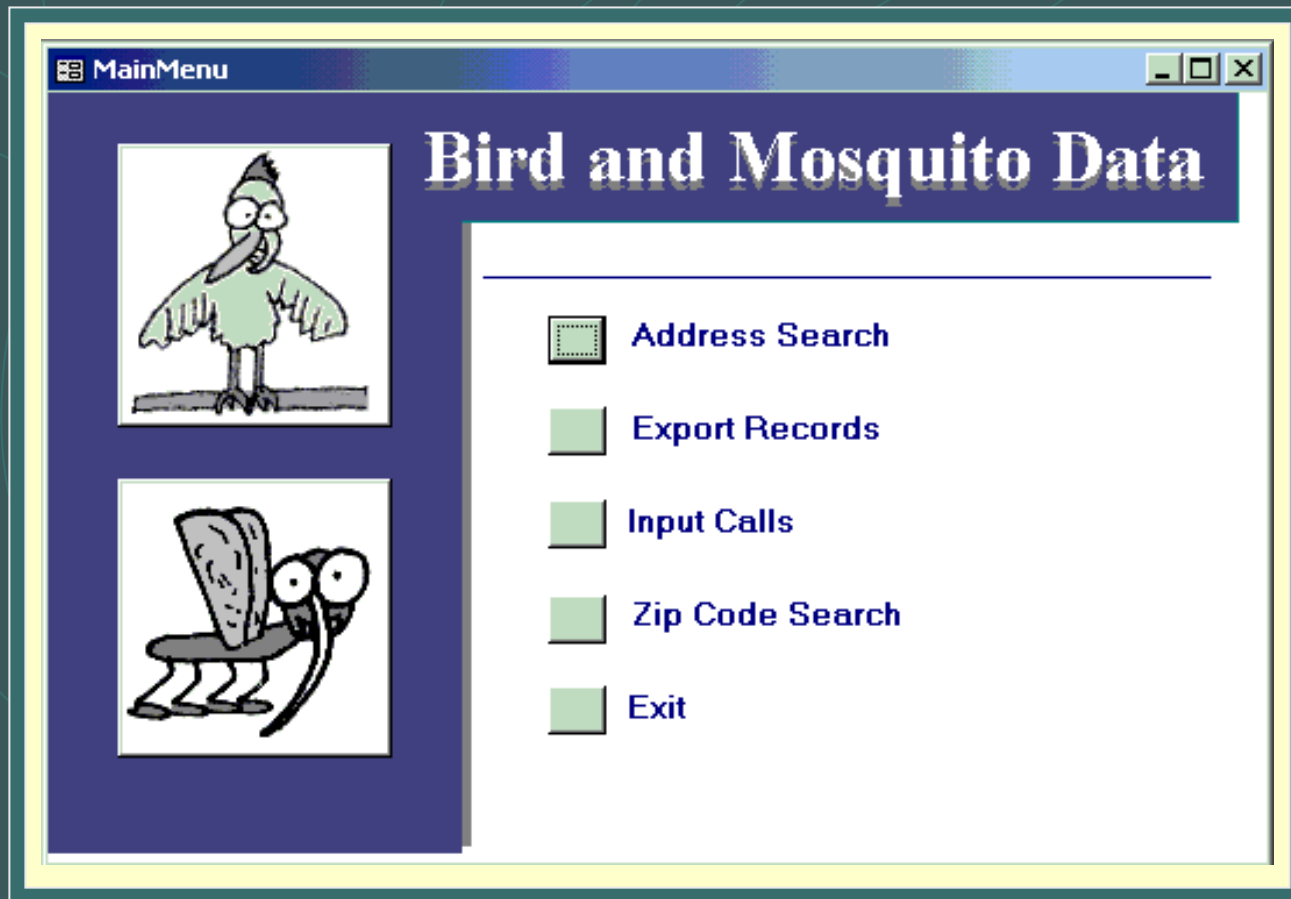


Fort Worth Public Health Photo

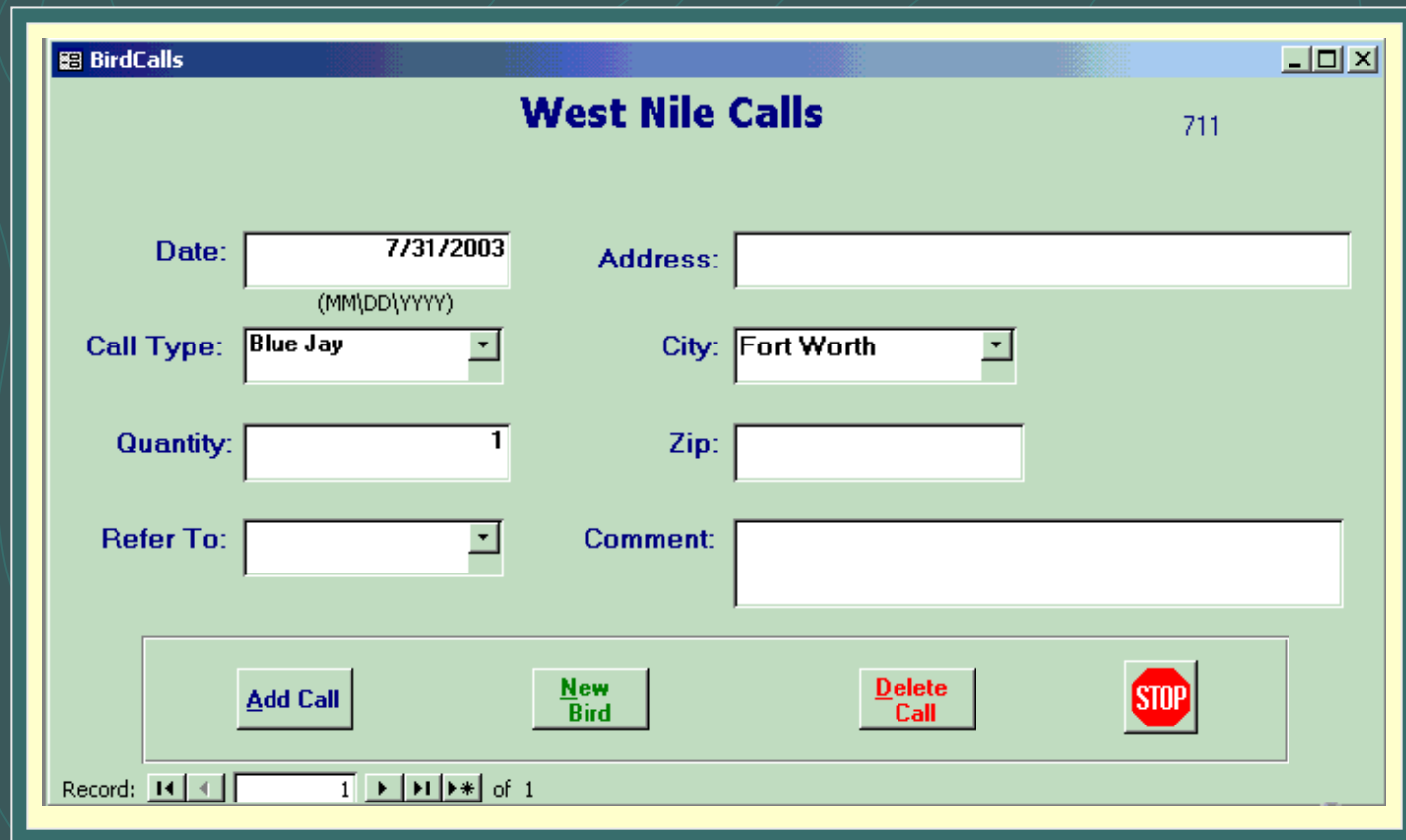
Field Data Collection - location



Mosquito and Dead Bird Reporting System



Mosquito and Dead Bird Reporting System



The screenshot shows a software window titled "BirdCalls" with a sub-header "West Nile Calls" and a count of "711". The form contains the following fields and controls:

- Date:** A text box containing "7/31/2003" with a format hint "(MM|DD|YYYY)" below it.
- Address:** A large empty text box.
- Call Type:** A dropdown menu with "Blue Jay" selected.
- City:** A dropdown menu with "Fort Worth" selected.
- Quantity:** A text box containing "1".
- Zip:** An empty text box.
- Refer To:** A dropdown menu.
- Comment:** A large empty text box.

At the bottom of the form are four buttons: "Add Call", "New Bird", "Delete Call", and a red octagonal "STOP" button. Below the buttons is a record navigation bar showing "Record: 1 of 1" with navigation icons.

Data integration – Enterprise GIS

- 
- City developed an Enterprise GIS in 2002
 - Data centrally stored in SDE server
 - Enterprise software licensing and license manager
 - Two-day training for all interested city employees
 - Enterprise projects prioritized, funded and completed
 - Structure:
 - IT Advisory Board
 - GIS Steering Committee
 - IT GIS staff
 - City-wide GIS User Group

Data integration – Enterprise GIS



- Basemap data utilized:

- Streets, Lots, Orthophotography, City Limits, Hydrology, Index files (MAPSCO)

- Other data maintained:

- Hospitals, Schools, Libraries, Assisted Living Facil., Nursing Homes, Childcare Centers, Community Centers, Churches, YMCA, Neighborhood organizations

- WNV specific data:

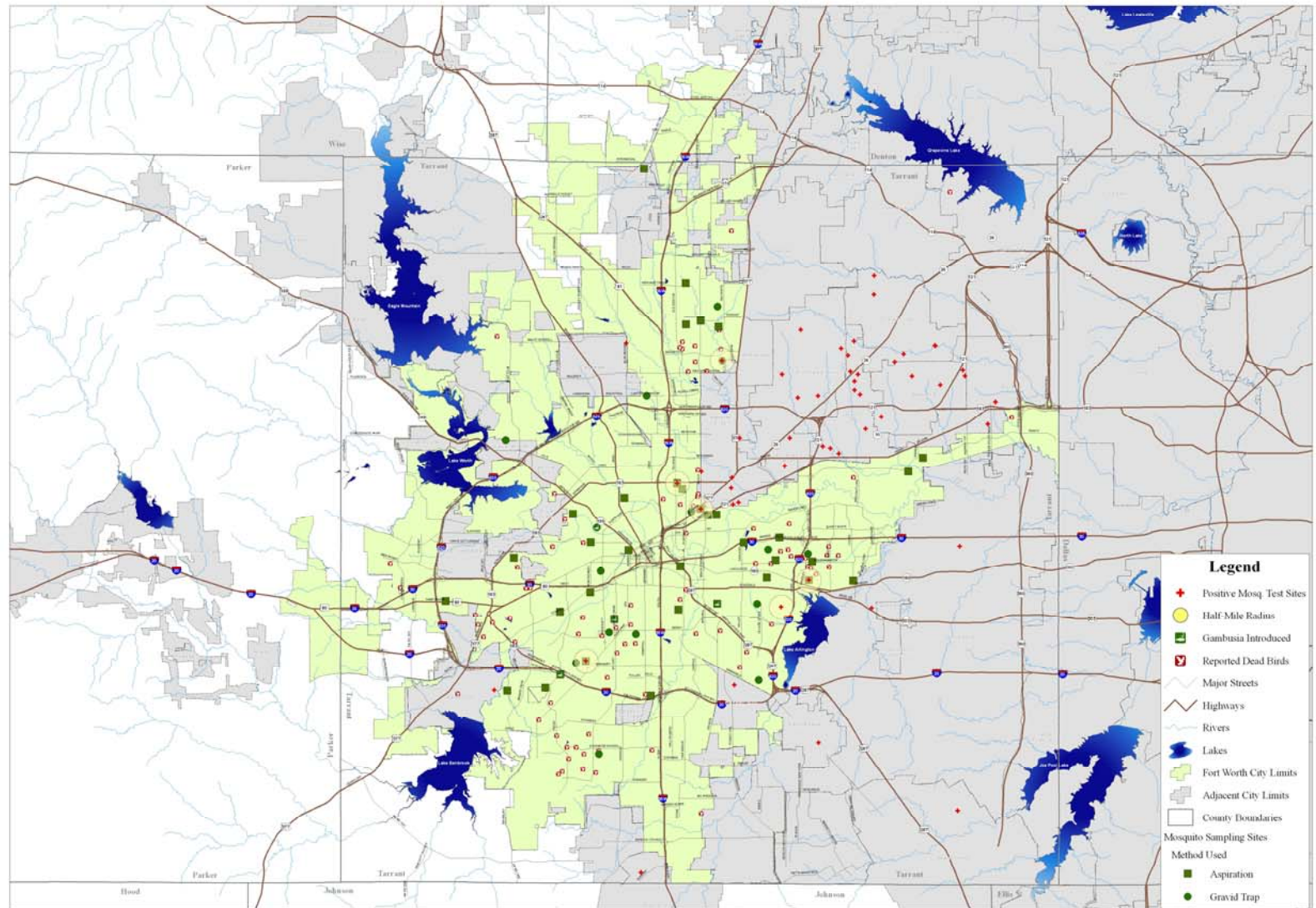
- Positive test sites, Human case reports, Human fatalities, Mosquito sampling sites, Reported dead birds, Nuisance mosquito complaints, Intervention sites



GIS in WNV Monitoring

- Mosquito complaint and reported dead bird layers guide selection of sampling sites
- Use of orthophoto layers aid in specific site selection
- Mapping of all testing sites assures adequate coverage of municipality
- All of these combined permit the ongoing evaluation of the mosquito surveillance program

2005 West Nile Virus Activity in Fort Worth



Potential Site for trapping




Legend

- ▲ 2002 Mosquito Complaints
- 2002 Dead Bird Reports
- MAPSCO Grid

Source: Epidemiology and Assessment Division, City of Fort Worth Public Health Department
Snapshots of reported dead birds and mosquito complaints provided by Environmental Management Department, GIS Division.

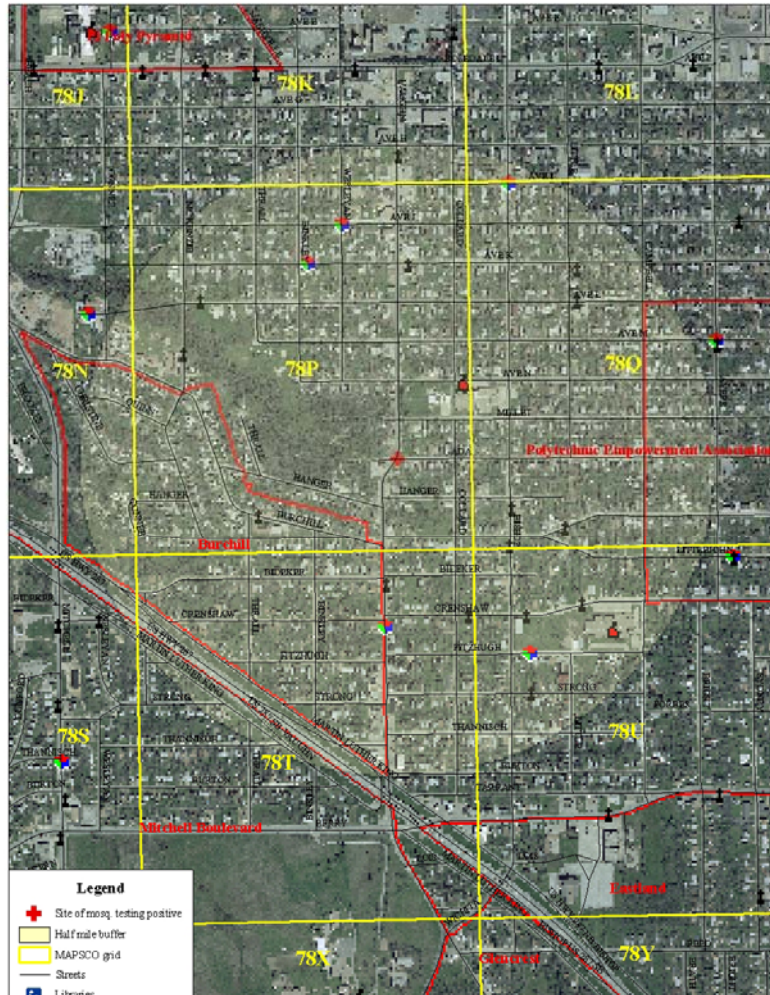


GIS in WNV Response

- 
- GIS is central to response plans
 - First action in the response flowchart is mapping of positive mosquito pool with ½ mile response buffer
 - Vector Control staff use map to identify sites for mitigation
 - Map products are forwarded to representatives on the inter-departmental team
 - Community assets identified within ½ radius of the site are contacted and provided information

Site of Positive (WNV) Mosquito Pool

2400 Vaughn Ave.



Legend

- Site of mosq. testing positive
- Half mile buffer
- MAPSCO grid
- Streets
- Libraries
- Community Centers
- Child Care Centers
- Churches
- Hospitals
- Schools
- YMCA
- Neighborhood Orgs

Source: Epidemiology and Assessment Division, City of Fort Worth Public Health Department.




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Mitigation – Source Reduction



Tarrant County Public Health Department

Issues Identified

- 
- Public Education (protective measures)
 - Elimination of breeding sites
 - Elimination of resting sites
 - Other source reduction activities
 - use of larvacide
 - introduction of fish into permanent bodies of water
 - Assistance from: Code Enforcement, Transportation and Public Works, Environmental Management, Parks and Community Services

ArcIMS Site

West Nile Virus Incidents - Microsoft Internet Explorer provided by City of Fort Worth, TX

Address <http://ims01/website/WNV/viewer.htm>

West Nile Virus Incidents

Layers

- YMCA's
- Libraries
- Community Centers
- Schools
- Dead Bird Reports 2003
- Dead Bird Reports 2002
- Childcare Facilities
- Churches
- Mosquito Complaints 2003
- Mosquito Complaints 2002
- Mosquito Complaints 2001
- Mosquito Complaints 2000
- Mapsco Grid
- County Boundary
- Zipcodes
- Neighborhood Associations
- Lakes
- City Limits
- Orthos

CFW GIS Map 2003

12 Miles

Zoom In

Map: 2415226.17, 7029010.02 -- Image: 582, 100 -- ScaleFactor: 401.481861702125

Local intranet

Start | Microsoft PowerPoint - [...] | West Nile - Microsoft Out... | WNV Site Security - Mess... | West Nile Virus Incide... | 11:28 AM

Future Plans



- Increased use of ArcIMS site for distribution and viewing data among vector control and other inter-departmental team members
- Expanded field GPS/GIS capacity

Questions/ Contact

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<http://www.fortworthgov.org/health/Epi/index.asp>



Thanks and Happy Trails...



City of Fort Worth, Texas – Twice daily cattle drive of municipal longhorn herd.