

Development of an Environmental Surveillance Network



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on behalf of the
ESN Development Team



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What Is ESN?

- ❑ A real-time surveillance network of mortality incidents (e.g. fish kills, bird kills, animal disease outbreaks, harmful algal blooms, marine mammal strandings, etc.)
 - (1) notifies participating network science and regulatory experts of mortality incidents;
 - (2) allows for quick assessments of potential links between and among mortalities and
 - (3) provides a mechanism to alert the emergency management community of incidents that could impact commerce and public health.

Suppose:



❑ Dolphin Mortality

- Call SC DNR Wildlife Emergency Dispatch
1-800-922-5431
- **Or**, NOAA pager 1-843-820-0612

Suppose:

❑ Dead Birds

- Report dead birds to local county environmental health office
 - Charleston County – 1-843-202-7020
 - Beaufort County – 1-843-525-7627 or 1-843-757-6441
 - Georgetown County – 1-843-546-3613
 - Horry County – 4 different numbers



Suppose:

☐ Fish Kill

- Chemical spills, oil spills, or fish kills call 24-hr SCDHEC Emergency Response 1-888-481-0125



Suppose:

- ❑ A container ship arrives from Asia that is from an area with active Bird Flu and is discharging a foreign substance
- ❑ Contact: National Response Center
1-800-424-8802
- ❑ **Or**, CG Sector Charleston Command Center
1-843-727-7616



No mechanism to link apparent disparate mortality incidents and transportation activities

- Are these related incidents?



?

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Background and Need

- ❑ Port-related, desk-top, scenario-based emergency management workshops
 - Norovirus on a cruise ship
 - Dirty bomb attack
 - Novel flu virus
- ❑ **Lesson learned:** emergency managers had little understanding of the potential implications relating to the many different reports of natural resource mortalities

DHS Target Capabilities

- ❑ Environmental Monitoring and Assessment
- ❑ Environmental Health
- ❑ Natural Resources Protection and Restoration
- ❑ Intelligence/Information Sharing and Dissemination
- ❑ CBRNE Detection
- ❑ Natural Hazards Monitoring

ESN: Objectives

- ❑ Horizontal integration of *Vertical Stove Pipes*
- ❑ Provides network participants ability to notify other agencies that have regulatory or expert compiled data bases that track mortalities
- ❑ Provides for convening of network experts to preliminarily assess mortality occurrences within a 24-hour period
- ❑ Provides a mechanism to inform emergency management of potential emerging animal/wildlife threats or incidents

Monitoring and Biosurveillance

- ❑ Public Health
- ❑ Environmental Health
- ❑ General Environment



Examples of Biosurveillance

❑ Public Health

- Vectors
- Disease symptoms
- Disease transmission
- Hospital admissions
- Emergency room visits
- Morbidity & mortality data

❑ Marine Environment

- Fishkills
- Marine mammal strandings
- HAB events
- Hypoxia events
- Birdkills
- Wildlife



Tuesday, Feb. 18, 2003

The Chicken Defense

By SIMON ROBINSON/south of the Kuwait-Iraq border

Friday, Feb. 21, 2003

A war against Iraq will see the debut of some of the most sophisticated weaponry ever used. But U.S. Marines will also rely on one of the most low-tech detection devices around: chickens. Worried that the pollution from blown oil installations will clog up complicated detection equipment and make it difficult to pick up deadly chemicals and nerve agents, U.S. marines will drive into battle....with caged chickens atop their Hum-Vees. The chickens, ...will work in the same way as canaries in coal mines used to. Small traces of poisonous gases or chemical agent will kill the birds — or Poultry Chemical Confirmation Devices,...— and warn troops to put on their gas masks.



From chickens caged on Hum-Vees
to pigeons caged on Hum-Vees

Environmental Surveillance Network (ESN): Current Members

- ❑ **NOAA** (*Phytoplankton Monitoring Network and Marine Mammal Strandings*)
- ❑ **SC DHEC** (*Fish Kills*)
- ❑ **SC DNR** (*Fish Kills and Bird/Wildlife Mortalities*)
- ❑ **USGS** (*Water Level and Water Quality Network*)
- ❑ **SC Veterinarians Office** (*Domestic/Companion Animal and Wildlife Surveillance*)
- ❑ **DHEC/SLED** (*Coordination with DHS under SLED*)
- ❑ **SC Emergency Preparedness** (*Coordination with State EPD*)
- ❑ **USC Center for Public Health Preparedness** (*Coordination Role*)
- ❑ **NOAA NESDIS NCDDC** (*IT System Architecture*)
- ❑ **Operation Sea Hawk** (*Future Member*)
- ❑ **DOE SRNL** (*Sensor Development*)

Environmental Surveillance Network (ESN)

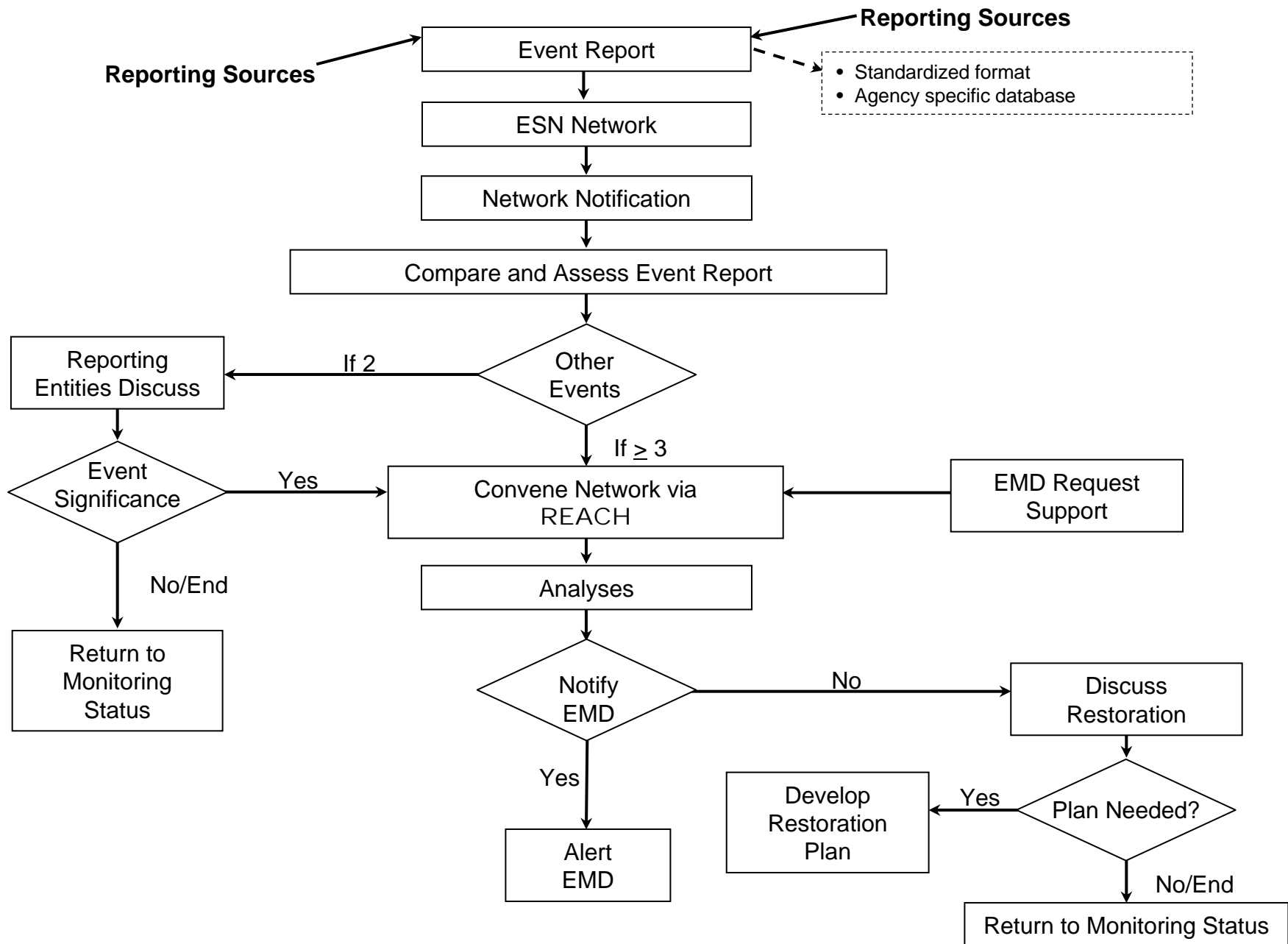
□ Outcome Criteria:

- Simple
- Uses current agency reporting format and criteria
- Move to a near real time reporting system
- Ability to track event to original source/cause
- Template/model for horizontal integration of present independent reporting systems into an distributed information network

Current Indicators Reported within ESN

- Fishkills
- Birdkills
- Marine mammals
- Wildlife
- Companion and domestic animals
- HABs
- Water levels and water quality

The Environmental Surveillance Network



ESN: Standardized Notification

- ❑ **Date(Month/date/year)/Local Time (24h)**
 - ESN notification
 - Incident occurrence
- ❑ **Location**
 - Map, description using ~lat/long or accurate location description (e.g. address)
 - Habitat type (e.g. inland water/marine waters, forest, swamp, pond, lake)
- ❑ **Incident Description** (e.g. spill, fishkill, HAB, marine mammal stranding, water quality/water level warning) with indication of severity (e.g. large fishkill >1000 fish)
- ❑ **Point of Contact**
 - Name, agency, phone #, email, agency 24hr response #
- ❑ **Agency Case Control Number**
 - Unique control # by agency
- ❑ **Comments** (e.g. additional relevant information)

REACH South Carolina



- ❑ South Carolina's Emergency Notification System
- ❑ An interactive tool linking state and local authorities in alerting emergency responders or special teams in an emergency situation.
- ❑ REACH SC is intended for the use of emergency management, public safety and public health organizations for contacting either a very localized segment of the public or specialized groups such as hospitals and response teams in critical situations.

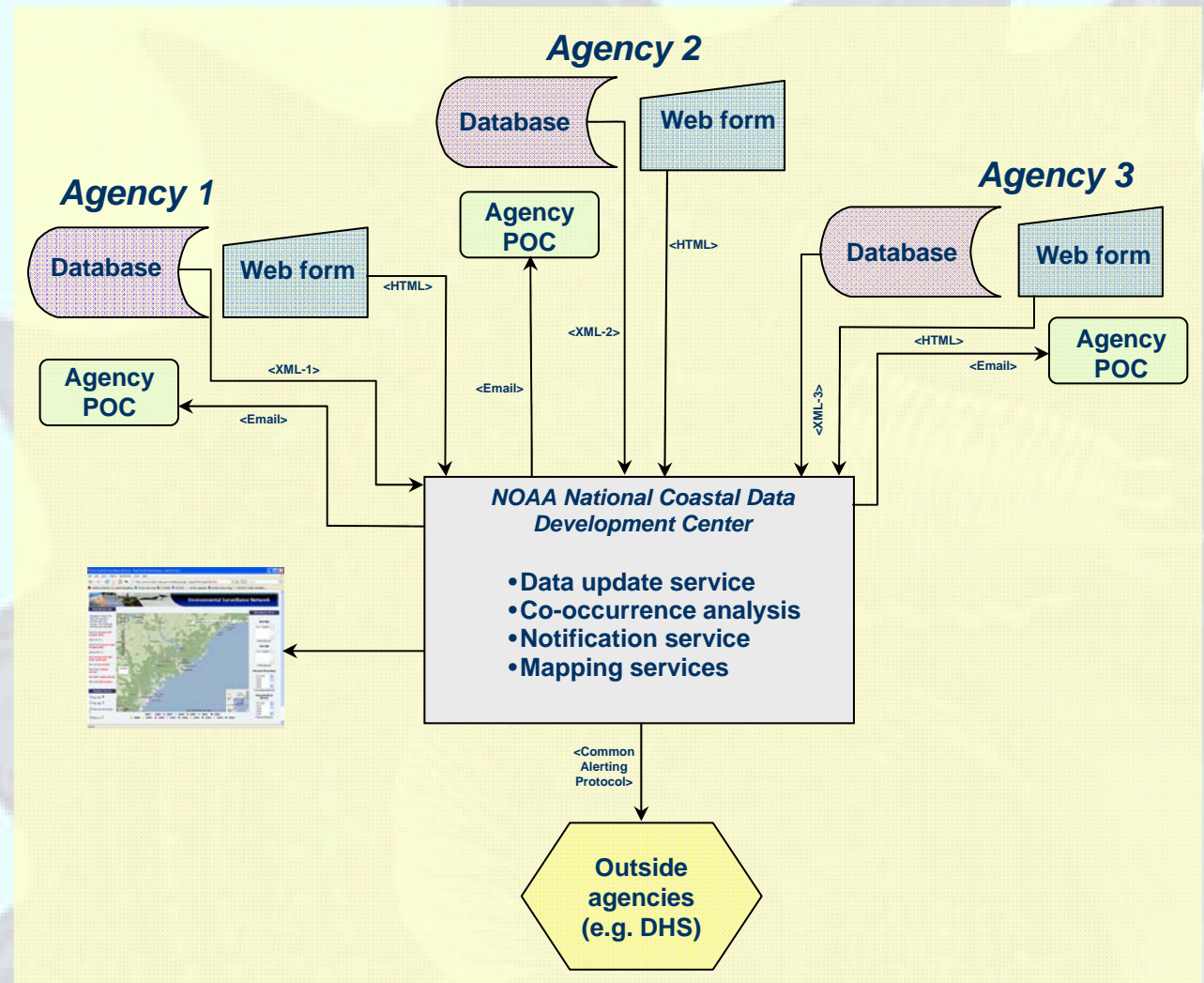
REACH SC Project Goals



- ❑ Multi-agency, shared alerting tool
- ❑ Low cost option for county emergency management (“reverse 911”)
- ❑ Special data sets (i.e. special needs groups)
- ❑ Also functions as DHEC’s health alert network (meets strict CDC requirements)
- ❑ Voice recording or text-to-voice message
- ❑ Document sharing (Microsoft Share Point)

ESN: Data Management Architecture

- ❑ Automated or manual web update
- ❑ Automated incident co-occurrence analysis
- ❑ Automated email notification
- ❑ Web mapping of incident information
 - Current incidents
 - Historical incidents



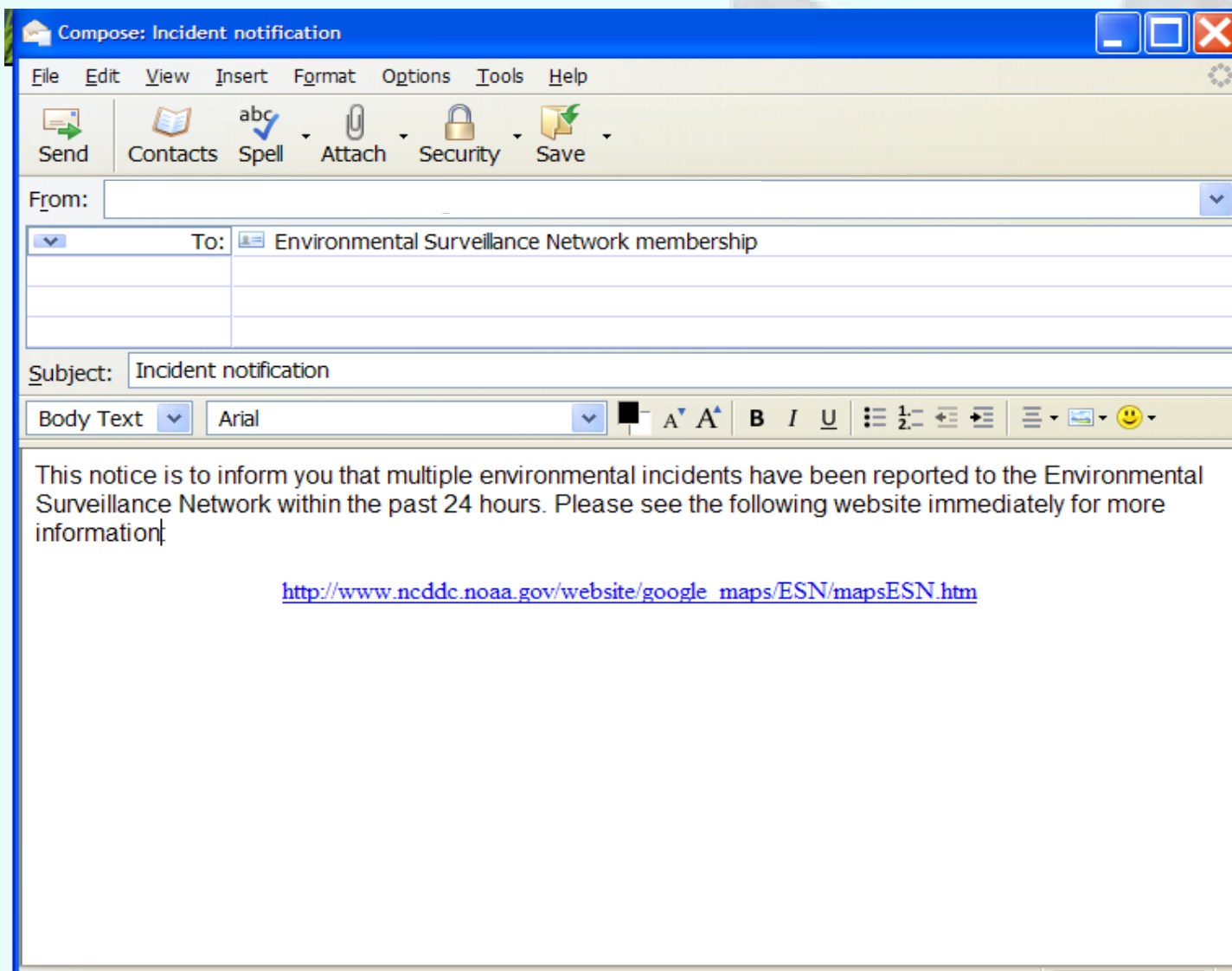
ESN IT Approach

❑ **Push/Pull Approach**

- **Push** = secure (passworded) Web data entry form
- **Pull** = Automated harvest of agency database through web services (e.g. REST, SOAP)

- ❑ Allows participation by Federal and State agencies that may or may not wish to publically share data bases or that may be prohibited from publically sharing data (e.g. HIPA) by simply providing the notification portion only

- ❑ **Emphasis on Notification of Incidents or Events and not research *per se* i.e. knowledge of multiple incidents enhances our knowledge of public health and safety**



ESN: Web Mapping

Environmental Surveillance Network

Current Activity

- Bird Kills
- Fish Kills
- Mammal Strandings
- Algal Blooms
- Clustered Reports

5 Reports Displayed

Toggle On Streamflow

Historical Activity

- Bird Kills (Not Available)
- Fish Kills (Not Available)
- Mammal Strandings (1992 - 2005)
- Algal Blooms (2001 - 2007)
- Clustered Reports

Time Frame

Jan	1992
Feb	1993
Mar	1994
Apr	1995
May	1996
Jun	1997

No Records Displayed

Search Reset

Map data ©2008 Tele Atlas - Terms of Use

SW: 32.073266, -81.639404
 NE: 34.520136, -78.425903
 Mouse Lat/Lng: 34.207259, -79.260864
 Zoom Level: 8

ESN: Web Mapping

Current Activity

- Bird Kills
- Fish Kills
- Mammal Strandings
- Algal Blooms
- Clustered Reports

5 Reports Displayed

Toggle On Streamflow

Satellite Terrain Hybrid

Incident ID NOAA_MMSN_May2008_01

Incident Type mammal stranding

Occurrence Time 05/06/2008 0900

Notification Time 05/06/2008 0900

Description Tursiops truncatus, juvenile female, skin lesions present

Habitat Type marine

Notification Agency NOAA Marine Mammal Stranding Network

Contact Name Wayne Bond

Contact Phone 843-555-7755

Contact Cell 843-555-7891

Contact FAX 843-555-4545

24 Hr Phone 843-555-4545

Comments FOR SYSTEM TEST PURPOSES ONLY - *THIS IS NOT A REAL INCIDENT*

Activity Reports

Historical Activity

- Bird Kills (Not Available)
- Fish Kills (Not Available)
- Mammal Strandings (1992 - 2005)
- Algal Blooms (2001 - 2007)
- Clustered Reports

Time Frame

Jan	1992
Feb	1993
Mar	1994
Apr	1995
May	1996
Jun	1997

No Records Displayed

Search
Reset

SW: 32.073266, -81.639404 Mouse LatLng: 34.343436, -79.090576

NE: 34.520136, -78.425903 Zoom Level: 8

ESN: Web Mapping

Historical mammal strandings during May over the period of record

Environmental Surveillance Network

Current Activity

- Bird Kills
- Fish Kills
- Mammal Strandings
- Algal Blooms
- Clustered Reports

1 Report Displayed

Toggle On Streamflow

Historical Activity

- Bird Kills (Not Available)
- Fish Kills (Not Available)
- Mammal Strandings (1992 - 2005)
- Algal Blooms (2001 - 2007)
- Clustered Reports

Time Frame

Jan	2000
Feb	2001
Mar	2002
Apr	2003
May	2004
Jun	2005

54 Reports Displayed

Search **Reset**

Activity Reports

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SW: 32.284811, -80.576477
 NE: 32.901497, -79.773102

Mouse LatLng: 32.698333, -80.528412
 Zoom Level: 10

ESN: Summary of Accomplishments

- ❑ Concept agreement that knowledge of real-time natural resource mortalities is important to the alert and warning processes
- ❑ Start date
- ❑ Participant commitment and REACH implementation
- ❑ Notification process is simple without much development effort
 - Visual email notification that is location driven
 - Standard notification information decided
- ❑ Flow chart developed
- ❑ Points of Contact identified

Accomplishments (continued)

- ❑ Direct link to EMD and law enforcement
- ❑ Direct link to companion and domesticated animal network
- ❑ Direct link to state veterinarian
- ❑ Ease of expansion for other participants
- ❑ ESN directly relates to natural resource and environmental agency missions of SC agencies and NOAA
- ❑ Directly relates to Homeland Security national preparedness capability development

ESN: Future Implications

□ Implementation Requirements

- Describe process procedures for new participants, new species
- Data base inventory and links from notification network
- Evaluation of network utility
- Funding sustainability

□ Science / Research Needs

- Numerous needs
- Priorities are:
 - wildlife-public health linkages
 - data analysis of past collated mortality events

ESN: Future Additions to Network

- Shellfish bed closures
- Beach closures
- NWS spot weather
- Swan and other relevant wildlife data
- Bird kill data at DHEC for West Nile monitoring
- Mosquito control data from county health departments
- Vector control data DHEC
- Rabies data DHEC

ESN: Historical Perspective of Archived Data

Environmental Surveillance Network

Current Activity

- Bird Kills
- Fish Kills
- Mammal Strandings
- Algal Blooms
- Clustered Reports

No Reports To Display

Toggle On Streamflow

Historical Activity

- Bird Kills (Not Available)
- Fish Kills (Not Available)
- Mammal Strandings (1992 - 2005)
- Algal Blooms (2001 - 2007)
- Clustered Reports

Time Frame

Jul	2001
Aug	2002
Sep	2003
Oct	2004
Nov	2005
Dec	2006

38 Reports Displayed

Activity Reports

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SW: 31.700130, -81.436157
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Mouse Lat/Lng: 34.134542, -80.551758
 Zoom Level: 8

Future Early Warning Systems

- ❑ Keystone Species – Indicator species that because of their toxicological/biological sensitivity or ecological function may help predict environmental condition and may include:
 - Oysters
 - Fish
 - Shrimp
 - Other (Bees; Vectors, Beach Closures)
- ❑ Biotechnology Sensors



Biotechnology Sensors: Gene Microarrays

STIMULUS

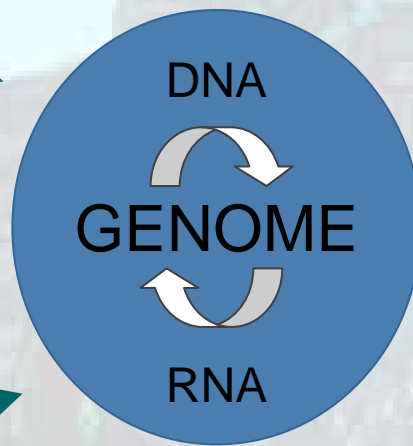
PHYSIOLOGICAL

- Hormonal
- Metabolic

INFECTION

ENVIRONMENT

- Physical
- Chemical
- Biological stress



GENE
EXPRESSION

RESPONSE

SYSTEMIC:

- Development?
- Differentiation?

IMMUNITY:

- Survival?
- Mortality?

STRESS:

- Physiological?
- Pathological?