Lessons Learned from El Nino: Successes, Failures, and the Value of Just Doing

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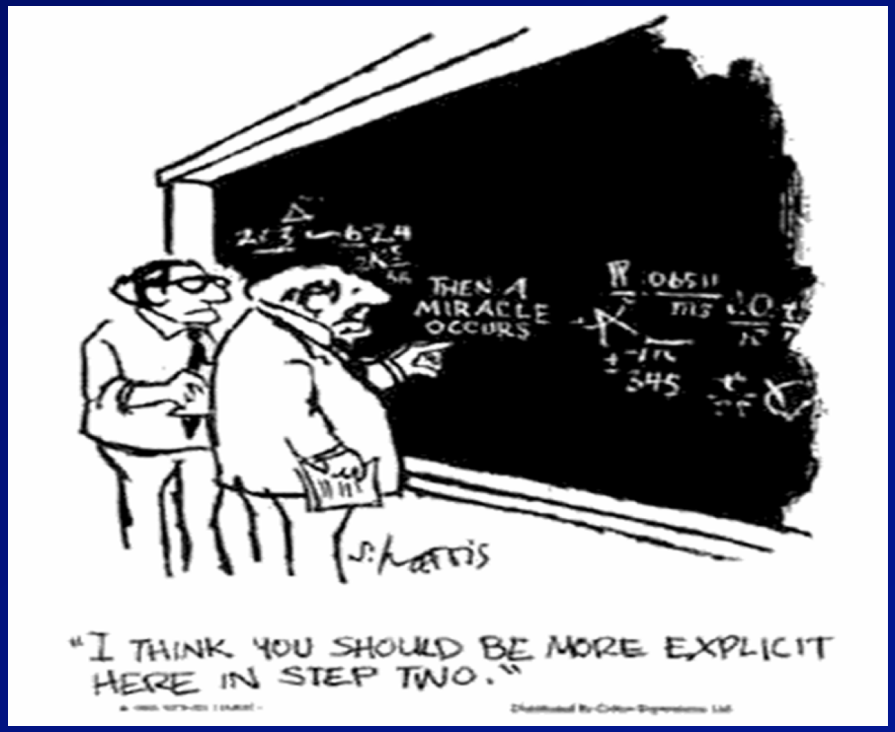
NOAA Climate Program Office

El Nino as Opportunity



- A little history
- A little institutional design
- The lasting impact of a handful of dedicated (and sometimes very tired) people
- Fostering ongoing change
- Taking Action

A Brief History--The Context

- A rapidly evolving capacity for seasonal to interannual prediction (1980s-present)
- A need to understand what information was needed, how it was or was not used, and the implications of that use
- Few non-climate scientists understood the concept of climate variability AND change

El Nino Is Coming!!

- ….it was 1996, and El Nino was not yet a household name
- The capacity to predict El Nino and it's 'teleconnections' was new
- Getting a 3-6 month lead time seasonal forecast product out the door was very challenging!
- The public health issues and community needed some special attention
- Enter the Pacific ENSO Application Center

El Nino is Coming!!
Now what?

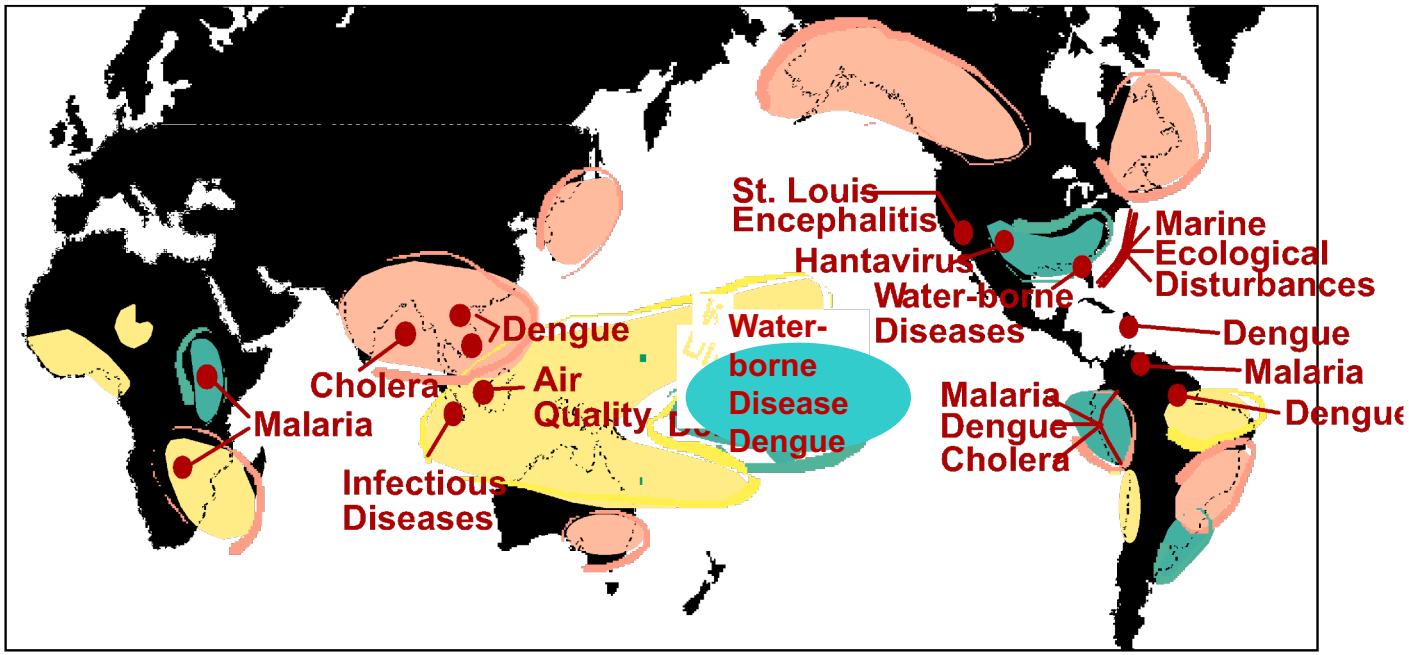
- 1996 American Society for Microbiology Colloquium "**Climate Variability and Human Health: An Interdisciplinary Perspective**"
- Combination of climate and health scientists and a few practitioners
- El Nino Prediction actually released
- All agreed to **DO** something together to further understand the health impacts of the upcoming El Nino, starting **NOW** (which was then)

The ENSO Experiment

- 25 + researchers and a few practitioners agreed to be coordinated
- build on existing funded activities to:

  - ***document and understand the impact of the upcoming El Nino on health***
  - ***improve the quality of the science***
  - ***improve capacity to inform public health***

The ENSO Experiment
Research Activities



Generalized El Niño-Southern Oscillation (ENSO) Impacts

= dry
= wet
= warm
= dry & warm
= wet & warm
= wet & cool

“The single biggest problem in communication is the illusion that it has taken place.”

- George Bernard Shaw

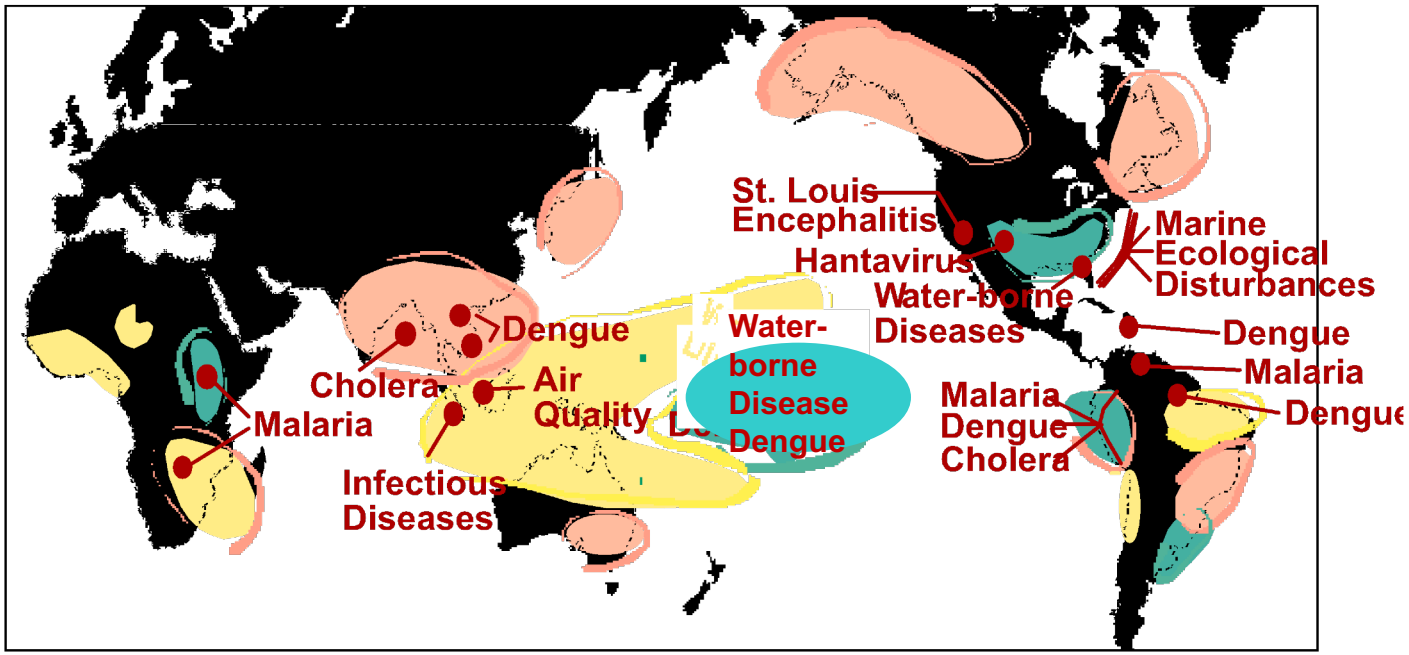
ENSO Experiment Beginnings

- The ‘What do you need stage’—initial meeting of participants with data and forecasters
- Supporting researchers in the field—with data, tools, people, forecasts
- Tracked media coverage
- Targeted regional outbreaks, events, climate outlooks and meetings around the world

ENSO Experiment Activities

- Forecasters hit the road
- Regular coordination team calls
- Regular ENSO Experiment meetings and retreats 1997-2000
- Hands on training for all participants
- Built partnerships and multiple levels and disciplines
- In the Pacific, first ENSO and health meeting in Fiji in 1997
- WHO/WMO/UNEP Climate and Health in SIDS-2000
- Synthesis of next steps
  - Types of and approach to research
  - Engaging public health, ecology, climate, etc

The ENSO Experiment
Research Activities



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The Institutional Design Lesson: Learn by Doing

- Define the Problem--Build and Sustain partnerships across institutions, disciplines and decision makers
- Implement action in learning mode--Use what you have to see what you need

institutionalize the learning and feedback

- Determine and do the research, data collection and actions needed
- Improve understanding of the problem and the solution
- Evaluate
- Drive the research, data and action

It's all about building trust

Public Health Benefits of Advanced Planning in Pohnpei

The Role of Climate in Predicting Infectious Disease Risk

Kenya 1997-98: Severe El Niño-related Flooding-- Rift Valley Fever Outbreak

- **The Public Health Question**

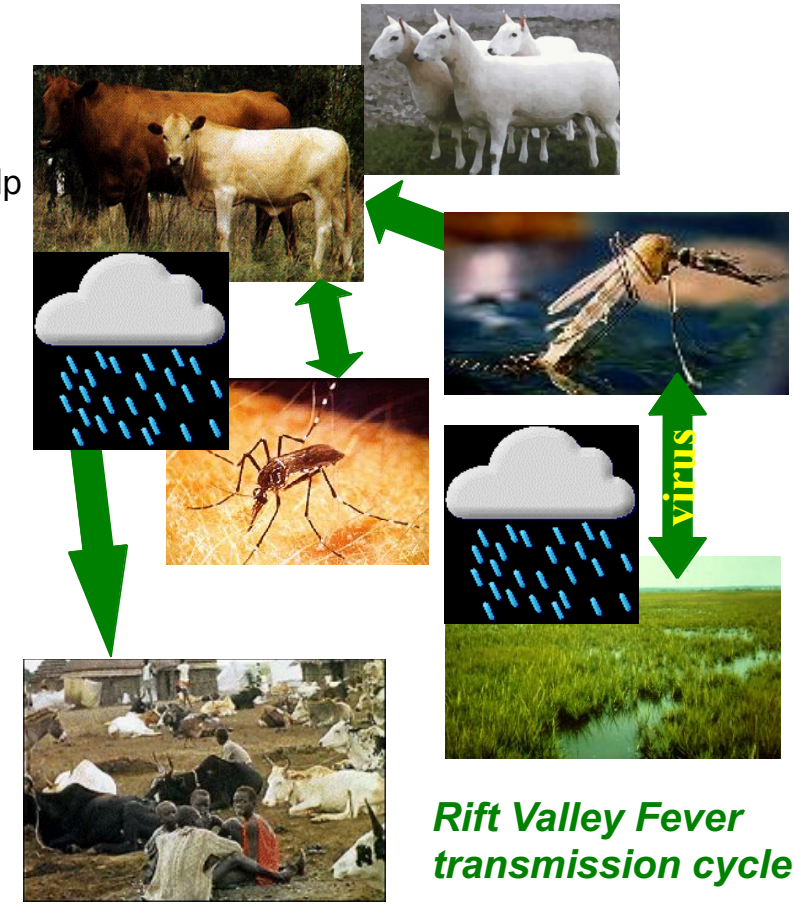
  Can we use climate information to help predict RVF and begin vaccination?

- **The Integrated Research Approach**

  Climate, Ecology, Public Health, Modeling, Field/Process Study

- **Integrated Spatial Spread Model Developed**

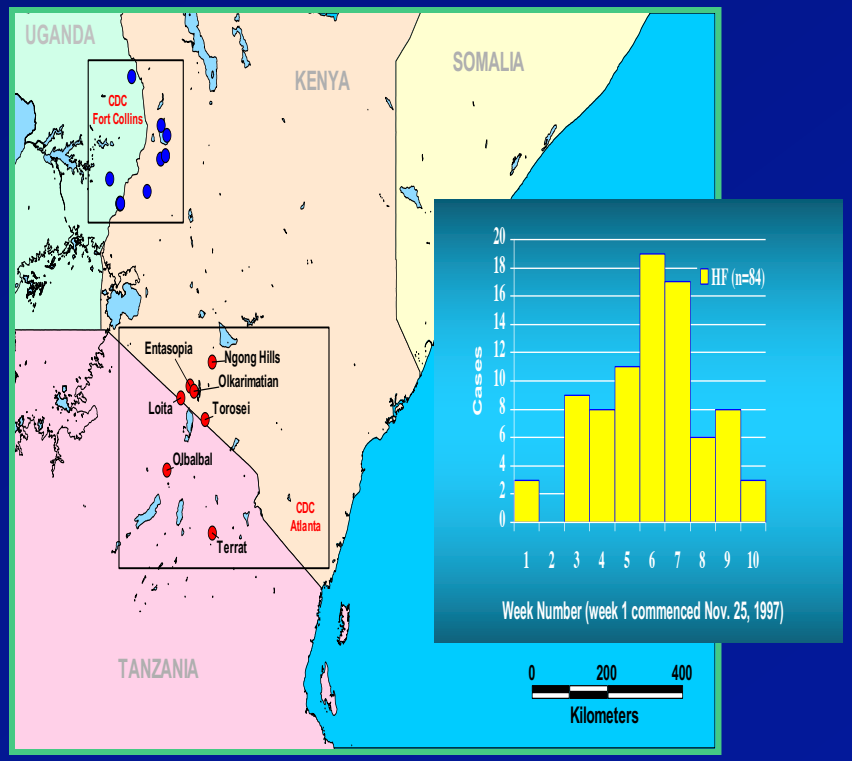
  Being applied to Plague and other issues of Homeland Security



Rift Valley Fever transmission cycle

Kenya RVF Outbreak 1997-1998

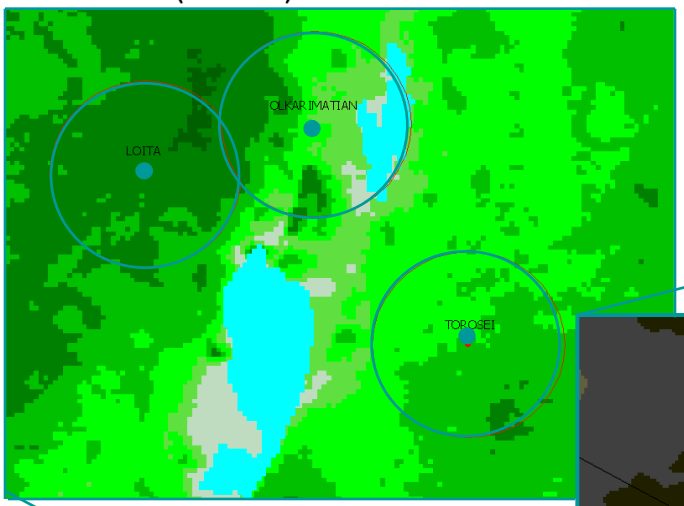
- Heavy rains between October 1997 and April 1998
- Dramatic regional epidemic of multiple diseases: Nov 1997 - Apr 1998
- Feb 98: Kenyan government requested U.S. medical aid & support
  - Ground specimen collections made in representative locations



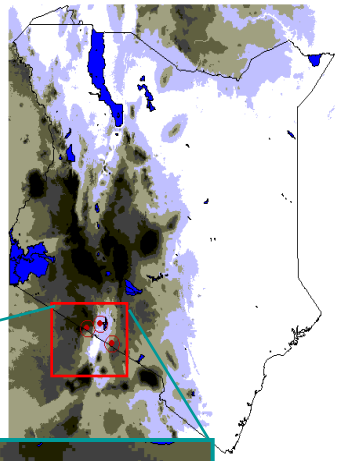
Kenya Sites Landscape Characteristics

Site	Elevation	Livestock pos.	Human pos.
L	*1796 m*	*4%*	*0%*
O	*677 m*	*53%*	*35%*
T	*1357 m*	*36%*	*10%*

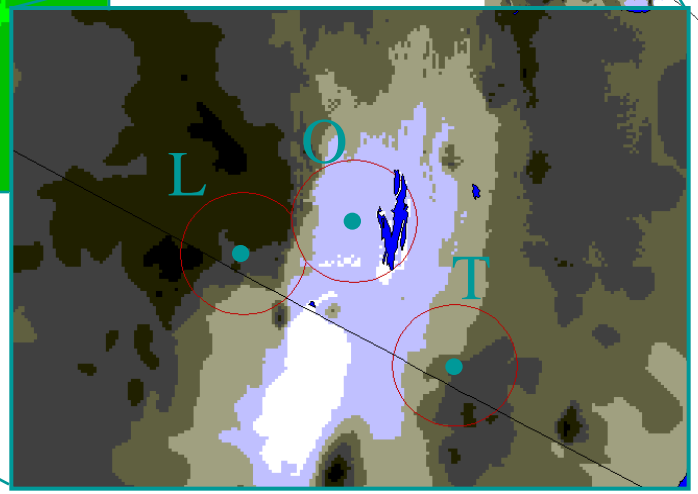
NDVI Maximum - RVF Study Sites (1997-98)



DEM and RVF Sites

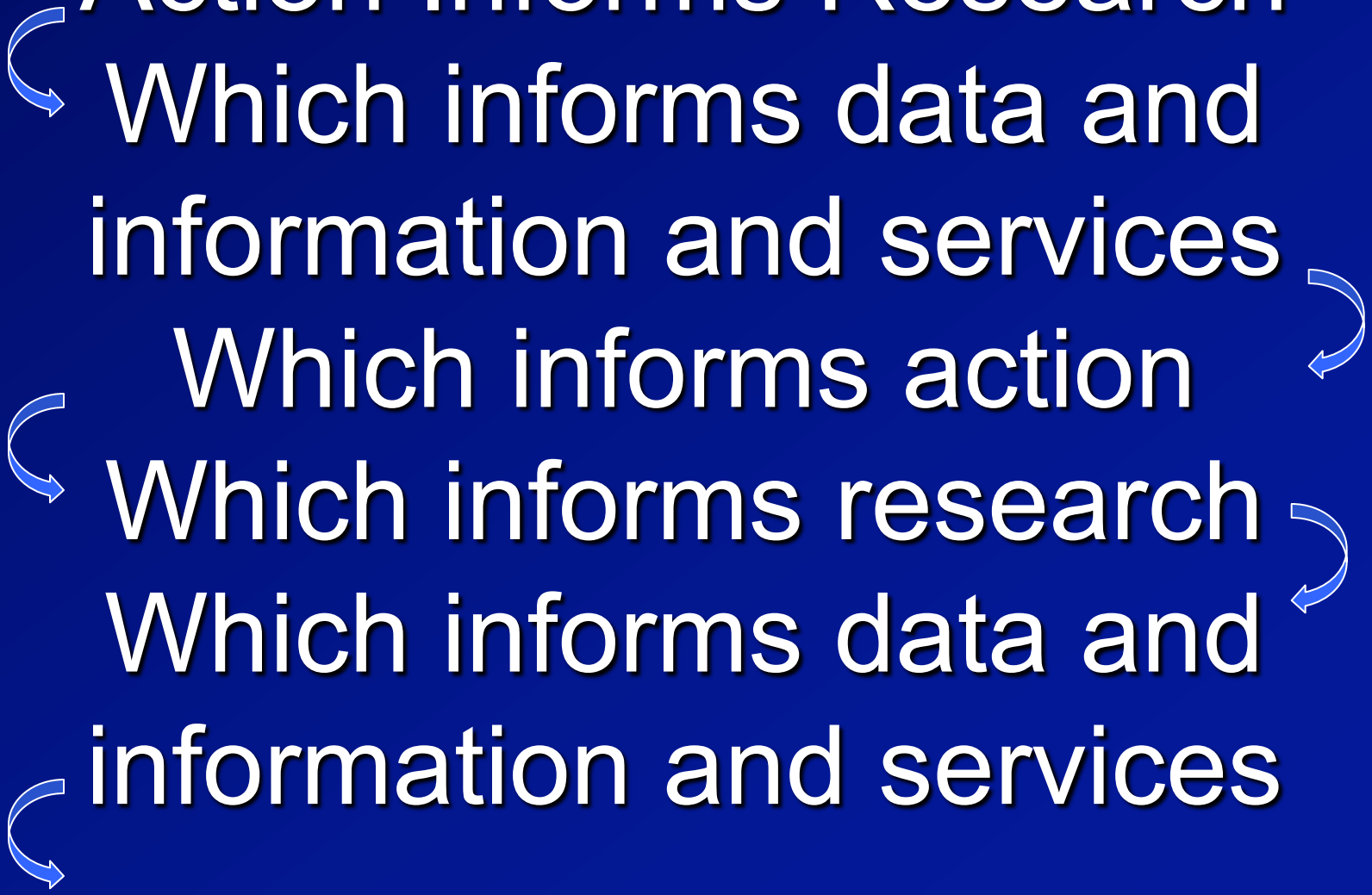


Hydro
Cntry_bndry
Study_sites
Study_areas
Dem
0 - 271
272 - 614
615 - 966
967 - 1297
1298 - 1595
1596 - 1913
1914 - 2317
2318 - 2994
2995 - 5590
No Data
(m)



NDVI = Normalized Difference Vegetation Index, a surrogate for rain fall

Action Informs Research
Which informs data and information and services
Which informs action
Which informs research
Which informs data and information and services



Integrated Research: Joint Announcement on Climate Variability and Human Health

Goal: To stimulate the formation of interdisciplinary teams to:

- Illuminate the pathways through which climate affects human health, and
- Explore the potential for incorporating useful climate information for public health policy and decision making

Joint Announcement on Climate Variability and Human Health 1999-2004

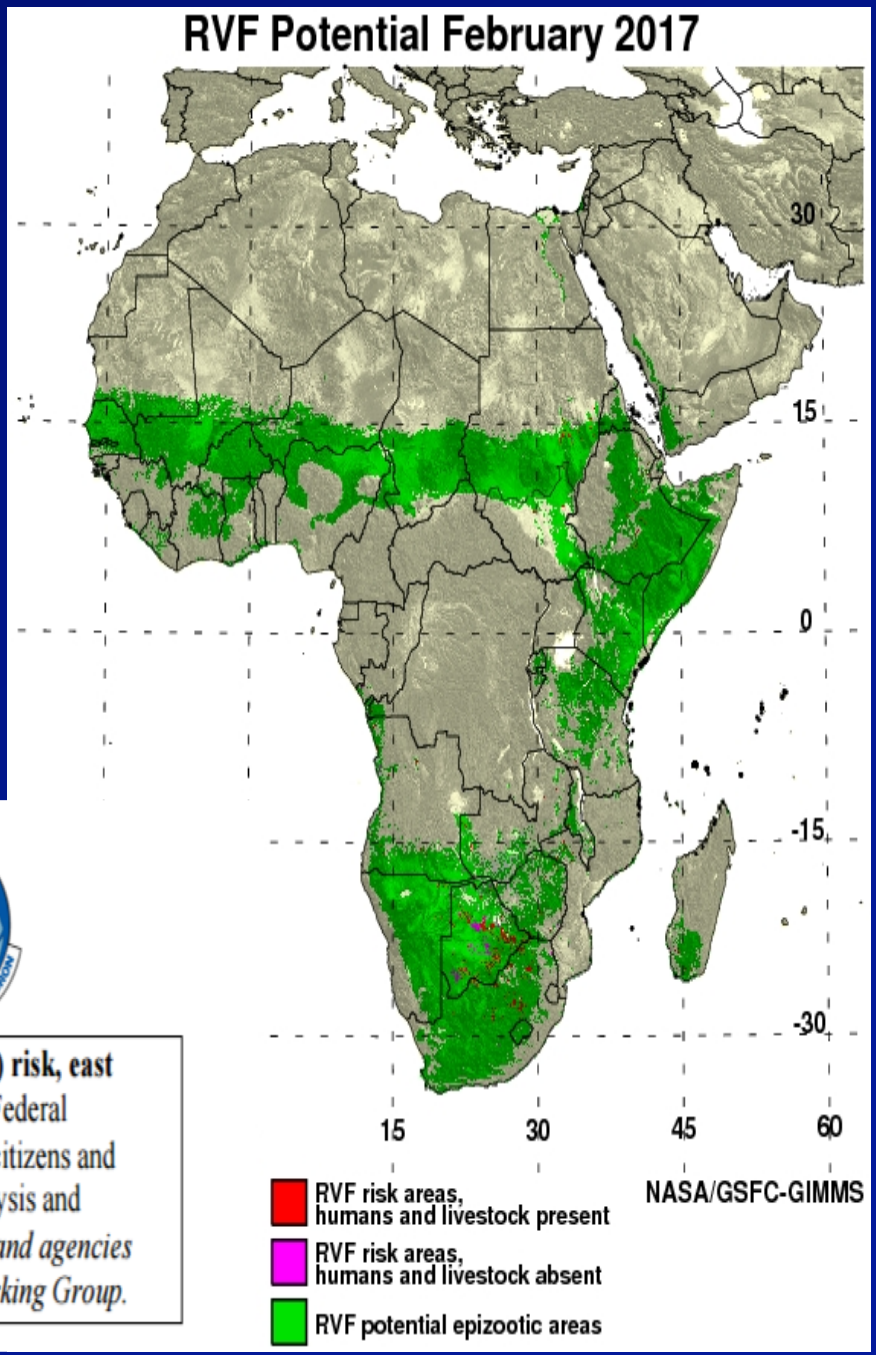
- NOAA, NSF, EPA, NASA and EPRI
- Requires public health, climate and ecology expertise on proposal team
- End goal is improved public health
- Domestic and International
- Approx $1.5 -$2 million per year
- Peer-reviewed, competitive
- Agencies pooled funding

Research Funded

- Rift Valley Fever--Zimbabwe
- Cholera in Bangladesh
- Bartonellosis in Peru
- Hantavirus in the US
- Diarrheal Diseases in Lima, Peru
- Dengue at the US/Mexico Border
- Climate and WEE, SLE in California
- Asthma and Aeroallergens in the Northeastern United States
- Mosquito Dynamics in Mid Atlantic
- Influenza
- Methods Research

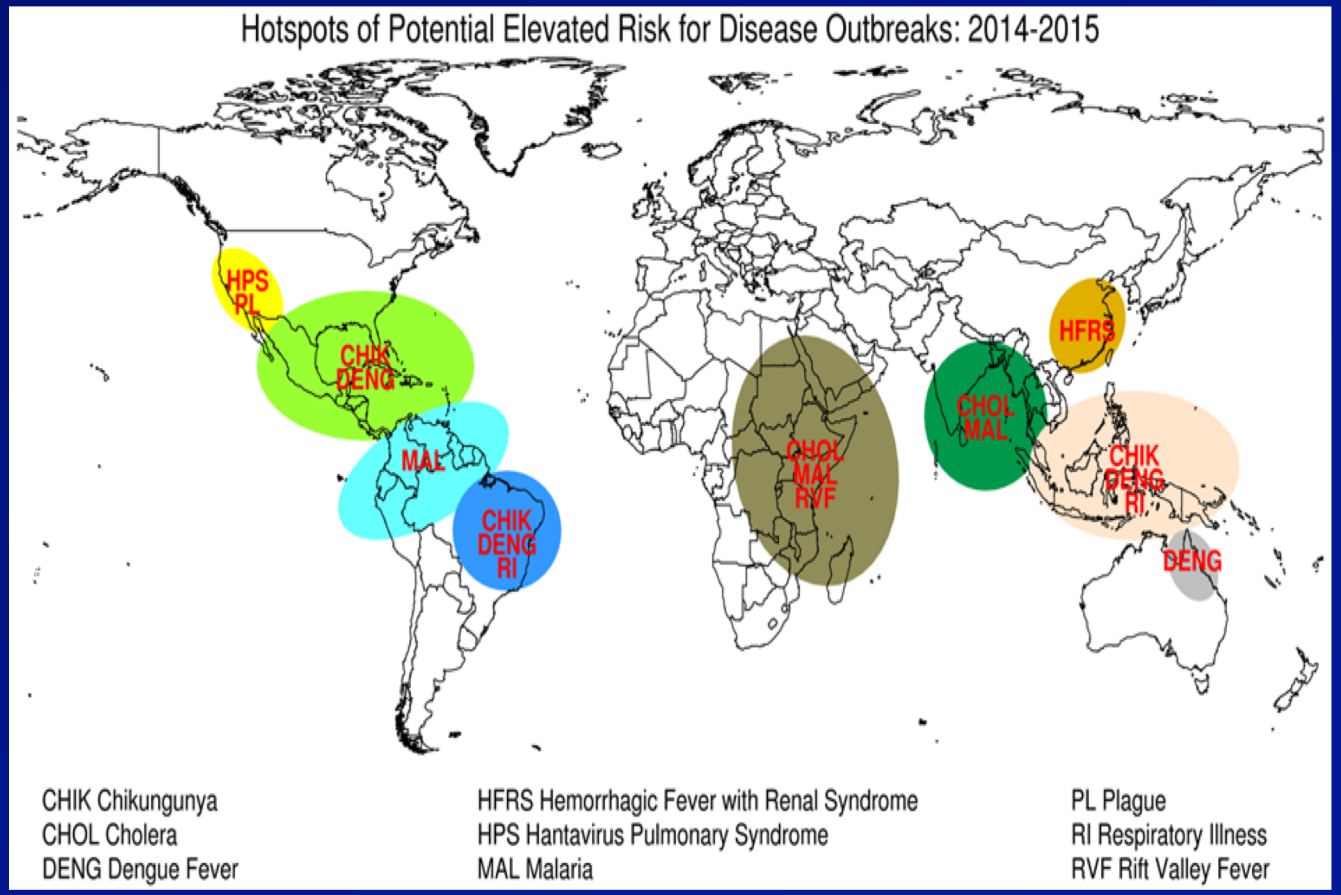
Rift Valley Fever

- Mosquito, Livestock, Human transmission cycle
- Well established links to El Nino-related rainfall
- Economic and health impacts
- Rift Valley Fever Monitor



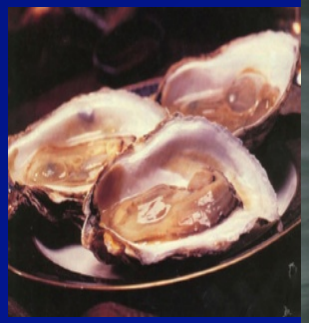
Emerging Health Risk Notification, 20 Dec 2015. El Niño and Rift Valley fever (RVF) risk, east Africa. This Notification is a pilot effort of an interagency working group that integrates Federal expertise to synthesize risk information and response options for biological threats to US citizens and interests. The Notification is provided to USG operational biosurveillance centers for analysis and dissemination. *The views expressed do not necessarily represent those of all departments and agencies that participate in the Pandemic Prediction and Forecasting Science and Technology Working Group.*

Predicting Infectious Disease Risk



Chretien J, Anyamba A, Small J, Britch S, Sanchez JL, Halbach AC, Tucker C, Linthicum KJ. Global Climate Anomalies and Potential Infectious Disease Risks: 2014-2015. PLOS Currents Outbreaks. 2015 Jan 26 . Edition 1. doi: 10.1371/currents.outbreaks.95fbc4a8fb4695e049baabfc2fc8289f.

Climate, Vibrio Cholera and its Bacterial Cousins

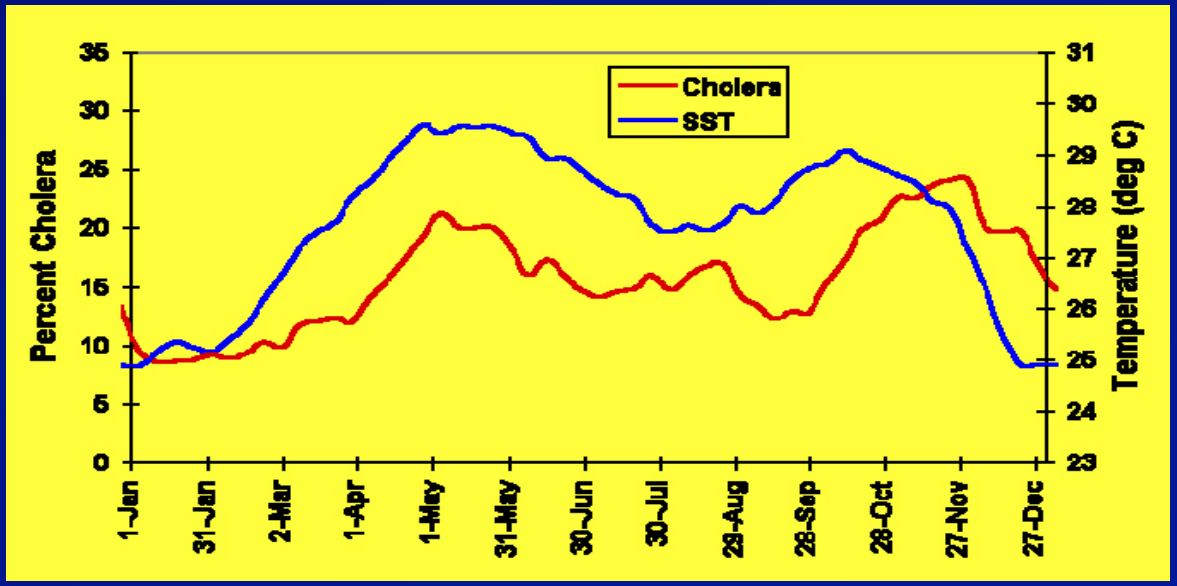


- *Vibrio parahaemolyticus*
  - main cause of seafood poisoning
  - under reported, misdiagnosed, increasing-8000 cases per year
- *Vibrio vulnificus*
  - 95% fatality rate from consumption
  - causes wound infections
- *Vibrio* infection rates have increased 115% over the last decade.
- *Vibrio Cholera*
  - 3–5 million cases, 100,000–120,000 deaths

What are the environmental drivers for cholera and other vibrios?

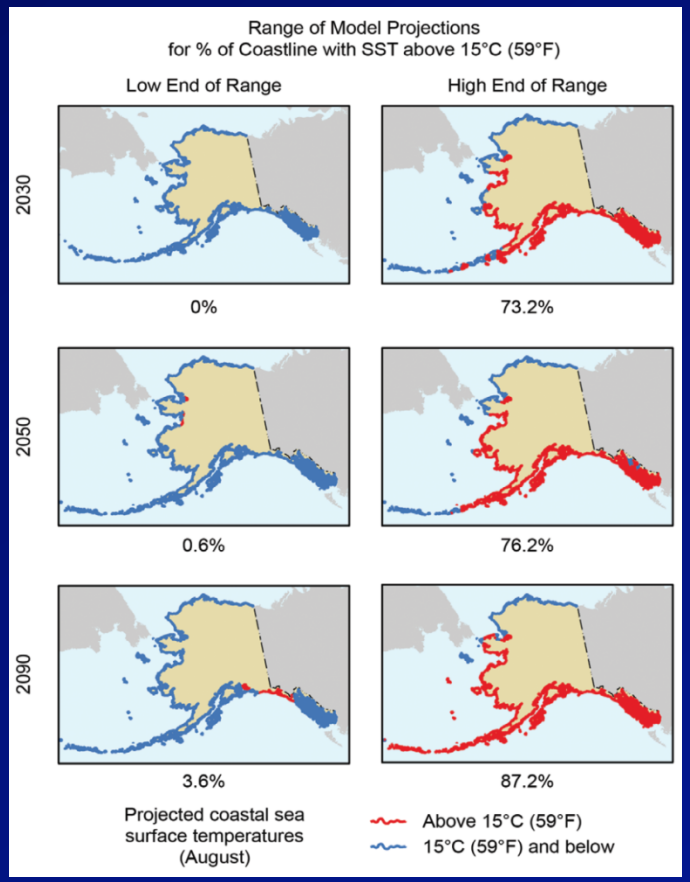
- Sea Surface Temperature
- Salinity
- Chlorophyll
- Temperature

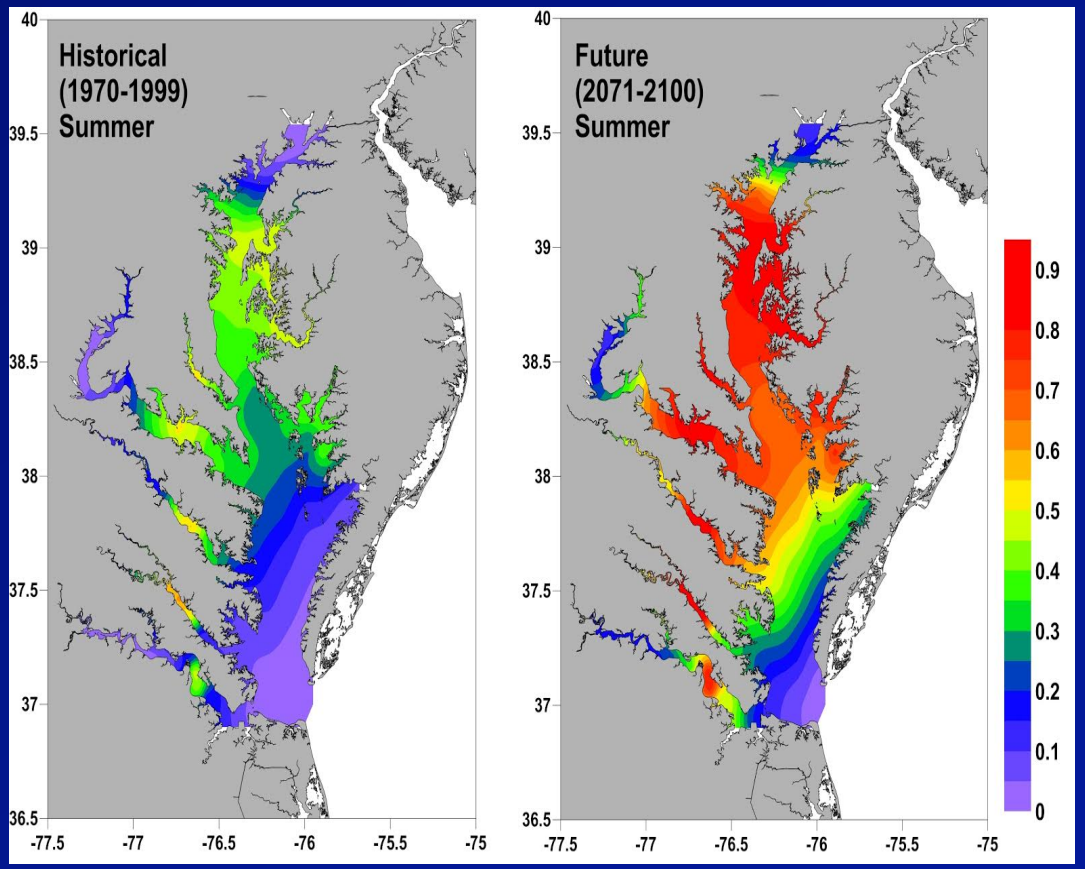
- Soil Moisture
- Precipitation
- Soil Type



Lobitz, B, R. Colwell, B Woods 1998

Vibrio projections



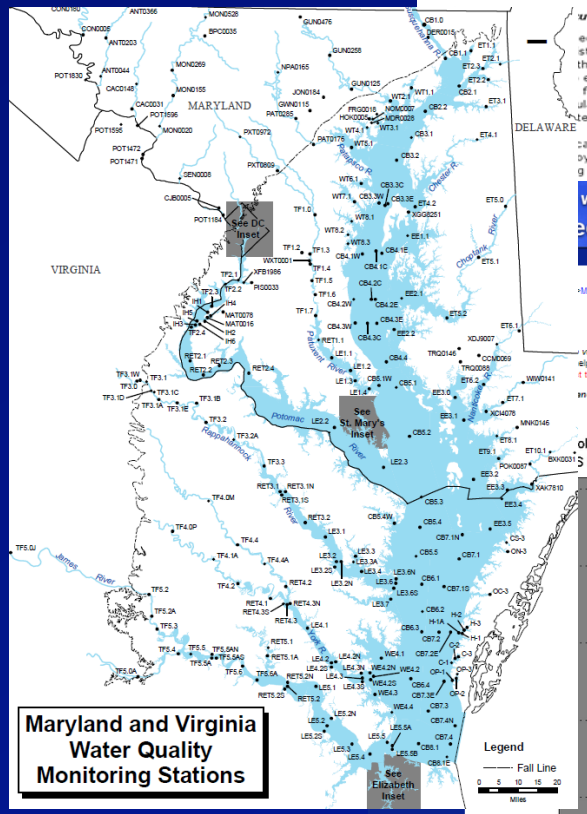


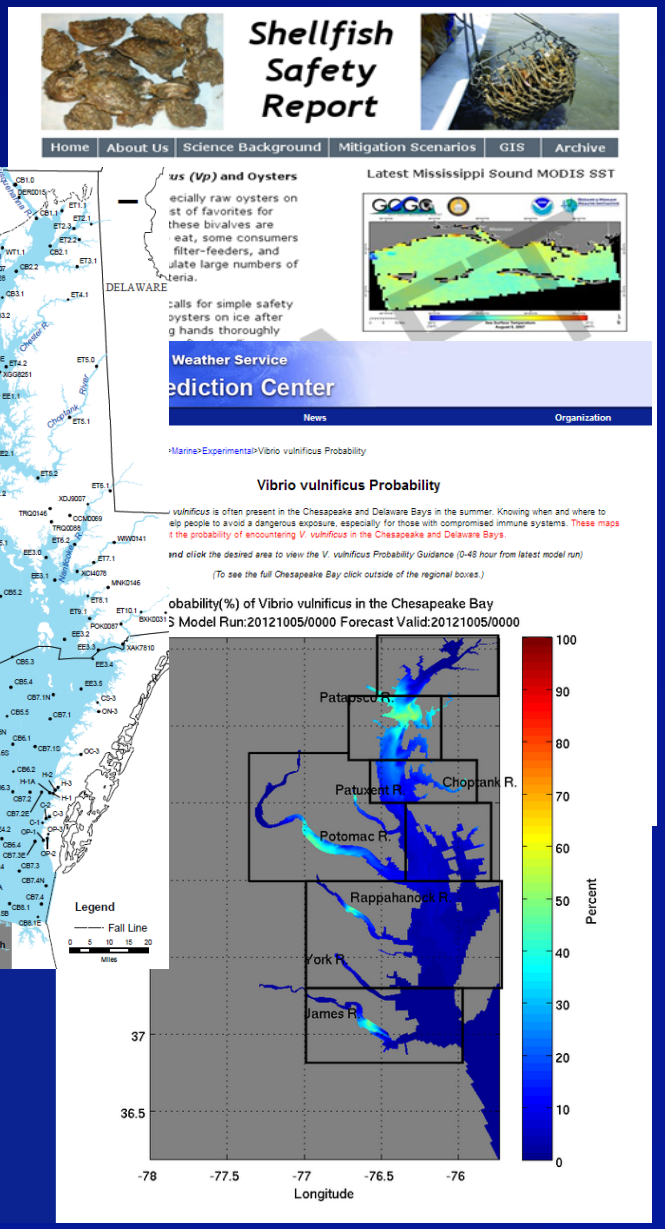
GFDL Geophysical Fluid Dynamics Laboratory

Muhling, Jacobs, Stock, Gaitlan, and Saba. *Submitted.* Projections of the future occurrence, distribution, and seasonality of three *Vibrio* species in the Chesapeake Bay under a high-emission climate change scenario. GeoHealth

Developing a Vibrio Operational Forecasting System

- Fully operational regional ocean model
- 48 hour predictions
- Pathogen and Water Quality monitoring~ 150 tidal stations
- Surface water samples
- Full physical and chemical water quality profiles
- Validation with CDC and State Health data
- Test and Validate other models—satellite based SST, salinity





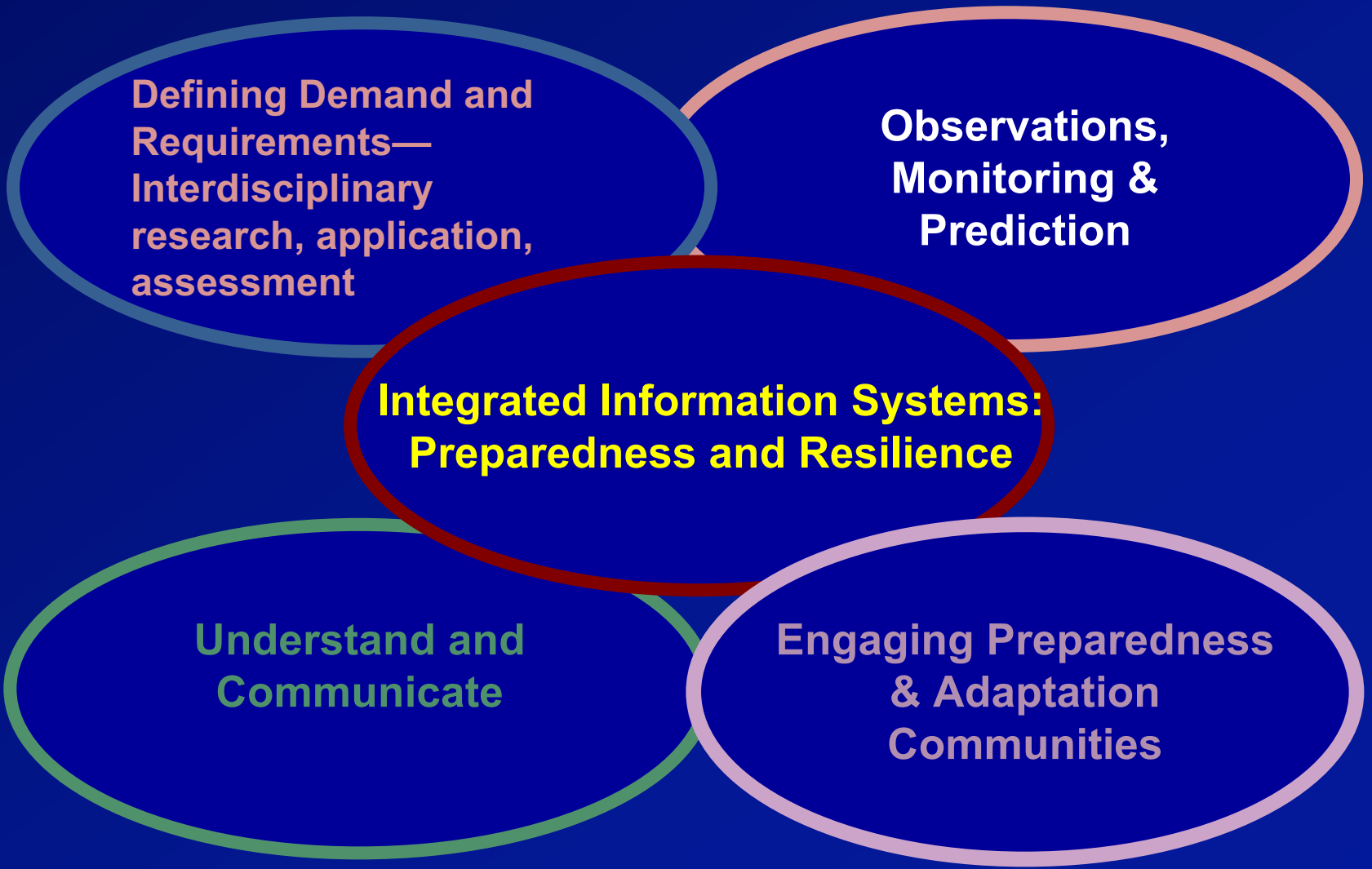
MARYLAND DEPARTMENT OF NATURAL RESOURCES

Chesapeake Bay Program
A Watershed Partnership

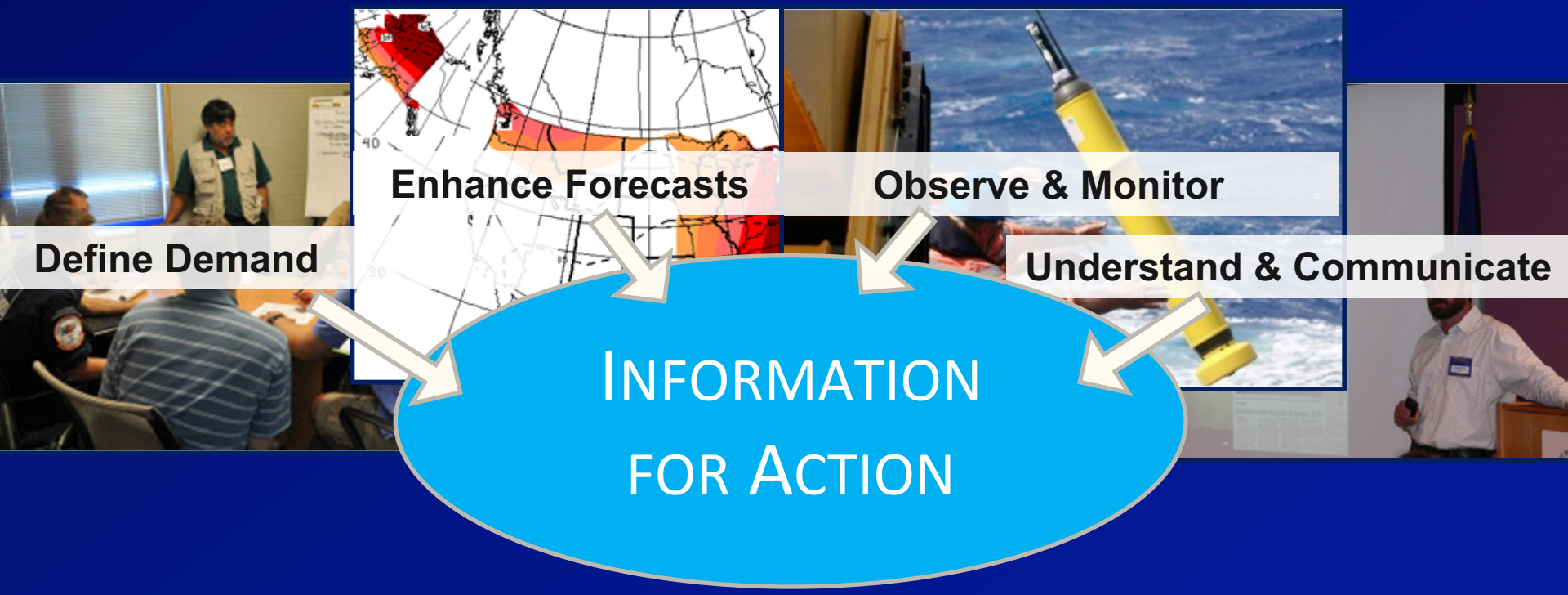
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Mutual priorities, resource dependencies and responsibilities

Defining the Problem—answering the right Question



Integrated Information Systems Inform Preparedness & Resilience



- Build relationships, establish trust
- Cultivate partnerships—map decision-making arrangements, share knowledge
- Distribute risk across institutions and time scales
- Improve options for forward-looking planning

Food Security Early Warning System

Agromet Update

2016/2017 Agricultural Season

Issue 05 Month: March-April **Season: 2016-2017** **28-04-2017**

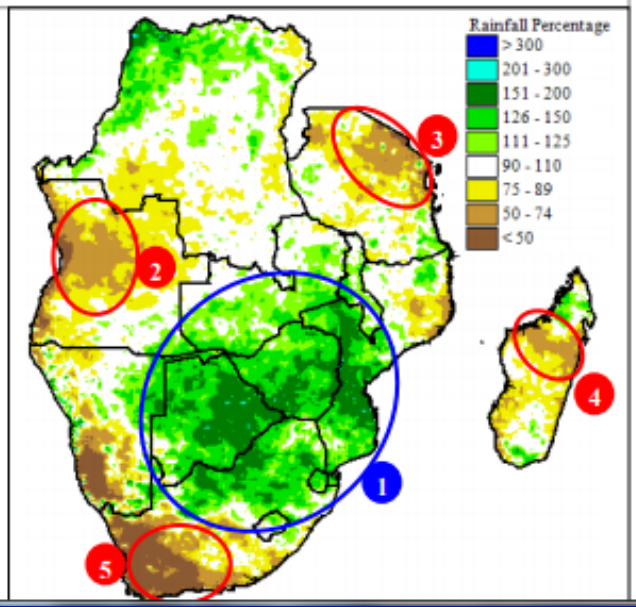
Highlights

- **Good rains continued to the end of season in most areas, resulting in positive production expectations in several countries**
- **The high seasonal rainfall improved dam and groundwater levels, providing good water availability for irrigation over the coming seasons**
- **Preliminary reports suggest the regional impact of the Fall Armyworm was not severe. However, experts advise robust, coordinated control measures for coming seasons**

Regional Summary

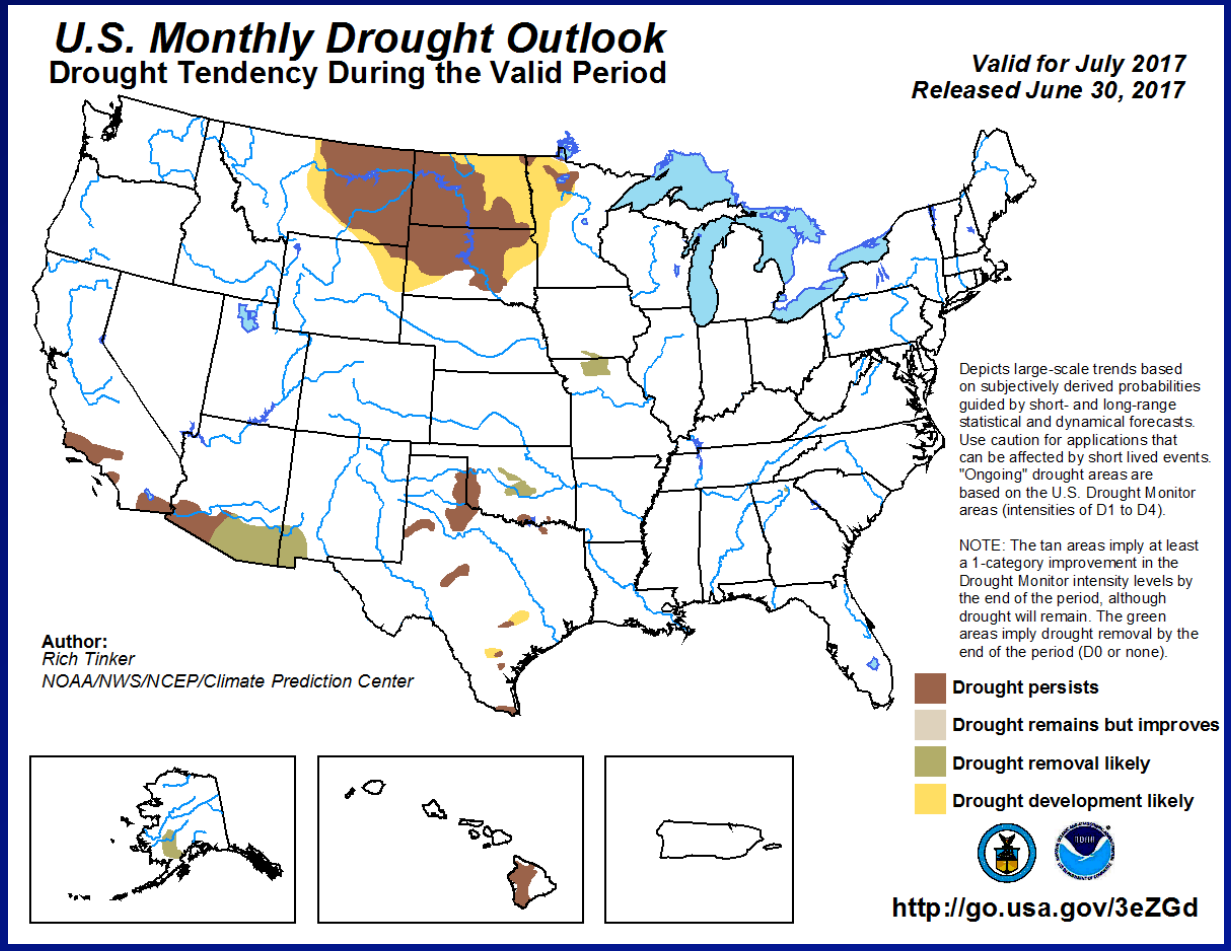
Seasonal rainfall and temperature overview

Central and southern parts of the region received well above-normal rainfall during the October-to-March 2016-17 rainfall season (Figure 1, blue oval #1). Many areas, including parts of Botswana, Mozambique, Namibia, South Africa and Zimbabwe received more than one and a half times their normal seasonal rainfall. Lesotho, Malawi, Swaziland and Zambia also received above-average rainfall over the course of the season. The bulk of the rains fell in January and February, although, some areas received heavy rains from as early as November (parts of Botswana, South Africa and Swaziland) and December (parts of Mozambique and Zimbabwe). In several areas, including parts of the above-mentioned countries, the onset of rains was delayed. After



https://www.fews.net/

National Integrated Drought Information System (NIDIS)



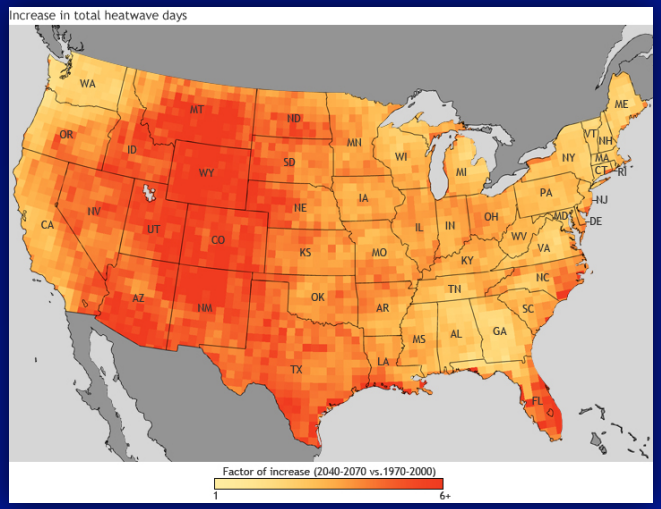
DROUGHT EARLY WARNING SYSTEM (DEWS)

[ACF River Basin]
[California-Nevada]
[Coastal Carolinas]
[Intermountain West]
[Midwest]
[Missouri River Basin]
[Pacific Northwest]
[Southern Plains]

Drought.gov

National Integrated Heat Health Information System (NIHHIS): Reducing Heat Risk from days to decades and beyond

- NOAA and CDC launched the National Integrated Heat Health Information System (NIHHIS) in June of 2015
- Regional and local foci to develop information decision makers
- Interagency group of 9 agencies
- FEMA addressed heat for first time
- Pilots, Partners, Web Portal, student rotations
- Global Heat Health Information Network (GHHIN)
- https://toolkit.climate.gov/nihhis/



The National Integrated Heat Health Information System weaves together existing pieces, identifies information needs, builds on existing partnerships, facilitates common learning.

NIHHIS sustains engagements for an integrated approach to providing a suite of decision support services to reduce heat related illness and death

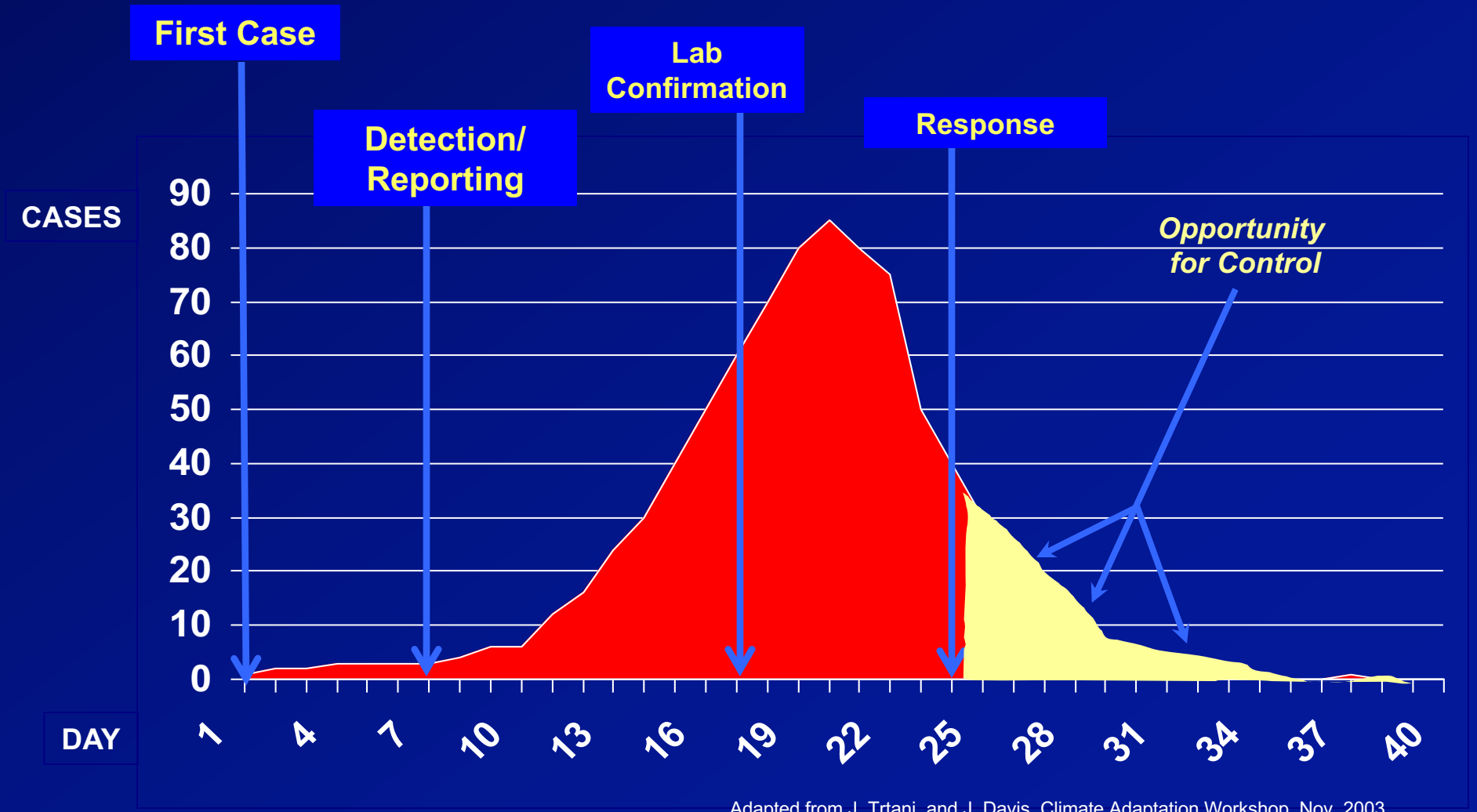
What is the Global Heat Health Information Network (GHHIN)?

A Network--of institutions and individuals working at the interface of understanding and reducing heat-related health risks globally that:

- Strives to learn from each other and agrees to **superimpose a set of common questions** to facilitate shared learning
- Seeks to harmonize and **improve information and opportunity** sharing
- **Facilitates more rapidly scaling up efforts** to manage the complex human health risks introduced by extreme and increasing ambient heat
- **Creates the space for relevant actors** from research, policy, practice, and the media to know each other, talk and learn from each other
- Provides a **platform for feedback** that informs
  - policy and action with available evidence and tools; and
  - Science, data and communication needs

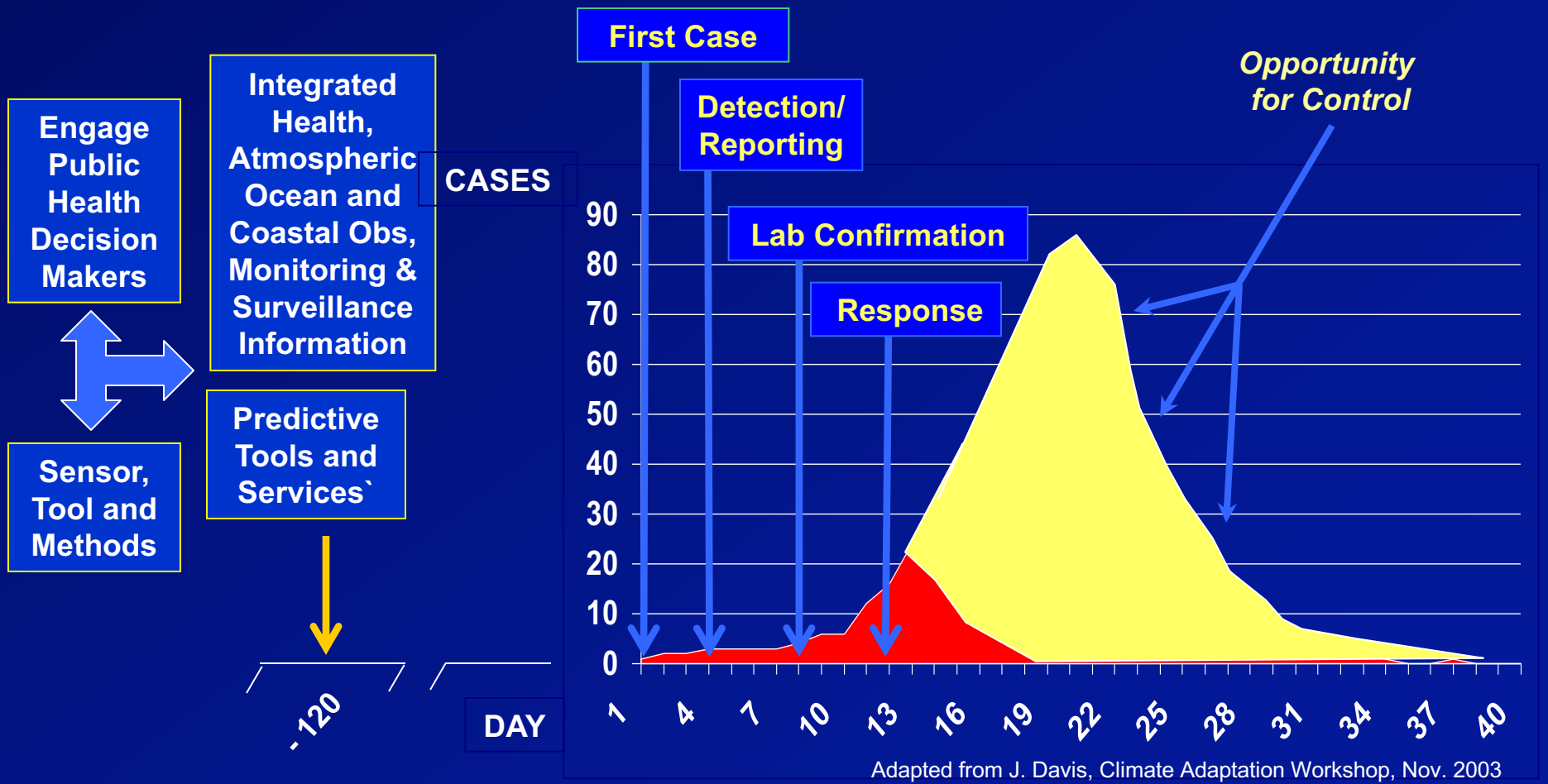
GHHIN.Org

Generalized Epidemic Curve



Adapted from J. Trtanj and J. Davis, Climate Adaptation Workshop, Nov. 2003

Getting ahead of the Curve: Changing the Culture to Prediction and Prevention



Enhancing Public Health Engagement, Outreach, and Feedback throughout

Thinking in Systems

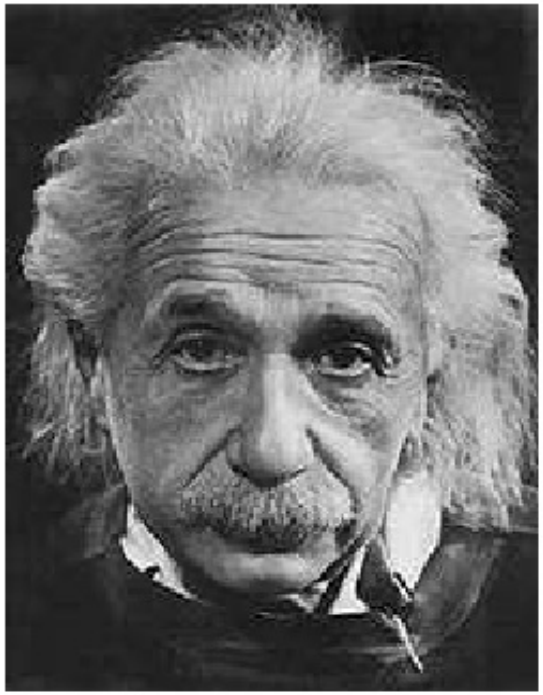


Image Source: Flickr Creative Commons, by mansionwb

"The problems we have created in the world today will not be solved by the level of thinking that created them."

--Albert Einstein

Lessons Learned from El Nino and the ENSO Experiment:

Seize the Moment

Learn by Doing

Structure it

Build Trust

Be Creative and Patient

It is possible and even fun!

THANK YOU

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