Applying a One Health Approach at the Statewide Level:

Integrating Human, Animal, and Environmental Health for Washington State

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2015 Arizona Infectious Disease Training & Exercise
Phoenix, Arizona 7/22/15

Center for
ne Health Research

Question

Which area of public health are you primarily engaged in?

Human health

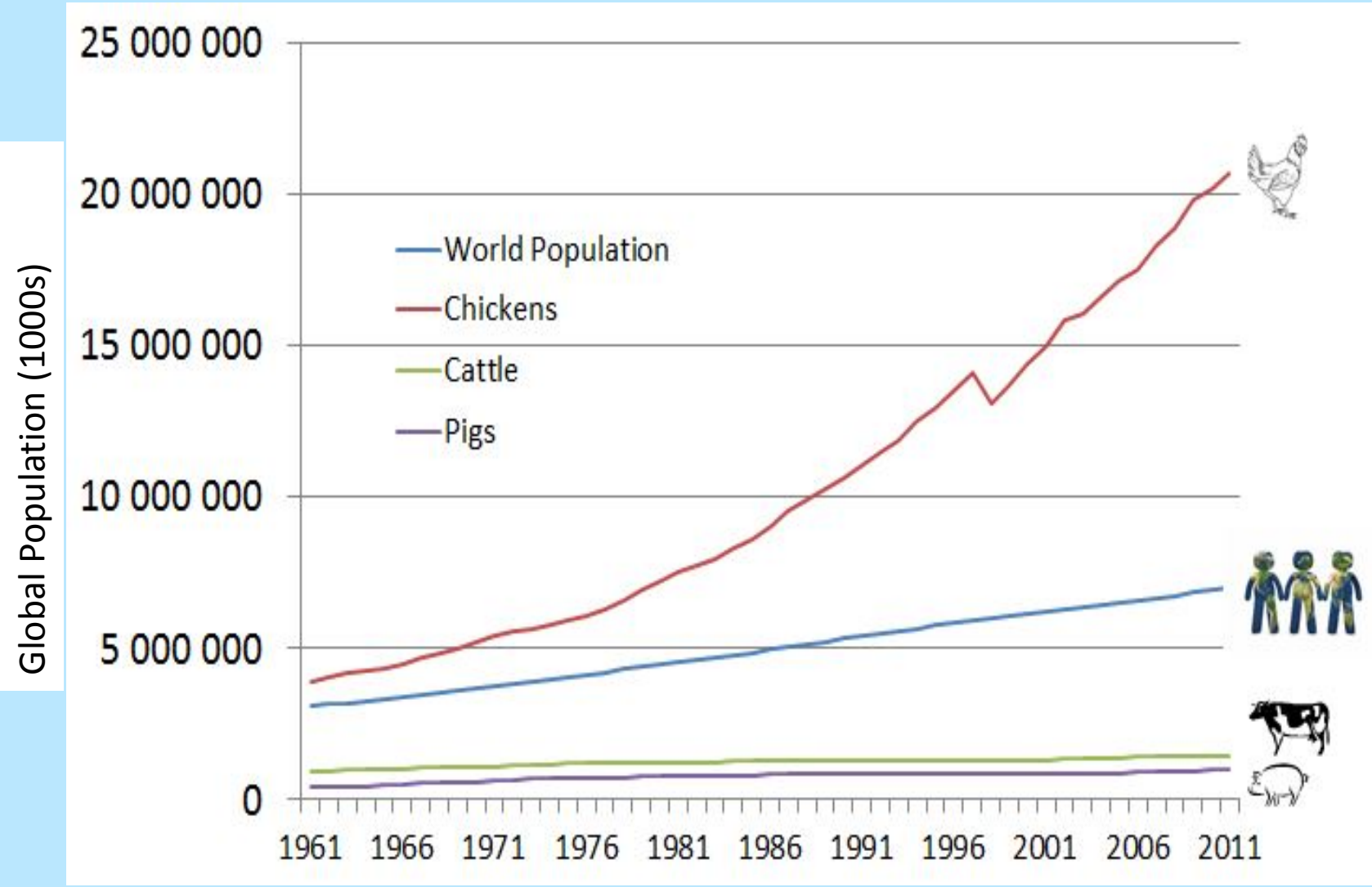
Animal health

Environmental health

Overview

- The One Health Concept
- The WA One Health initiative
- One Health Challenges
  - Avian influenza
  - Coccidioidomycosis
  - Antibiotic resistance
- Future directions

Why Do We Need One Health?



Sally Trufan, UW Center for One Health Research. Data source: FAO

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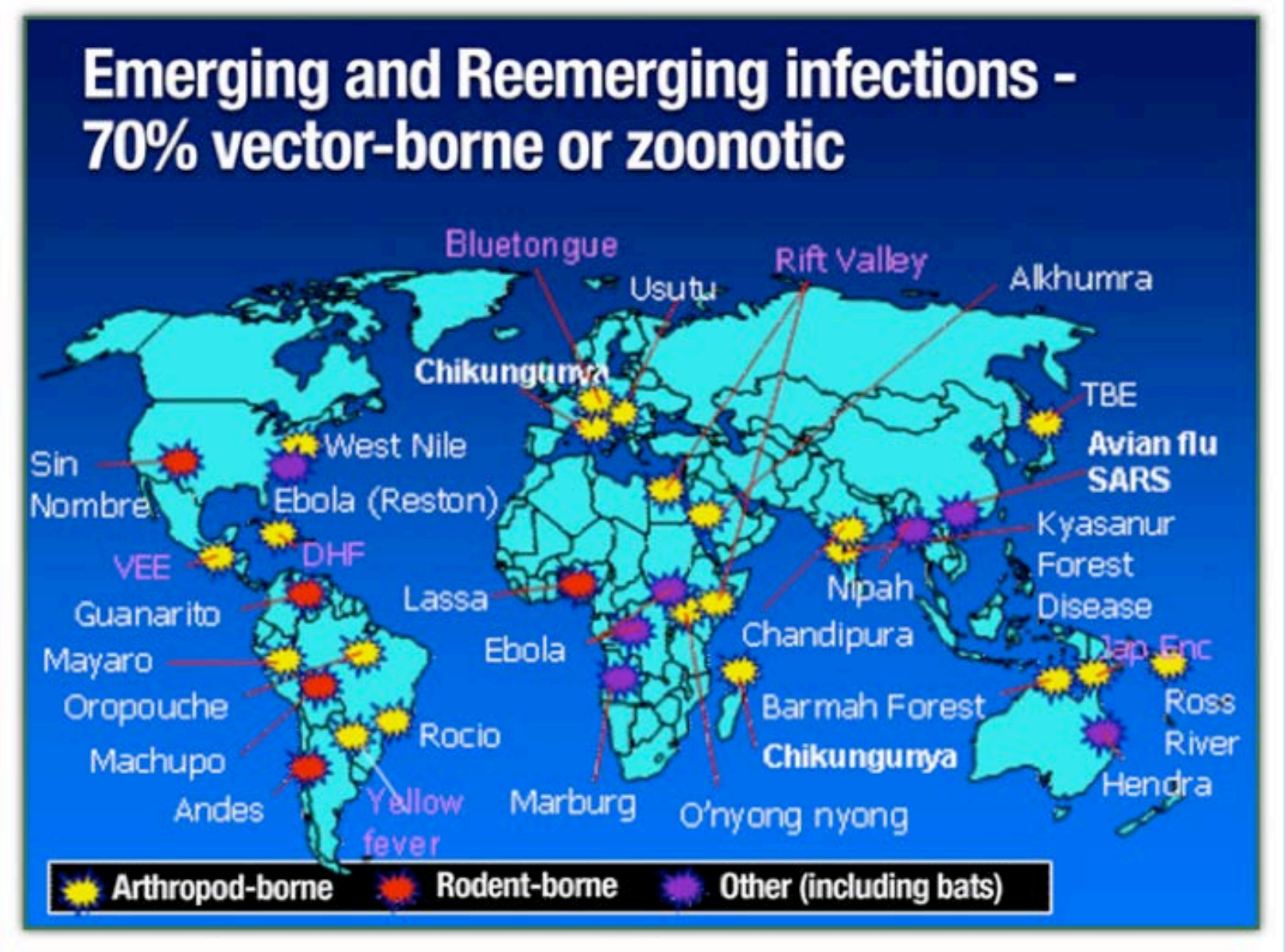


One Health Initiative

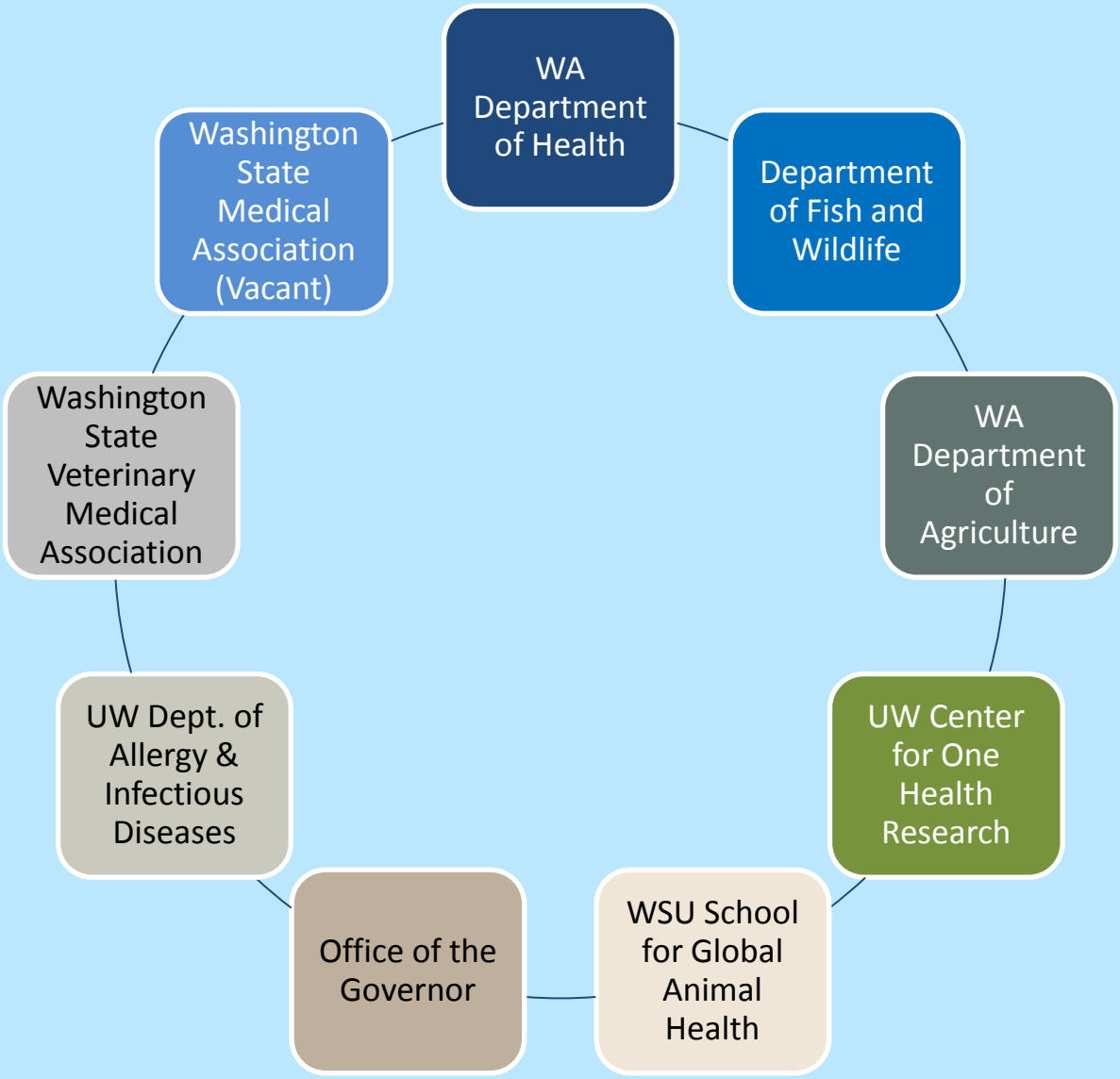
Silos

Ebola, MERS, SARS and other new diseases from wild and domestic animals are emerging as a result of agriculture intensification, habitat loss, and climate change.

"**One Health**" is a transdisciplinary systems concept connecting human, animal, and environmental health to address emerging disease challenges.

Wildlife and domestic animals, like the "canary in the coalmine," can provide early warning of environmental hazards

WA One Health Steering Committee



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WA One Health Approach

Needs Assessment

Across human, animal, and environmental health sectors:

- Need for better integration of data to predict and prevent zoonotic and other diseases
- Need to improve antibiotic stewardship and reduce antibiotic resistance

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WA One Health Approach

Goals

Across human, animal, and environmental health sectors:

- Develop a model for antimicrobial stewardship for Washington State
- Develop an integrated disease pathogen notification system
- Develop a One Health surveillance plan for antibiotic resistance

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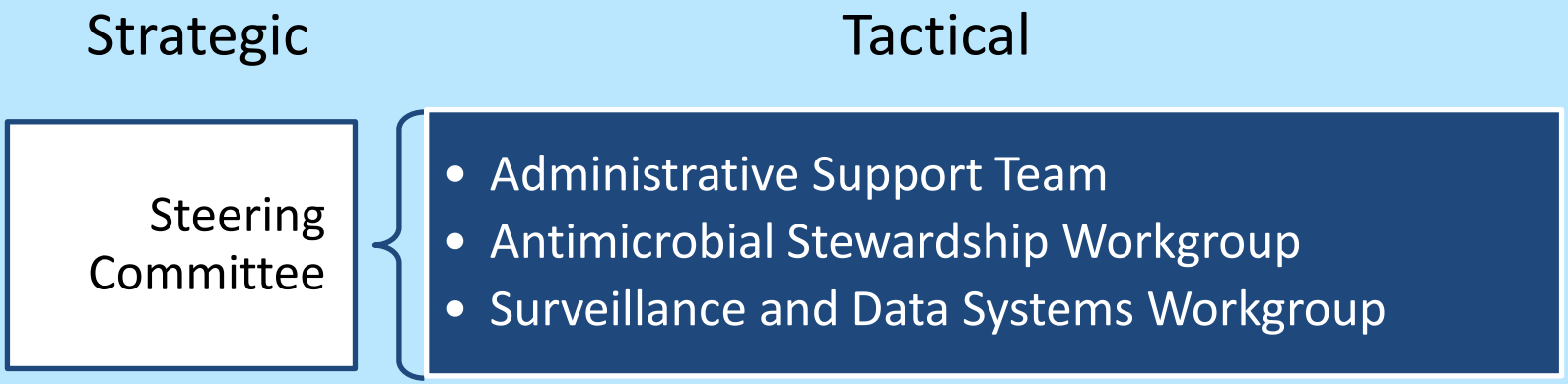
WA One Health Approach

Structure



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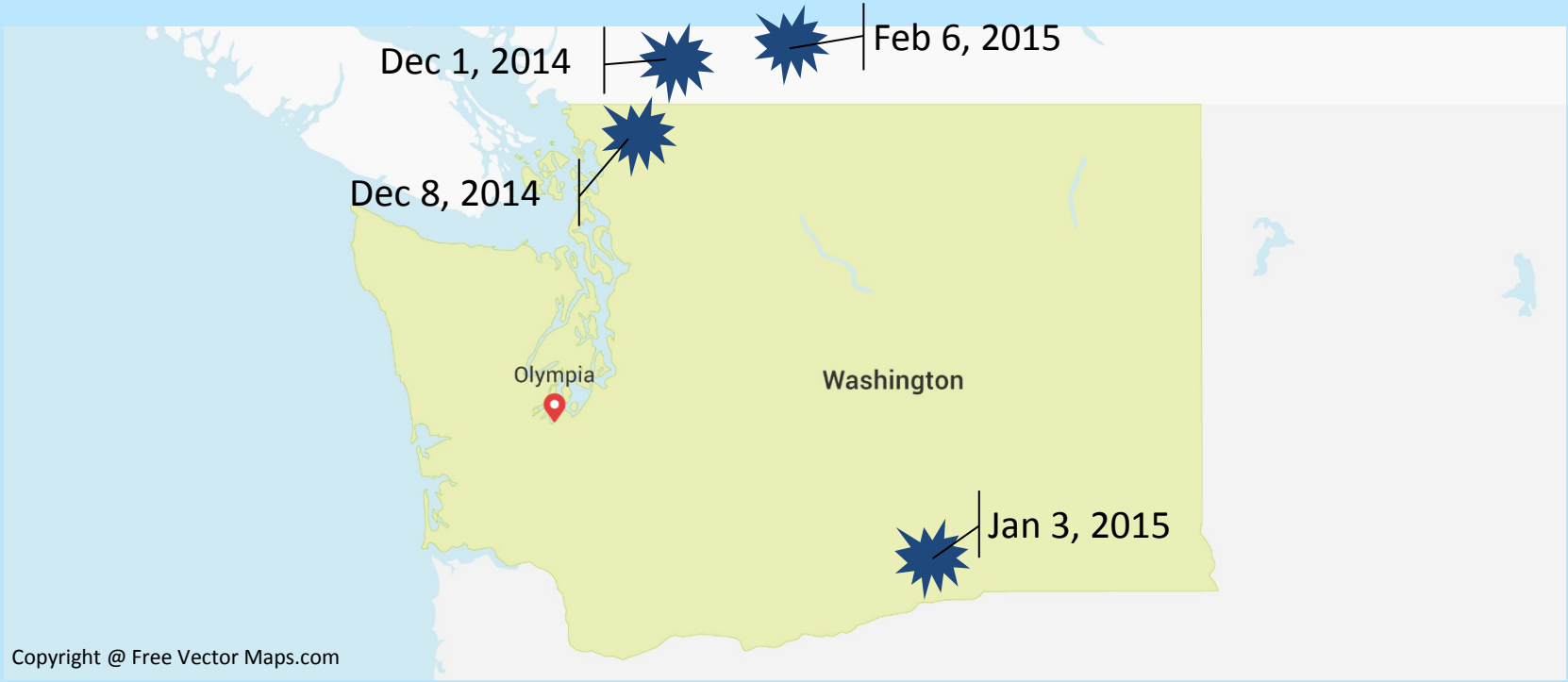
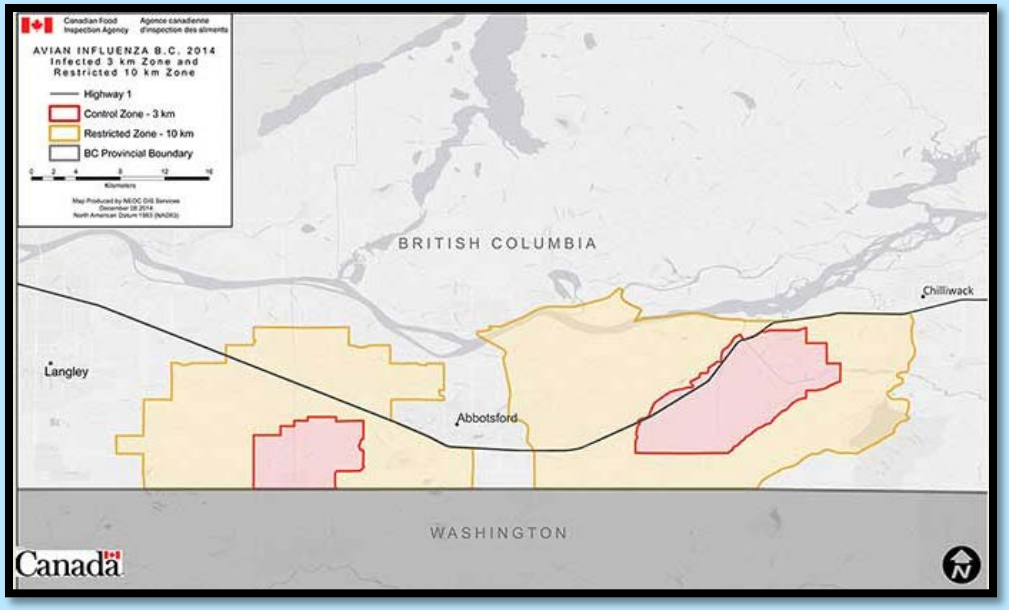
Avian Influenza, Pacific Northwest

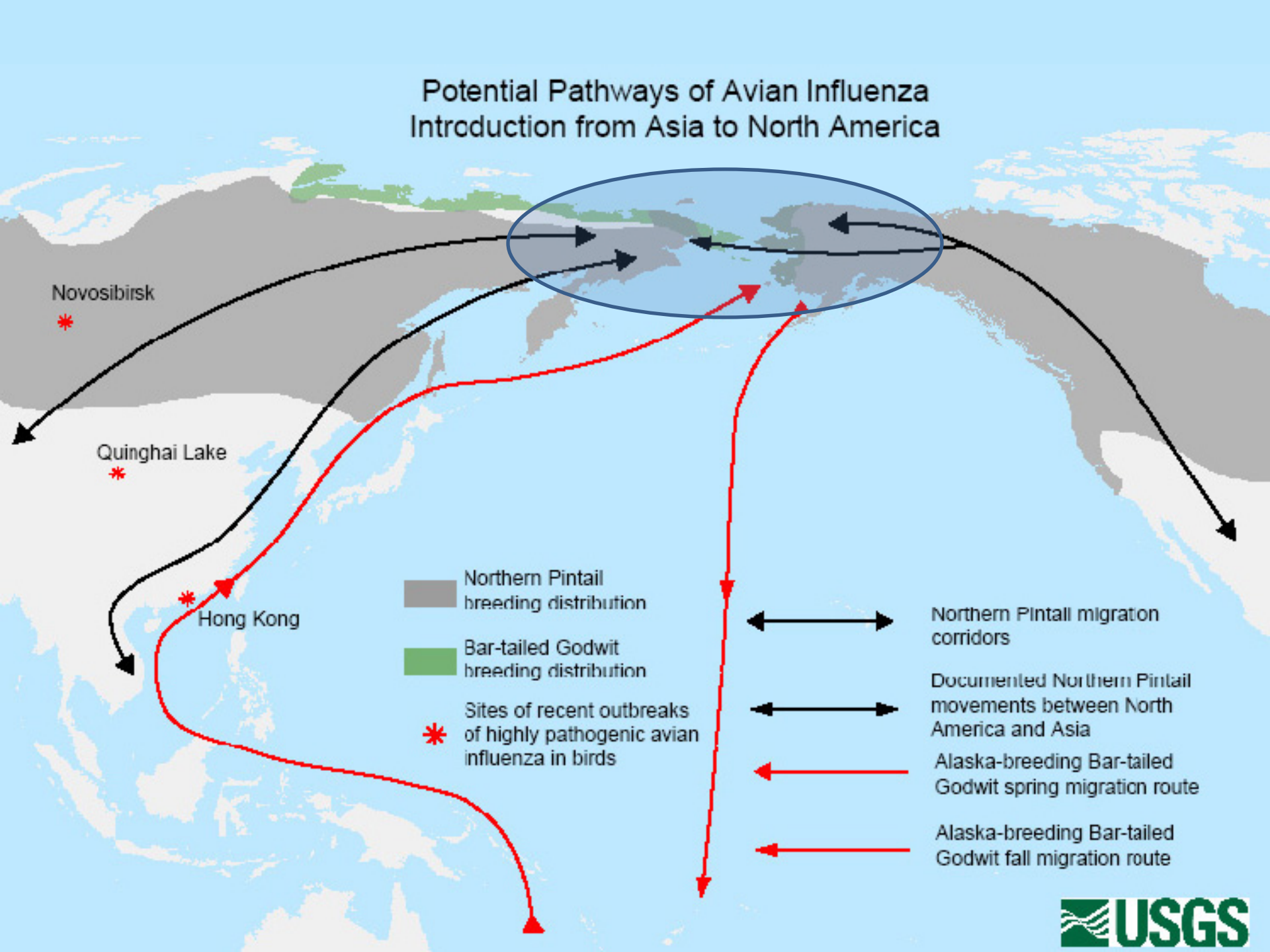


December 1, 2014:
HPAI H5N2 Reported in the Fraser Valley, British Columbia

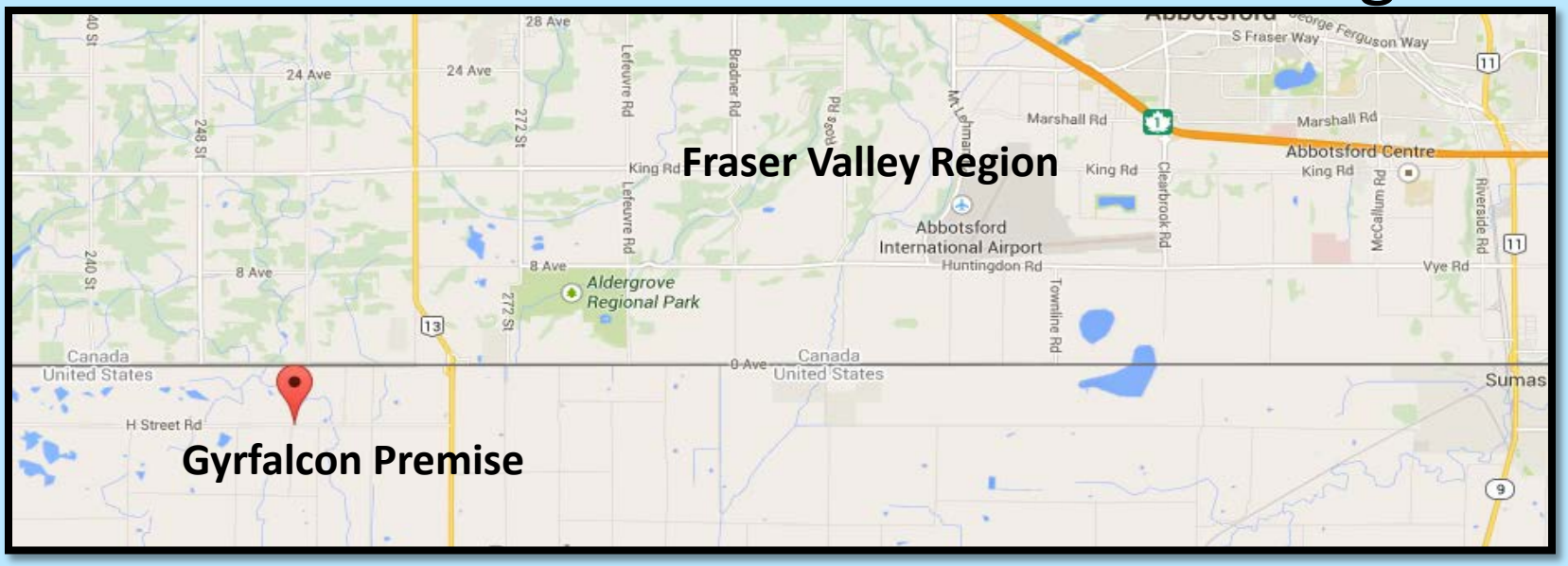


- A commercial turkey flock and a broiler operation found positive for HPAI H5N2.
- 12 flocks found H5N2 positive over the following 3 weeks: 245,000 birds.
- February 6, 2015 - A backyard flock found HPAI H5N1 positive near Chilliwack, B.C.

Washington State Department of Agriculture


Potential Pathways of Avian Influenza
Introduction from Asia to North America
Novosibirsk
Quinghai Lake
Hong Kong
Northern Pintail breeding distribution
Bar-tailed Godwit breeding distribution
Sites of recent outbreaks of highly pathogenic avian influenza in birds
Northern Pintail migration corridors
Documented Northern Pintail movements between North America and Asia
Alaska-breeding Bar-tailed Godwit spring migration route
Alaska-breeding Bar-tailed Godwit fall migration route
USGS

December 8, 2014:
First Documentation of HPAI in Washington

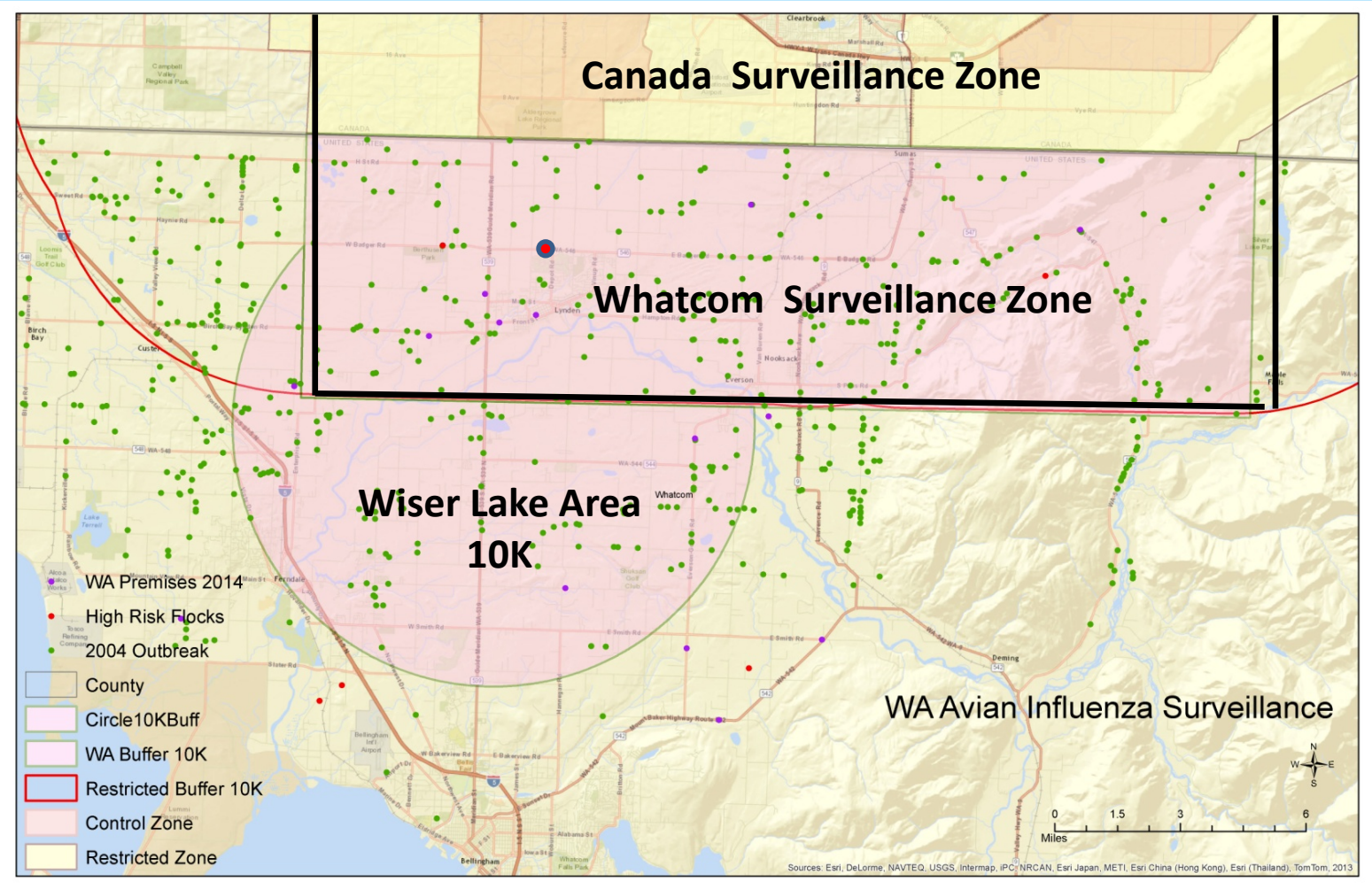


- **HPAI H5N8 was isolated from three Gyrfalcons.**
  - Owner reported death of four Gyrfalcons fed wild duck meat.
  - The premises was quarantined

- **HPAI H5N2 was isolated from Pin-Tail Duck**
  - WA State Fish and Wildlife reported 66 duck die off in Wiser Lake Area
  - Die off actually due to Aspergillosis

Washington State Department of Agriculture

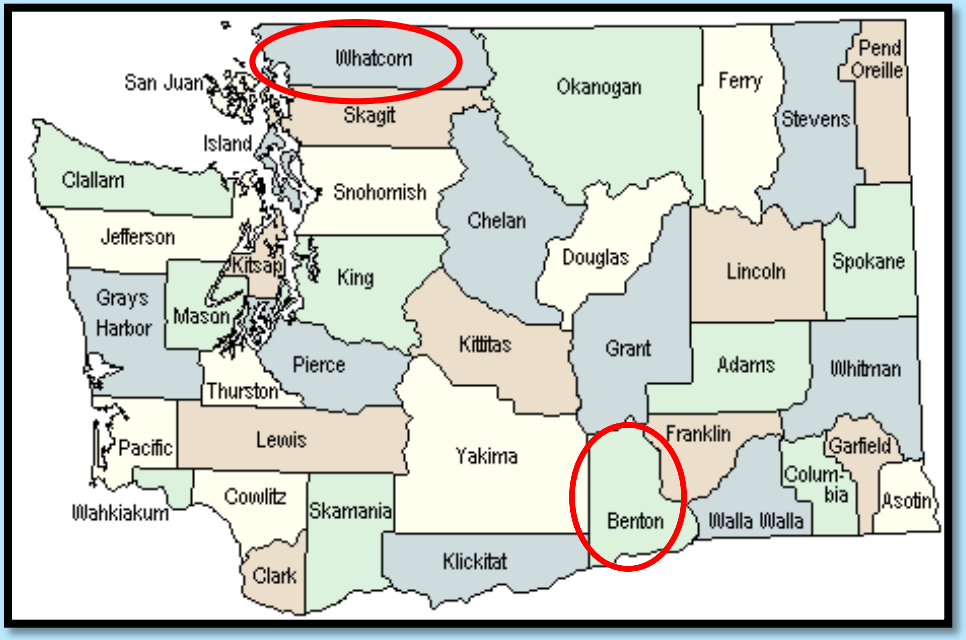
High-Risk Surveillance Zone Established in Northern Whatcom County Washington



Washington State Department of Agriculture

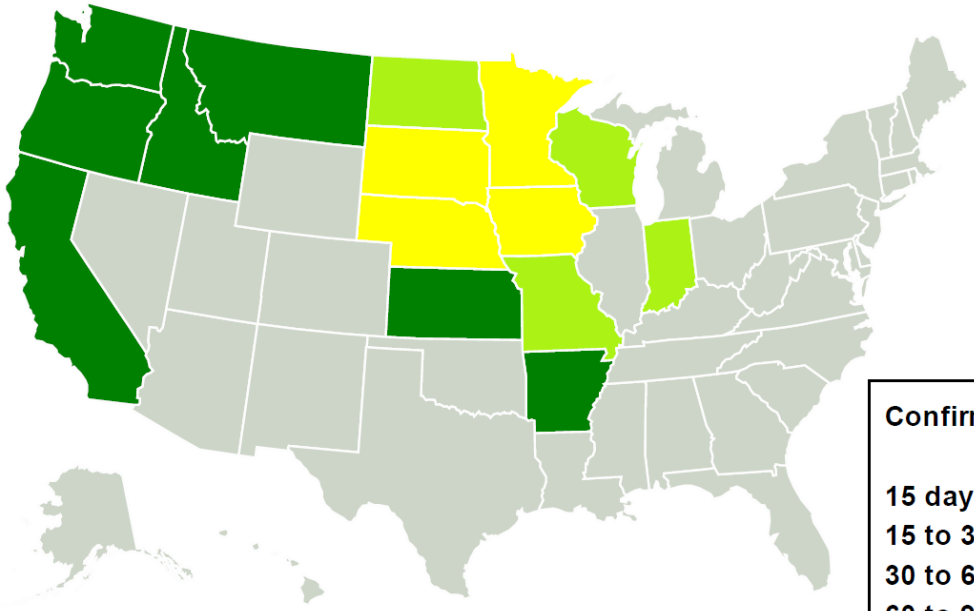
January 3, 2015:

Benton County - First Domestic Poultry HPAI Positive



- **HPAI H5N2 was isolated from backyard flock in Benton County**
  - Reported the death of turkeys, chickens and one goose.
  - There had been active commingling of domestic birds with wild waterfowl.
  - The flock was depopulated on January 5, 2015.

Update on Avian Influenza Findings
Poultry Findings Confirmed by USDA's National Veterinary Services Laboratories



Confirmed in the past

15 days:
15 to 30 days:
30 to 60 days:
60 to 90 days:
90 plus days:

223 Detections Reported	**48,091,293** Birds Affected
12/19/14 First Detection Reported	**6/17/15** Last Detection Reported

http://www.aphis.usda.gov/ accessed 7/18/15

Economic Impact of Avian Influenza

Value of U.S. poultry exports in 2014	Over $6 billion
Percentage of world poultry breeding stock produced in the U.S.	90%
Impact of mid-1980s outbreak on poultry stocks	17 million birds destroyed
Cost to taxpayers of mid-1980s outbreak	$65 million
Number of nations that have restricted U.S. poultry imports due to 2015 cases	30

Bird Flu One Health Challenges

Relationship to bird abundance and climate change?

Best way to perform ongoing monitoring and prediction?

Best way to assess human risk?

Tamiflu or Flu vaccine for workers?

How to coordinate efforts and share data in an integrated One Health approach?

Surveillance of Waterfowl

Wild bird surveillance continues and will be enhanced

1500 wild birds sampled in WA

Visit the Washington Department of Fish and Wildlife website for more information about wild birds and Avian influenza

http://wdfw.wa.gov/conservation/health/avian_flu/index.htm

Environmental Surveillance for Avian Influenza?

Photo courtesy of Christa Fagnant

Coccidioidomycosis: a One Health Challenge for the Pacific NW

Image courtesy of CDC

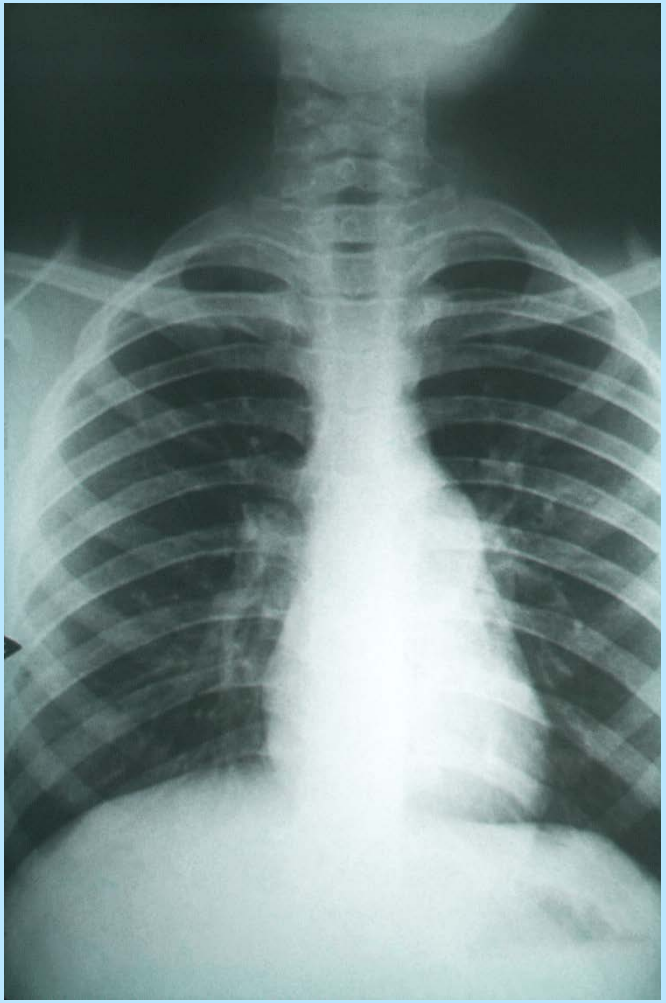
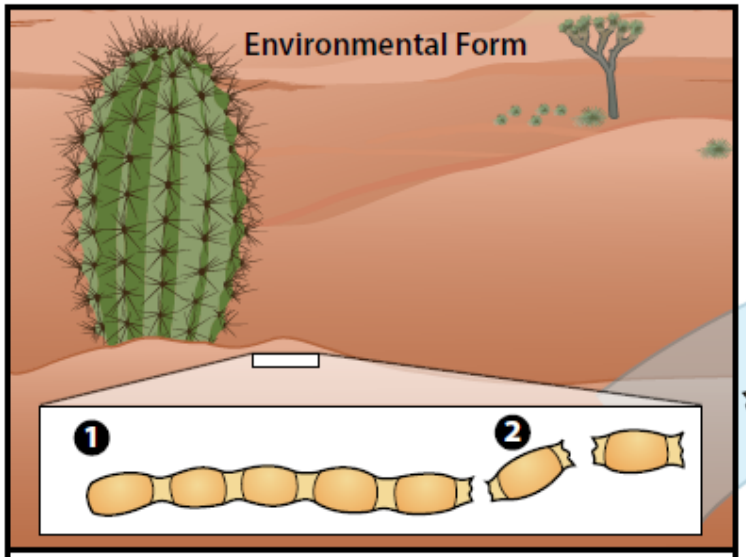
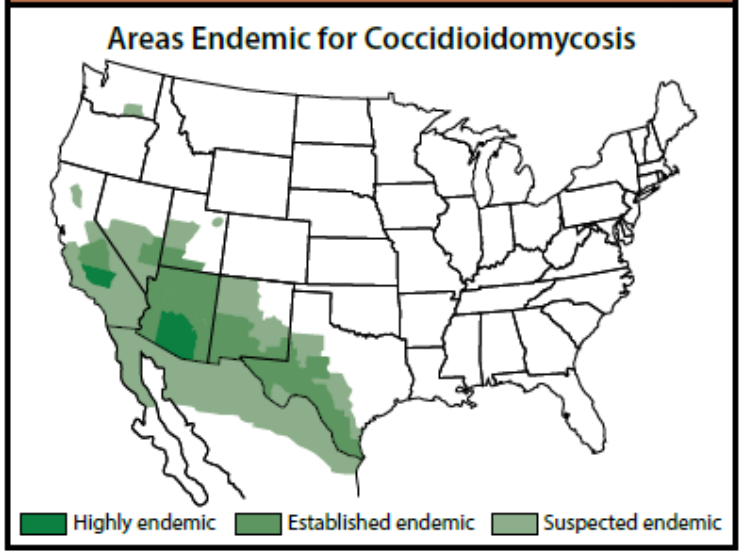
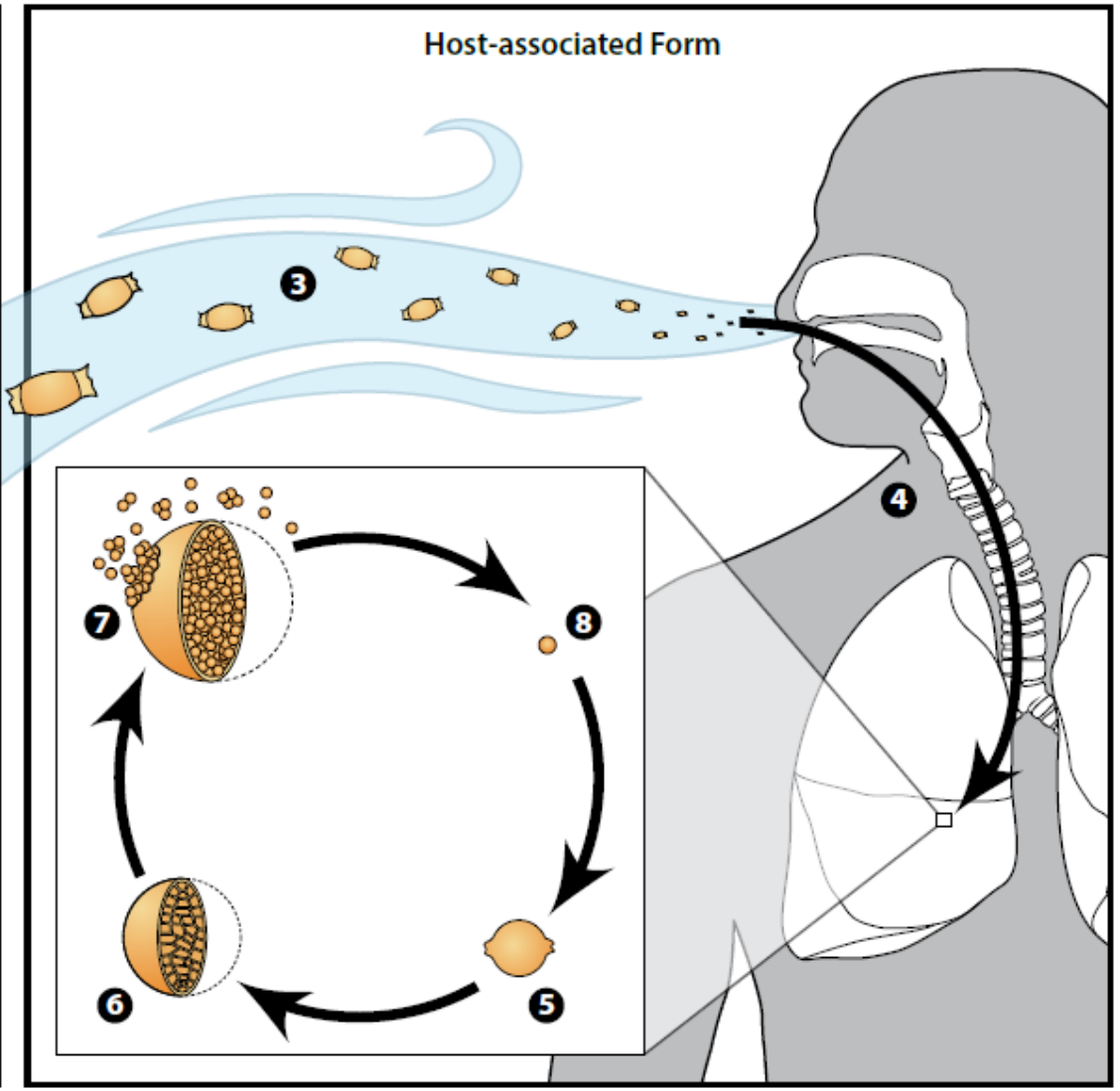


Image courtesy of CDC

Biology of Coccidioidomycosis

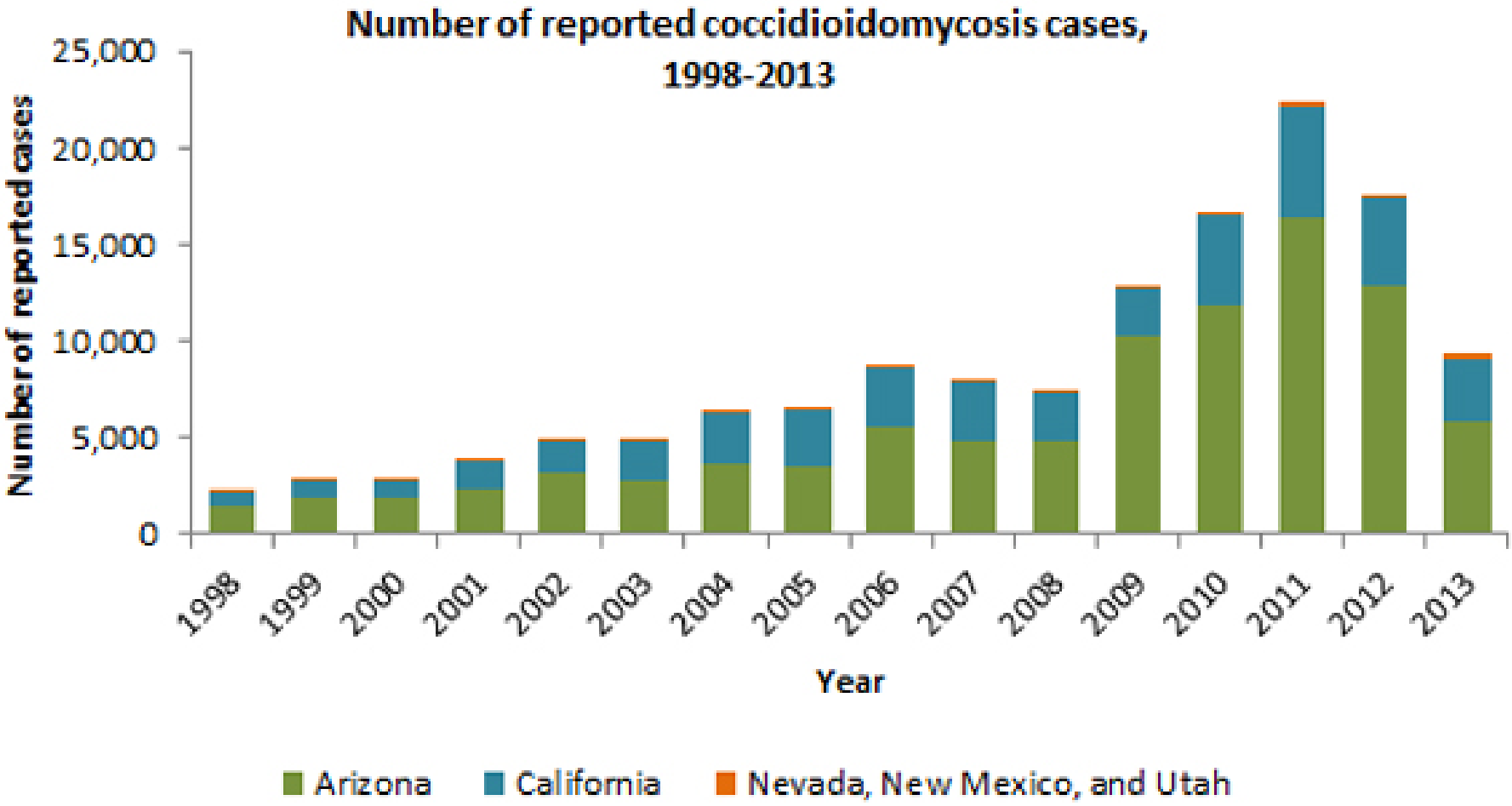






In the environment, *Coccioides spp.* exists as a mold (1) with septate hyphae. The hyphae fragment into arthroconidia (2), which measure only 2-4 µm in diameter and are easily aerosolized when disturbed (3). Arthroconidia are inhaled by a susceptible host (4) and settle into the lungs. The new environment signals a morphologic change, and the arthroconidia become spherules (5). Spherules divide internally until they are filled with endospores (6). When a spherule ruptures (7) the endospores are released and disseminate within surrounding tissue. Endospores are then able to develop into new spherules (6) and repeat the cycle.

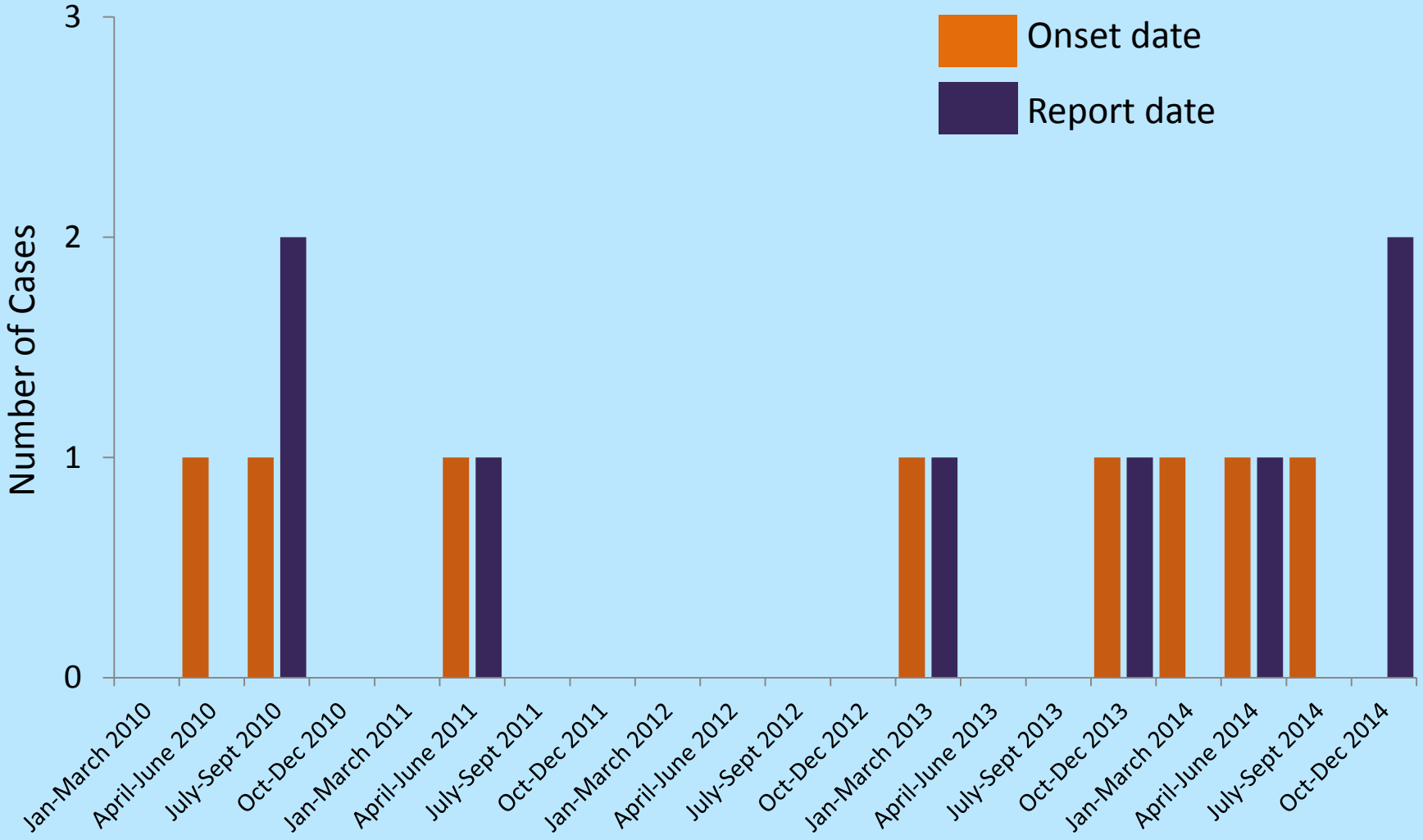
Coccidioidomycosis Cases



In Phoenix and Tucson, may account for 15-30% of community acquired pneumonias.

Source: CDC

Cases of Locally Acquired Coccidioidomycosis, WA State, 2010-2014



Source: Hanna Oltean, WA Dept. of Health

Cocci Case Examples

12 Year Old Boy

- June 1, 2010
- Chest pain, fever, difficulty breathing
- Regularly played and bicycled in a dirt canyon with native vegetation
- Only travel outside of WA was 2-day trip to CA in 2008

Animal Cases

- 1997-2012
- Two dogs and one horse
- Diagnosed culture-confirmed as coccidioidomycosis by Animal Disease Diagnostic Laboratory

Environmental Factors

Climate

Semi-arid environment

Average temperature -3°C to 31°C (0.5°C to 24.4°C)

Annual rainfall 18-20cm/year (5-50cm/year)

Climate change will likely impact the dry summer season (July-October), creating a more favorable environment for the coccidioides fungus.

Soil

- Use soil variables to create risk map

Wind Event in South Central WA

Courtesy of Wayne Clifford

Coccidioidomycosis: One Health Challenges

Image courtesy of CDC

Related to climate changes?

Is there a rodent reservoir?

Can dogs and other animals be “sentinels” for human risk?

What type of surveillance and prevention?

How to coordinate efforts and share data in an integrated One Health approach?

Recent Cocci Trainings in WA

- Attendance by human and veterinary health professionals
- Presentations by veterinarians, CDC, State health, local physicians
- Planning for environmental sampling and risk mapping
- Planning for human and animal surveillance

Question

What is the biggest factor leading to increasing antibiotic resistance?

A) Antibiotic use in human health care

B) Antibiotic use in industrial agriculture

Antibiotic Resistance: A One Health Issue

Question about role of animal agriculture

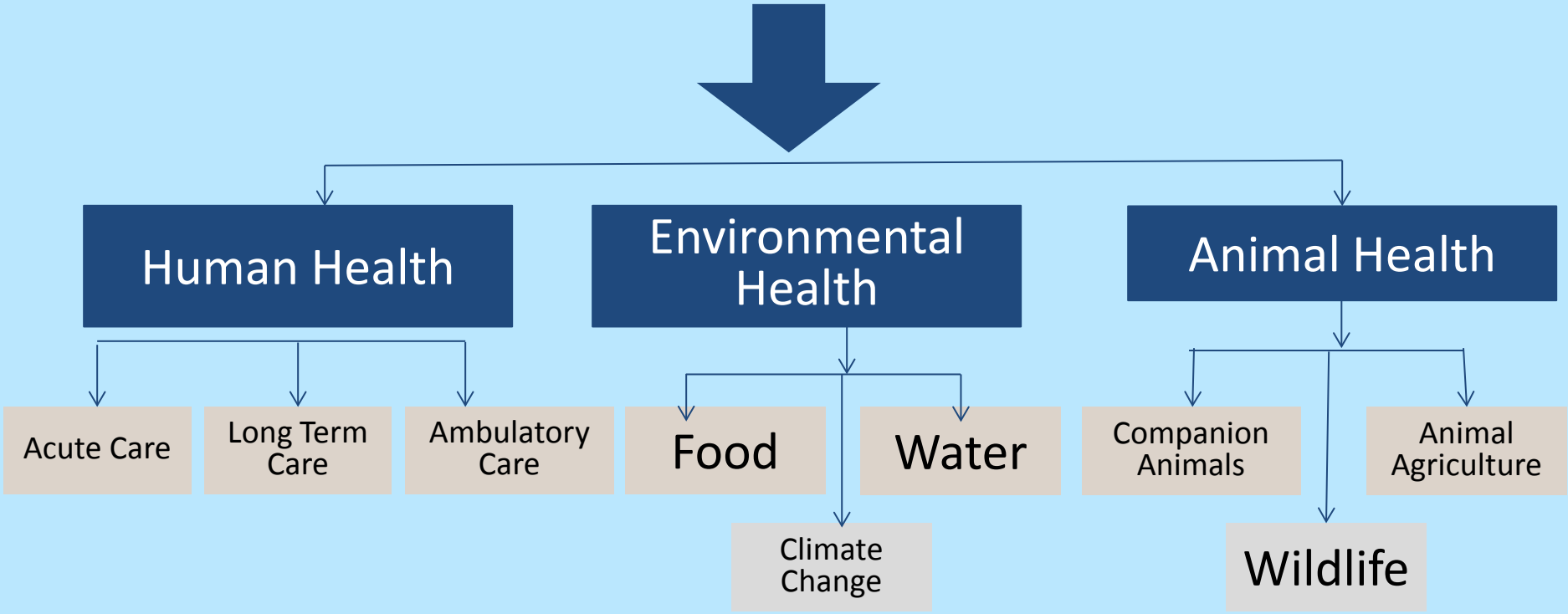
Recent FDA directives about use of antibiotics for growth promotion and veterinary oversight

Fall 2014 White House report calls for “One Health” approach to surveillance

NIAA white paper 11/14 calls for “shared antibiotic stewardship” across human and animal health

WA One Health Antimicrobial Stewardship Workgroup (Draft)

Identifies current work and gaps, and plans and coordinates future statewide activities, to promote AMS across the One Health spectrum



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Stewardship and Surveillance *(a sample)*

Sector	Systems for Antibiotic Stewardship	Current Systems for Surveillance		
Human Health Hospitals	Designated stewards; formulary restrictions; case reviews	Laboratory antibiograms		
Human Health: Outpatient	Insurance restrictions; continuing education; CDC Get Smart	Laboratory reports on antibiotic sensitivities		
Human Public Health	Education of providers	NARMS, public health laboratories		
Veterinary Public Health	Education of providers	NARMS, public health laboratories		
Animal Health: Companion Animal Practice	Programs at some veterinary colleges	Diagnostic laboratories provide antibiograms on veterinary request		
Animal Health: Agriculture	Species-specific judicious use programs; therapeutic use; adherence to withdrawal times; Guidance 209, 213 and Vet Feed Directive	USDA's Agriculture Research Service collects on-farm data to support NARMS		

Shared stewardship activities?

Shared surveillance activities?

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Antibiotic Resistance One Health Challenges

Surveillance

- How to track usage across sectors
- Assess impact of FDA directives

Shared Stewardship

- Sharing of best practices
- Integrated efforts: education, monitoring

Antibiograms

St. Elsewhere Medical Center

2012 Antibiogram

Isolates, Jan - Dec 2012

% Susceptible

% Susceptible for Gram-Positive Isolates

USE OF IN VITRO DATA MUST BE INTERPRETED IN REFERENCE TO CLINICAL STATUS, SITE OF INFECTION, AND PENETRATION OF THE ANTIMICROBIAL ANTIBIOTIC

Organism	# Strains (all/ blood)	ALL Isolates (from all patients & sources)								Blood Isolates (from all patients) *						
		Clindamycin	Doxycycline	Erythromycin	Oxacillin	Penicillin	Rifampin	Trimethoprimi-Sulfamethoxazole	Vancomycin	Ampicillin	Daptomycin	Linezolid	Oxacillin	Vancomycin	Gentamicin (SYN)	Streptomycin (SYN)
Staphylococcus aureus (all)	1473/ 107														--	--
Outpatient	781								100						--	--
Inpatient	461								100						--	--
ICU	231								100						--	--
Methicillin-resistant *S. aureus*	625/ 41															
Coagulase-negative staphylococcus§	1005/ 121															
Viridans group *Streptococcus* (sterile sites only)	37/ (10)									--	--	--	--	--	--	--
Enterococcus faecalis †	425/ 32														54	62
Enterococcus faecium ‡	94/ (12)														61	60

Examples of footnotes for gram-positive pathogens follow:
* Includes agents acceptable for treatment of bloodstream infection. ID consult is recommended for bloodstream infections due to gram-positive infections.
† 19% high-level resistance to both GEN SYN and STR SYN ‡ 44% high-level resistance to both GEN SYN and STR SYN
§ Excludes *S. lugdunensis* and *S. saprophyticus*
( ) Less than 30 isolates; susceptibility results are not provided

Source: http://www.azdhs.gov/phs/oids/hai/advisory-committee/documents/antimicrobial-stewardship/antibiogram-toolkit.pdf

Proposed WA State "Shared Antibiogram" across species:

Pathogen X: 2015: % of isolates susceptible (Data not accurate)

Antimicrobial agent	Humans	Beef cattle	Dairy	Broilers	Dogs	Cats	Environment
	%	%	%	%	%	%	%
Tetracycline							
Chloramphenicol							
Erythromycin							
Streptomycin							
Gentamicin							
Ciprofloxacin							
Nalidixic Acid							
Fully sensitive							
Multiresistant							
#isolates							
comparison to 2014:		0-5% increase					
		0-5% decrease					
		>5% decrease					

Future One Health Directions: WA State

- Look at real time prediction
- Look at toxic exposures
- Joint training and prevention

Reportable Diseases in Humans and Animals: WA

Diseases of Importance	WA State Dept. of Health	WA State Dept. of Agriculture	USDA National Veterinary Services Laboratories	WSU WADDL (Disease Surveillance Testing)	WA Department of Fish & Wildlife (Wildlife Health)
Amoebic meningitis	X				
Anaplasmosis	X	X		X	
Anthrax	X	X			
Atrophic rhinitis of swine		X			
Mycoplasma		X		X	
Babesiosis	X	X			
Piroplasmosis		X	X		
Bovine spongiform encephalopathy	X	X		X	
Bovine trichomoniasis		X		X	
Brucellosis	X	X	X		
Campylobacteriosis	X	X			
Caseous lymphadenitis		X		X	
Chagas disease	X				
Coccidioidomycosis	X	X			
Glanders	X	X			
Influenza	X	X	X		X
Johne’s disease (paratuberculosis)		X	X	X	
Leptospirosis	X	X	X		
Listeriosis	X	X			
Lyme disease	X	X			
Q fever	X	X			
Rabies	X	X	X		
Salmonellosis	X	X			
Scrapie		X	X		
Severe acute respiratory syndrome	X				
Tuberculosis (TB)	X		X		
Tularemia	X	X			
West Nile Virus	X		X		X

Arizona Reportable Diseases: Human and Animal

Disease	Human Reportable	Animal Reportable
Coccidioidomycosis	YES	NO
Leptospirosis	YES	YES
Plague	YES	NO
Rocky Mountain Spotted Fever	YES	NO
Tularemia	YES	NO

Acknowledgments

- WA One Health Steering Committee
- WA DOH
- WSDA
- Wayne Clifford
- Ron Wohrle
- Mindy Buswell
- Joe Baker
- Paul Kohrs
- Marisa D’Angeli
- Michael Park
- Scott Meschke
- Hanna Oltean
- Alex Kossick
- Christa Fagnant
- Heather Fowler
- Gemina Garland-Lewis
- Vickie Ramirez
- Sarah Cohen
- UW Center for Public Health Practice
- Others!