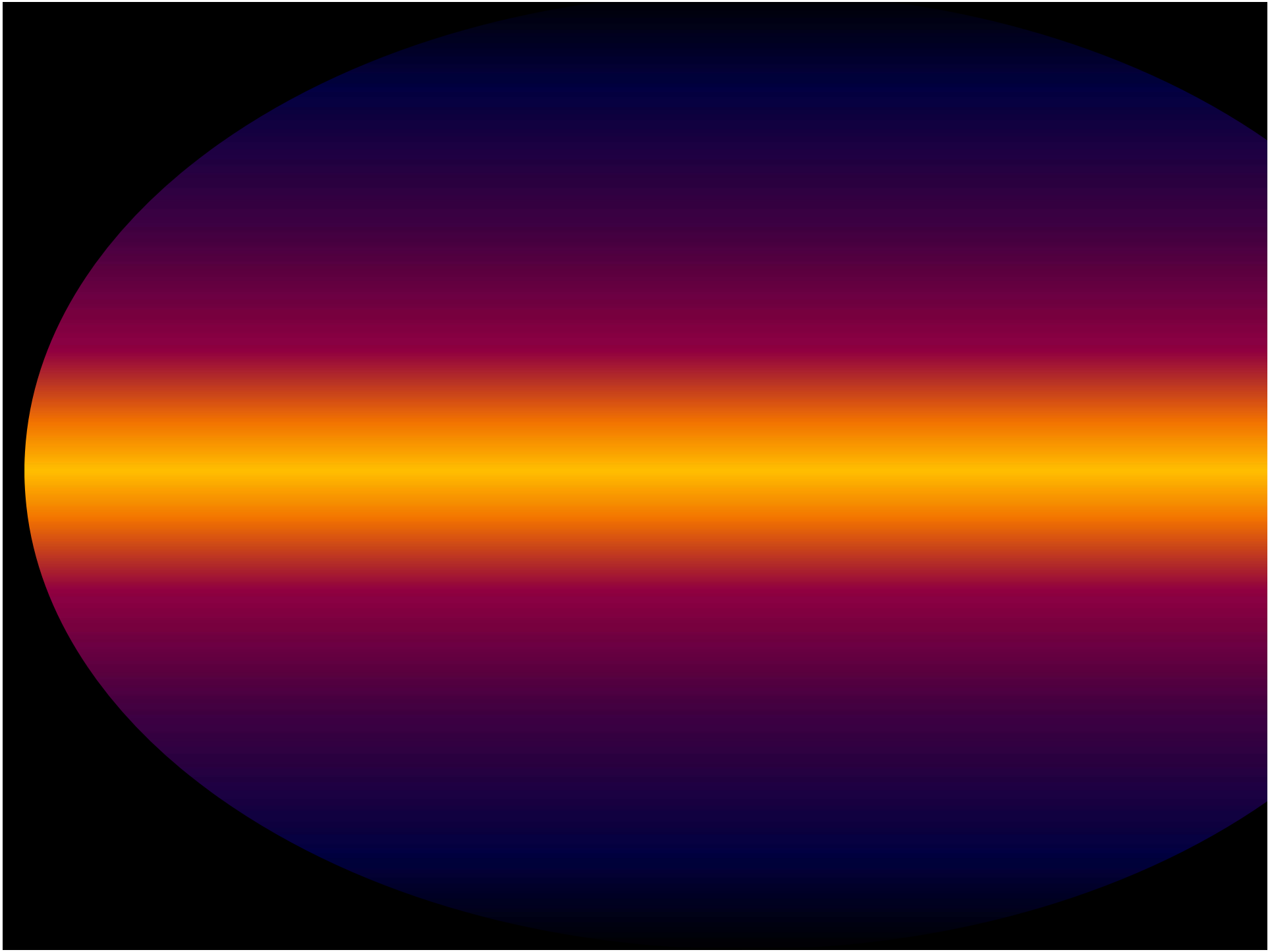
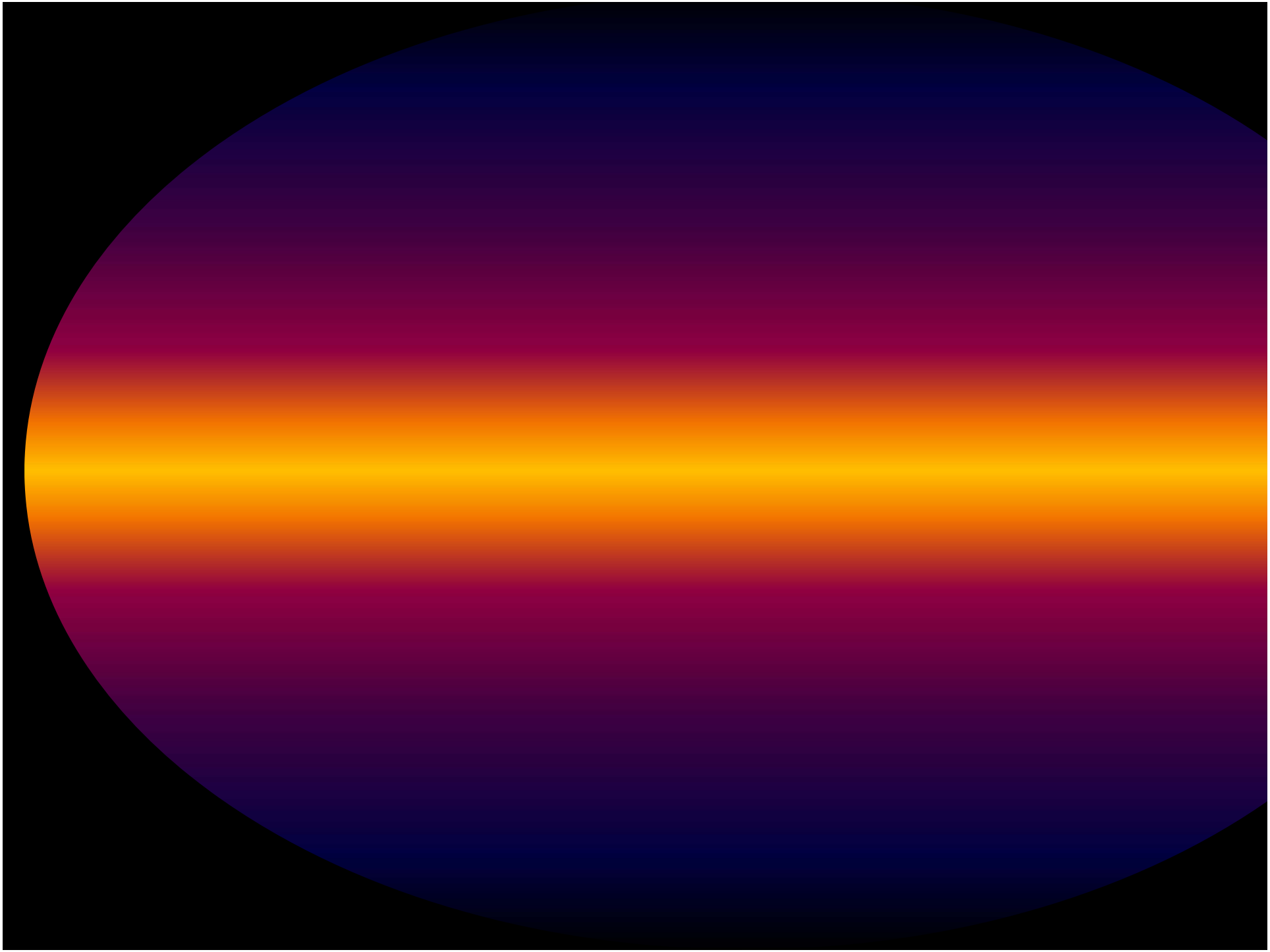


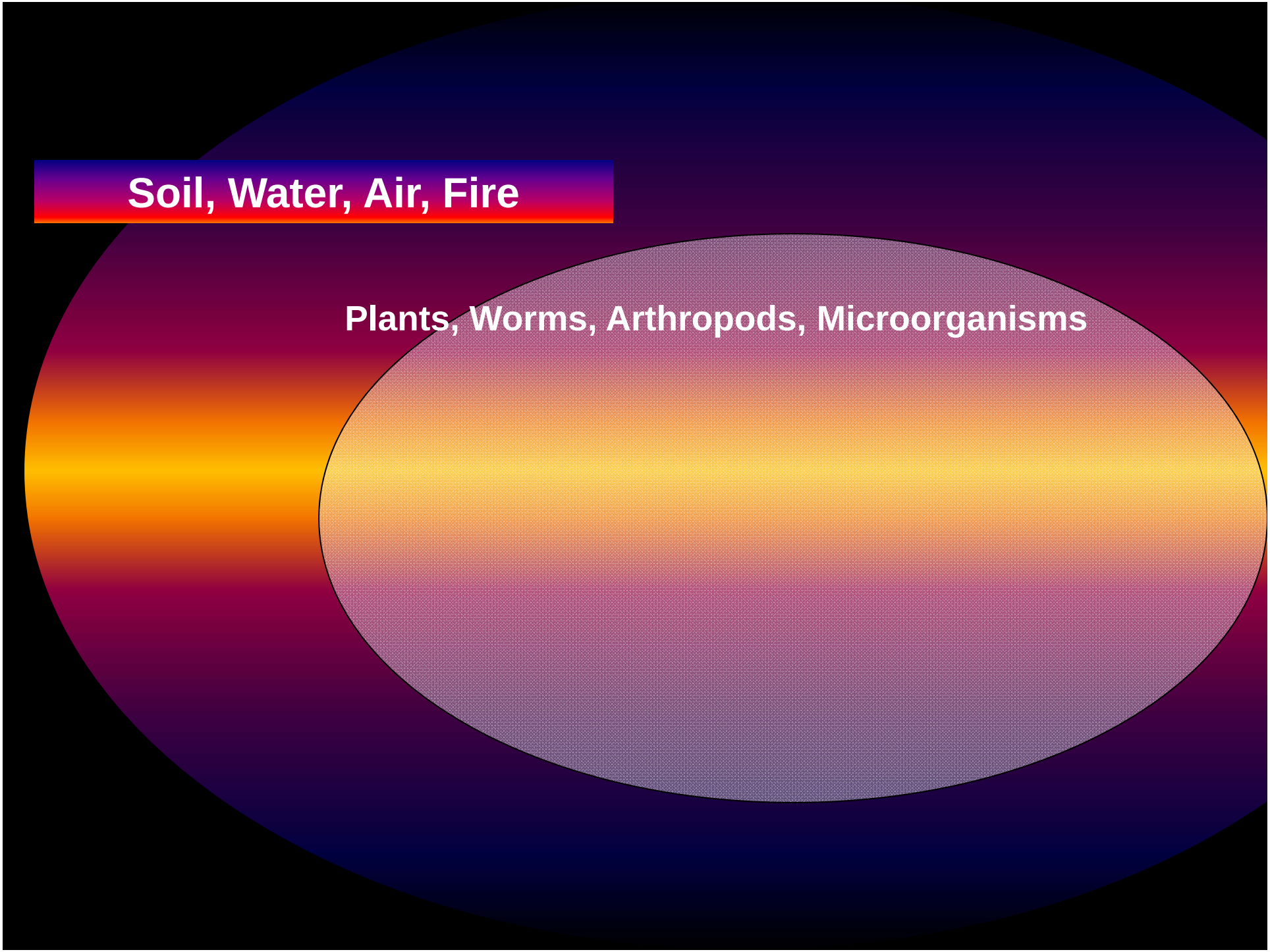
Interprofessional Integration & Sustainability of One Health in Education and Beyond

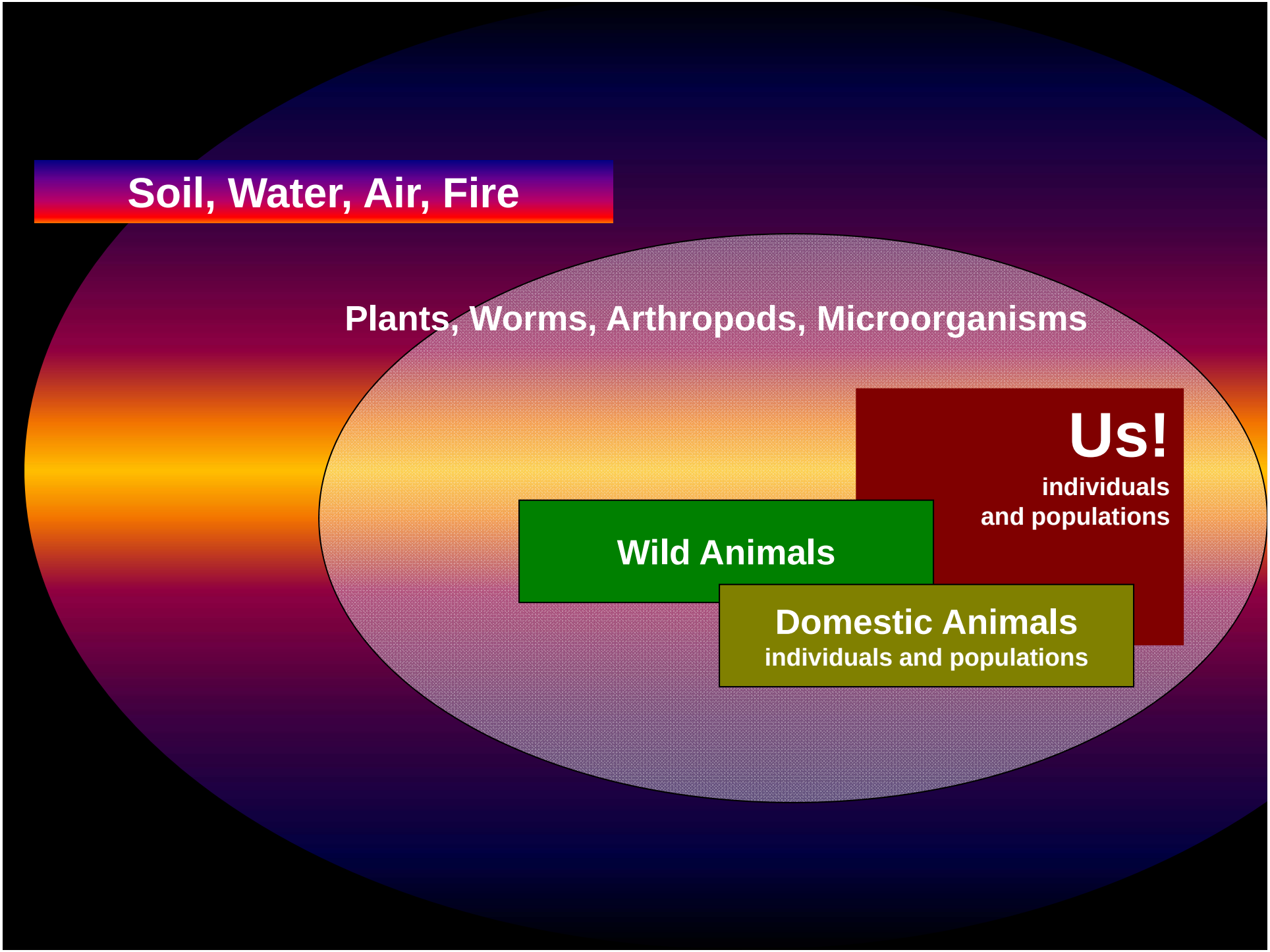
Kaja Abbas, **François Elvinger**, **Stephen Eubank, Jennifer Hodgson**, **Kathryn Hosig**, **Cynda Johnson, Thomas Kerkering**, **Leigh-Anne Krometis**, **Susan Marmagas**, **Margaret O'Dell**, **William Pierson**, **Kerry Redican**, **Gerhardt Schurig**, **Peter Vikesland**, **Jocelyn Widmer**

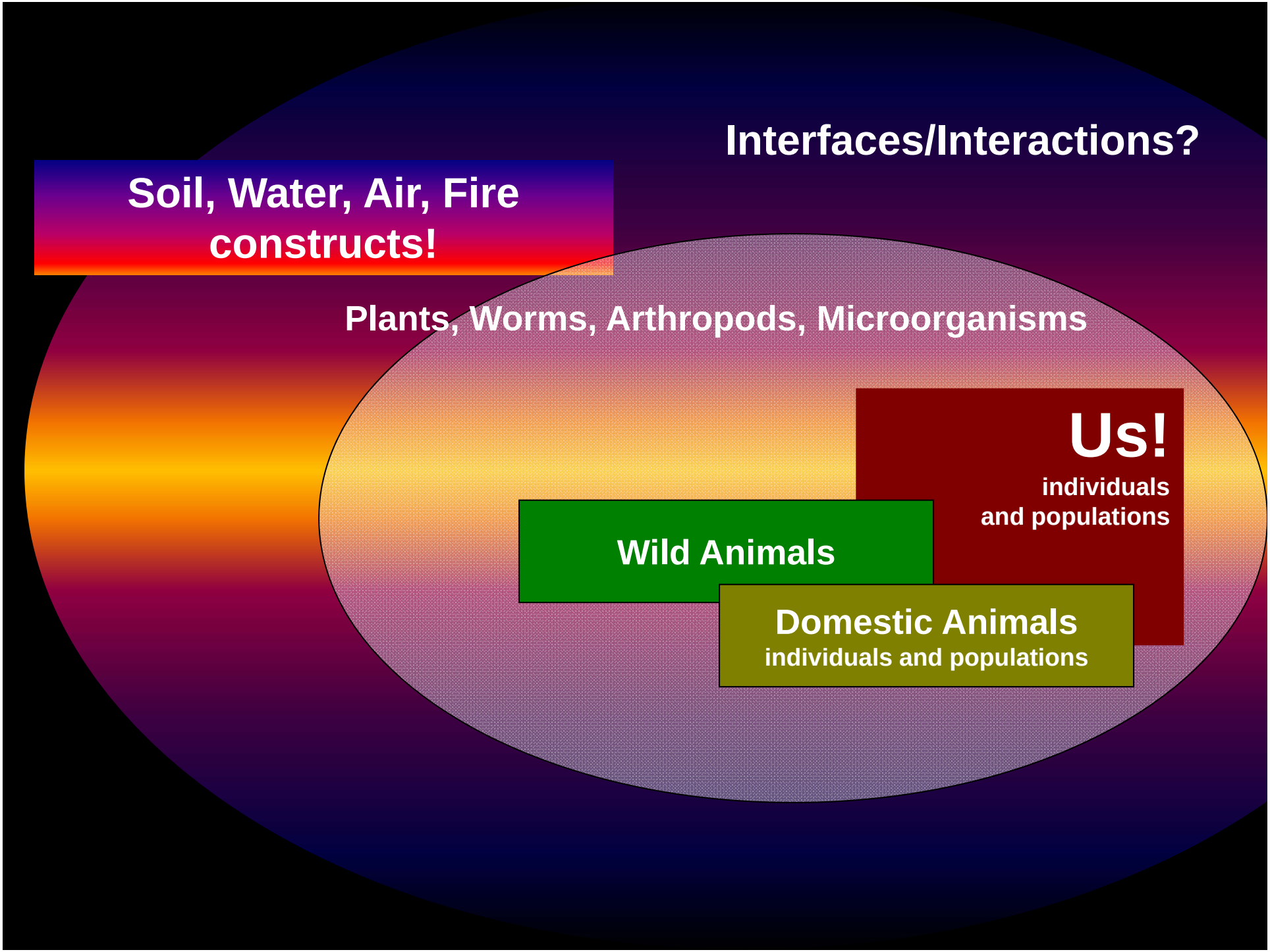
VirginiaTech



Soil, Water, Air, Fire


Soil, Water, Air, Fire
Plants, Worms, Arthropods, Microorganisms


Soil, Water, Air, Fire
Plants, Worms, Arthropods, Microorganisms
Us!
individuals
and populations
Wild Animals
Domestic Animals
individuals and populations


Interfaces/Interactions?
Soil, Water, Air, Fire constructs!
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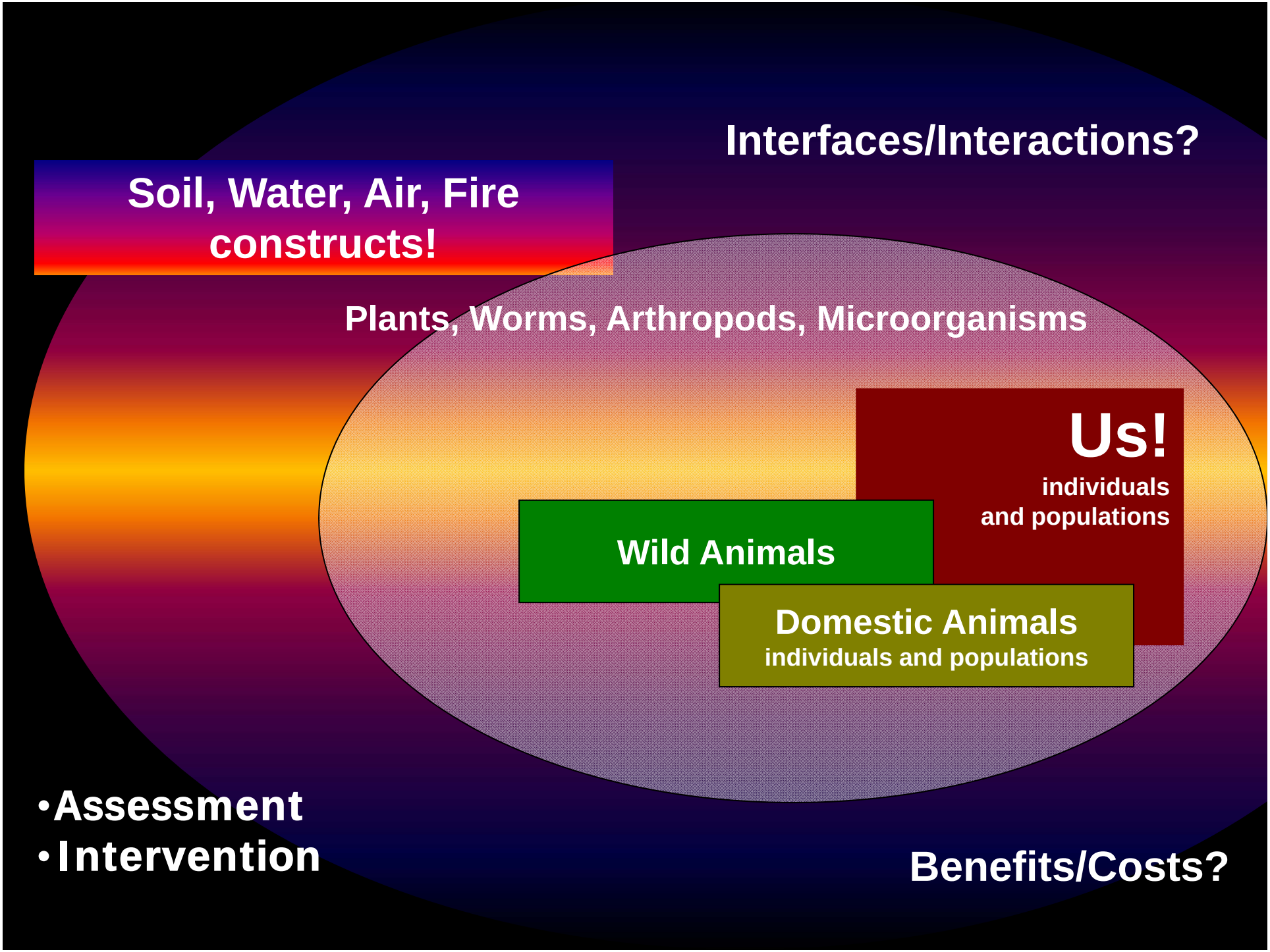
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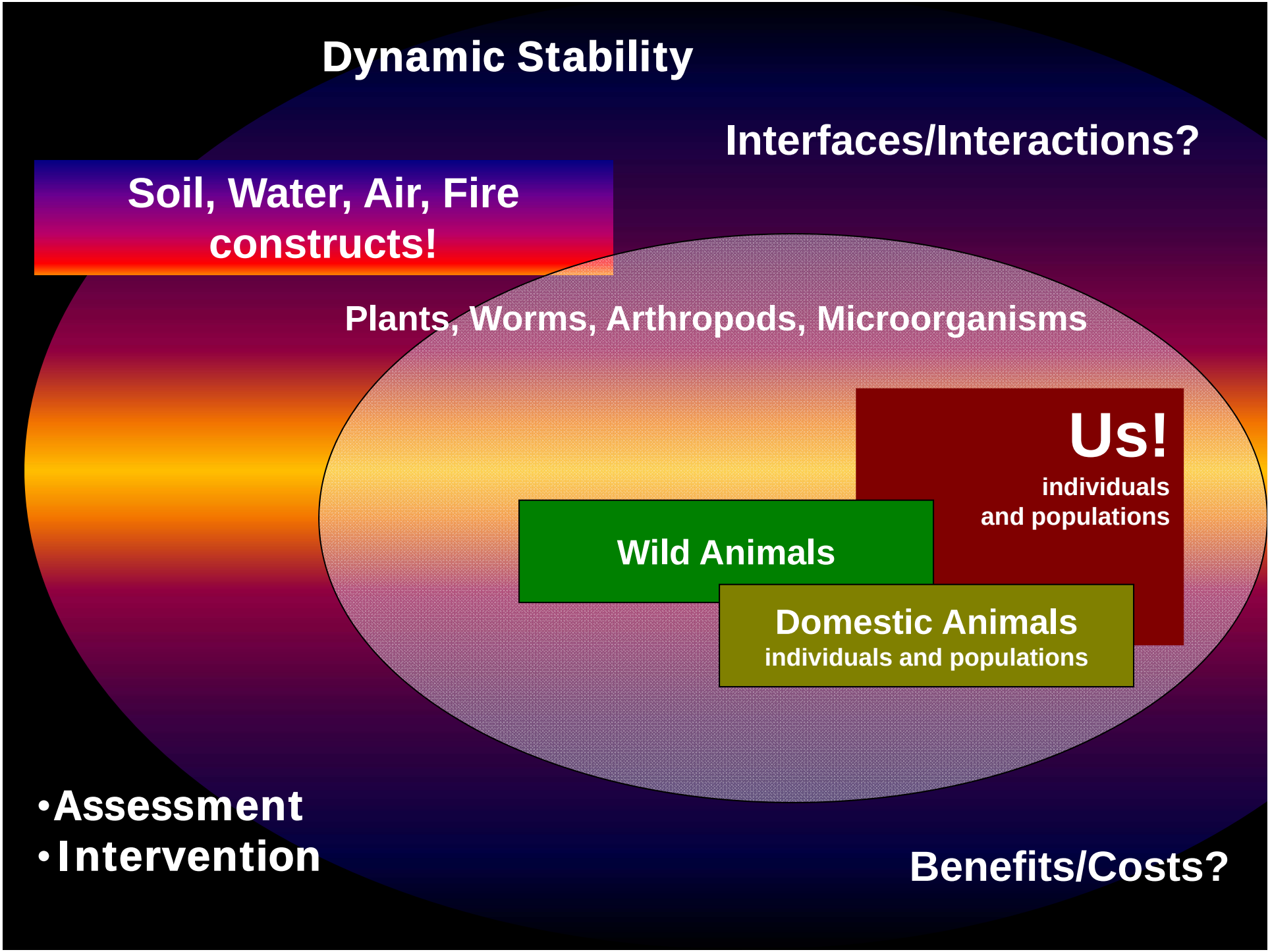
•Assessment
•Intervention
Benefits/Costs?


Dynamic Stability
Interfaces/Interactions?
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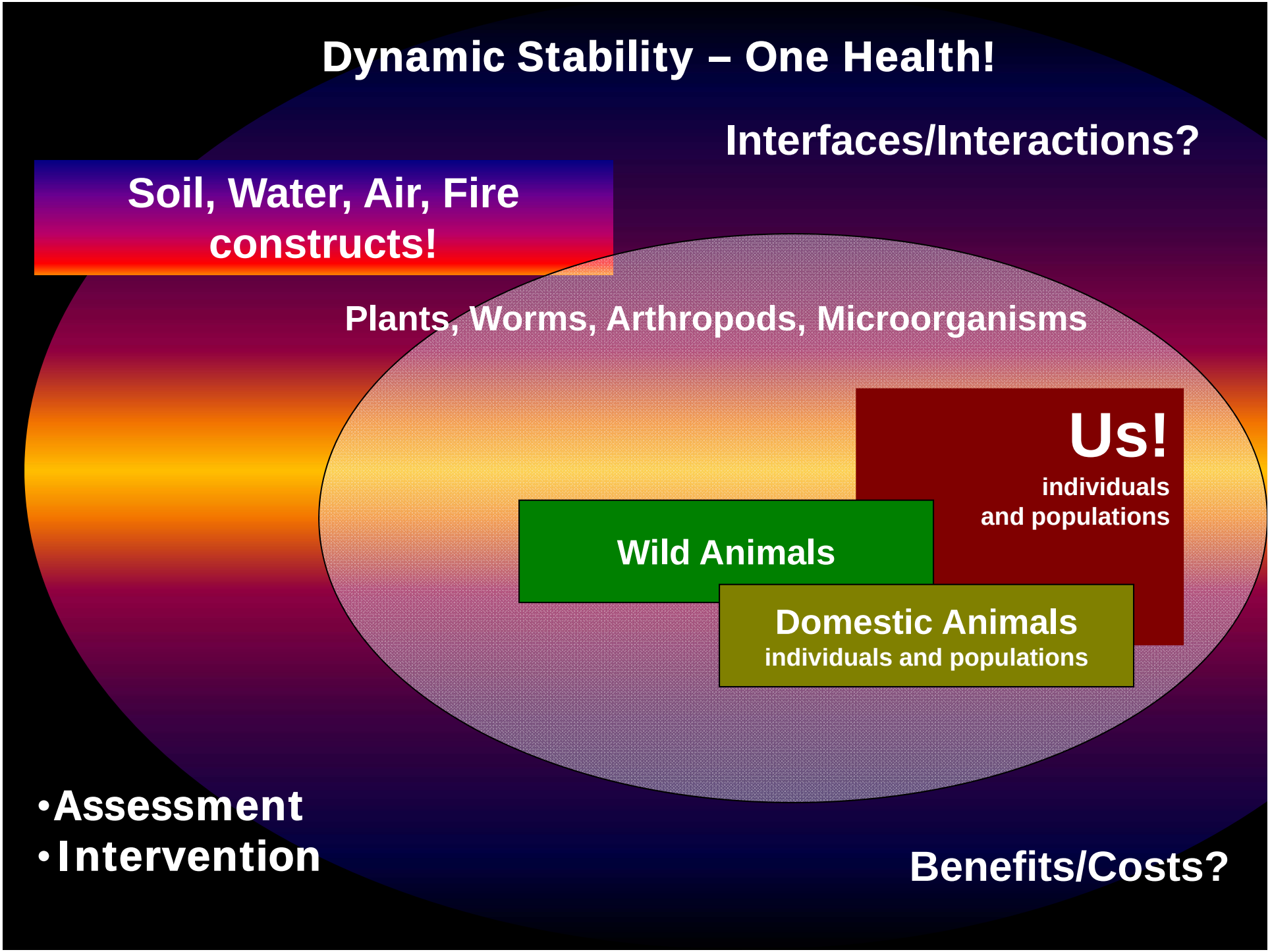
Dynamic Stability – One Health!
Interfaces/Interactions?
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Plants, Worms, Arthropods, Microorganisms
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Wild Animals
Domestic Animals
individuals and populations
•Assessment
•Intervention
Benefits/Costs?

One Health

One Health recognizes the dynamic interdependence of human, animal, and environmental health, and encompasses the interdisciplinary efforts of medical, veterinary, public health and environmental professionals to protect, promote, and improve health.

Virginia Tech VMRCVM Population Health Group

One Health – the Disciplines and Topics …

Incomplete, alphabetic order (no importance rank), with overlaps and interdependencies

- **Agriculture** (land use and sustainability)
- **Animal welfare**
- **Antimicrobial resistance**
- **Biomedical and translational research**
- **Economics of health and disease**
- **Environmental burden of human and animal 'activities'**
- **Food quality, production, protection, safety, security** } Water!
- **Global health**
- **Human-animal bond** (companion, service, production, entertainment and culture)
- **Infectious diseases (emerging)**
- **Movement and trade**
- **Occupational health**
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- **Public policy and regulation**
- **Preparedness** (diagnostics, surveillance, response, mitigation, continuity of ops)
- **Toxins**
- **Urban planning, built environment**
- **Wildlife** (interaction, incursion in space and time, cohabitation)
- **Zoonoses**

… and others

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- **Zoonoses**

Systems!

… and others

One Health – the Cast …

The enviros –
Leigh Anne Krometis
Susan Marmagas
Peter Vikesland
Jocelyn Widmer

The physicians –
Cynda Johnson
Tom Kerkering
Molly O'Dell

The others –
Kaja Abbas
Stephen Eubank
Kathy Hosig
Kerry Redican

The vets –
François Elvinger
Jennie Hodgson
Bill Pierson
Gerhardt Schurig

… and others!





One Health







Virginia-Maryland Regional College of Veterinary Medicine

VirginiaTech
Invent the Future
Institute for Society, Culture and Environment

Center for Public Health Practice and Research

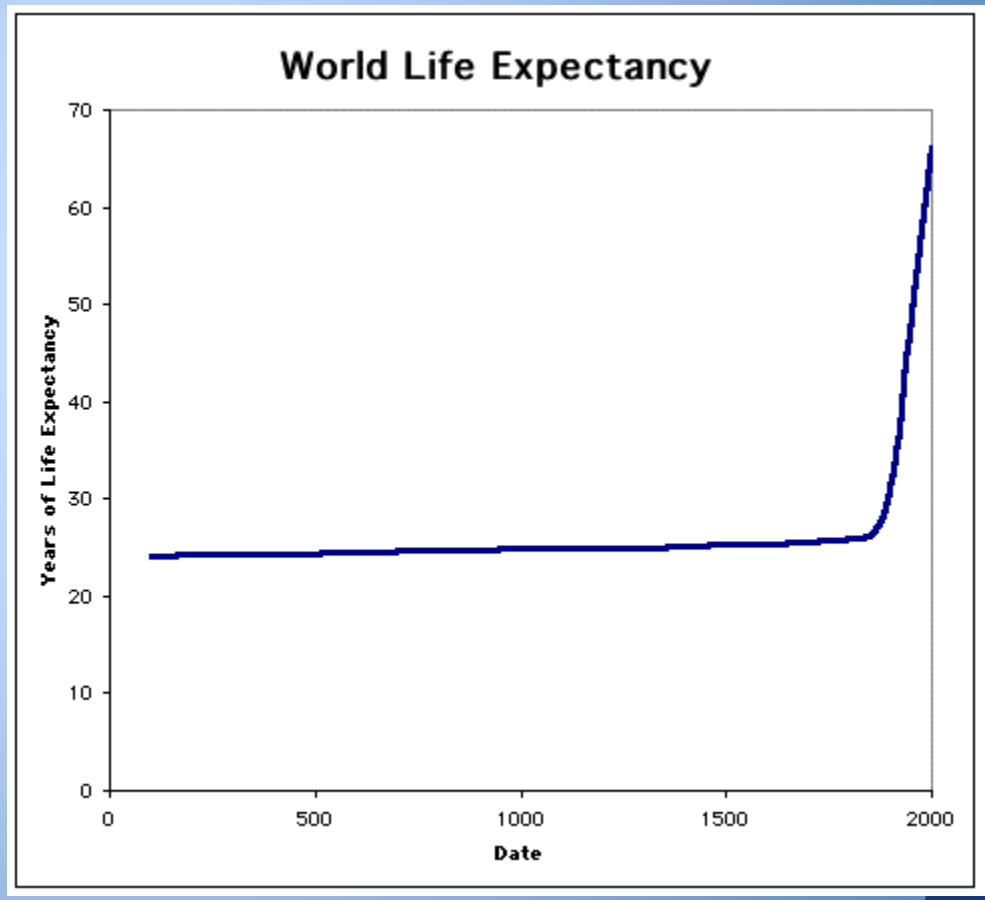
Dr. Abbas

One Health

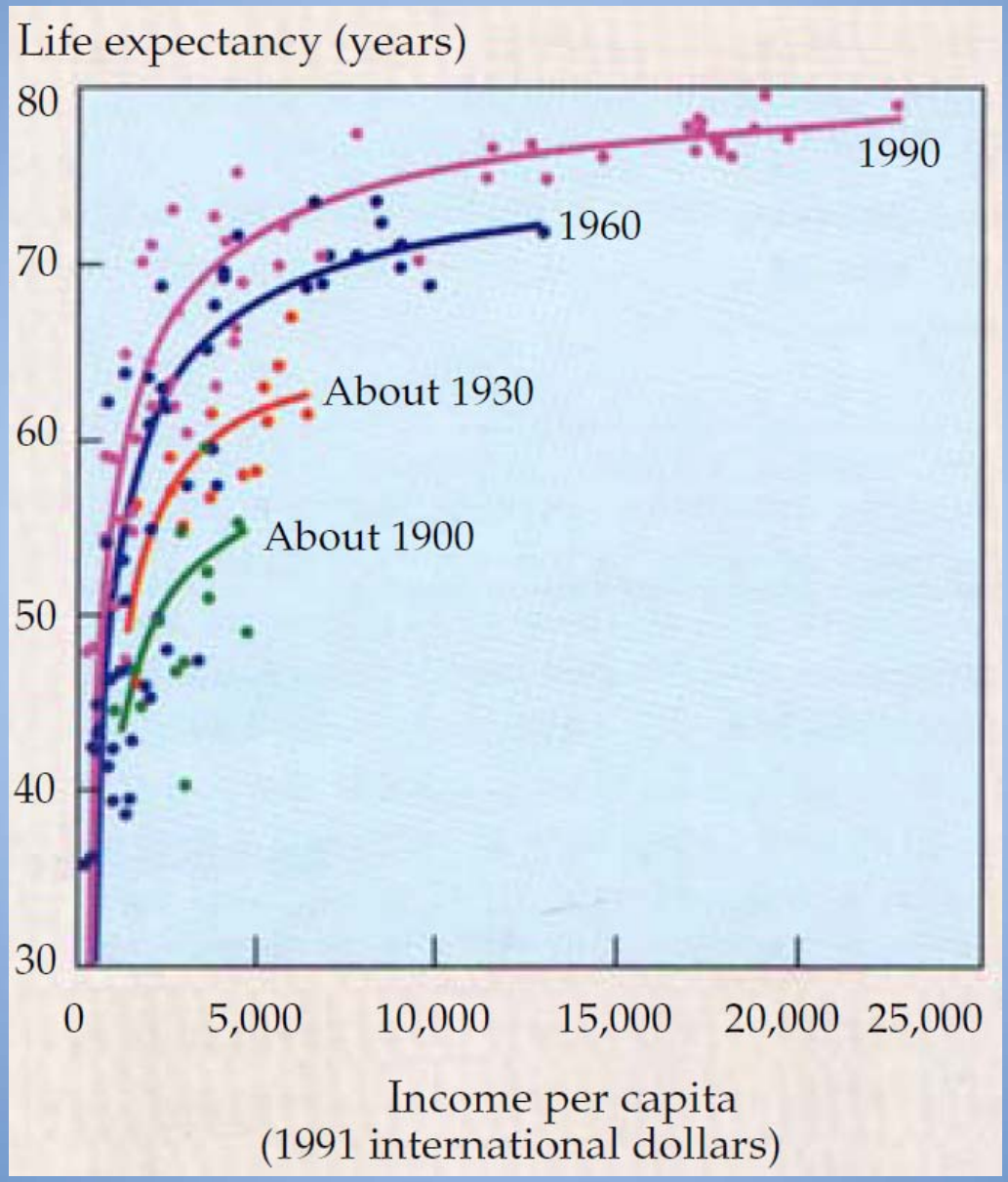
Systems Perspectives on Competency Based Curriculum & Interprofessional Education

Health revolution of 20th century

- Life expectancy
  - 10,000 BC - 1820
    - ~ 25 years
  - 1900
    - ~ 31 years
  - 2000
    - ~ 64 years
  - 2013
    - ~ 68 years

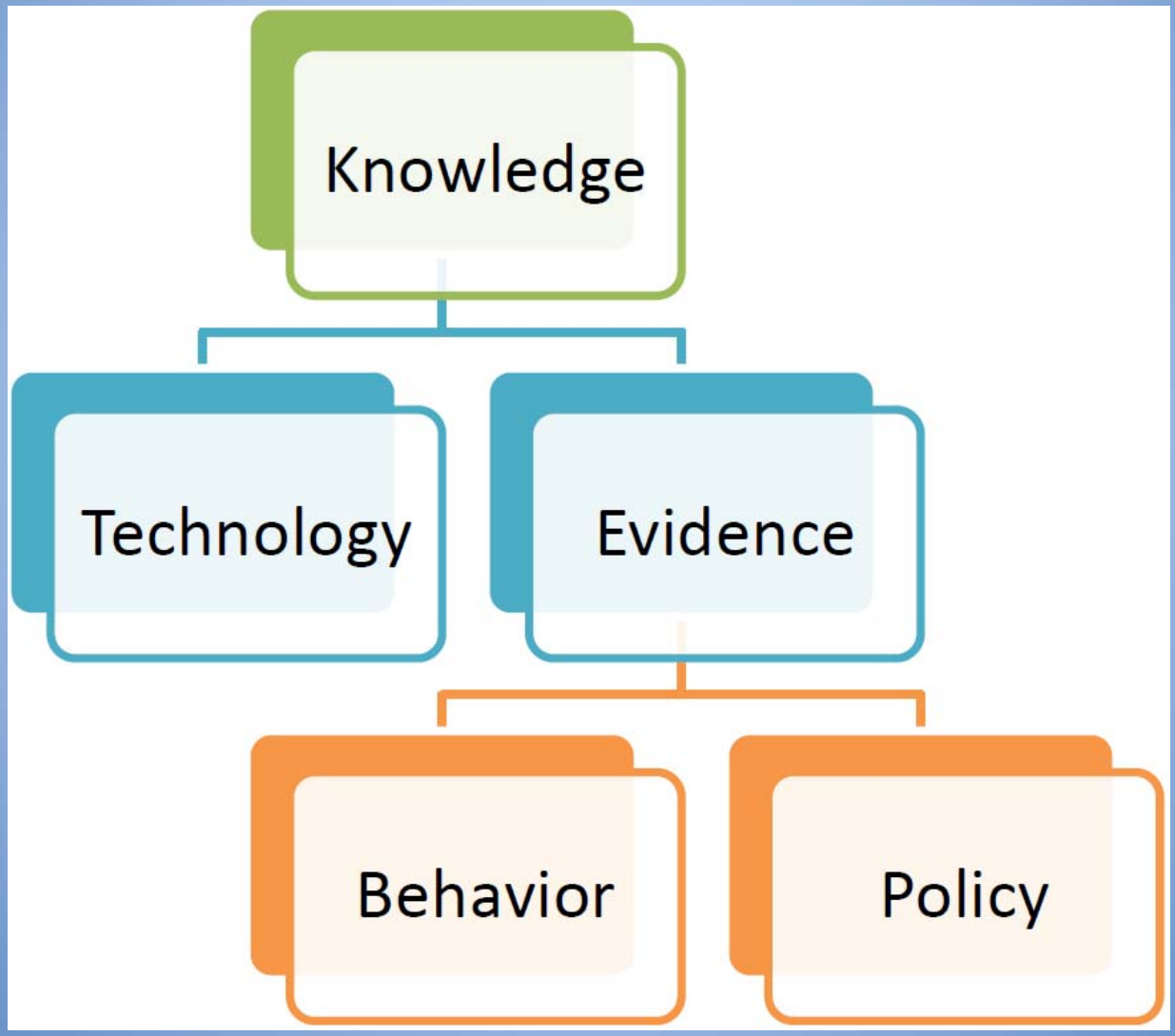


Life expectancy, income per capita, by decade



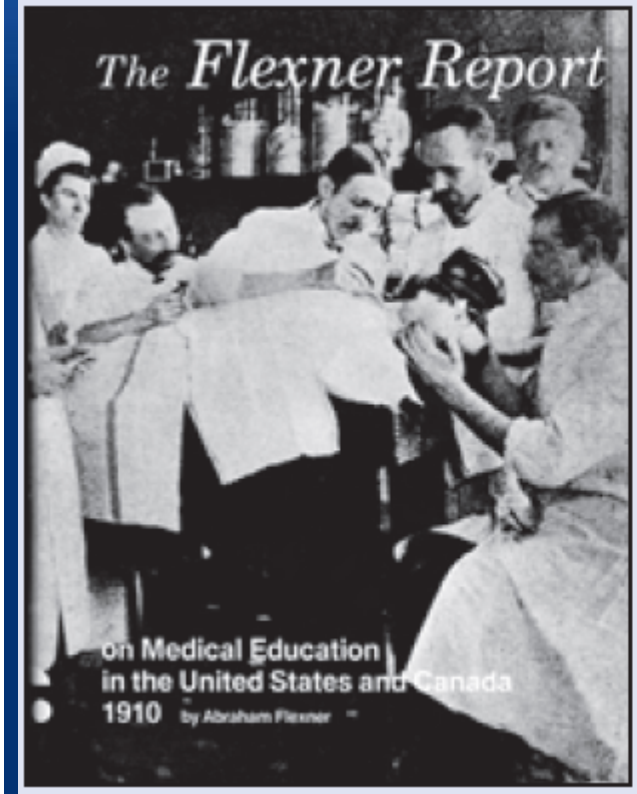
Source: Preston et al, World Bank Data

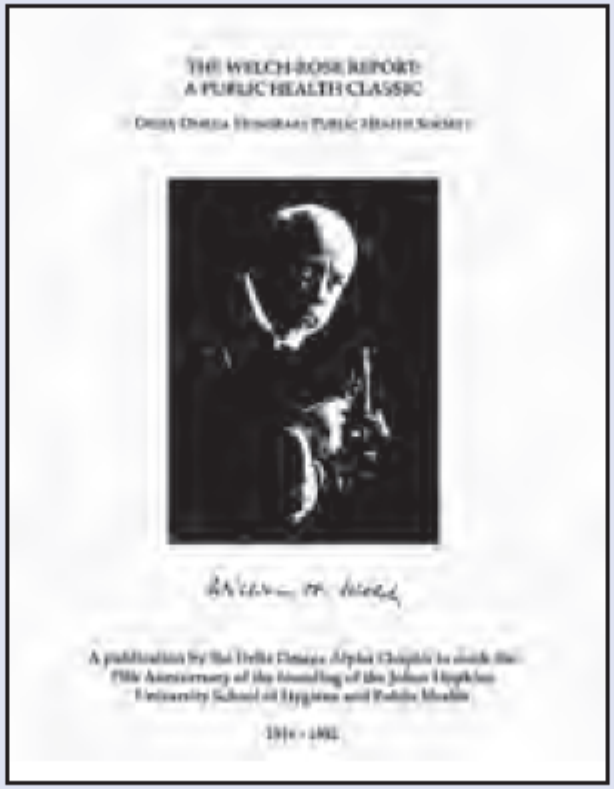
Knowledge to improve health

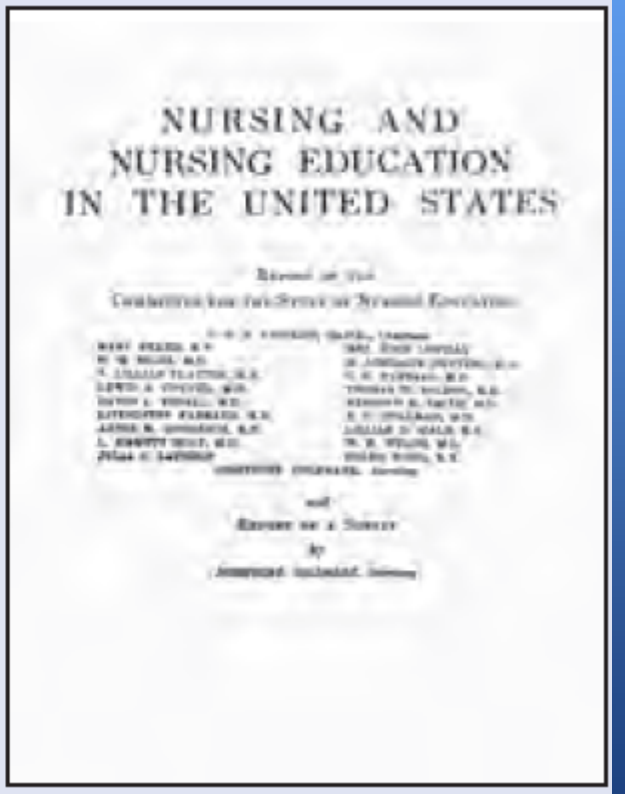


Courtesy of Julio Frank

Flexner report (1910) - Medicine
Welch-Rose report (1915) - Public Health
Goldmark report (1923) - Nursing







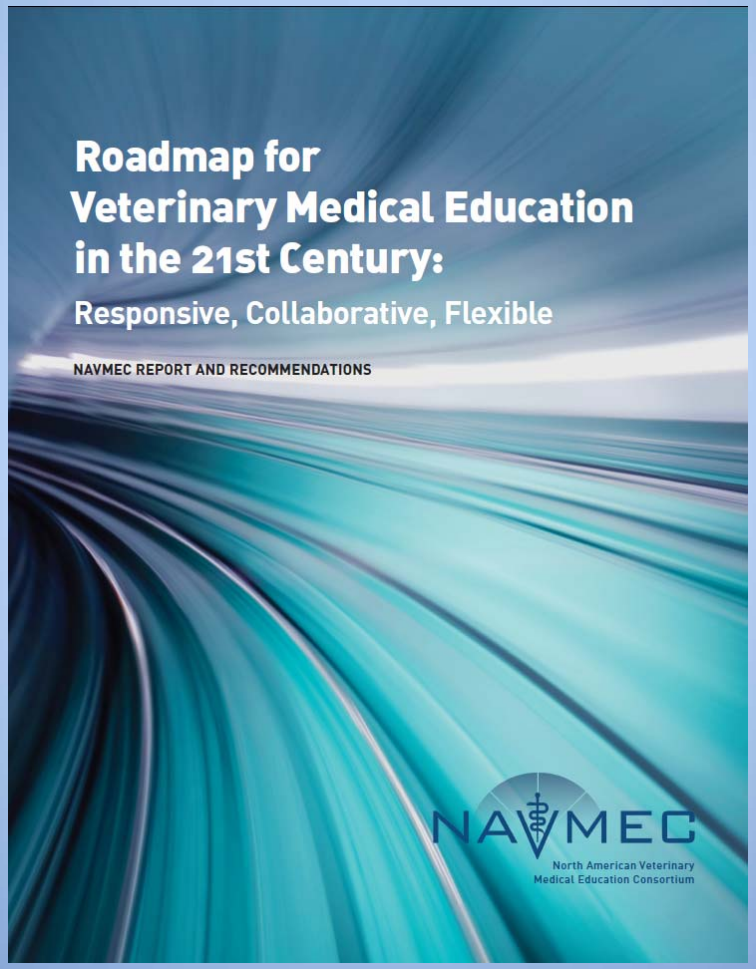
Health Professionals for a New Century:
Transforming Education to Strengthen Health Systems in an Interdependent World

http://www.healthprofessionals21.org/

Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, Fineberg H, Garcia P, Ke Y, Kelley P, Kistnasamy B, Meleis A, Naylor D, Pablos-Mendez A, Reddy S, Scrimshaw S, Sepulveda J, Serwadda D, Zurayk H. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010 Dec 4;376(9756):1923–1958. PMID: 21112623

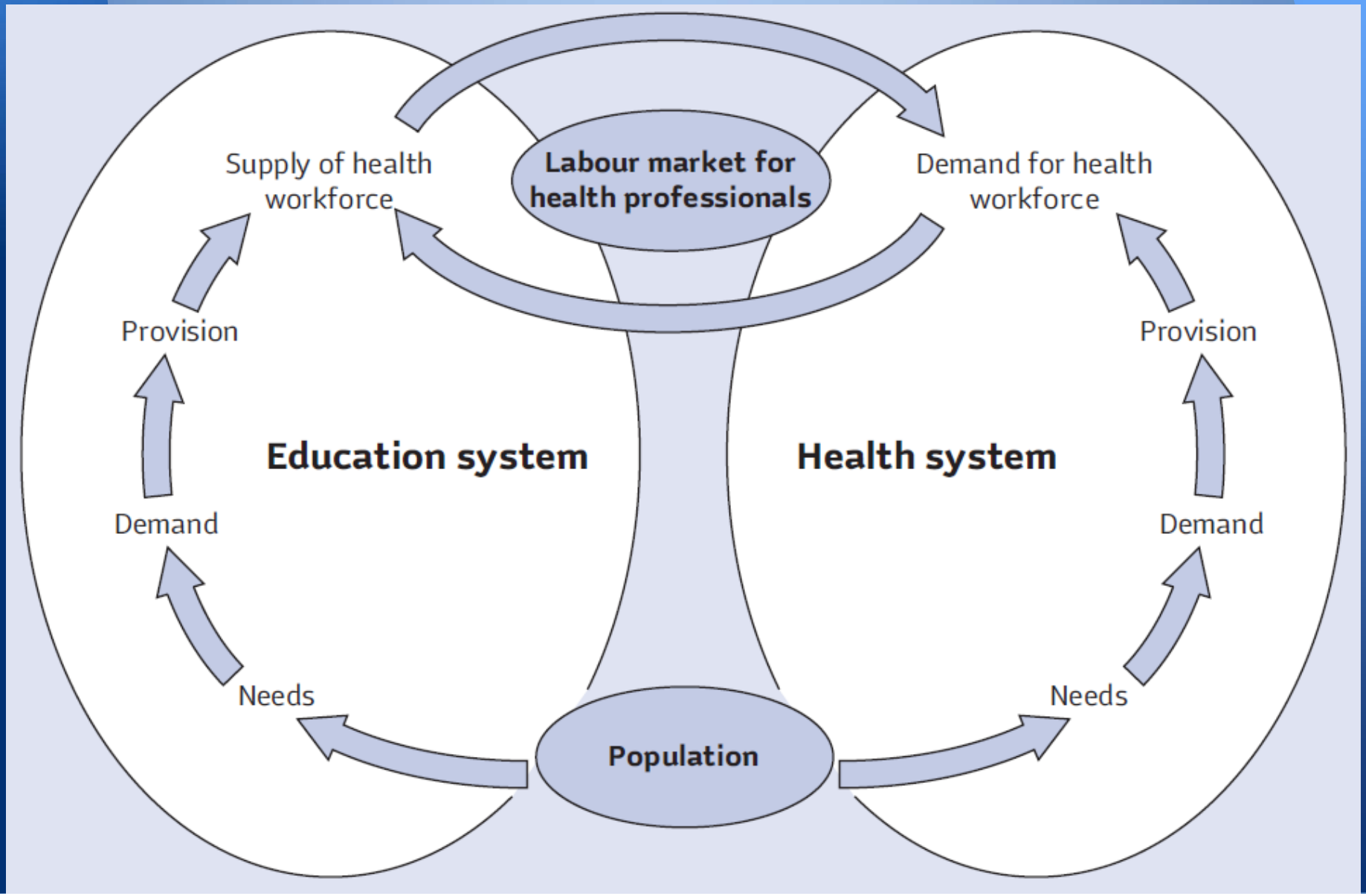
Roadmap for Veterinary Medical Education in the 21st Century — Responsive, Collaborative, Flexible

http://www.aavmc.org/roadmap



North American Veterinary Medical Association Consortium. Roadmap for Veterinary Medical Education in the 21st Century - Responsive, Collaborative, Flexible. NAVMEC Report and Recommendations.

Systems framework of education & health



Proposed reforms

Instructional reforms

1. Adopt a competency based curriculum
2. Promote interprofessional and transprofessional education
3. Exploit the power of IT for learning
4. Harness global resources and adapt locally
5. Strengthen educational resources
6. Promote new professionalism
7. Establish joint planning mechanisms

Institutional reforms

8. Expand from academic centers to academic systems
9. Link through networks, alliances, and consortia
10. Nurture a culture of critical inquiry

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Health disciplines

How to diffuse knowledge across multiple disciplines?

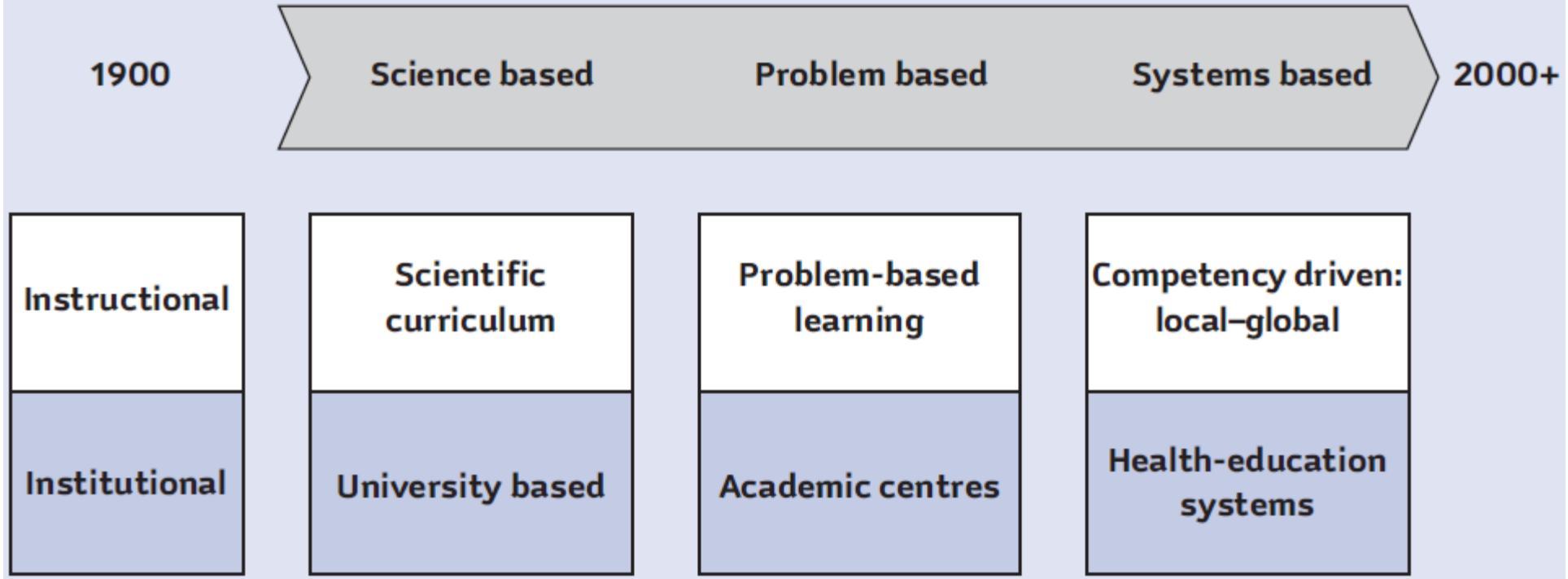
- Human medicine (& nursing)
  - prevention and *treatment* of human diseases
- Veterinary medicine
  - *prevention* and *treatment* of animal diseases
- Public health
  - (*human* & animal) disease *prevention*
  - *health promotion*
- Engineering
  - *technology* to improve human & animal health
- ... & more disciplines ...

Health professional

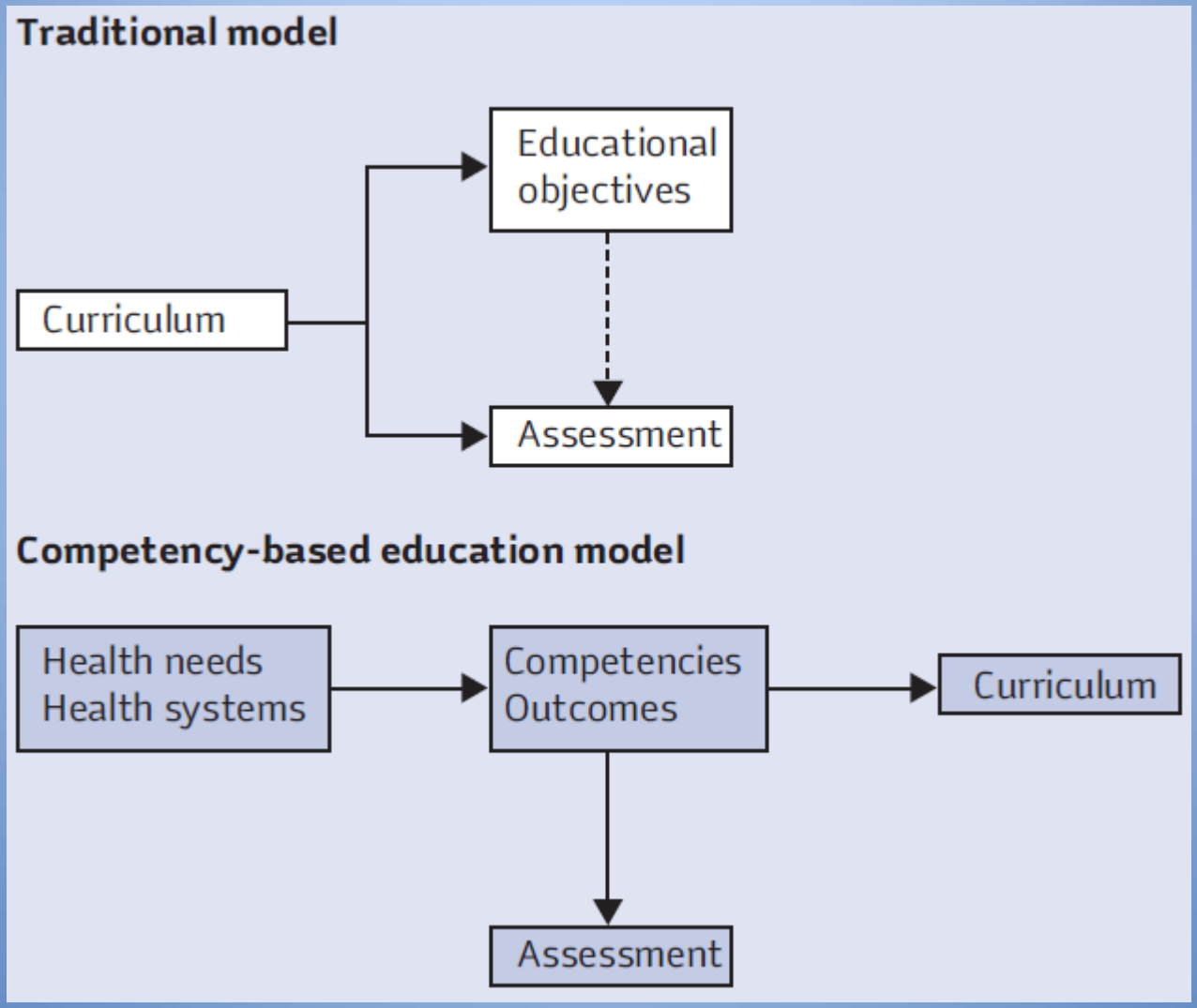
Why provide interprofessional education?
Enhanced knowledge to improve health

- Norm
  - knowledge expertise & skills in a silo discipline
    - human medicine
    - veterinary medicine
    - nursing
    - public health
    - engineering
    - … & more …
- 21st century
  - knowledge expertise & skills in a silo discipline
  - effective *team* member
    - communicate & collaborate across disciplines

Three generations of reform



Competency-based education



Case study

- Competency-based education
- Interprofessional education
- New course
  - Modeling infectious diseases in humans & animals
    - public health program
    - Virginia Tech
    - spring 2014

Health system needs?

- CDC
  - 2009 influenza pandemic
    - Interpret findings from modeling studies published in academic journals.
    - Develop an in-house team to develop virtual models to understand infectious disease epidemiology and economics.
      - recommend implementation of effective interventions
    - Communicate to wide range of audience
      - policy makers
      - community
- *How to provide education in modeling infectious diseases to address this health system need?*
  - public health departments
    - international, national, state, local

Modeling infectious diseases in humans & animals

New course (Spring 2014)

Competencies

1. Critically evaluate scientific articles in mathematical modeling of infectious diseases.
2. Develop computer models to simulate infectious disease epidemics and prevention interventions.
3. Communicate scientific findings effectively to interdisciplinary audience.

Curriculum

- Journal club
- Systematic review
- Labs
- Project
- Report & presentation
- Systematic review & project

Modeling infectious diseases in humans & animals

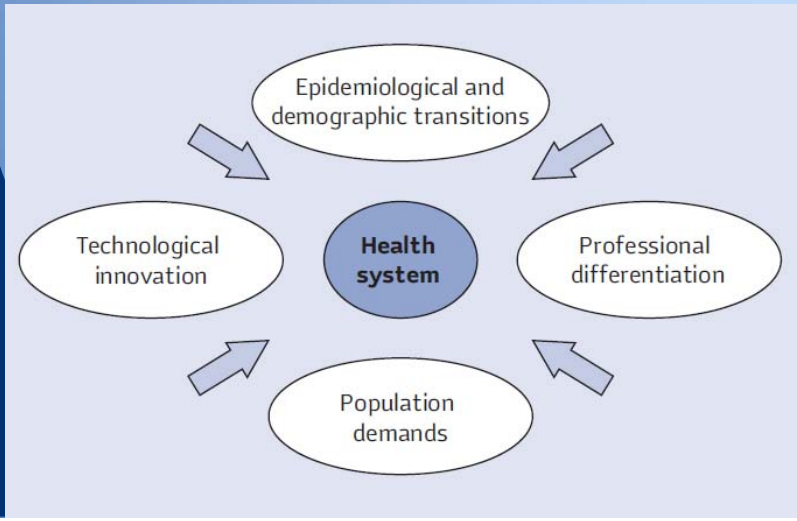
Team taught course

- Faculty
  - 7 faculty members
- Research focus
  - modeling infectious diseases
- Formal training
  - computer science
  - ecology, virology, pathology
  - epidemiology
  - genetics, bioinformatics & computational biology
  - human medicine (guest speaker)
  - physics
  - public health
  - mathematics
  - mechanical engineering
  - veterinary medicine
- Students (9)
  - public health graduate level
- Backgrounds
  - biology
  - biochemistry
  - engineering
  - (human medicine)
  - veterinary medicine
  - wildlife science
- Semester course
  - 3 credits

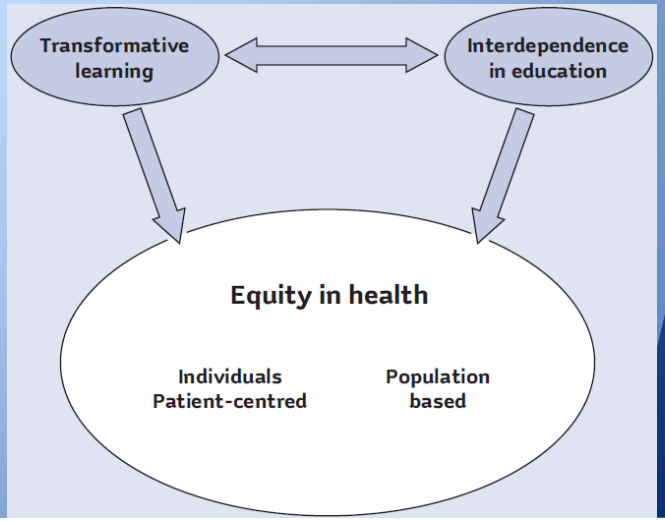
Key messages

	Objectives	Outcome
Informative	Information, skills	Experts
Formative	Socialisation, values	Professionals
Transformative	Leadership attributes	Change agents

- **Competency-based education**
  - Education of health professionals has to adapt to the evolving needs of the health system.



- **Interprofessional education**
  - *One Health*: Health professionals responsibly use their *knowledge* in *collaboration* with other professionals to advance health and welfare of humans, animals, communities, and environment locally and globally.



One Health

in education

… at Virginia Tech

Virginia Tech
Invent the Future

VTC Virginia Tech Carilion
School of Medicine and Research Institute

The Master of Public Health Degree in the Virginia-Maryland College of Veterinary Medicine

CEPH
Council on Education for Public Health

The Program – Facts and Numbers

- **Program and department started Fall 2010**
- **by December 2013**
  - **51 MPH graduates**
    - **of which 12 DVM/MPH**
    - **2 physicians**
- **currently 98 students in MPH degree**
  - **of which 18 DVM/MPH**
- **Currently ~14 faculty …**

- **Student mid career "types" –** anthropologist, community services coordinator, ESL teacher, fitness coordinator, food safety expert, geographer, Health Department epidemiologist, health educator, laboratory technician / specialist / facilities manager, medical facilities coordinator, medical technologist, osteopathic school faculty member, patient navigator, physician, Public School nutritionist, registered dietician, Rescue Squad volunteer, veterinarian, wellness coordinator, …

Virginia Tech's CEPH accredited Public Health and MPH program in the Veterinary College

- **Mission**

The mission of the public health program is to protect, improve, and promote population health in Southwest and Southside Virginia, the Commonwealth, Central Appalachia, the Nation and the world by training future public health leaders through learning, discovery, and engagement in public health

- **Goal for Learning**

The program grounded in a One Health model at the human-animal-environmental health interface will provide experiential learning and professional preparation in the core and concentration competencies, functions and responsibilities of public health, and support placement …

- **Goals for Discovery, Engagement**

…

Core competencies – One Health in the MPH

- Biostatistics
- Epidemiology
- Environmental Health
- Health Behavior
- Health Administration
    - Public Health Education
    - Infectious Disease
- Experiential Learning! --- practicum and capstone in One Health!

Challenges and Approaches in a Study of Companion Animals as Human Disease Sentinels in Rural Southwest Virginia

LAURA BOUTWELL, DVM
MASTER OF PUBLIC HEALTH CANDIDATE

FINAL CAPSTONE PRESENTATION
VIRGINIA TECH
DECEMBER 6TH, 2013

Others to add !!!

One Health in the Veterinary Curriculum

'Preclinical' (n= 31+)

anatomy, anesthesiology, biochemistry, biostatistics, cardiorespiratory, *clinical techniques*, dermatology, endocrinology, epidemiology, ethology, gastroenterology, *general veterinary medicine*, histology, immunology, large animal husbandry, medicine, microbiology (bact., mycol., virol., parasitol.; emerging infectious diseases), neurology, nutrition, oncology, ophthalmology, radiology, pathology, pharmacology, physiology, *professional foundations*, public health, reproduction/theriogenology, surgery, toxicology, urology

+ track courses + elective courses

Clinical (17 three-week clerkships)

Core Clerkships: anesthesiology, community practice, laboratory services, large animal clinical services, production management medicine, public / corporate, small animal surgery

Track clerkships: Small animal; equine; food animal; mixed animal; public/corporate track

Elective clerkships

Veterinary School Curriculum – **How to integrate One Health?**

'Preclinical' (n= 31+ → 9)

biostatistics
epidemiology
immunology
microbiology (bact., mycol., virol., parasitol.; emerging infectious diseases)
pathology pharmacology *professional foundations*
public health
toxicology
+ track courses + elective courses

Clinical (17 three-week clerkships)

Core Clerkships: community practice, laboratory services, large animal clinical services, production management medicine, public / corporate

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Elective clerkships

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- **Zoonoses**

… and others

Systems!

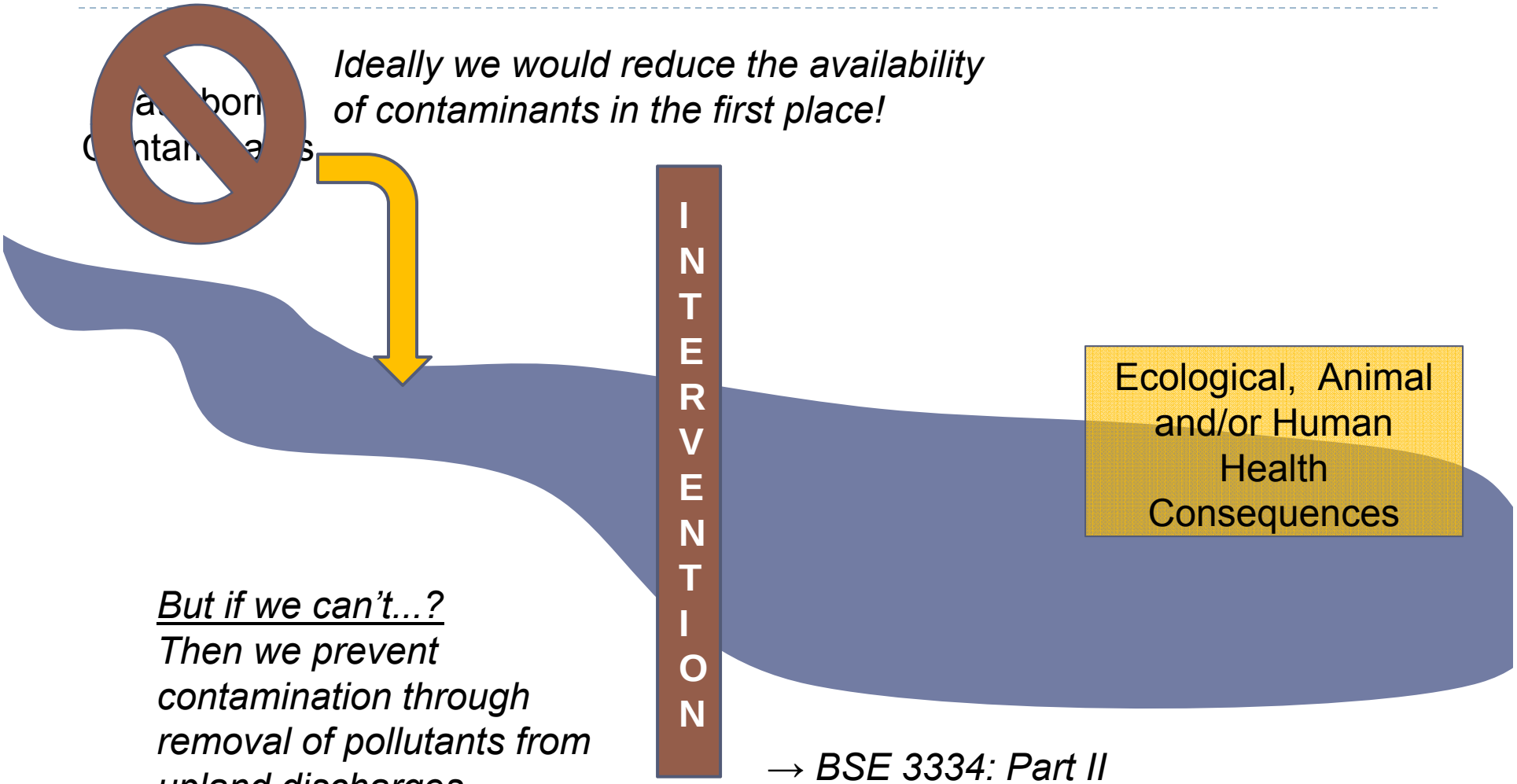
Dr. Widmer

One Health – only in professional education?

One Health –

“in undergraduate education!”

How do we improve water quality?

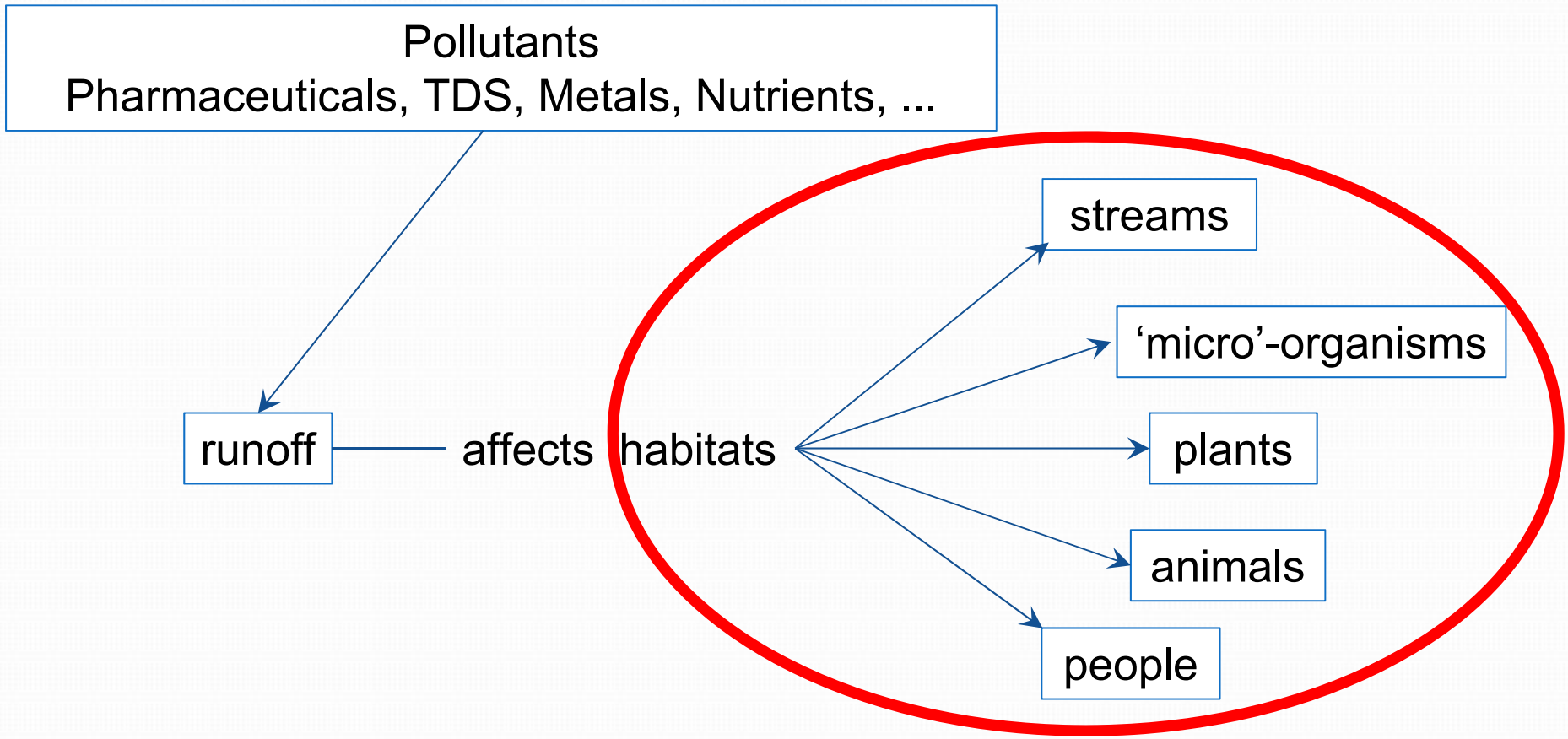


But if we can't...?
Then we prevent contamination through removal of pollutants from upland discharges.

→ BSE 3334: Part II
(generally structural) Best Management Practices

Designated Uses?

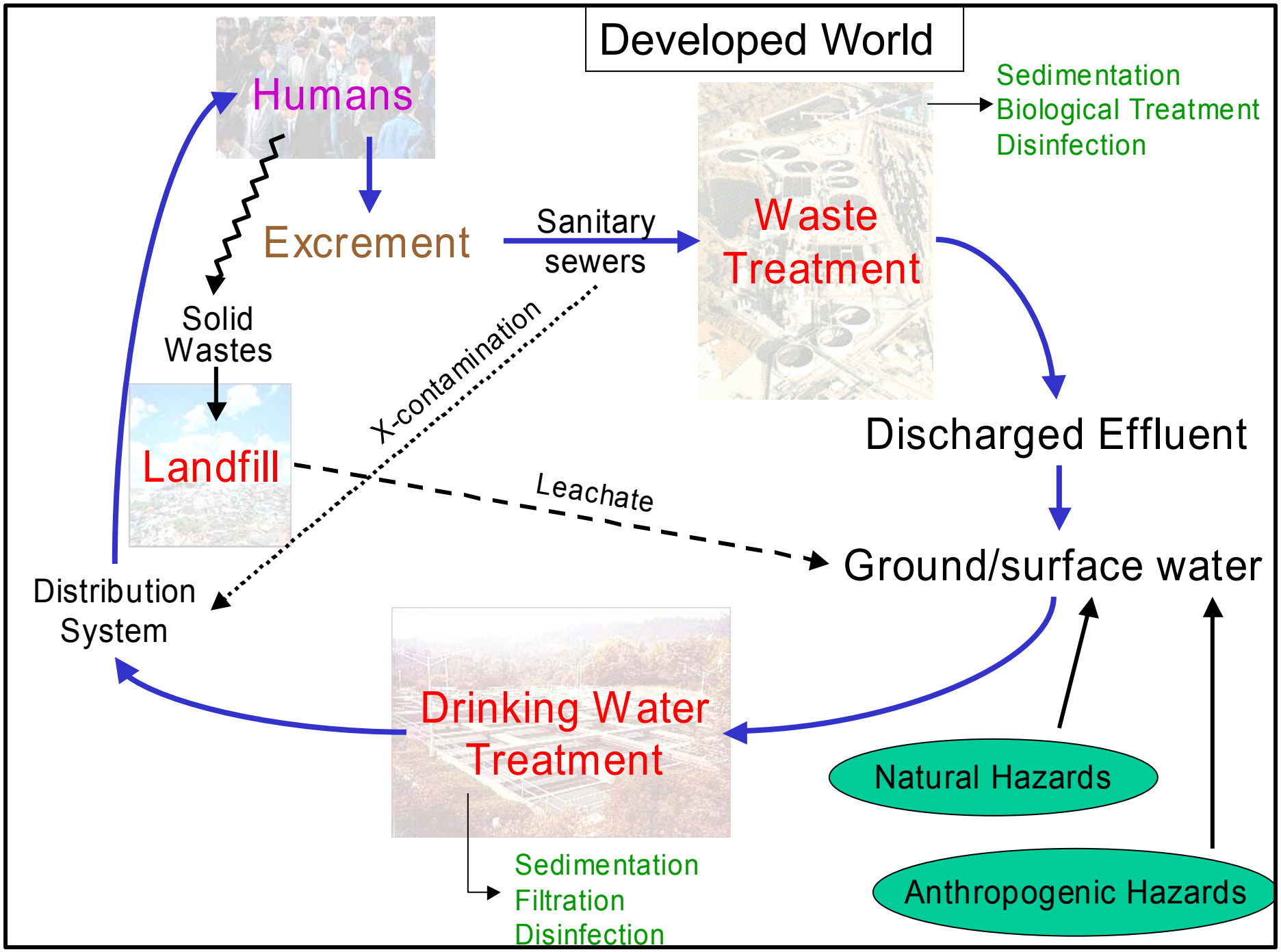
(why do we care?)

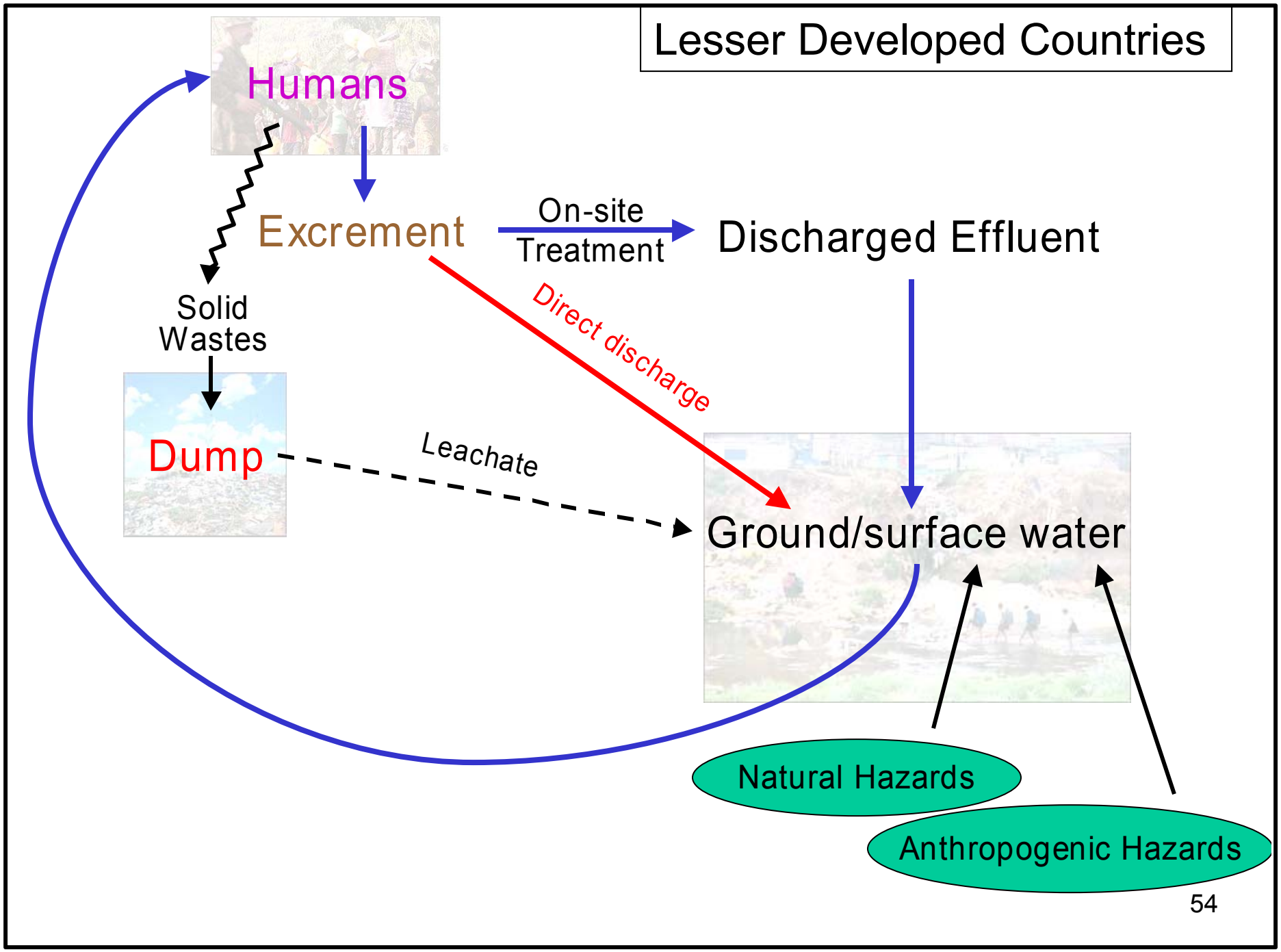


WHY SHOULD WE CARE?

CEE 4114 – Fundamentals of Public Health Engineering

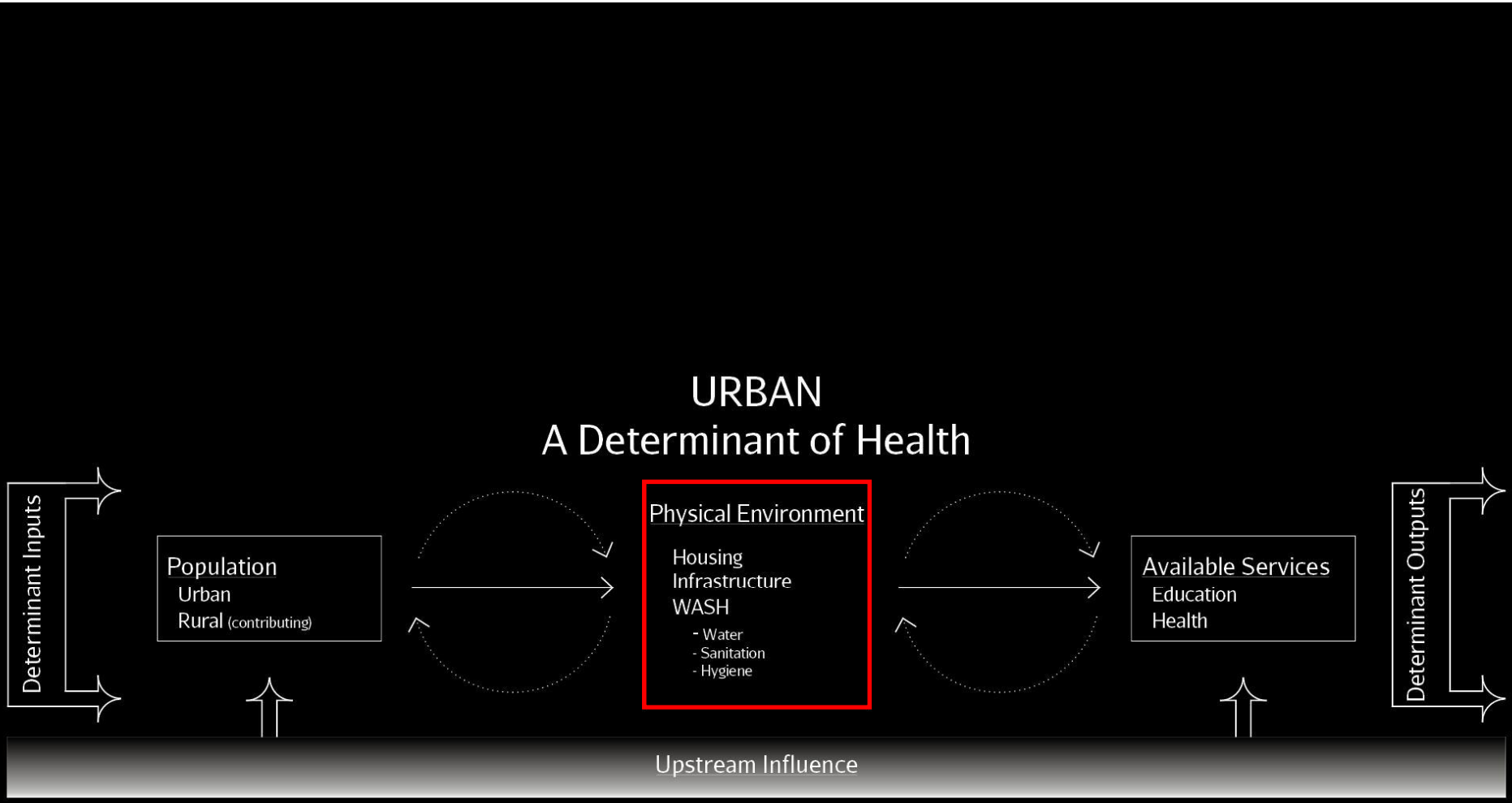
Spring 2014


Developed World
Humans
Excrement
Solid Wastes
Landfill
Sanitary sewers
X-contamination
Waste Treatment
Sedimentation
Biological Treatment
Disinfection
Discharged Effluent
Leachate
Ground/surface water
Distribution System
Drinking Water Treatment
Sedimentation
Filtration
Disinfection
Natural Hazards
Anthropogenic Hazards


Lesser Developed Countries
Humans
Excrement
On-site
Treatment
Discharged Effluent
Solid
Wastes
Direct discharge
Dump
Leachate
Ground/surface water
Natural Hazards
Anthropogenic Hazards

One Health –

… and in “graduate certificates!”



THE URBAN LIVING ENVIRONMENT DEFINED | SYSTEMS –BASED APPROACH

BY 2015

23 MEGACITIES (> 10 MILLION)

19 IN THE DEVELOPING WORLD

564 CITIES 1 MILLION +

432 IN DEVELOPING WORLD (75%)

2/3 OF WORLD'S POPULATION WILL LIVE IN URBAN AREAS

(VLAHOV, ET AL., 2007)

URBAN | A DETERMINANT OF HEALTH

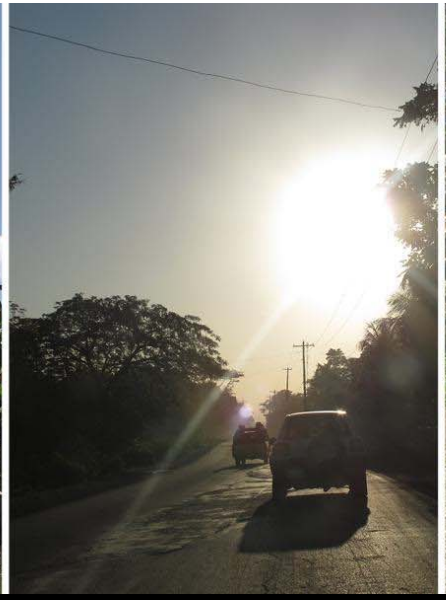
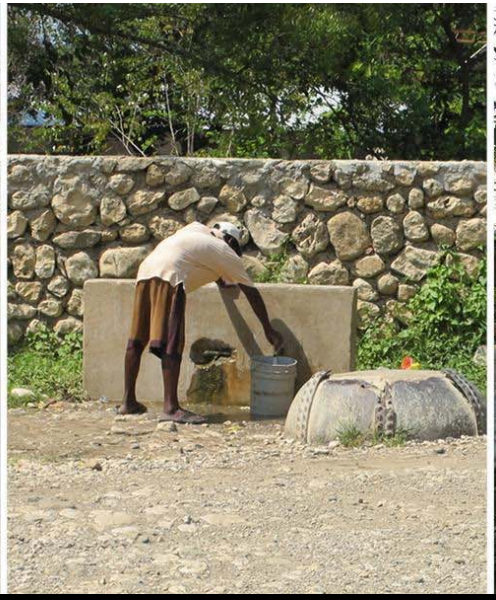
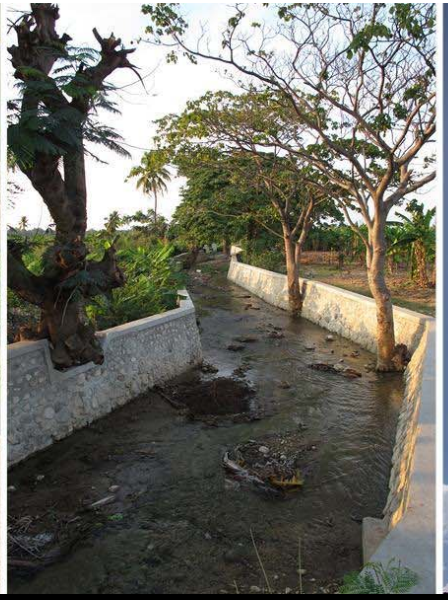
OUTSIDE OF PORT AU PRINCE, HAITI . POPULATION ~ 1 MILLION

RE-FOCUSING THE RELATIONSHIP BETWEEN RURAL & URBAN AREAS
RURAL PROFILE IN GRESSIER + LEOGANE

RE-FOCUSING THE RELATIONSHIP BETWEEN RURAL & URBAN AREAS
URBAN PROFILE IN GRESSIER + LEOGANE

Risk Factor	*Communicable Disease*	*NCD & Injuries*
Defects in Buildings	Insects (vector diseases) Rodent (vector diseases) *Geohelminthiases* Overcrowding-Related Disease	Dust, Damp, Mold-Induced Diseases Injuries Burns Neuroses Violence & Delinquency Drug & Alcohol Abuse
Poor Fuel & Ventilation	Acute Respiratory Infections	Peri-natal Defects Heart Disease Chronic Lung Disease & Cancer Burns Poisoning

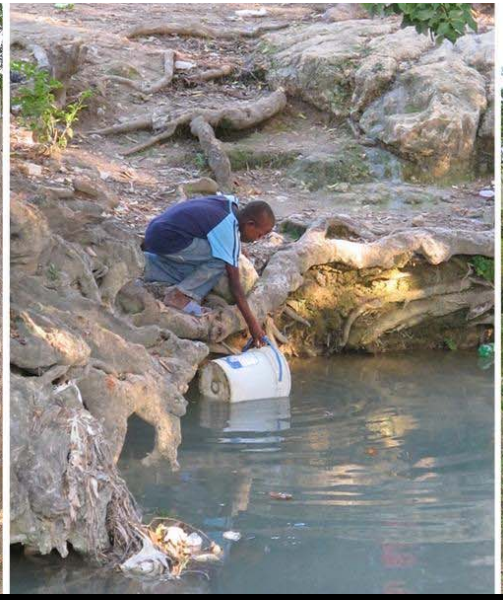
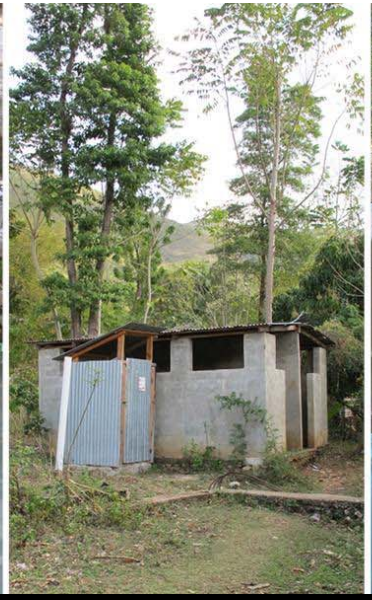
HOUSING | MAJOR RISK FACTORS OF UNHEALTHY LIVING CONDITIONS
ADAPTED FROM WHO, 2008


Risk Factor	*Communicable Disease*	*NCD & Injuries*
Poor Refuse Storage & Collection	Insect-Vector Diseases Rodent-Vector Diseases	Injuries Burns
Poor Location	Airborne Excreta-Related Diseases Enhanced Infectious Respiratory Disease Risk	Chronic Lung Disease Health Disease, Cancer Neurological/Reproductive Diseases Injuries Psychiatric Organic Disorders due to Industrial Chemicals Neuroses

INFRASTRUCTURE | MAJOR RISK FACTORS OF UNHEALTHY LIVING CONDITIONS
ADAPTED FROM WHO, 2008

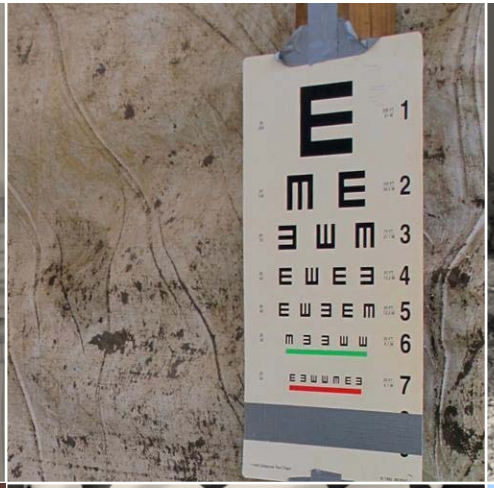



Risk Factor	*Communicable Disease*	*NCD & Injuries*
Defective Water Supply	Fecal-Oral Diseases Non-Fecal Oral-Related Diseases Insect-Vector Diseases	Heart Disease Cancer
Defective Sanitation	Fecal-Oral Diseases *Taeniases & Helminthiases* Insect & Rodent-Vector Diseases	Stomach Cancer

WASH | MAJOR RISK FACTORS OF UNHEALTHY LIVING CONDITIONS
ADAPTED FROM WHO, 2008

LINKING SPATIAL INVESTIGATION TO HEALTH-FOCUSED URBAN DEVELOPMENT PLANNING







KLINIK
MEDIKAL
HAITI HEALTH
MINISTRIES


One Health –

"… in High School?!"

One Health - Challenges

- acceptance
- benefit-cost
- leadership
- penetration
- sustainability
- metrics

Paolas Lachen: Das kleine Mädchen freut sich über den Besuch von Lancelot in einem Krankenhaus in Ecuadors Hauptstadt Quito. Lancelot, ein amerikanischer Cockerspaniel, und andere Hunde besuchen jeden Mittwoch die jüngsten Patienten der Krebsstation.

http://www.spiegel.de/fotostrecke/kinder-schnappschuesse-2012-bilder-des-jahres-fotostrecke-90897-5.html

Thank you!

VirginiaTech