Conservation as a public health strategy for climate change preparedness

Craig Stephen DVM PhD

CEO Canadian Wildlife Health Cooperative

Professor – Western College of Veterinary Medicine

Clinical Professor- School of Population and Public Health

Start by reframing the determinants of health

Nature is not a hazard

- Environmental determinants of health are fundamental positive contributions to our health

https://www.pinterest.ca/pin/495396027732592544/

My Proposition

- Health equity is a cornerstone of climate change resilience
  - But, the determinants of equity are more than the social determinants of health
- Climate change health equity needs to be inter-generational
  - Climate change impacts have been coming for 100 years and will take longer to abate
- Intergenerational health equity requires a sustainable, resilient biosphere
  - Cannot be achieved without interspecies health equity

Climate change health equity

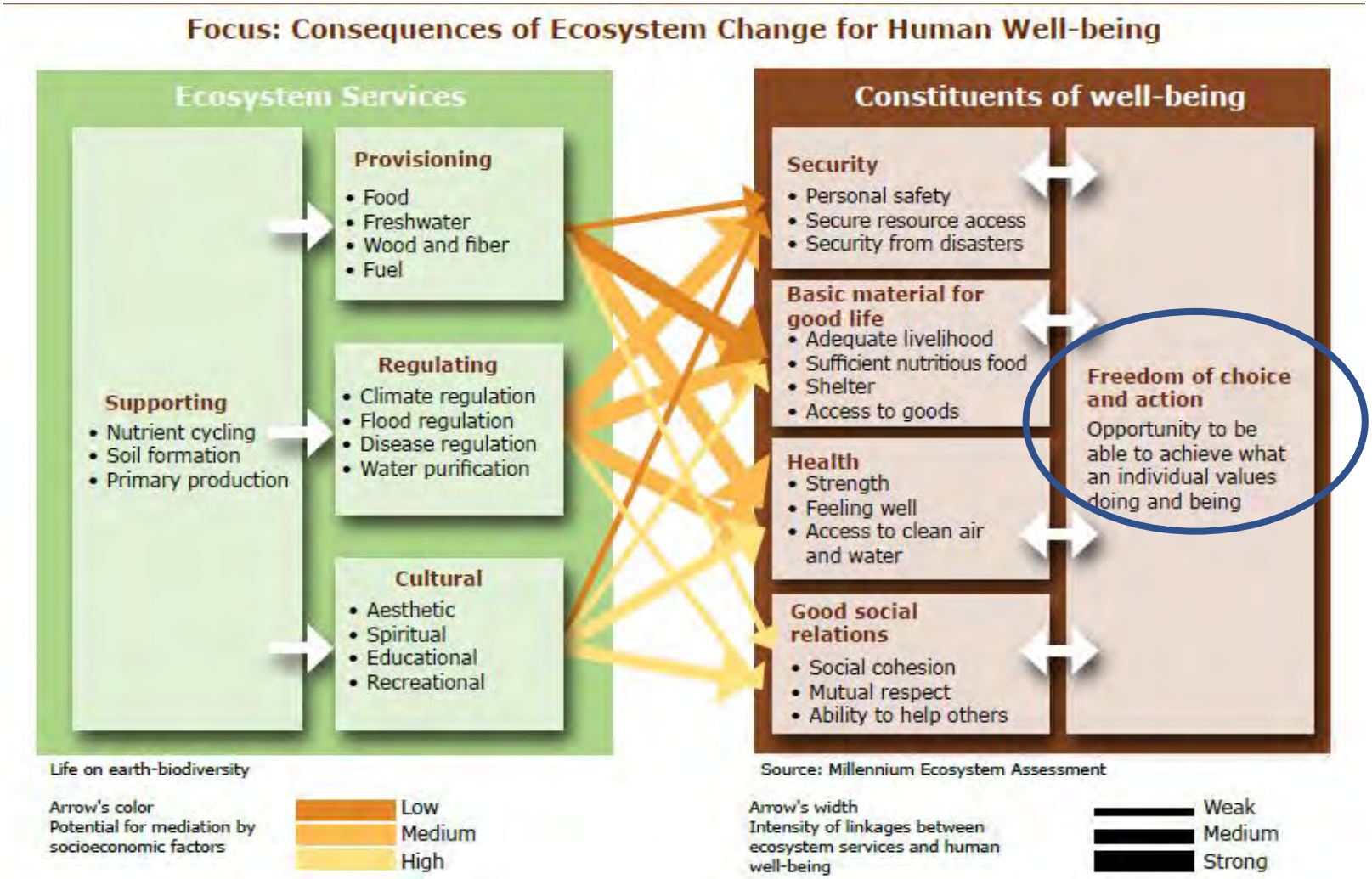
- all species, across multiple generations, can reach their full health potential and should not be disadvantaged from attaining it because of climate change

- the fair and equitable distribution of resources needed for health and sustainability that balances the needs of today with the needs of tomorrow by investing in and maintaining social and ecological services

The biosphere is the foundation for the social determinants of health

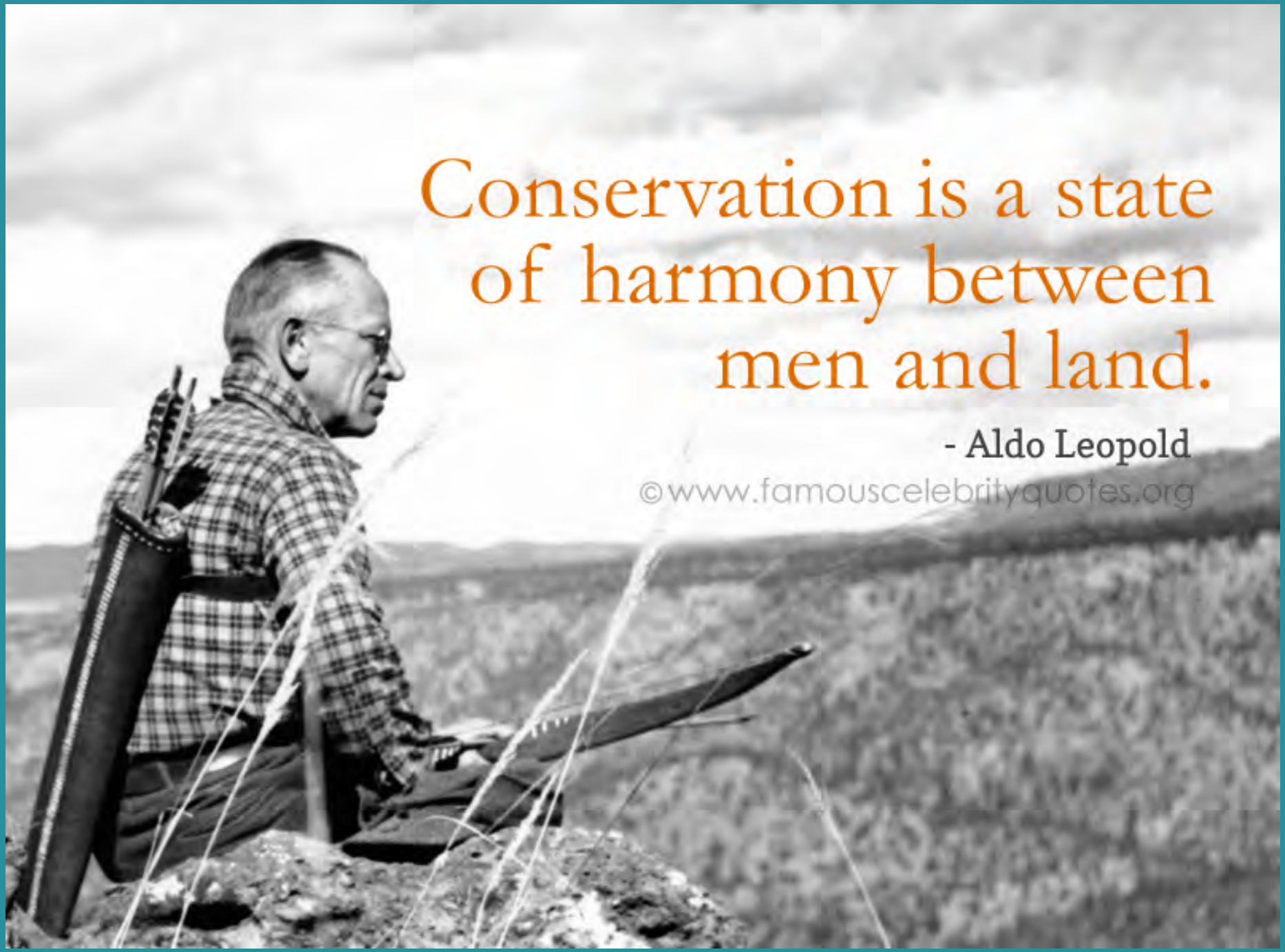
http://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html

Millennium Ecosystem Assessment



CANADIAN
WILDLIFE HEALTH
COOPERATIVE

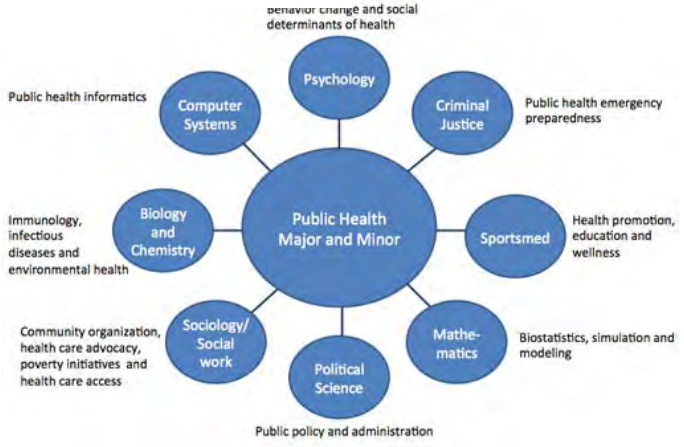
"The overall guiding principle [in health promotion policy] for the world, nations, regions and communities alike, is the need to encourage reciprocal maintenance– to take care of each other, our communities and our natural environment."
–*Ottawa Charter* (1986)


Conservation is a state of harmony between men and land.
- Aldo Leopold
©www.famouscelebrityquotes.org

The conceptual bond

- Public health
  - Preventing disease, prolonging life and promoting health through the organized effort of society
- Conservation biology
  - Preventing the loss, protecting and restoring biodiversity by managing physical, ecological and social factors

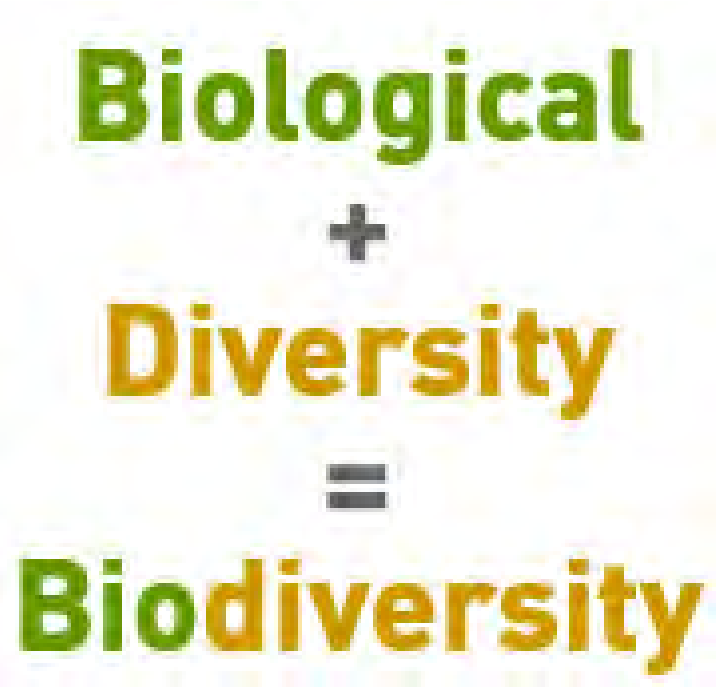
http://www.rebeccajarvis.info/post/54635372051/what-is-conservation-science



http://www.mercyhurst.edu/academics/academic-departments/public-health/public-health-major

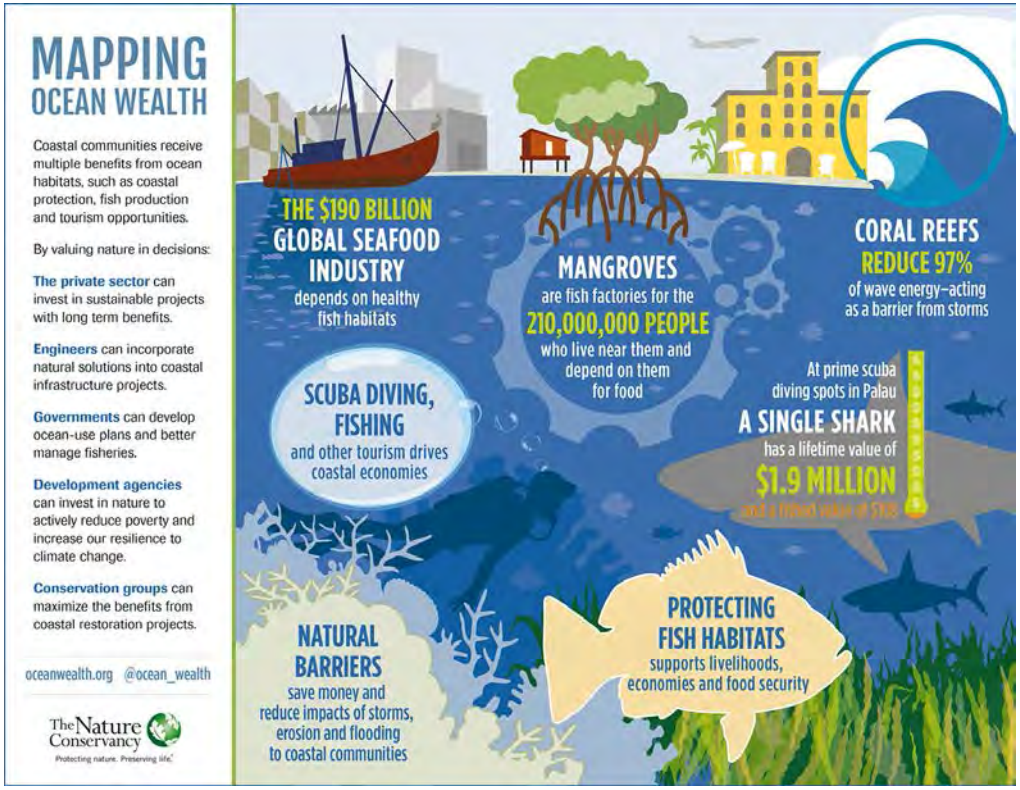
Biodiversity

- all the variety of life that can be found on Earth as well as to the communities that they form and the habitats in which they live
- not only the sum of all ecosystems, species and genetic material but the variability within and among them



Climate change is a shared threat

- Healthscape concept
  - Shared space when people, animals and environments interact
- Climate change works at the healthscape rather than community level
- Critical inter-dependencies
  - Ex. “The Narrows”



Intermissions – Climate change and health across sectors

https://www.pinterest.ca/knutsrosenlund/green-stuff/

Public health priorities

CANADIAN WILDLIFE HEALTH COOPERATIVE

PHAC Sustainable Development Strategy

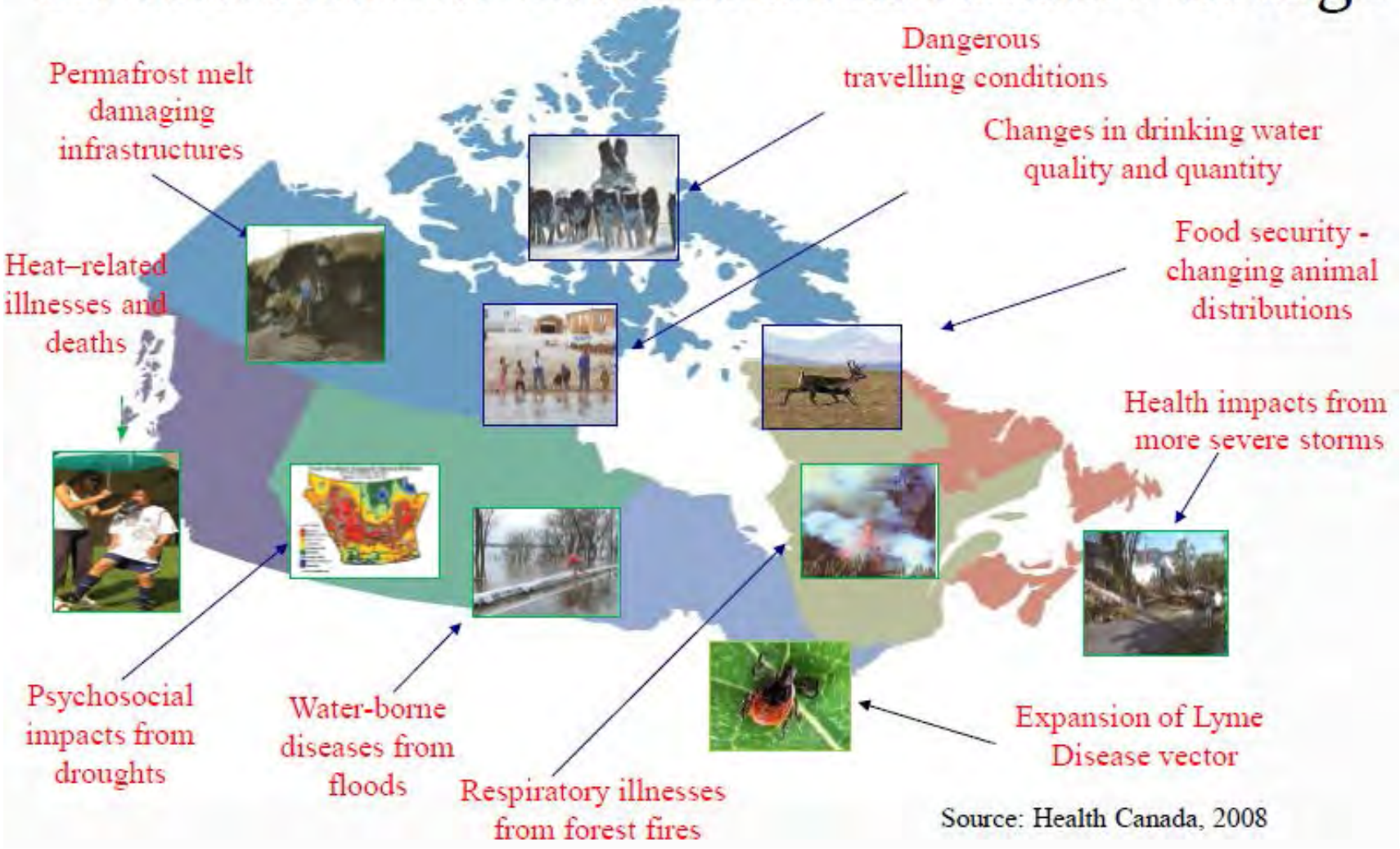
- to reduce the vulnerability of individuals, communities, and regions to climate change impacts which can adversely affect health
  - to ***reduce infectious disease emergence*** and other climate change risks through evidence-based information

Chief Medical Health Officer

- Public health must strive to prevent and adapt to current as well as anticipated and unforeseen threats and identify the most vulnerable populations

CANADIAN WILDLIFE HEALTH COOPERATIVE

Health risks in Canada from climate change



https://www.canada.ca/en/health-canada/services/environmental-workplace-health/climate-change-health/environmental-health-assessments-health-canada.html

Impact of climate change on livestock production

Water *- reduced quantity*	• Change in quantity and timing of precipitation affects - Dry areas will get drier and wet ones wetter
Feed *- reduced quality and quantity*	• Land use and systems changes • Decline in productivity of rangelands, crops, forages • Quality of plant material deteriorates • Reduced feed intake
Changes in the incidence of infectious diseases	• Changes in the patterns and range of infectious diseases • Loss of disease resistant breeds • Increased heat stress, deterioration of immunity

HOW WE'RE ENDANGERING ANIMALS

CLIMATE CHANGE

HUMANS AFFECT CLIMATE CHANGE BY ADDING GREENHOUSE GASSES TO THE ATMOSPHERE, WHICH RAISE THE PLANET'S TEMPERATURE, CONSEQUENTLY MELTING ICE CAPS, RAISING SEA LEVELS AND WARMING OCEANS. CLIMATE CHANGE ALSO CREATES DROUGHTS, WHICH THREATEN ANIMALS' FOOD AND FRESH WATER SOURCES. THE LARGEST MAN-MADE CONTRIBUTIONS TO CLIMATE CHANGE COME FROM RUNNING FACTORIES AND POWER PLANTS, HEATING AND COOLING HOMES, AND DRIVING AUTOMOBILES.

ONLY ABOUT **350** NORTH AMERICAN RIGHT WHALES STILL EXIST

With rising ocean temperatures killing off their food, these whales can no longer properly bulk up for pregnancy.

80% OF LOGGERHEAD TURTLES ARE FEMALE

Changes in temperature have affected nesting conditions, skewering their gender ratio.

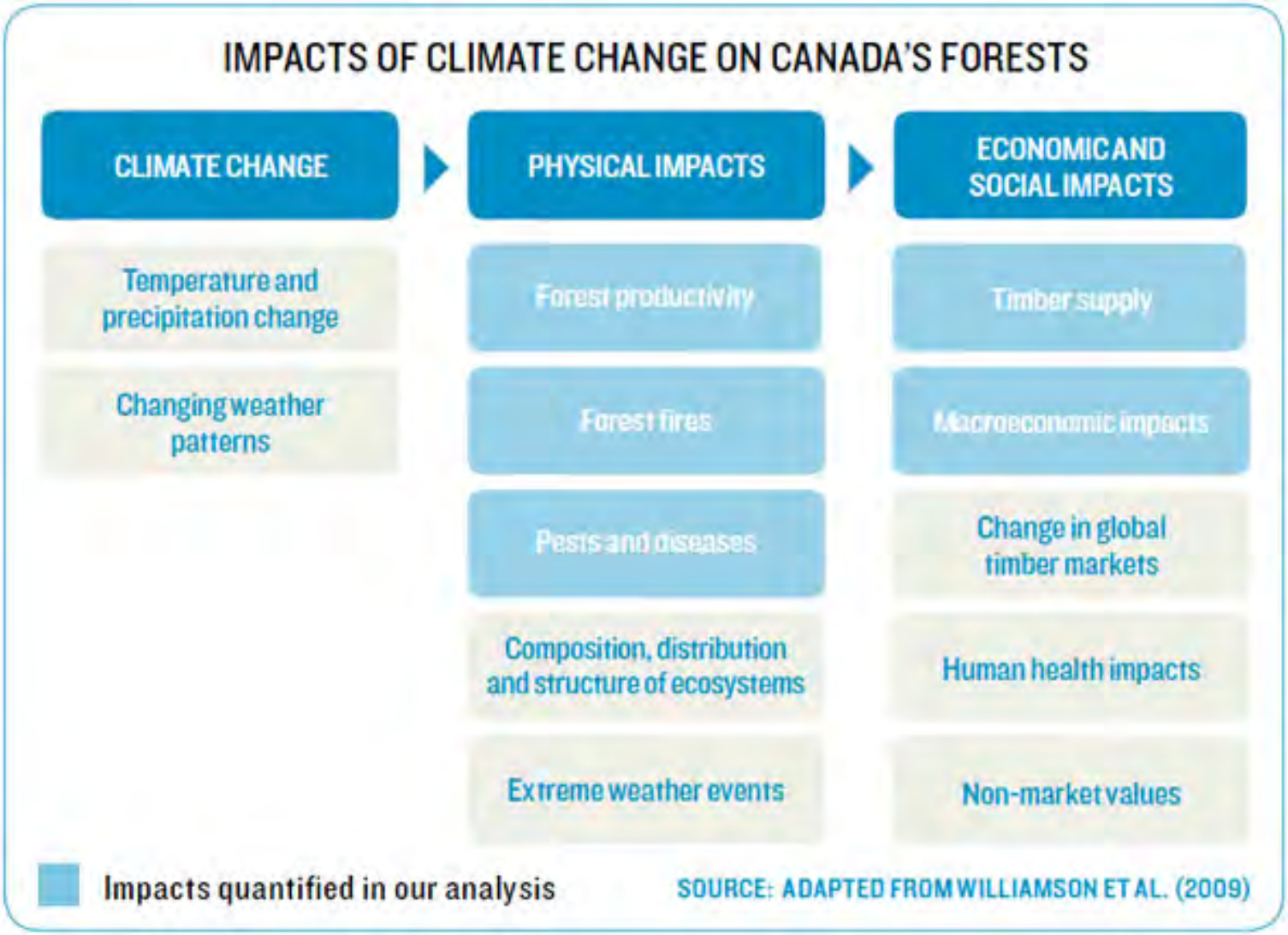
PENGUIN POPULATIONS HAVE DECLINED ABOUT **60%**

Since the 1960s, Antarctic penguins have been vanishing due to a loss of habitat resulting from melting sea ice.

POLAR BEARS ARE **10** PERCENT THINNER THAN **30** YEARS AGO

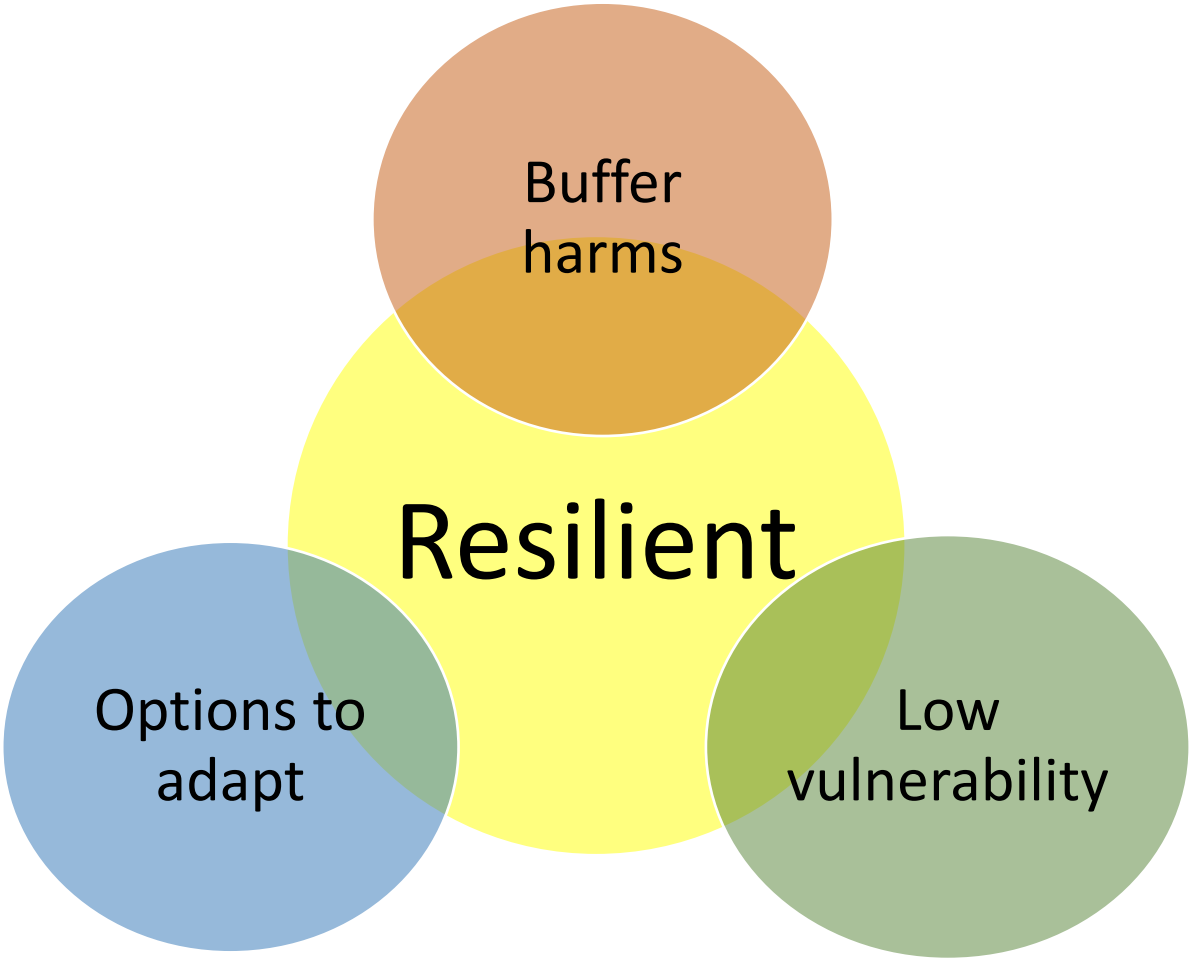
Rising temperatures are melting sea ice, leaving hungry polar bears with less hunting grounds.

CANADIAN WILDLIFE HEALTH COOPERATIVE



http://nrt-trn.ca/climate/climate-prosperity/the-economic-impacts-of-climate-change-for-canada/paying-the-price-timber-supply

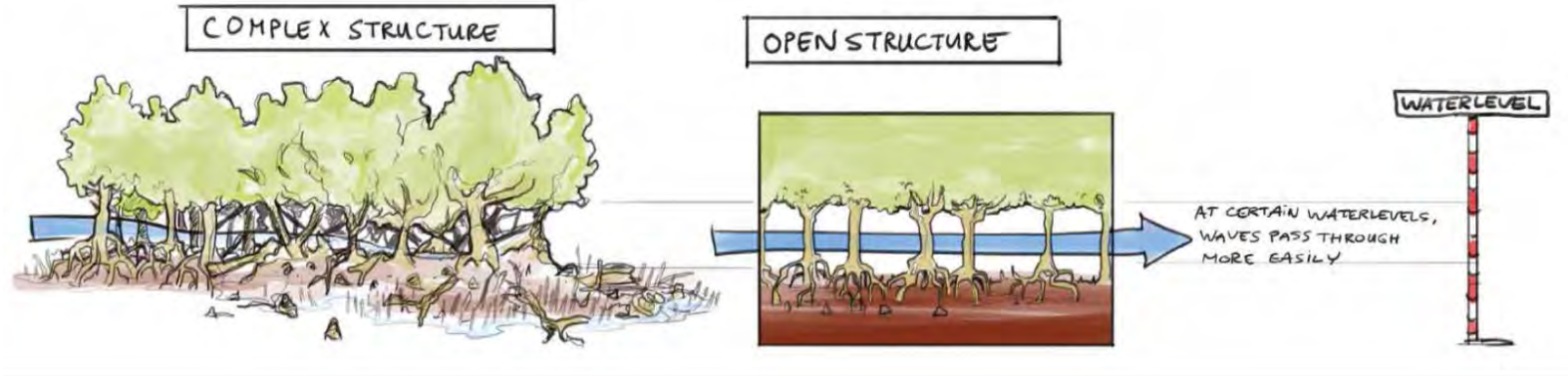
What can we do?



Green infrastructure buffers against extreme events

http://www.newterrain.us/green-infrastructure/green-infrastructures-maintenance-opportunity/

Protection from Extreme Events



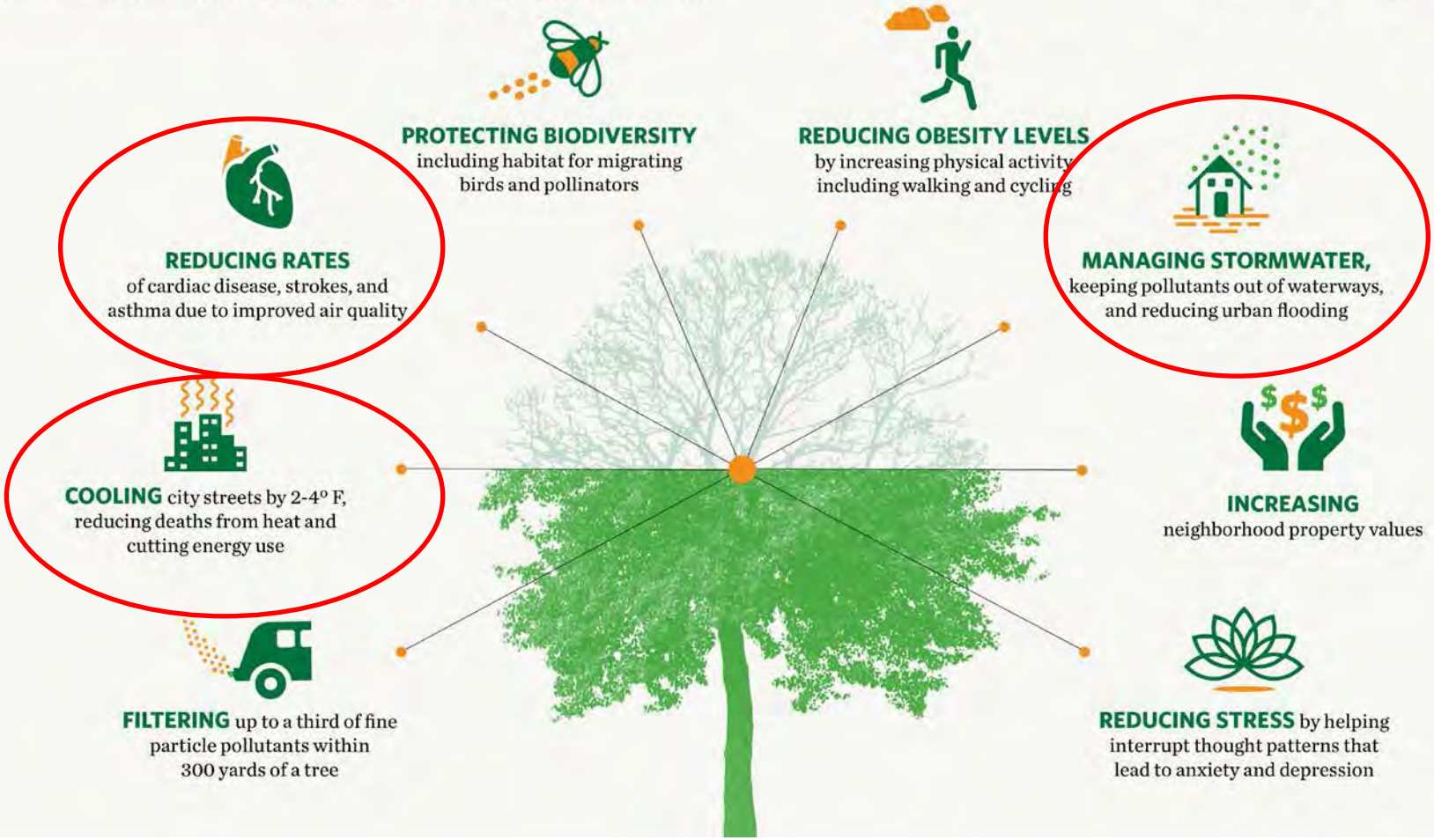
Spalding M, McIvor A, Tonneijck FH, Tol S and van Eijk P (2014) Mangroves for coastal defence. Guidelines for coastal managers & policy makers. (Wetlands International and The Nature Conservancy) : 16

http://www.nola.com/environment/index.ssf/2013/08/lawmakers_flood_authority_spar.html
http://www.fishingcatcambodia.org/tag/mangrove-conservation/

Benefits of Urban Trees

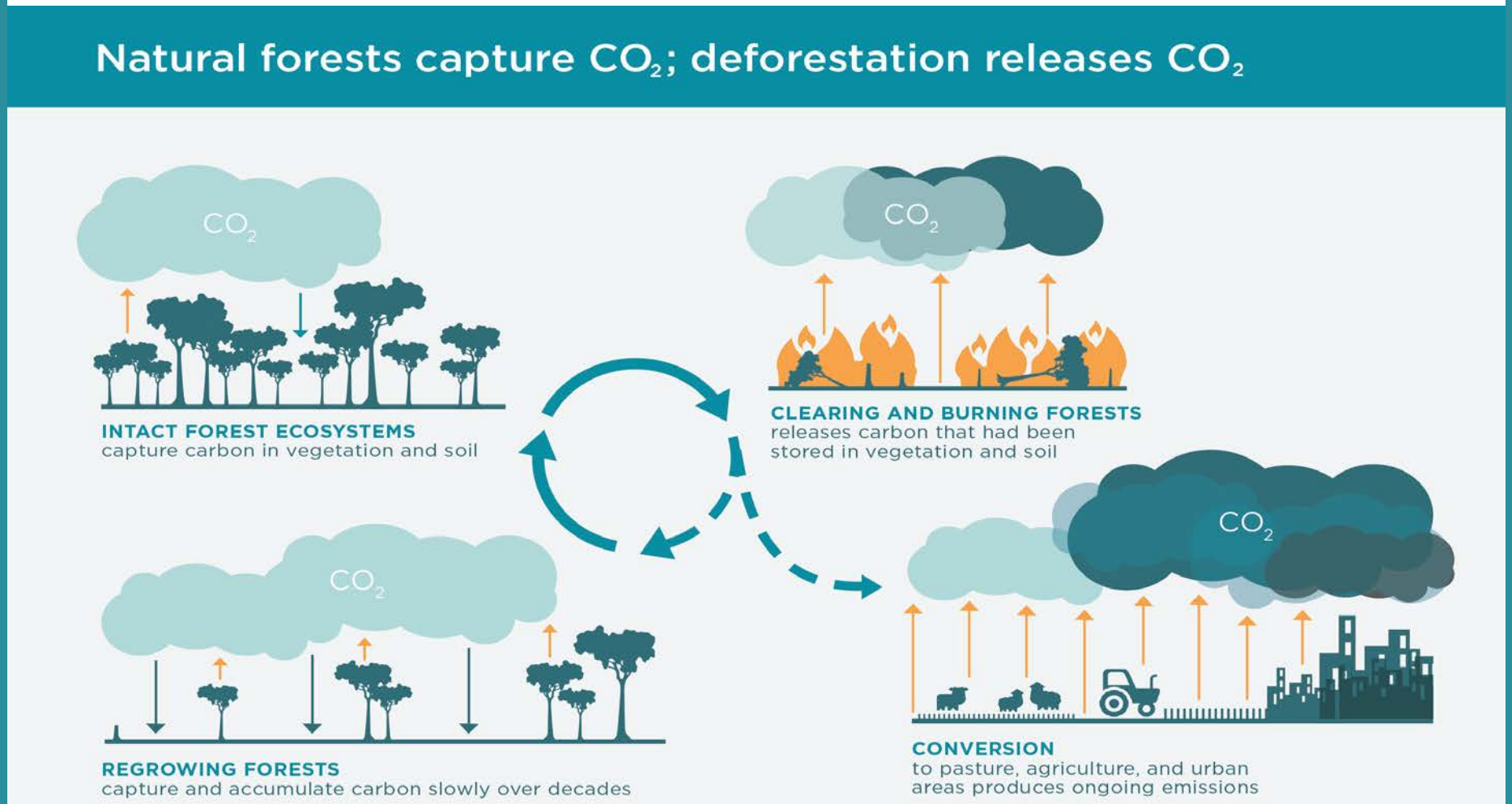
Research has linked the presence of urban trees to...

The Nature Conservancy



Buffer climate change

CANADIAN WILDLIFE HEALTH COOPERATIVE



https://www.cgdev.org/blog/tropical-forests-offer-24%E2%80%9330-percent-potential-climate-mitigation

Center for Global Development

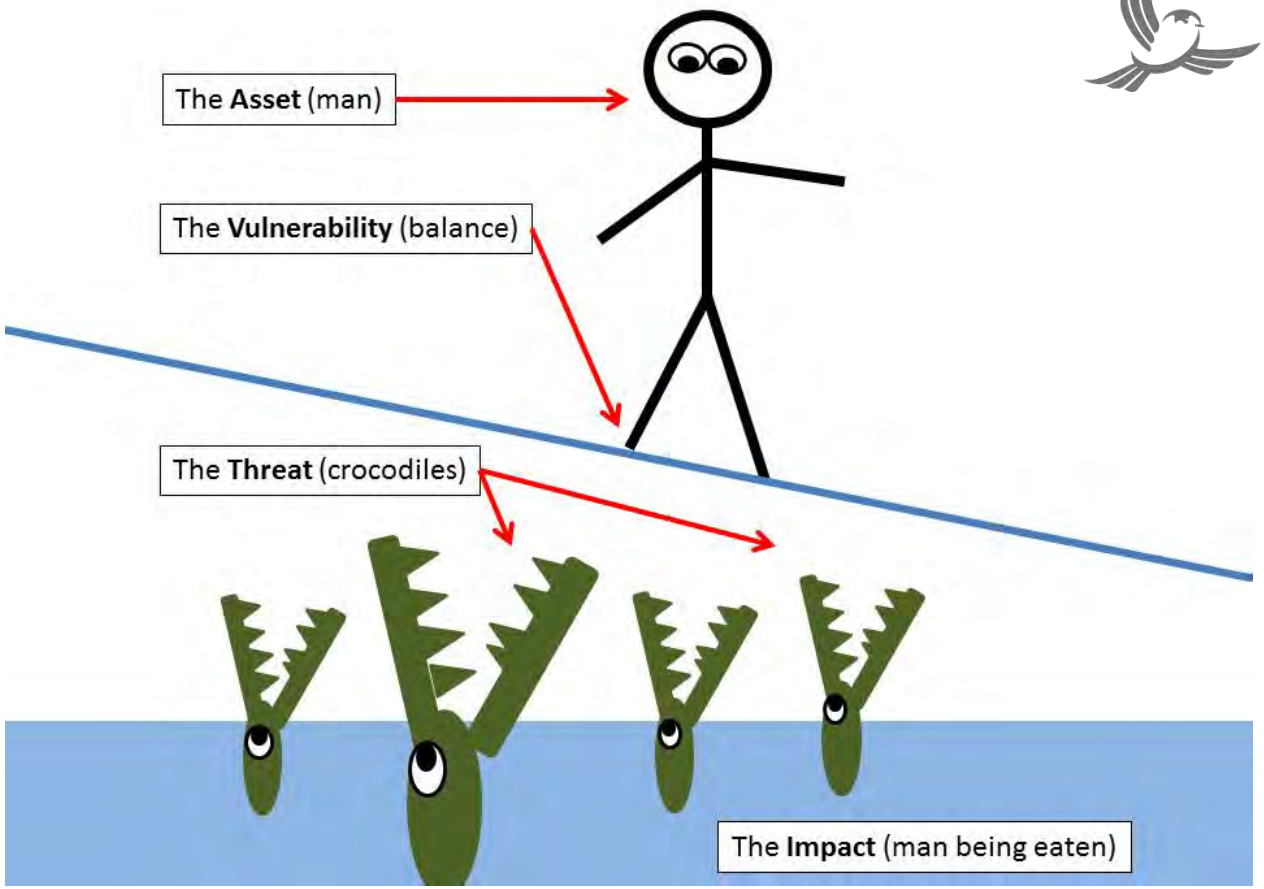
Storms and water quality

Clean water

- The continued loss of forests and the destruction of watersheds reduce the quality and availability of water supplied to household use and agriculture.

Remember Toxoplasma, Victoria, watersheds, rain and pooping cougars

CANADIAN WILDLIFE HEALTH COOPERATIVE



Vulnerability and Biodiversity

The propensity to be adversely affected.

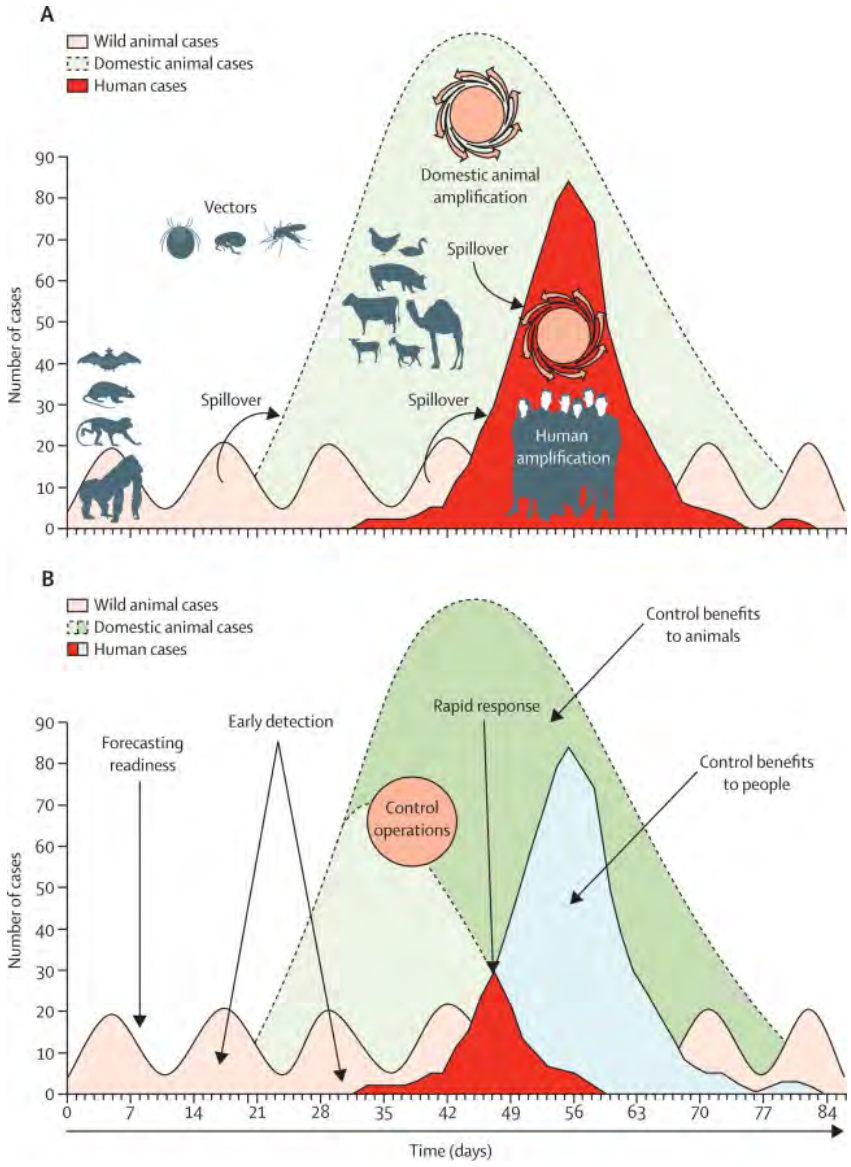
exposure and sensitivity to hazards and lack of capacity to cope and adapt

CANADIAN WILDLIFE HEALTH COOPERATIVE

Reducing exposure through early warning

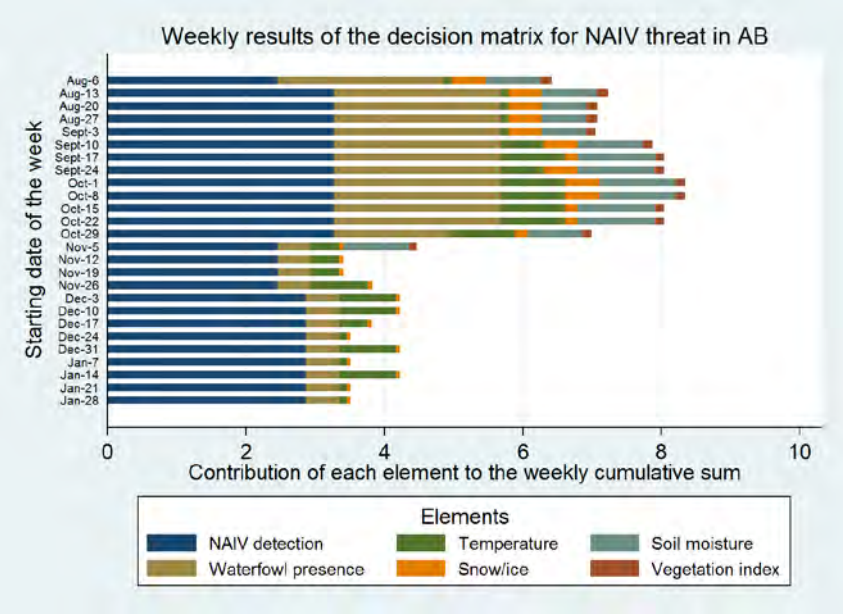
Disease emergence

The ‘sexy’ case

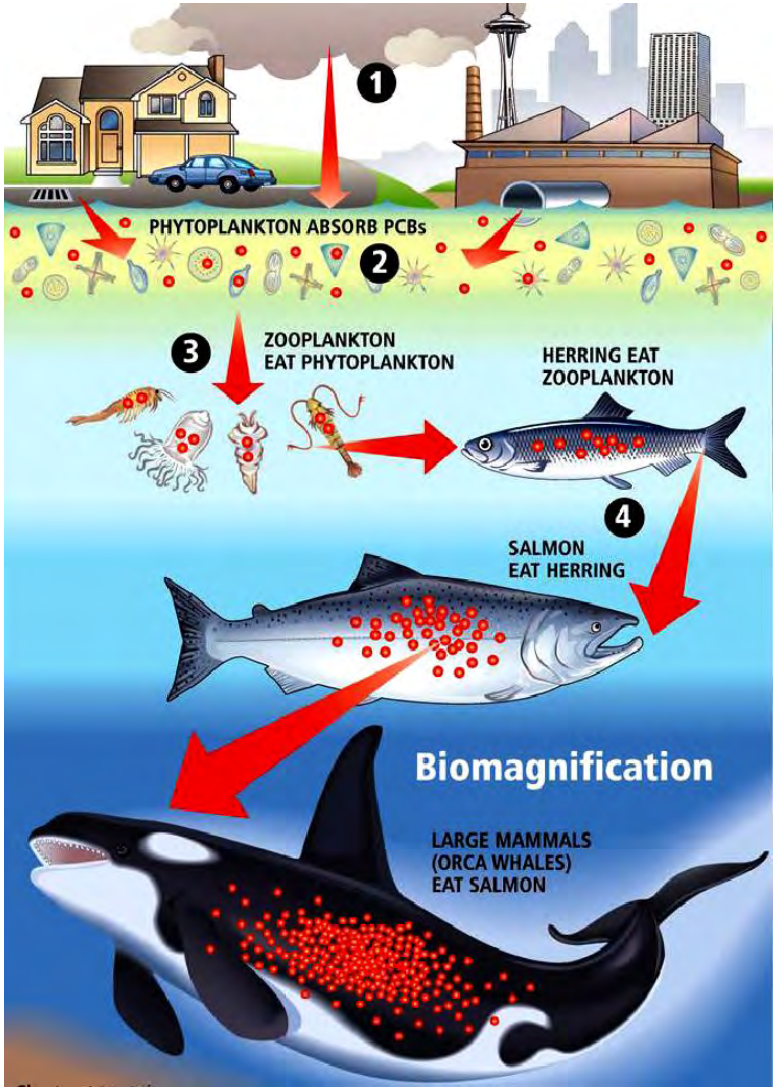


Signals of exposure

- Is it there *(exposure assessment)*
  - Detect hazards in a shared environment
  - Where is it
- Can it hurt us *(probability and magnitude of harm)*
  - Biological evidence of harm
- Evidence to action
  - Sick animals can inspire action in advance of human harm
    - best use has been contaminants
    - Most action today = zoonooses



Beyond zoonoses



https://www.canada.ca/en/environment-climate-change/services/pollutants/mercury-environment/about/atmospheric-transport.html
http://www.blue-growth.org/Plastics_Waste_Toxins_Pollution/Biomagnification_Bio_Accumulation.htm

We suck at prediction

- Missed Zika
- SARS 100x less than predicted
- Credibility lost over calls for avian influenza pandemics
- Never even imagined Mad Cow
- Despite billions invested

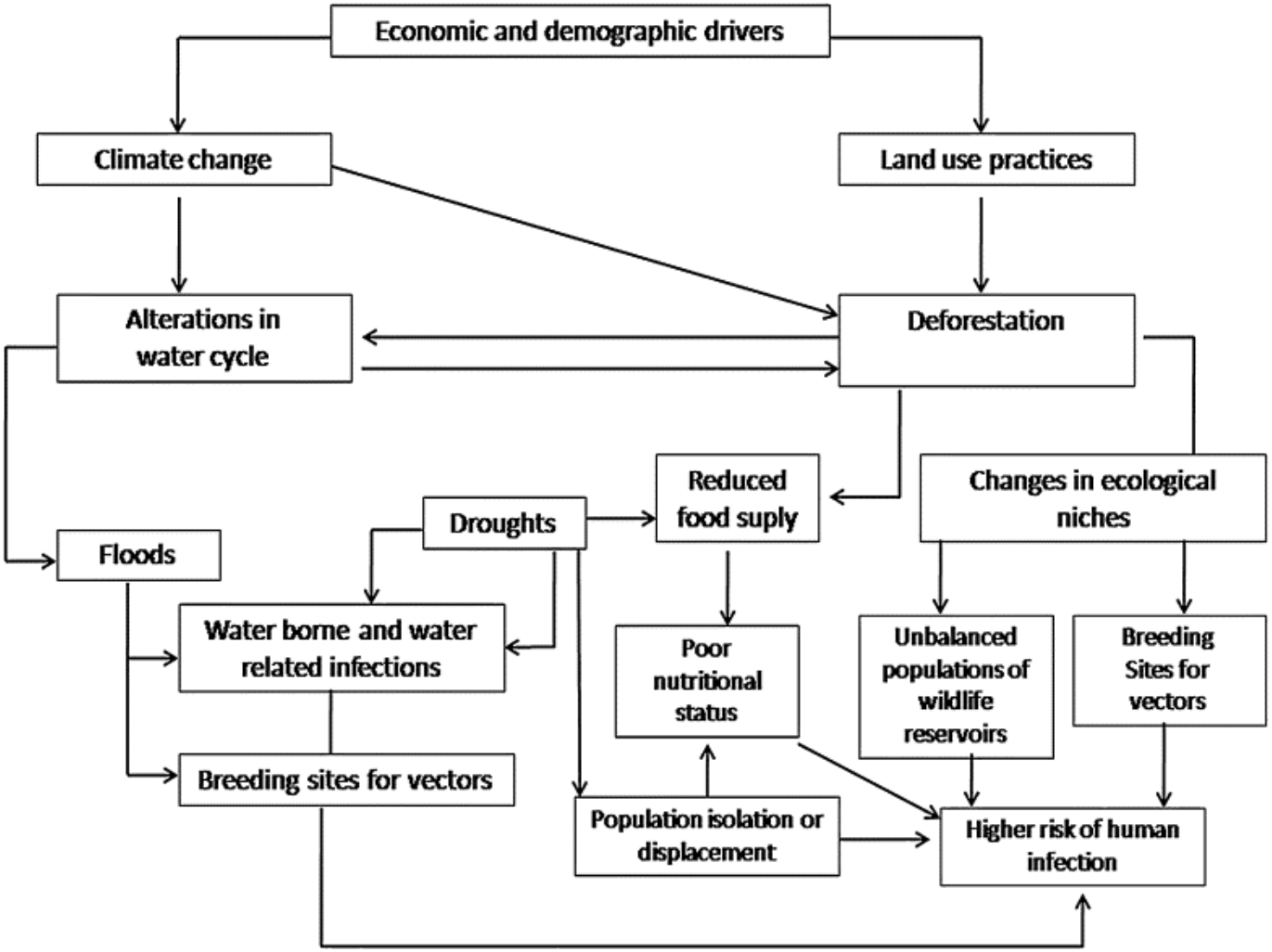
Apocalyptic Attention Deficit Disorder

https://escapetoreality.org/2017/05/25/the-market-for-bad-predictions/

Why prediction is tough.

Complex dynamic systems

We expect the pathogen to be the clue



If we can't predict can we be surprised less often?

Type	Example
Rare event with serious consequences	Post-tsunami nuclear accident in Japan
Common event we didn't recognize as a warning signal	Translocated pathogens – 1st cases not seen as a warning (ex. West Nile virus)
Unexpected consequences	Moving New York's garbage to Ohio made rabies jump borders
Knowable consequence from an unexpected source	Feeding cows to cows lead to mad cows

Strategies to reduce surprise

CANADIAN WILDLIFE HEALTH COOPERATIVE

Category of Surprise	Response
Knowable in retrospect but **elude detection**	**Is a harm possible?** • Connect specialized pools of knowledge to see hazards sooner • Track changing exposures • Track clues of harm in other contexts
Fail to recognize actionable signal or not able to **respond** despite warning	
Unanticipated consequences of socio-ecological interactions	**Can they deal with it?** • Track changing sensitivities due to changing determinants of health and cumulative effects • Assess capacity to cope
Previously **inconceivable** events	

Strategies to reduce surprise

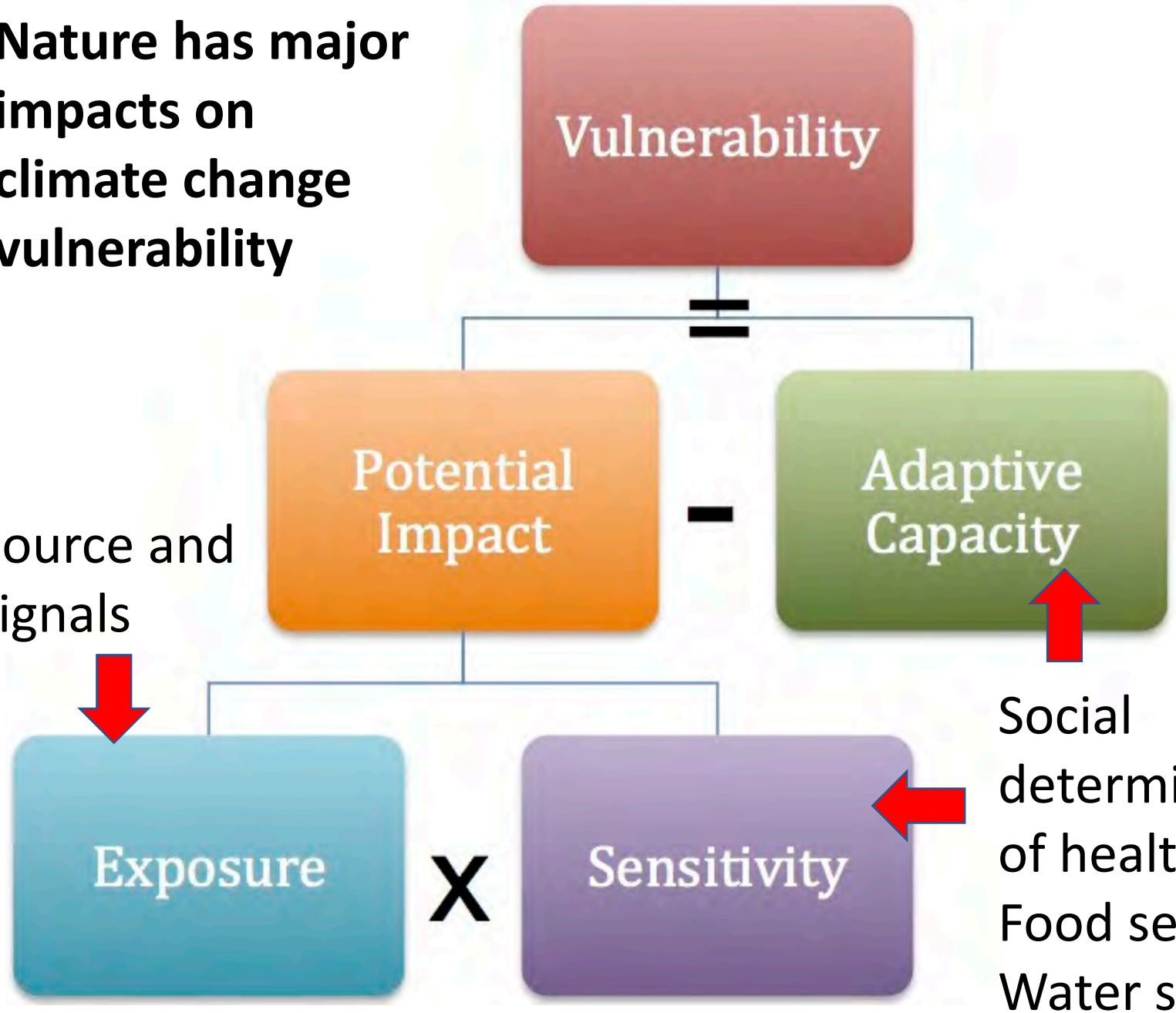
CANADIAN WILDLIFE HEALTH COOPERATIVE

Category of Surprise	Response
Knowable in retrospect but **elude detection**	**Is a harm possible?** • Biosentinel • Better sharing and integration via health intelligence
Fail to recognize actionable signal or not able to **respond** despite warning	
Unanticipated consequences of socio-ecological interactions	**Can they deal with it?** • Public health observatories • Looking for upstream clues of changing resilience options
Previously **inconceivable** events	

Wildlife as biosentinels of vulnerability – more than exposure information

PUBLIC HEALTH CONCERNS	WILDLIFE INFORMATION
Vector-borne disease	Document pathogen & vector distribution; reveal changes in pathogen/vector lifecycles; establish host effects
Food & water safety & security	Identify infectious and non-infectious hazards, biosentinels of effects of hazards; maintain accessible country foods and commercial seafood
Mental health & social cohesion	+ve mental health value of nature; cultural importance of wildlife; contributions to income and traditional food security
Indirect effects related to physical infrastructure	Not applicable
Effects of extreme heat	Not applicable

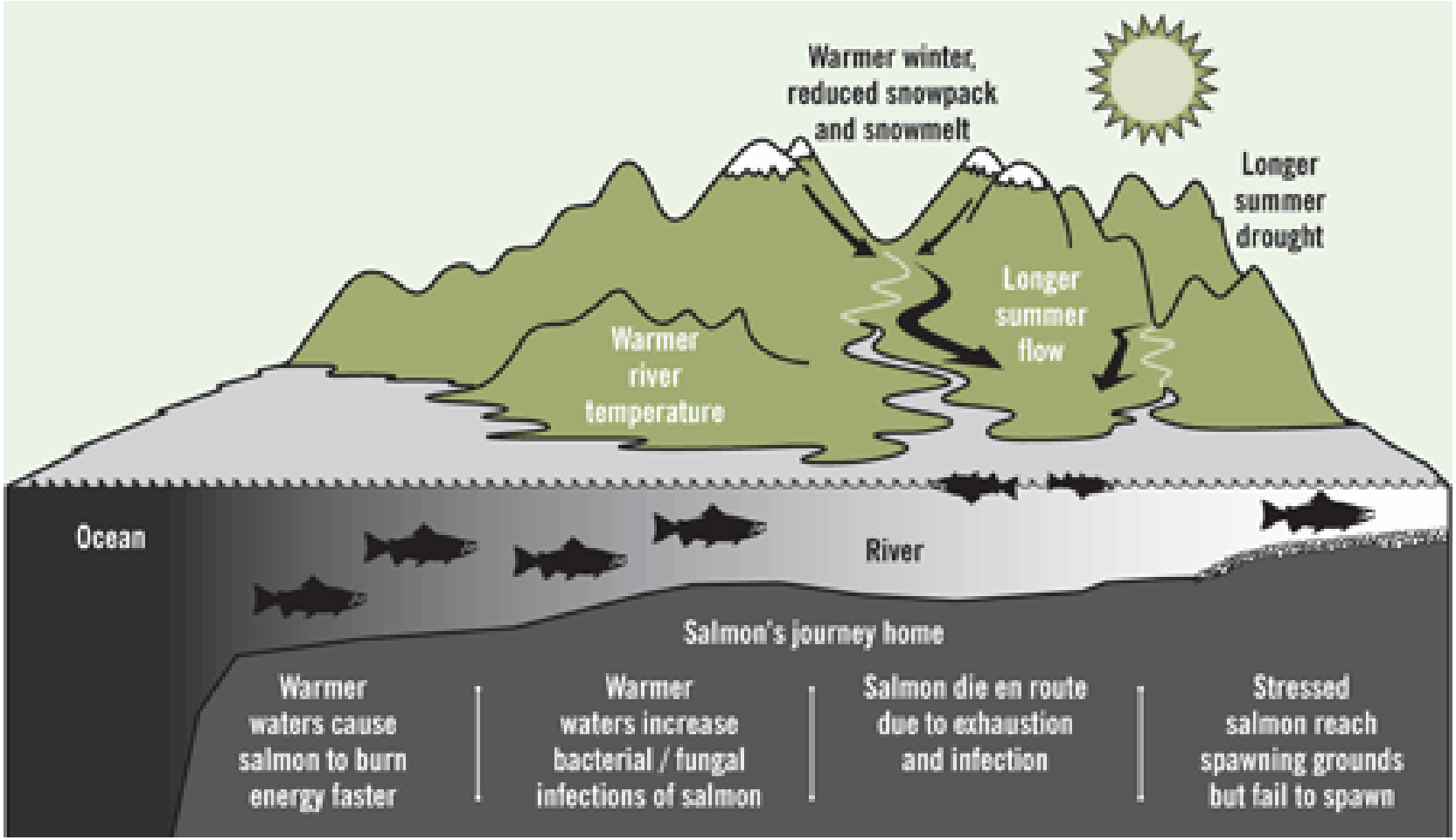
Nature has major impacts on climate change vulnerability



Source and signals

Social determinants of health
Food security
Water safety

Salmon, climate change and us



http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201012_03_e_34426.html

Social harms

CANADIAN WILDLIFE HEALTH COOPERATIVE

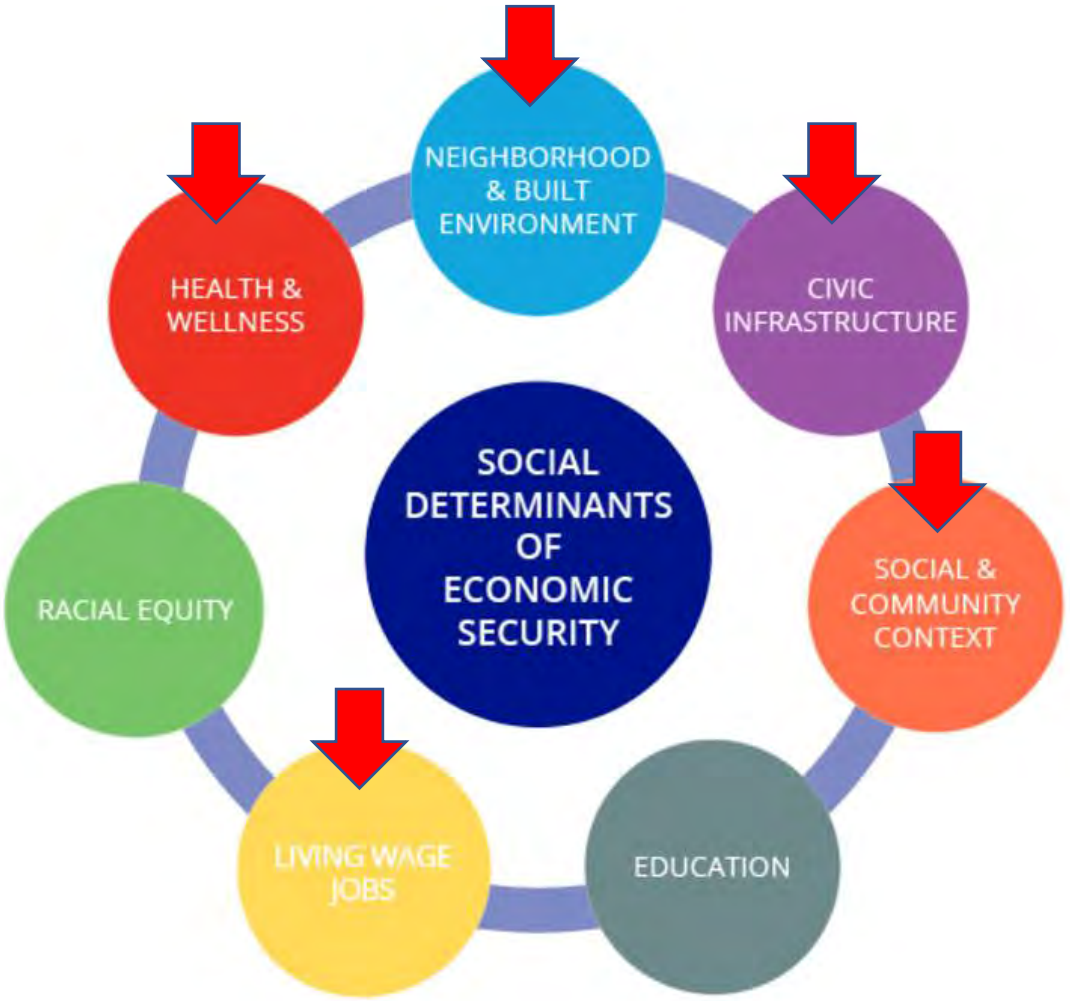
Remember when the cod disappeared

Occupational risks ↑

Alcoholism ↑

Family violence ↑

Mental health ↓

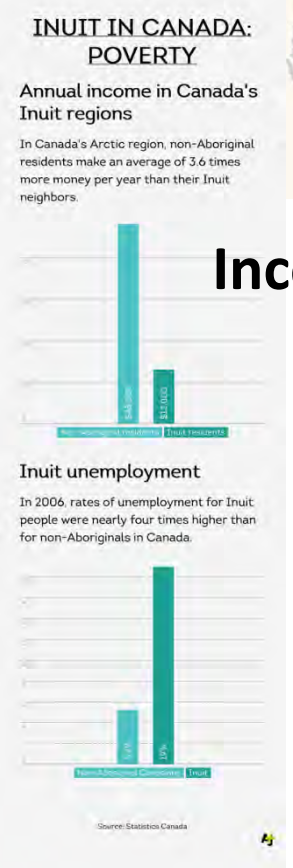


Its happening in the North now

CANADIAN WILDLIFE HEALTH COOPERATIVE

Contributions

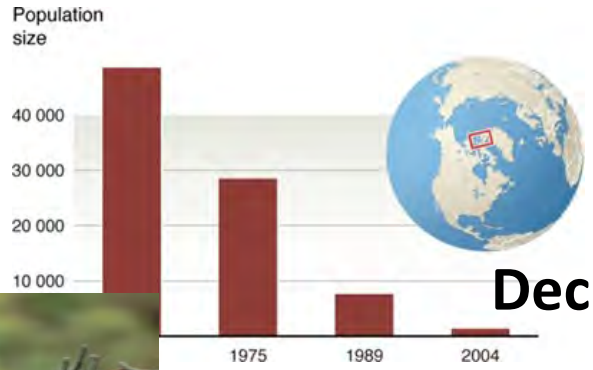
Food



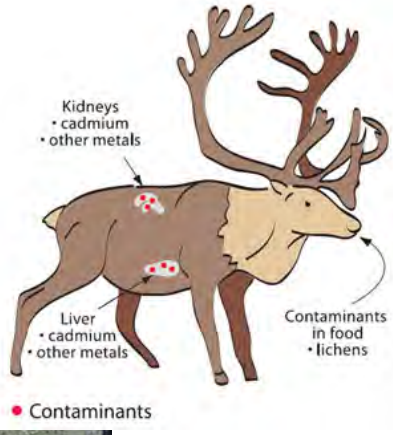
Income

Culture

Threats



Declines

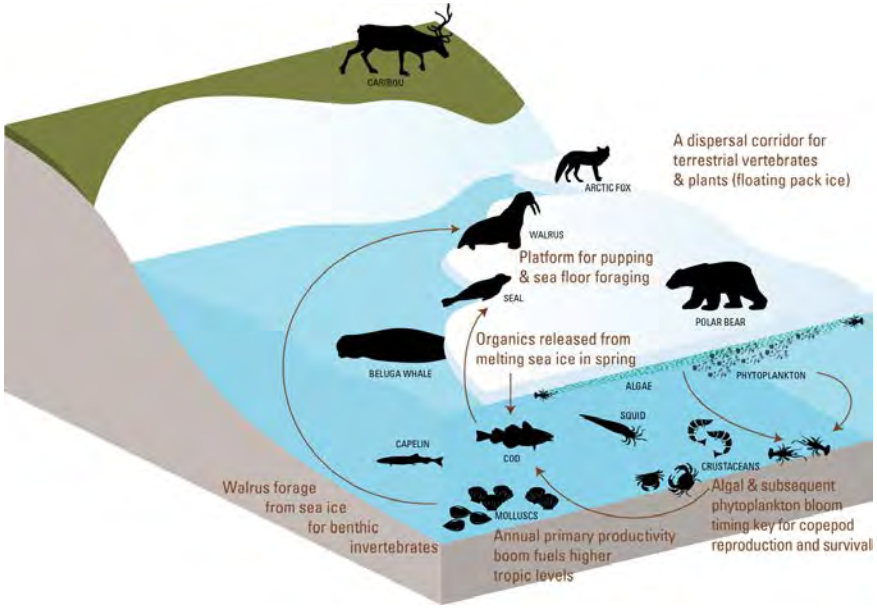


Food Safety

Food Safety

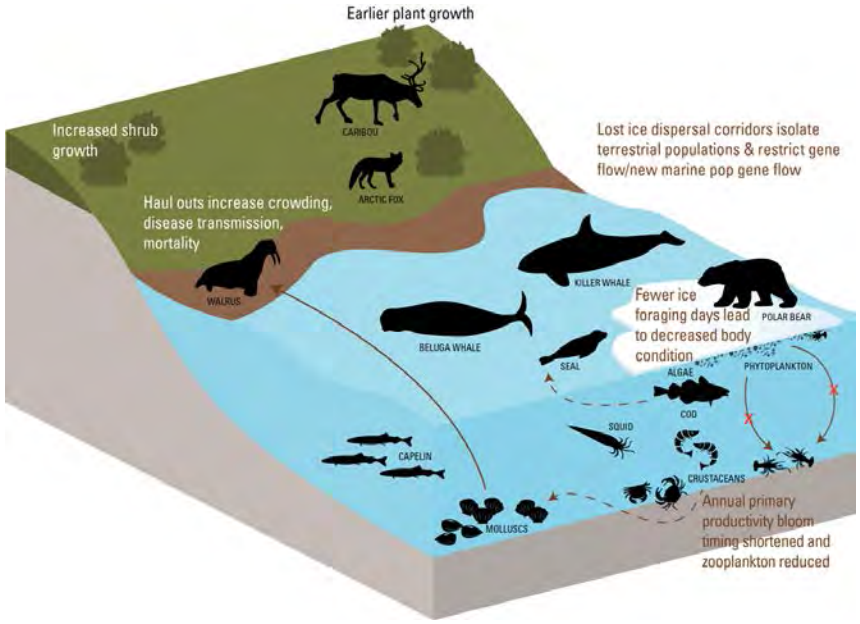
Sensitivity and exposures will be changed concurrently

CANADIAN WILDLIFE HEALTH COOPERATIVE



Environmental hazard exposure

- New infections cycles
- Release of pollutants
- Both affect conservation, food safety and confidence in the safety of nature

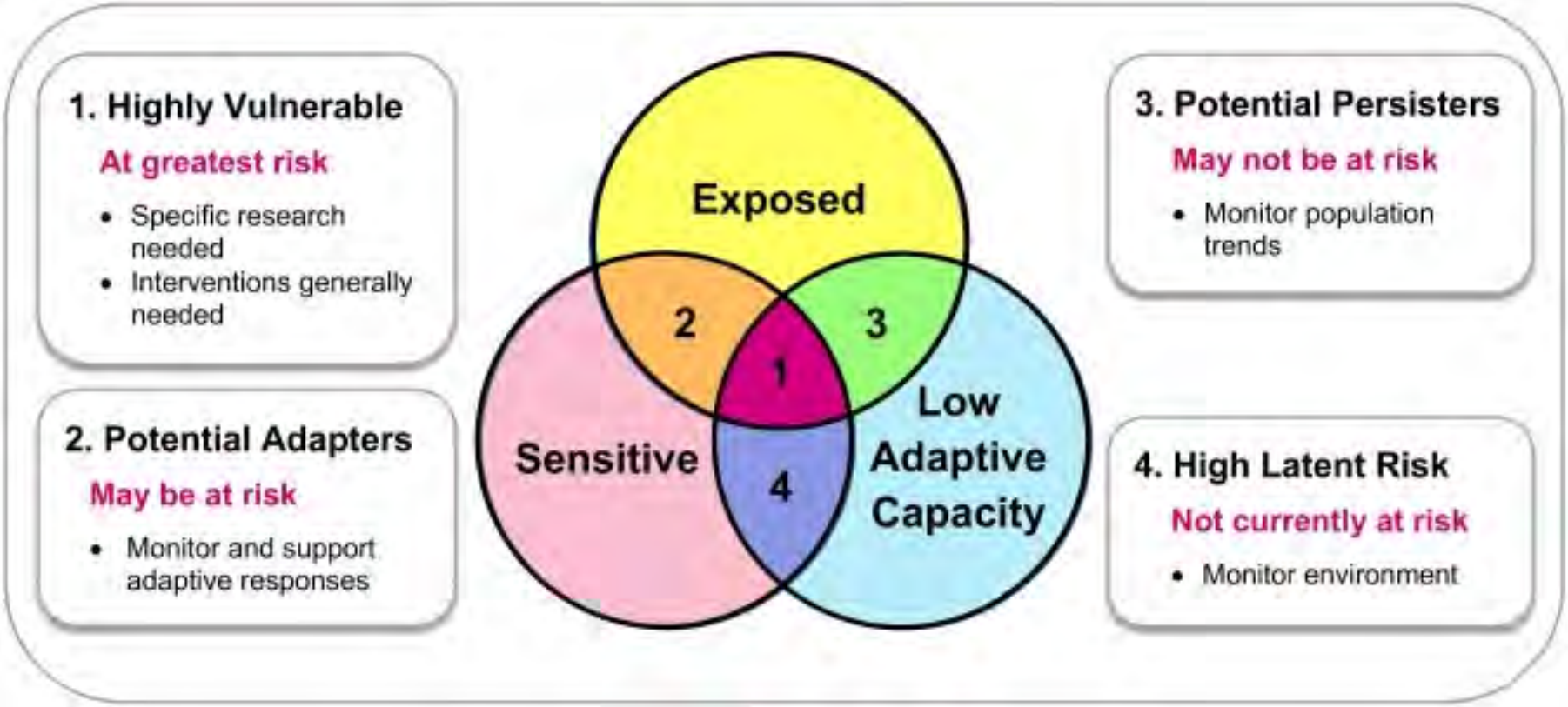


Social determinants of sensitivity

- Less accessible country food = lower food security
- Less hunting tourism revenue = lower income
- Less opportunity for traditional cultural activities

Post *et al.*, 2013. Science

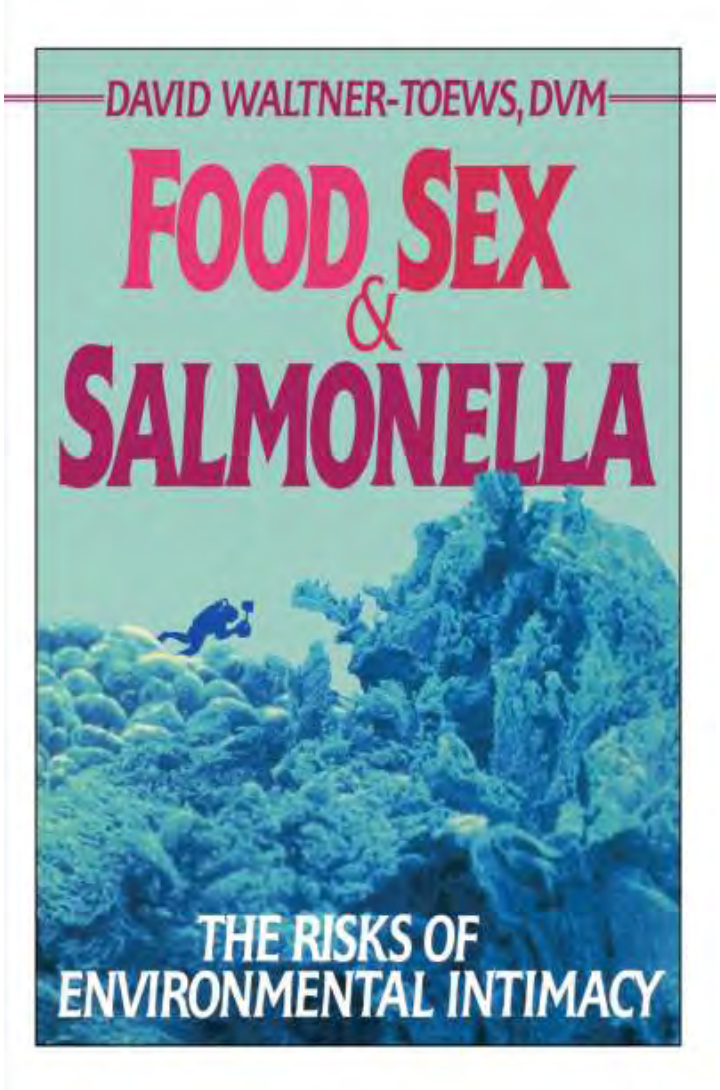
Climate change action need to be tailored to what makes a community vulnerable



Reciprocal care for resilience

None of us are independent of the Earth

- Some communities have more regular, direct and daily dependencies
  - Rural and remote communities
    - Food security
  - Aboriginal health
    - Connections to the land a defining feature
- But the needs for daily living come from nature



Seafood feeds most of the world's poor – how to adapt?

CANADIAN WILDLIFE HEALTH COOPERATIVE

Major challenges to fishing communities posed by climate change:

Relocation of resources and replacement with less commercially valuable species requires diversification of fishing operations and markets.

Changes in the timing of fish spawning and recruitment will need adjustments to management interventions.

In areas where production is already limited by temperature (e.g. tropics) traditional productive areas may be reduced. Dependent communities will need to diversify their livelihoods.

Increases in the frequency and severity of storms may affect infrastructure, both at sea and on shore.

The impact of ocean acidification may be locally significant, for example in activities dependent on coral reefs.

All fishing policies must address these issues and help fishing communities adapt to the changes they are experiencing as a result of climate change. FAO, member countries and partners must work together to strengthen the resilience of fishing communities in areas most affected by climate change.

WELL MANAGED MARINE PROTECTED AREAS SUPPORT FISHERIES

MPAs IMPROVE THE HEALTH OF OCEANS BY:

MPA

- Protecting and Restoring Marine Habitats
- Increasing Resilience to Environmental Changes
- Protecting Species and Rebuilding Fish Stocks

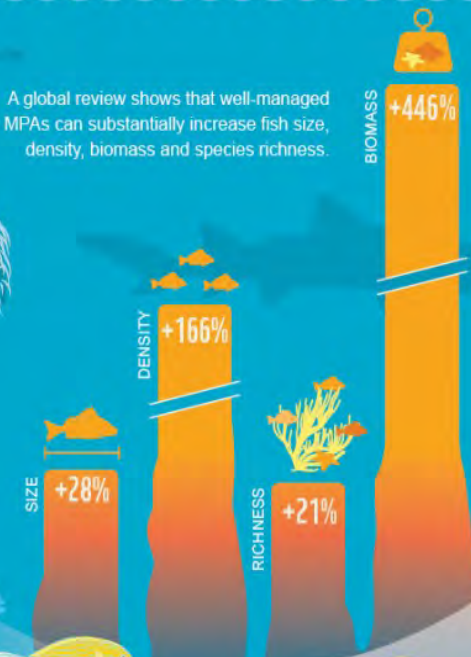
KEY PRINCIPLES FOR MPAs TO WORK:

- Well Designed Networks of MPAs
- Enforced and Complied With
- Local Community Engagement
- Part of an Integrated Management Plan
- Sustainably Financed

MPAs SUPPORT LIVELIHOODS

In Apo Islands, Philippines, fishers have doubled their catch rate 18 years after the MPA was created. As a result, they go out to sea less, saving on fuel and time.

A global review shows that well-managed MPAs can substantially increase fish size, density, biomass and species richness.



MPAs CAN PUMP FISH INTO ADJACENT AREAS

As fish populations recover within MPAs, juveniles and adults can spill over across the boundaries and replenish fishing grounds.

EXAMPLE: APO ISLAND PROTECTED AREA, PHILIPPINES

Surgeonfish and jackfish represent 40-75% of local fishery yields.

Since the MPA was established, their population has tripled...

...resulting in an increase in catch per unit effort of **+50%**

MPAs CAN EXPORT LARVAE INTO ADJACENT AREAS

Larger fish inside MPAs produce disproportionately more eggs and larvae. Some larvae then drift to fished areas.

EXAMPLE: GREAT BARRIER REEF PROTECTED AREA, AUSTRALIA

The coral trout and the stripey snapper are exploited locally.

± 50%

Local MPAs produce ± 50% of total juvenile recruitment in nearby fished areas.

Globally, WWF works to support Marine Protected Areas and ensure they contribute to securing food and livelihoods for people while conserving critical habitat and species.

www.panda.org/mpa

WWF

SOURCES: Harrison et al., 2012; Lester et al., 2009; Russ et al., 2004

Design by: Catalyze

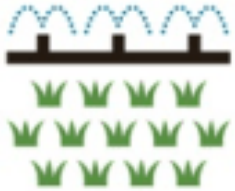
Biodiversity gives options to adapt for food security

Adaptation will be key

CROPS

Temperate regions will benefit more from adaption than tropical regions

Switching to varieties tolerant to heat, drought or salinity



Optimising irrigation

Managing soil nutrients and erosion

LIVESTOCK

Key adaptations for small-scale producers include:

Matching animal numbers to changes in pastures

More farms that mix crops and livestock

Controlling the spread of pests, weeds and diseases

FISHERIES

Key adaptations for small-scale fisheries include:

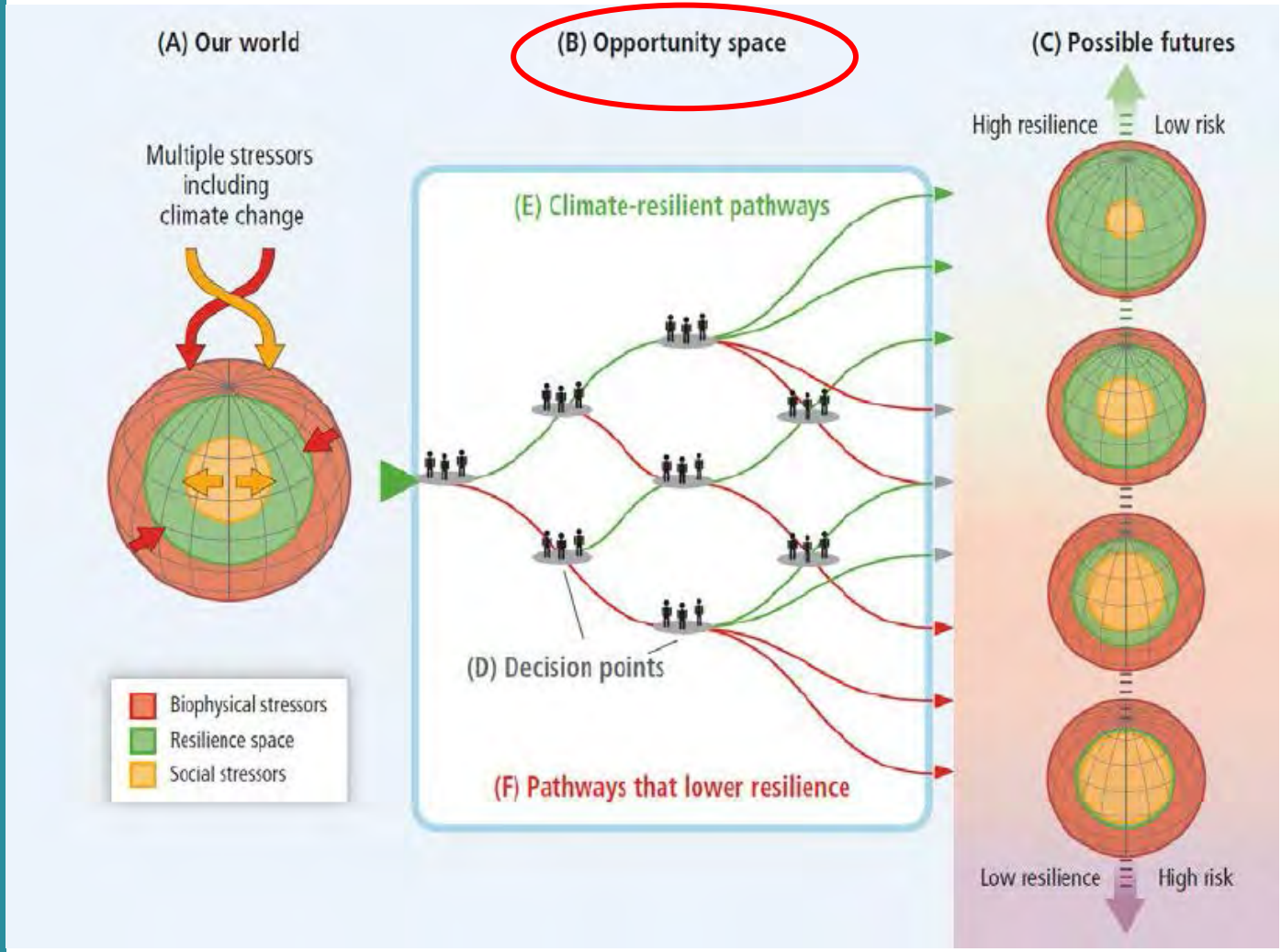
Switching to more abundant species

Restoring degraded habitats and breeding sites like mangroves

Strengthening infrastructure such as ports and landing sites

Capacity to Cope

The capacity of social, economic and environmental systems to cope with a hazardous event or disturbance

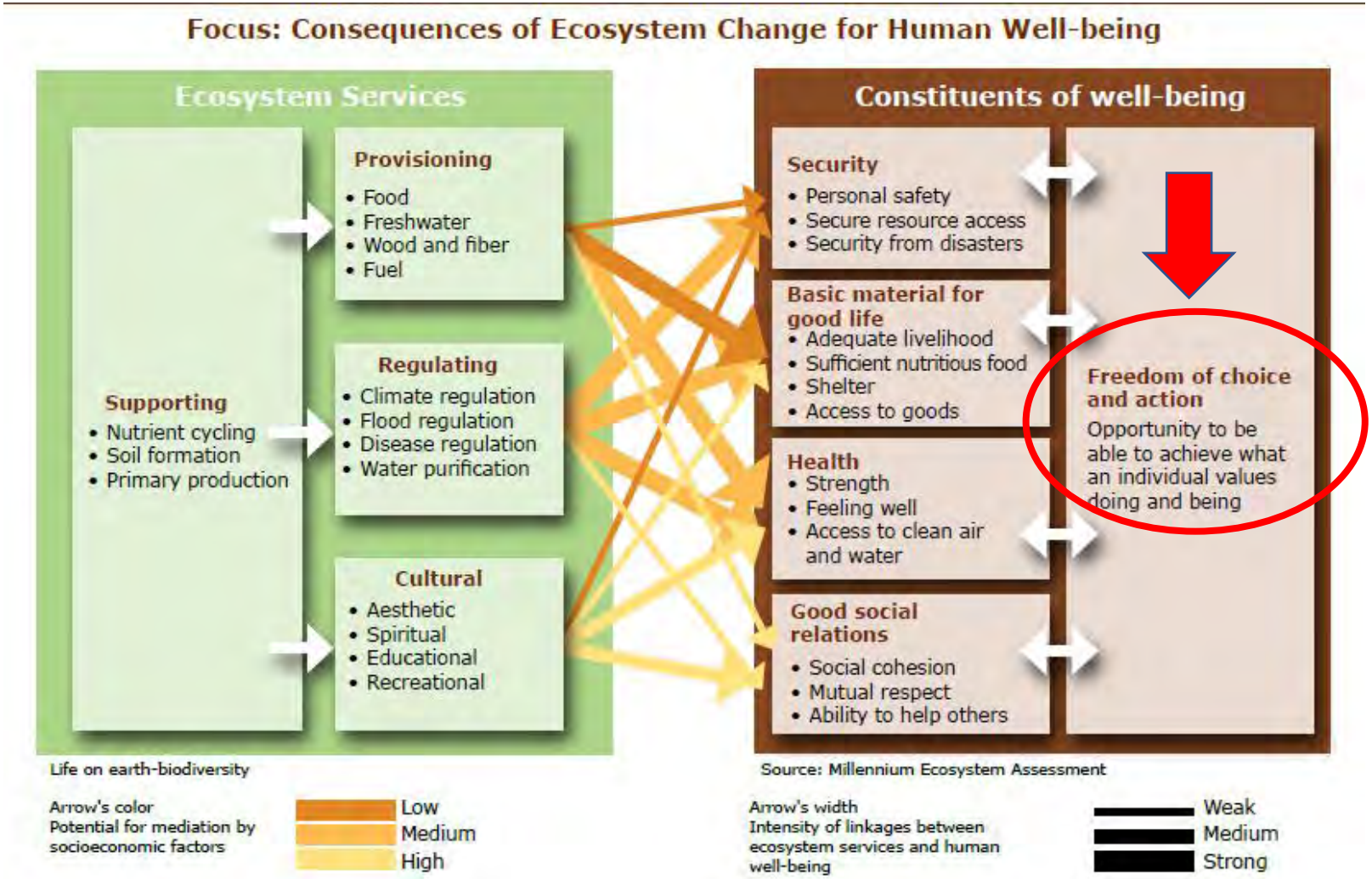


The 3rd Pillar

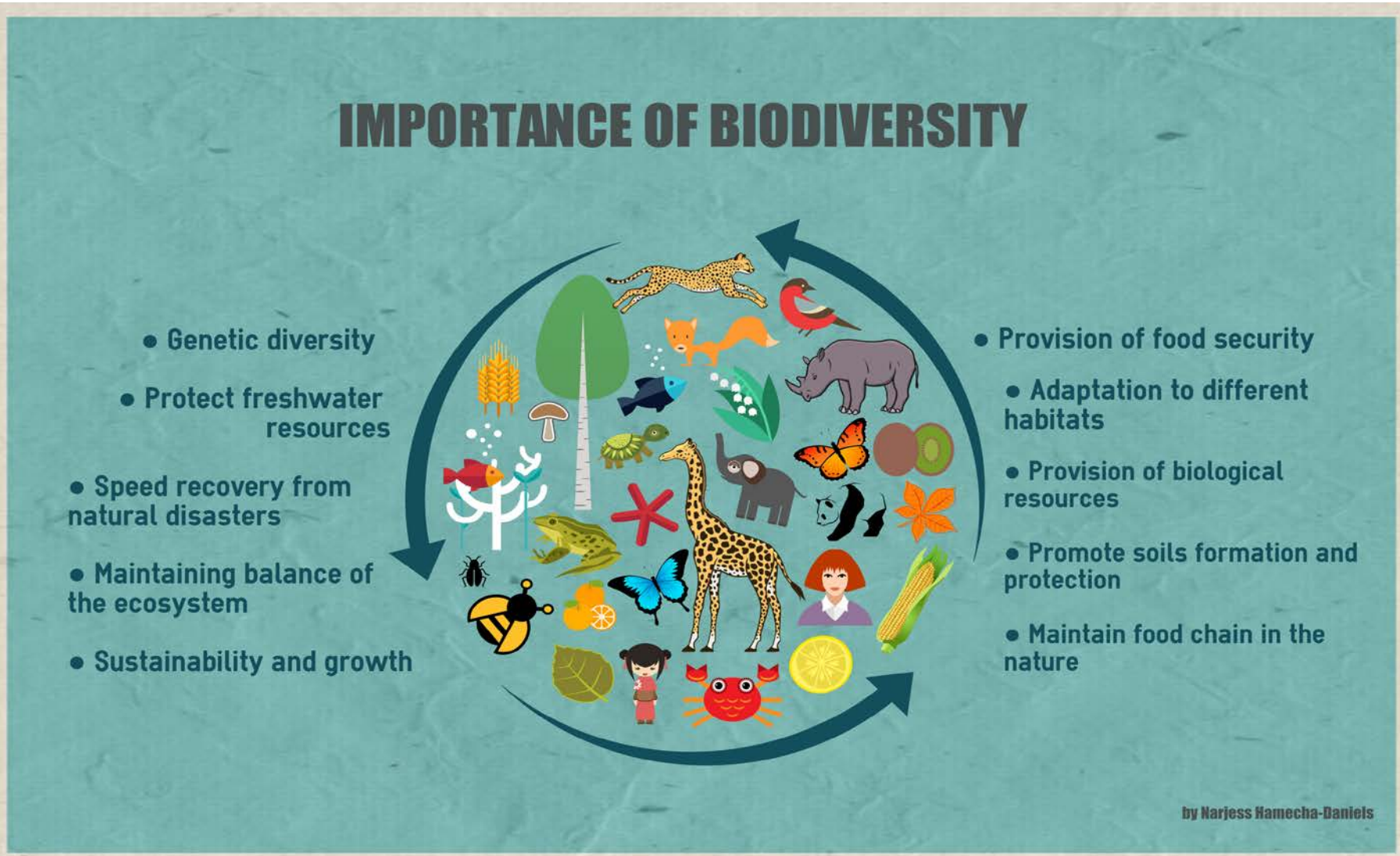
We need options to Act

https://www.researchgate.net/publication/277132841_National_RD_Priorities_Climate_Change_Impacts/figures?lo=1

Raw material for Freedom of Choice



The diversity in biodiversity



Role for public health advocacy for nature

http://www.alternativesjournal.ca/energy-and-resources/biodiversity-protects

https://www.iucn.org/resources/issues-briefs/ecosystem-based-adaptation

Building climate change health equity requires reciprocal care of us and nature

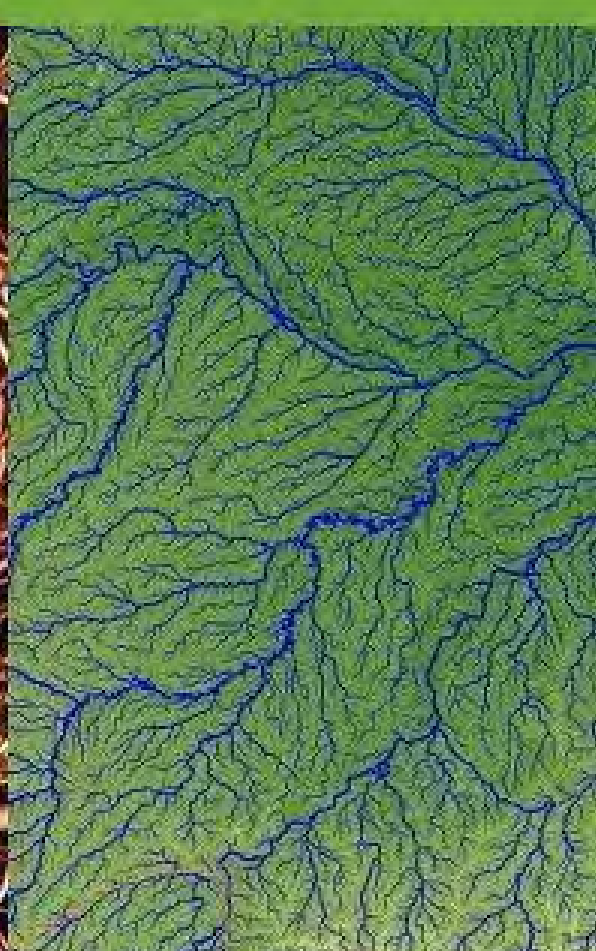
How can public health build intergenerational health equity without paying attention to nature?

http://nccdh.ca/blog/entry/who-is-using-the-public-health-roles-for-health-equity-action

WE ARE NATURE

Close-up of a small leaf

Blood vessels of a human heart



River network of the Amaz

Thank-you

Questions?

CANADIAN WILDLIFE HEALTH COOPERATIVE

cstephen@cwhc-rcsf.ca