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C3 Centro de Ciencias de la Complejidad

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CHILAM
Laboratorio para la simulación de Sistemas Complejos y Adaptativos

Una Salud: Ecología de Enfermedades

Dr. Gabriel E García Peña

species

Epi-species

Epi-PUMA

PROYECTO 42

Conductome

MOTIVACIÓN

Reflexión sobre

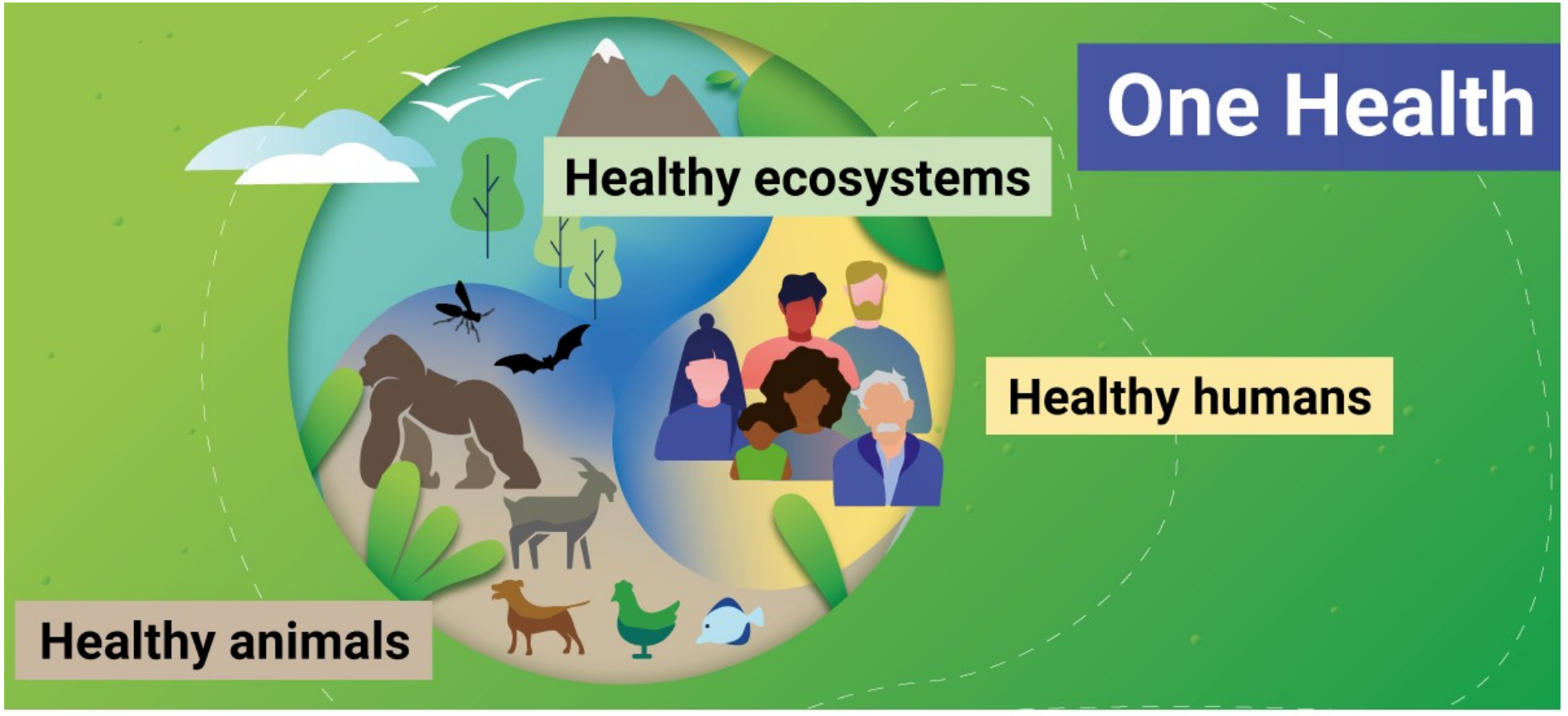
+ Una Salud y la Ecología de Enfermedades

+ Aproximación de la Ciencia de Datos a estos Sistemas Complejos

Conceptos que revisaremos:

Una Salud
Ecosistema Saludable
La Emergencia de Enfermedades Zoonóticas

¿Cuanto sabemos del riesgo potencial de los patógenos zoonóticos?
Ciencia de Datos para investigar las Enfermedades.



Food and Agriculture Organization of the United Nations

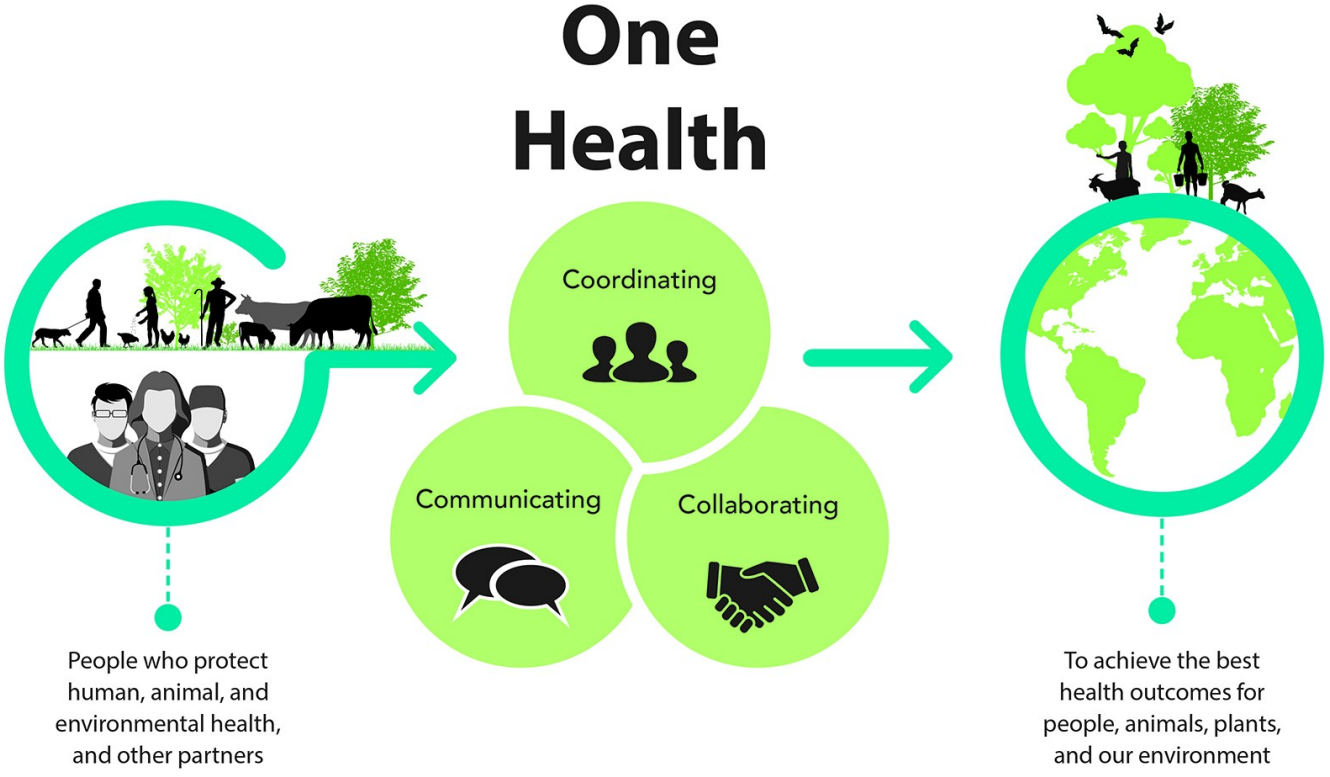
WORLD ORGANISATION FOR ANIMAL HEALTH

World Health Organization

UN environment programme

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

Transdiciplina...

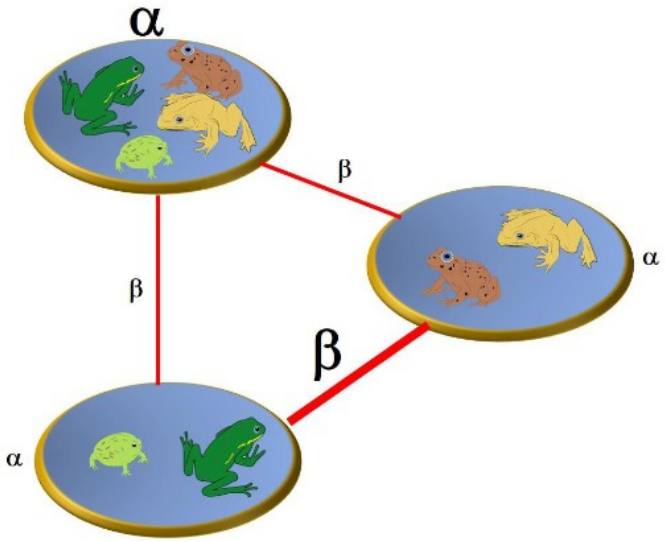


CS302365-A

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

¿Qué es un ecosistema?

we isolate systems mentally for the purposes of study, … actually the systems we isolate mentally are not only included as parts of larger ones, but they also overlap, interlock and interact with one another.



A. G. Tansley, 1935

VIEWPOINT

The Evolution of Species Interactions

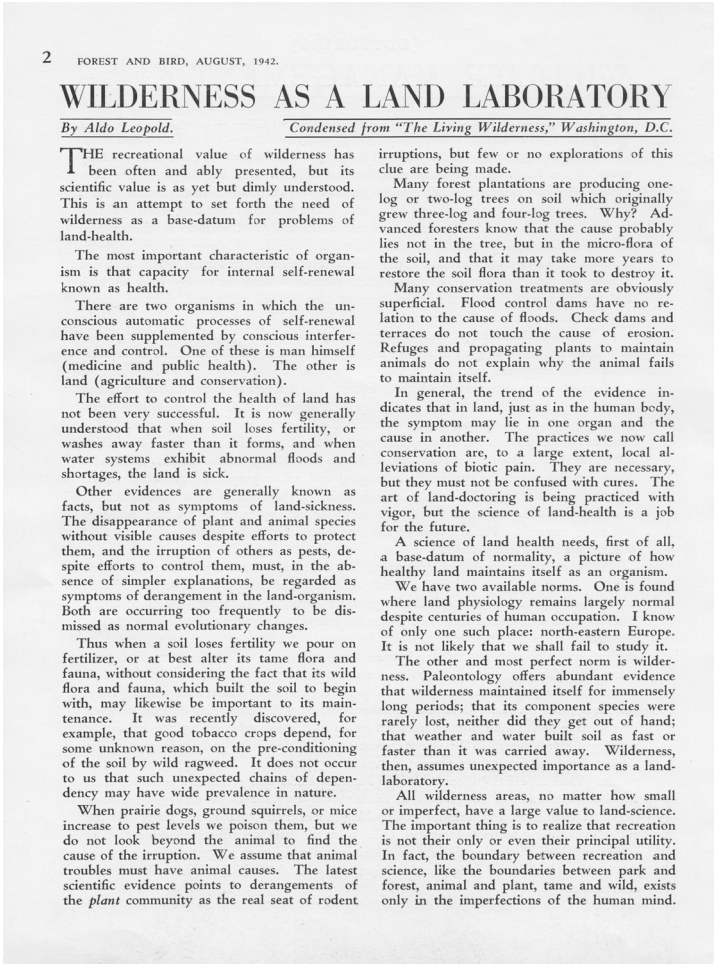
John N. Thompson

Interactions between species are as evolutionarily malleable as the species themselves and have played a central role in the diversification and organization of life. This malleability creates complex geographic mosaics in interspecific interactions that can evolve rapidly over decades, blurring the distinction between evolutionary time and ecological time and making the study of coevolution crucial for human health and welfare.

istic interactions, magnify their eff
now have convincing examples of
tion forging obligate mutualisms am
living species such as yuccas an
moths (*4*); creating divergence
among competing fish, lizards, n
and other taxa [for example, (*5*)]; p

Passiflora cumbalensis y Ensifera ensifera

La salud del ecosistema



2 FOREST AND BIRD, AUGUST, 1942.

WILDERNESS AS A LAND LABORATORY

By Aldo Leopold. *Condensed from "The Living Wilderness," Washington, D.C.*

THE recreational value of wilderness has been often and ably presented, but its scientific value is as yet but dimly understood. This is an attempt to set forth the need of wilderness as a base-datum for problems of land-health.

The most important characteristic of organism is that capacity for internal self-renewal known as health.

There are two organisms in which the unconscious automatic processes of self-renewal have been supplemented by conscious interference and control. One of these is man himself (medicine and public health). The other is land (agriculture and conservation).

The effort to control the health of land has not been very successful. It is now generally understood that when soil loses fertility, or washes away faster than it forms, and when water systems exhibit abnormal floods and shortages, the land is sick.

Other evidences are generally known as facts, but not as symptoms of land-sickness. The disappearance of plant and animal species without visible causes despite efforts to protect them, and the irruption of others as pests, despite efforts to control them, must, in the absence of simpler explanations, be regarded as symptoms of derangement in the land-organism. Both are occurring too frequently to be dismissed as normal evolutionary changes.

Thus when a soil loses fertility we pour on fertilizer, or at best alter its tame flora and fauna, without considering the fact that its wild flora and fauna, which built the soil to begin with, may likewise be important to its maintenance. It was recently discovered, for example, that good tobacco crops depend, for some unknown reason, on the pre-conditioning of the soil by wild ragweed. It does not occur to us that such unexpected chains of dependency may have wide prevalence in nature.

When prairie dogs, ground squirrels, or mice increase to pest levels we poison them, but we do not look beyond the animal to find the cause of the irruption. We assume that animal troubles must have animal causes. The latest scientific evidence points to derangements of the *plant* community as the real seat of rodent irruptions, but few or no explorations of this clue are being made.

Many forest plantations are producing one-log or two-log trees on soil which originally grew three-log and four-log trees. Why? Advanced foresters know that the cause probably lies not in the tree, but in the micro-flora of the soil, and that it may take more years to restore the soil flora than it took to destroy it.

Many conservation treatments are obviously superficial. Flood control dams have no relation to the cause of floods. Check dams and terraces do not touch the cause of erosion. Refuges and propagating plants to maintain animals do not explain why the animal fails to maintain itself.

In general, the trend of the evidence indicates that in land, just as in the human body, the symptom may lie in one organ and the cause in another. The practices we now call conservation are, to a large extent, local alleviations of biotic pain. They are necessary, but they must not be confused with cures. The art of land-doctoring is being practiced with vigor, but the science of land-health is a job for the future.

A science of land health needs, first of all, a base-datum of normality, a picture of how healthy land maintains itself as an organism.

We have two available norms. One is found where land physiology remains largely normal despite centuries of human occupation. I know of only one such place: north-eastern Europe. It is not likely that we shall fail to study it.

The other and most perfect norm is wilderness. Paleontology offers abundant evidence that wilderness maintained itself for immensely long periods; that its component species were rarely lost, neither did they get out of hand; that weather and water built soil as fast or faster than it was carried away. Wilderness, then, assumes unexpected importance as a land-laboratory.

All wilderness areas, no matter how small or imperfect, have a large value to land-science. The important thing is to realize that recreation is not their only or even their principal utility. In fact, the boundary between recreation and science, like the boundaries between park and forest, animal and plant, tame and wild, exists only in the imperfections of the human mind.

The most important characteristic of organism is that capacity for internal self-renewal known as health.

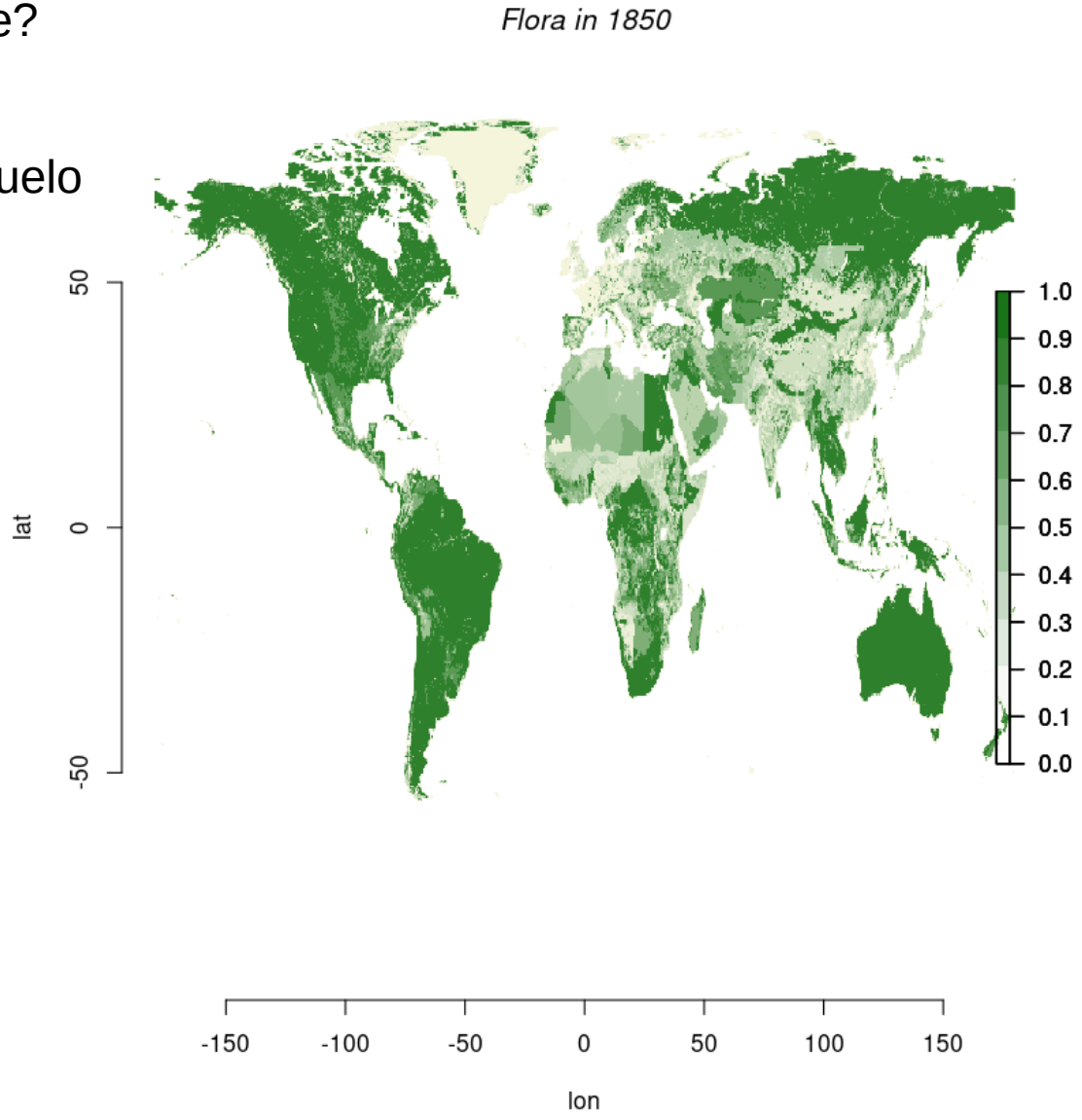
… It is now generally understood that when soil loses fertility, or washes away faster than it forms, and when water systems exhibit abnormal floods and shortages, the land is sick.

Aldo Leopold 1942, Wilderness as a land laboratory

¿Cuál es el estado de Salud del Ecosistema?

¿Ecosistema saludable?

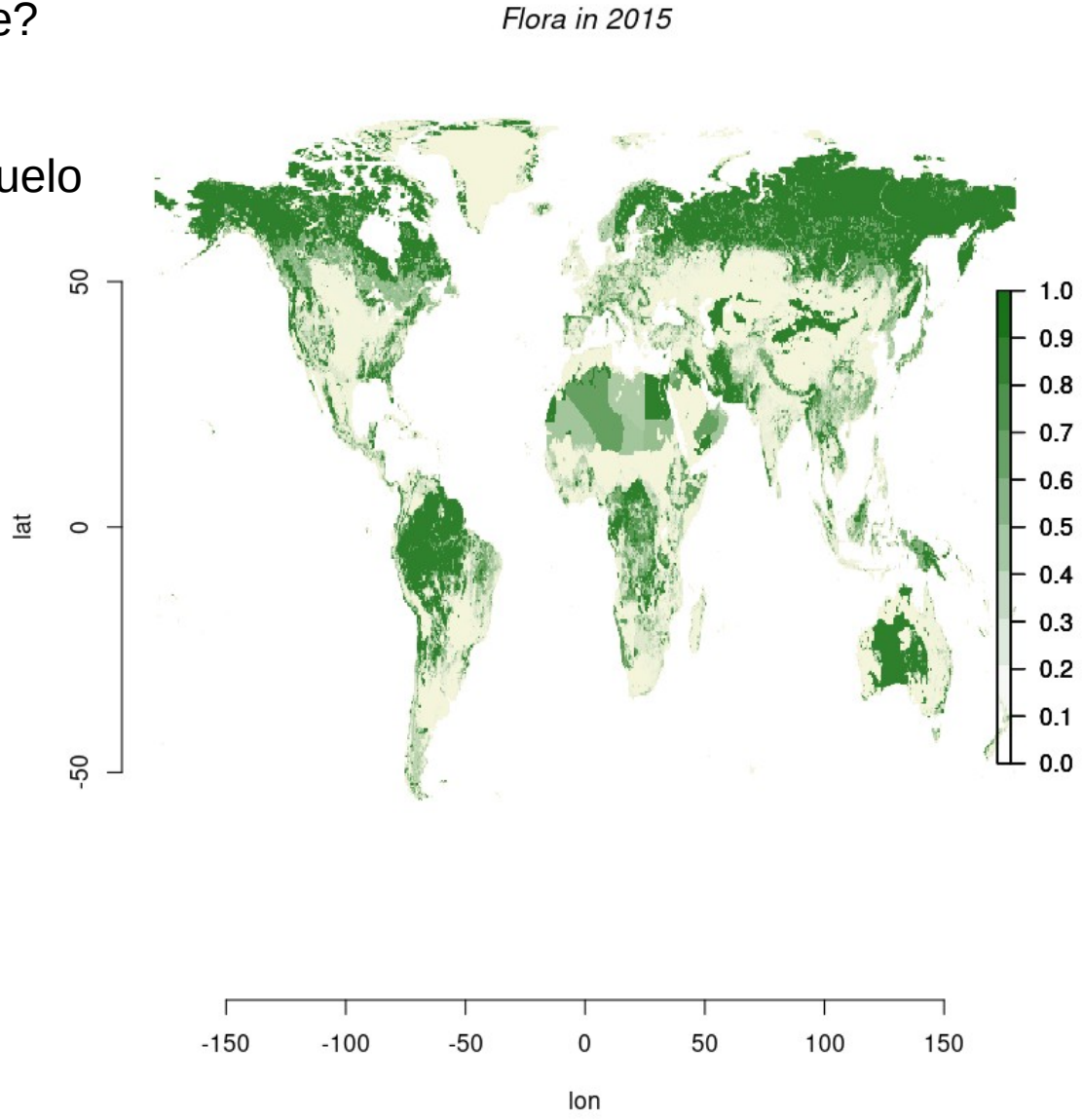
Deforestación y
cambio en el uso del suelo



Cobertura
de bosque

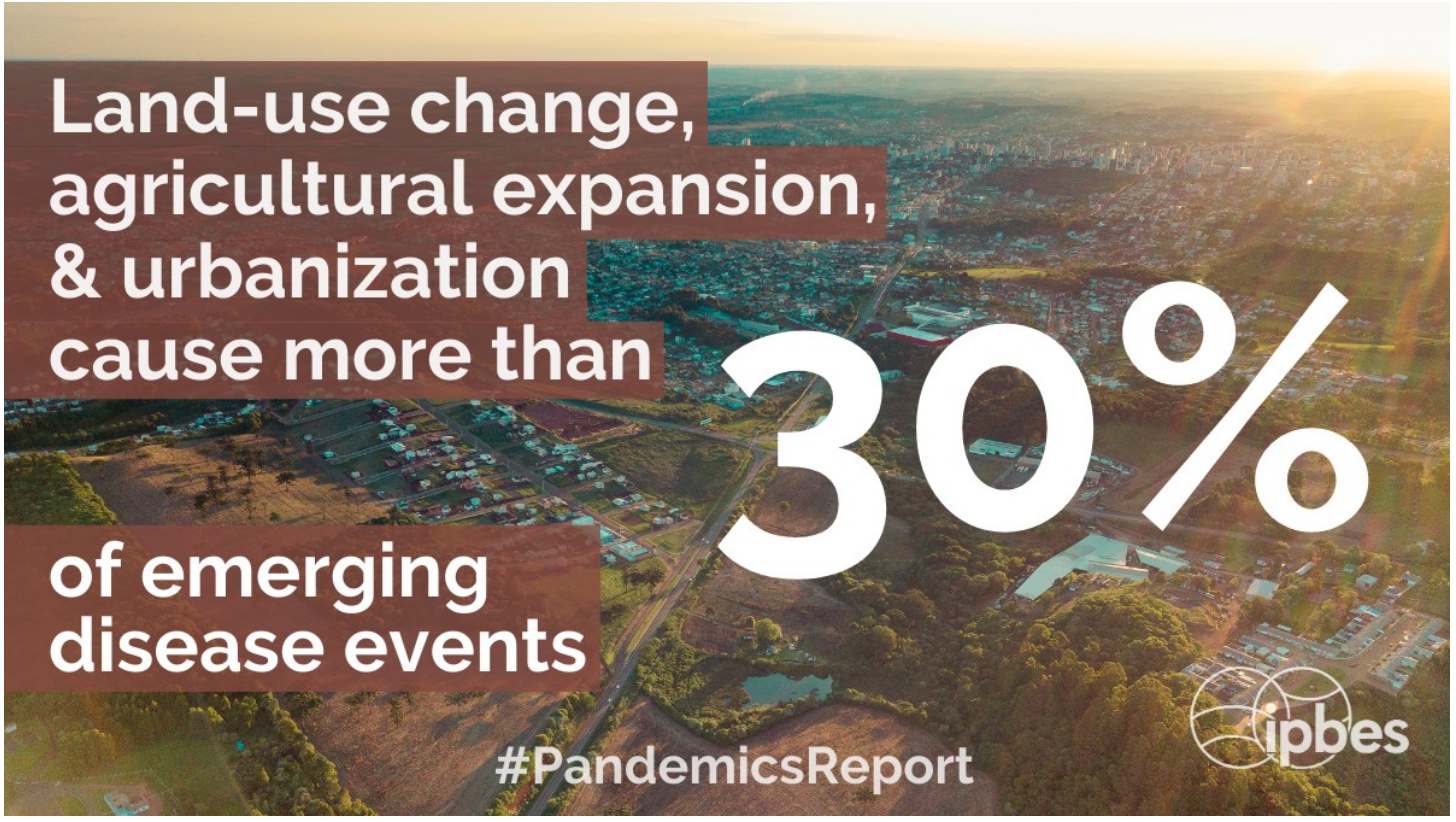
¿Ecosistema saludable?

Deforestación y
cambio en el uso del suelo



Cobertura
de bosque

Al modificar nuestro ecosistema e impactar en su biodiversidad, causamos también la emergencia de enfermedades de origen zoonótico



Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Fundada en 21 April 2012, Panama

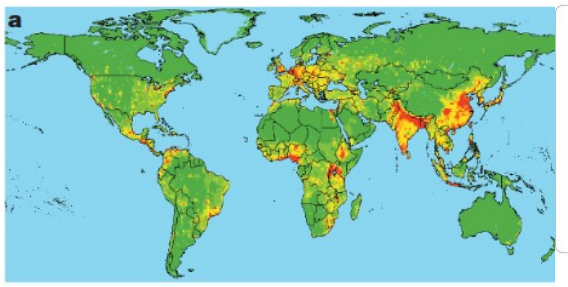
Las enfermedades transmitidas por fauna silvestre y por vector, son las más frecuentes.

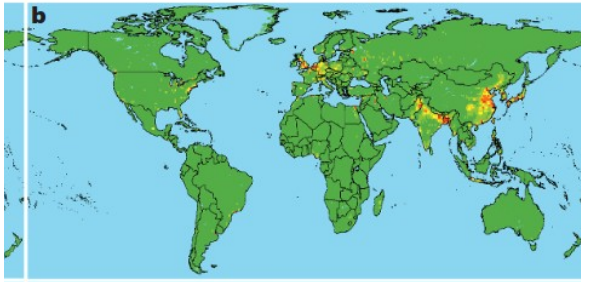
nature Vol 451|21 February 2008|doi:10.1038/nature06536

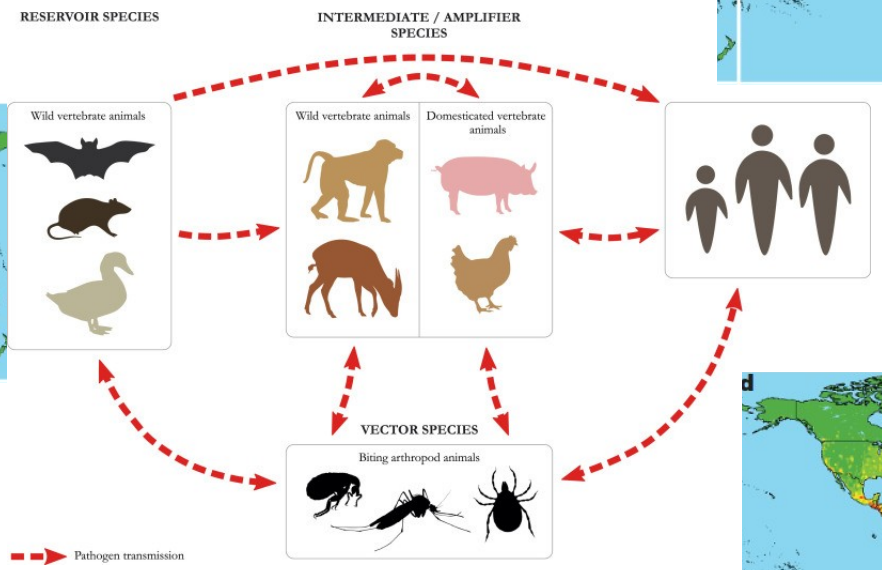
LETTERS

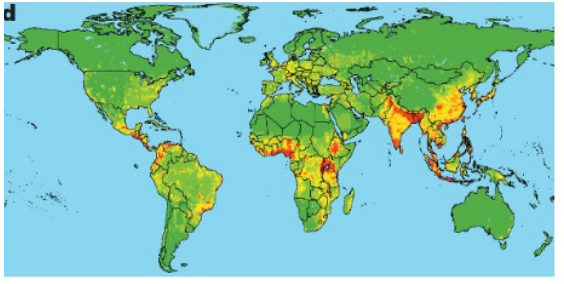
Global trends in emerging infectious diseases

Kate E. Jones[1], Nikkita G. Patel[2], Marc A. Levy[3], Adam Storeygard[3]†, Deborah Balk[3]†, John L. Gittleman[4] & Peter Daszak[2]



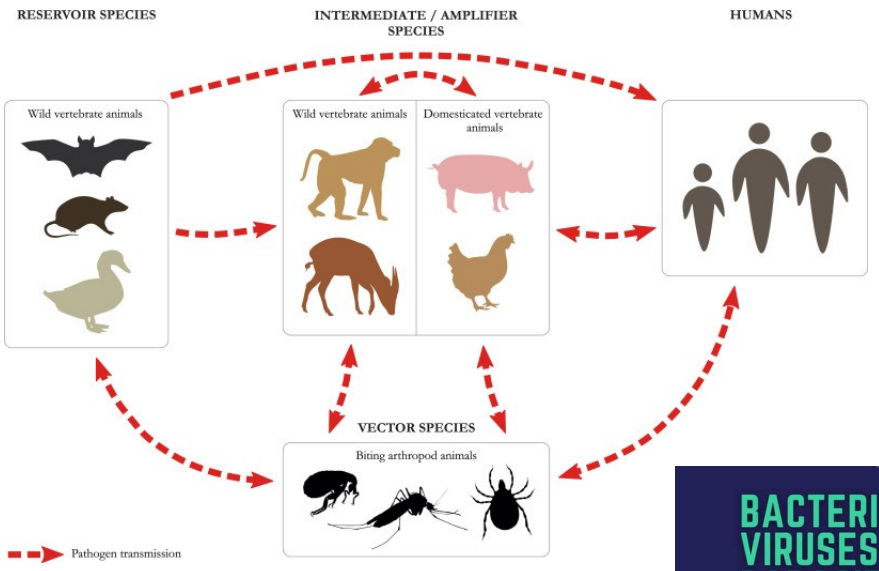






eClinicalMedicine
Part of THE LANCET Discovery Science
17 abril, 2022 DOI:10.1016/j.eclinm.2022.101386

¿Cuál es la diversidad de patógenos zoonóticos?



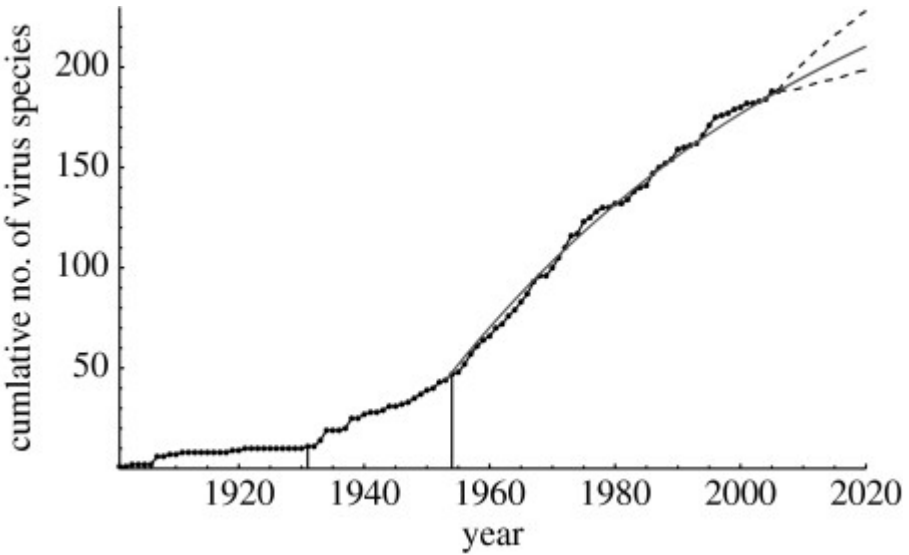
Bryan Walsh May 4, 2017

PROCEEDINGS OF THE ROYAL SOCIETY B

Proc. R. Soc. B (2008) **275**, 2111–2115
doi:10.1098/rspb.2008.0294
Published online 27 May 2008

Temporal trends in the discovery of human viruses

Mark E. J. Woolhouse*, Richard Howey, Eleanor Gaunt, Liam Reilly, Margo Chase-Topping and Nick Savill



Se han identificado ~ 300 virus en el humano.

AMERICAN SOCIETY FOR MICROBIOLOGY | mBio®

RESEARCH ARTICLE
September/October 2013 Volume 4 Issue 5 10.1128/mbio.00598-13
https://doi.org/10.1128/mbio.00598-13

A Strategy To Estimate Unknown Viral Diversity in Mammals

Simon J. Anthony[a,b], Jonathan H. Epstein[b], Kris A. Murray[b], Isamara Navarrete-Macias[a], Carlos M. Zambrana-Torrelio[b], Alexander Solovyov[a], Rafael Ojeda-Flores[c], Nicole C. Arrigo[a], Ariful Islam[b], Shahneaz Ali Khan[d], Parviez Hosseini[b], Tiffany L. Bogich[e,f], Kevin J. Olival[b], Maria D. Sanchez-Leon[a,b], William B. Karesh[b], Tracey Goldstein[g], Stephen P. Luby[h], Stephen S. Morse[g,i], Jonna A. K. Mazet[g], Peter Daszak[b], W. Ian Lipkin[a]

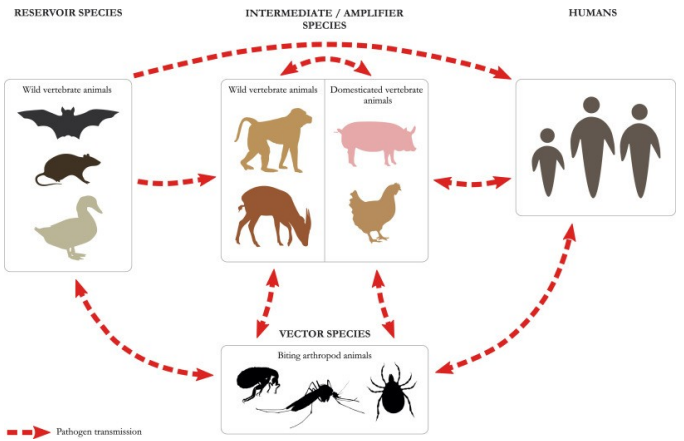
De ~ 320 000 virus
solo 300 son patógenos,

Bastó 1 solo para causar
la pandemia de CoVID

“We used a simple extrapolation to estimate that there are a minimum of **320,000 mammalian viruses awaiting discovery** within these nine families.”

¿Cómo investigar la diversidad de organismos potencialmente patógenos?

Nuestro ecosistema* es
un sistema complejo y desconocido,
y puede estudiarse con Ciencia de Datos



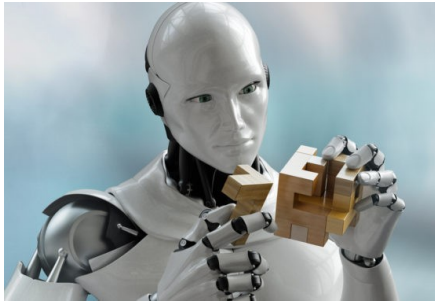
* patógenos incluidos

En chilam,

El Aprendizaje de Máquina sobre
Muchos Datos Diversos permite inferir:

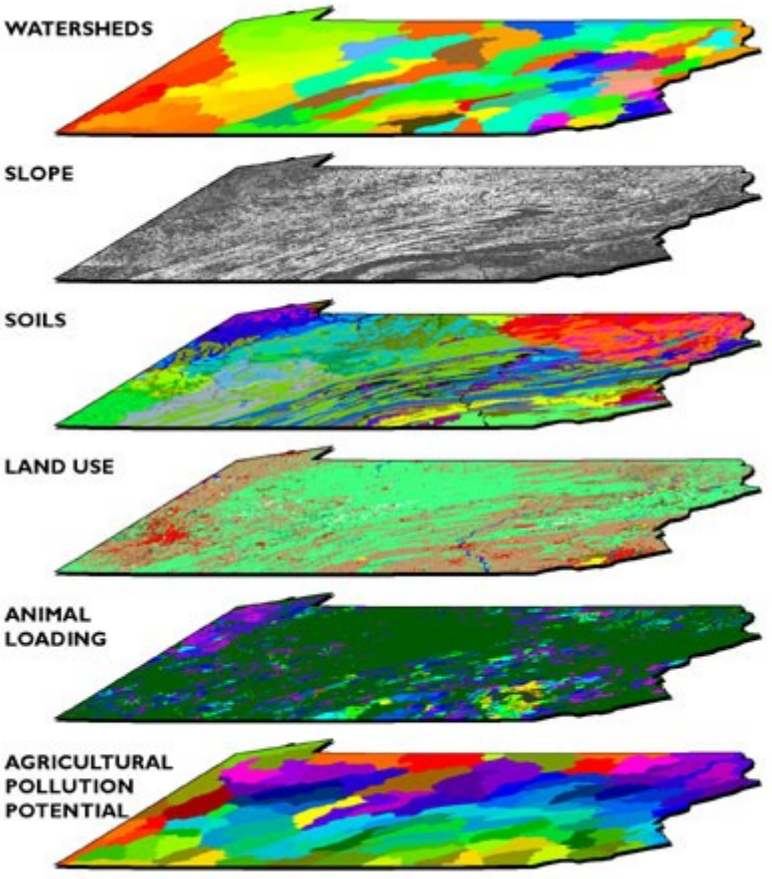
¿Quienes son hospederos potenciales de patogenos (ciclos enzoóticos)?

Los lugares y condiciones en los que un patógeno zoonótico puede emerger.



P(C|Xn)

superposición de mapas (información)



Coordinación de la Investigación Científica

Centro de Ciencias de la Complejidad

CHILAM

Laboratorio para la simulación de Sistemas Complejos Adaptativos

UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

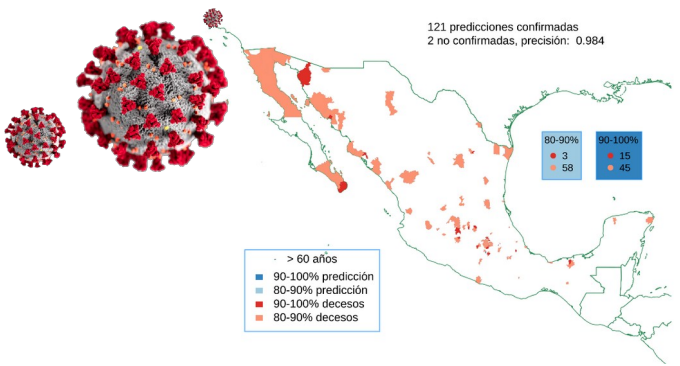
POR MI RAZA HABLARÁ EL ESPÍRITU

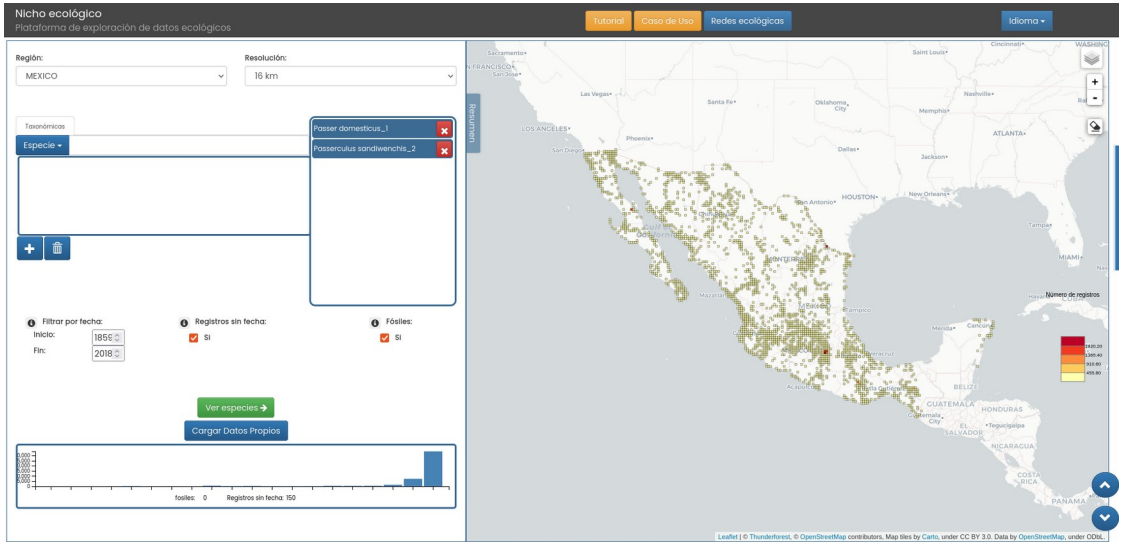
Epi-species

species

PROYECTO 42

Epi-PUMA





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¡Gracias!

species

Epi-species

Epi-PUMA

PROYECTO 42

Conductome