



Early Warning Systems for Human-Wildlife Conflict, Zoonotic Spillover, and Other Conservation Challenges

Tuesday April 23, 2024



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TRAFFIC

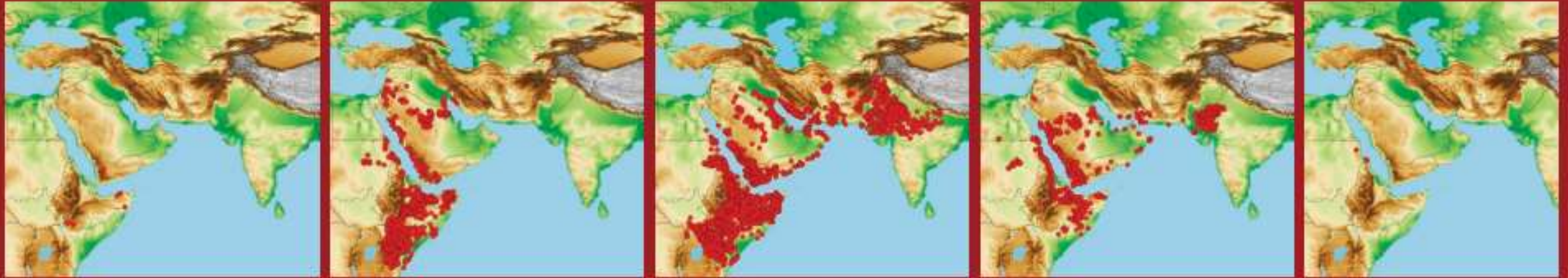






Melissa Williams,
Senior Agriculture Economist, World Bank

Evolution of desert locust swarms, 2018 – 2022



2018

Late 2019

Early 2020

2021

2022

Evolutions of desert locust response, 2018-2022

2018

- **December:** FAO desert locust warning

2019

- January: IGAD warning

2020

- January: FAO Appeal
- February: IGAD Ministerial
- May: World Bank ERLP

2021

- WB grant for Transboundary Pest Platform approved
- Control operations continue

2022 →

- IGAD Transboundary Pest Platform operating



ICPAC

IGAD Climate Prediction
and Applications Centre

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Platform for Management of Transboundary Pests

Inter-regional Platform for the Sustainable Management of Desert Locusts and other
Transboundary Pests

[Djibouti](#) | [Ethiopia](#) | [Kenya](#) | [Somalia](#) | [South Sudan](#) | [Sudan](#) | [Uganda](#) | [DLCO](#) | [FAO](#) | [ICIPE](#) | [CABI](#) | [more . . .](#)



Bruce Jones

Partnerships Director, EarthRanger



EARTH RANGER

Early Warning Systems for Conservation

www.EarthRanger.com | brucej@earthranger.com | [@EarthRangerTech](https://twitter.com/EarthRangerTech)

The screenshot displays the Earthranger mobile application interface. On the left, a 'Reports' panel is open, showing details for a report with ID 190927. The report title is 'EM16 crossed Park Boundary.' and the subtitle is 'Geofence Break'. The report was made on 18 Mar '24 at 05:11 and is marked as 'Red' priority. The report is currently 'Active'. The 'Reported By' field is empty. The 'Report location' is -14.078807°, 25.789049°. The 'Report Date' is 2024/03/18 and the 'Report Time' is 04:49. The 'Name of subject' is EM16, the 'Total Fix Count' is 24, and the 'Subject Heading' is 6,801855727718271. The 'Current Region' is 'Unknown region'. At the bottom of the panel are buttons for 'Note', 'Attachment', 'Report', 'Cancel', and 'Save'. On the right, a map of Greater Kafue National Park shows a red dashed geofence boundary. A blue line with an arrow indicates the movement of subject EM16, crossing the boundary. A circular inset provides a magnified view of the crossing point, with a text box stating 'EM16 crossed Park Boundary. 18 Mar 24' and an elephant icon labeled 'EM16'. A legend in the top right of the map indicates '2 subjects' and '79 points over 3 days'. The top of the screen shows the Earthranger logo, the location 'Greater Kafue National Park', and a 'Healthy' status indicator.

EARTH RANGER Easter Island - Healthy - brucej

Events 56684 **Subject Proximity** Amber 19 Apr 24 06:02

Details Active

Reported By: EarthRanger System Priority: Amber

Event Location: -27.151406°, -109.390046° Event Date: 2024/04/06 Event Time: 23:58

Analyzer Details

Subject 1 Name: Horton	Subject 2 Name: Najin
Subject 1 location: -27.151221, -109.390885	Subject 2 location: -27.151527, -109.389169
Subject 1 Speed Kmhr: 3.7	Subject 2 Speed Kmhr: 5.2
Subject 1 Heading: 58.19	Subject 2 Heading: 253.82

Proximity Dist Meters: 180
Total Fix Count: 2

History Time ↓
External Analyzers 19 Apr 24 06:02
Note Attachment Event Cancel Save

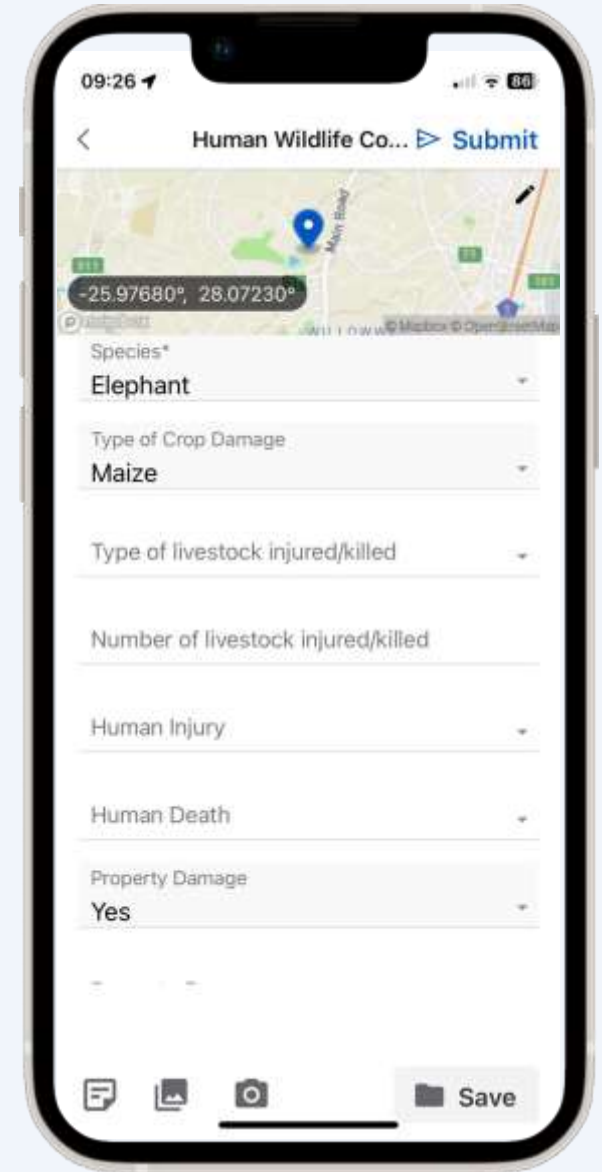
2 subjects 599 points over 21 days

Subject Proximity 06 Apr 24

50m

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

HWC Early Warning: Proximity Alerts





58894 Subject Proximity Amber 19 Apr 24 06:02

Details Active

Reported By: EarthRanger System Priority: Amber

Event Location: -27.151406, -109.390046 Event Date: 2024/04/06 Event Time: 23:58

Analyzer Details

Subject 1 Name	Subject 2 Name
Horton	Najin
Subject 1 location	Subject 2 location
-27.151221, -109.390885	-27.151527, -109.389189
Subject 1 Speed Kmhr	Subject 2 Speed Kmhr
3.7	5.2
Subject 1 Heading	Subject 2 Heading
55.19	253.82

Proximity Dist Meters: 180

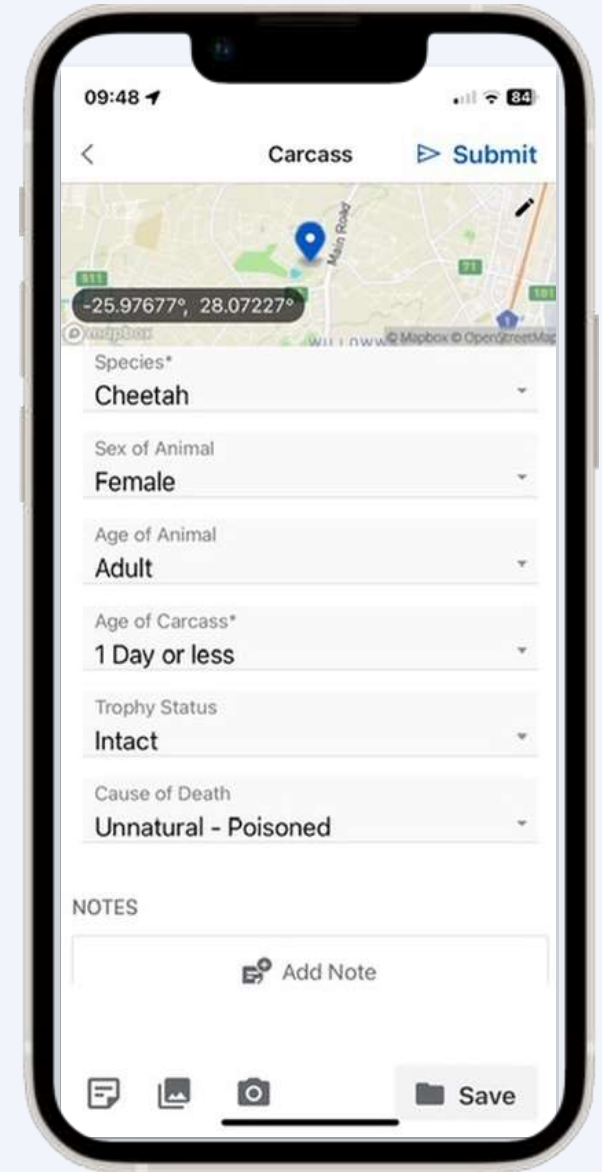
Total Fix Count: 2

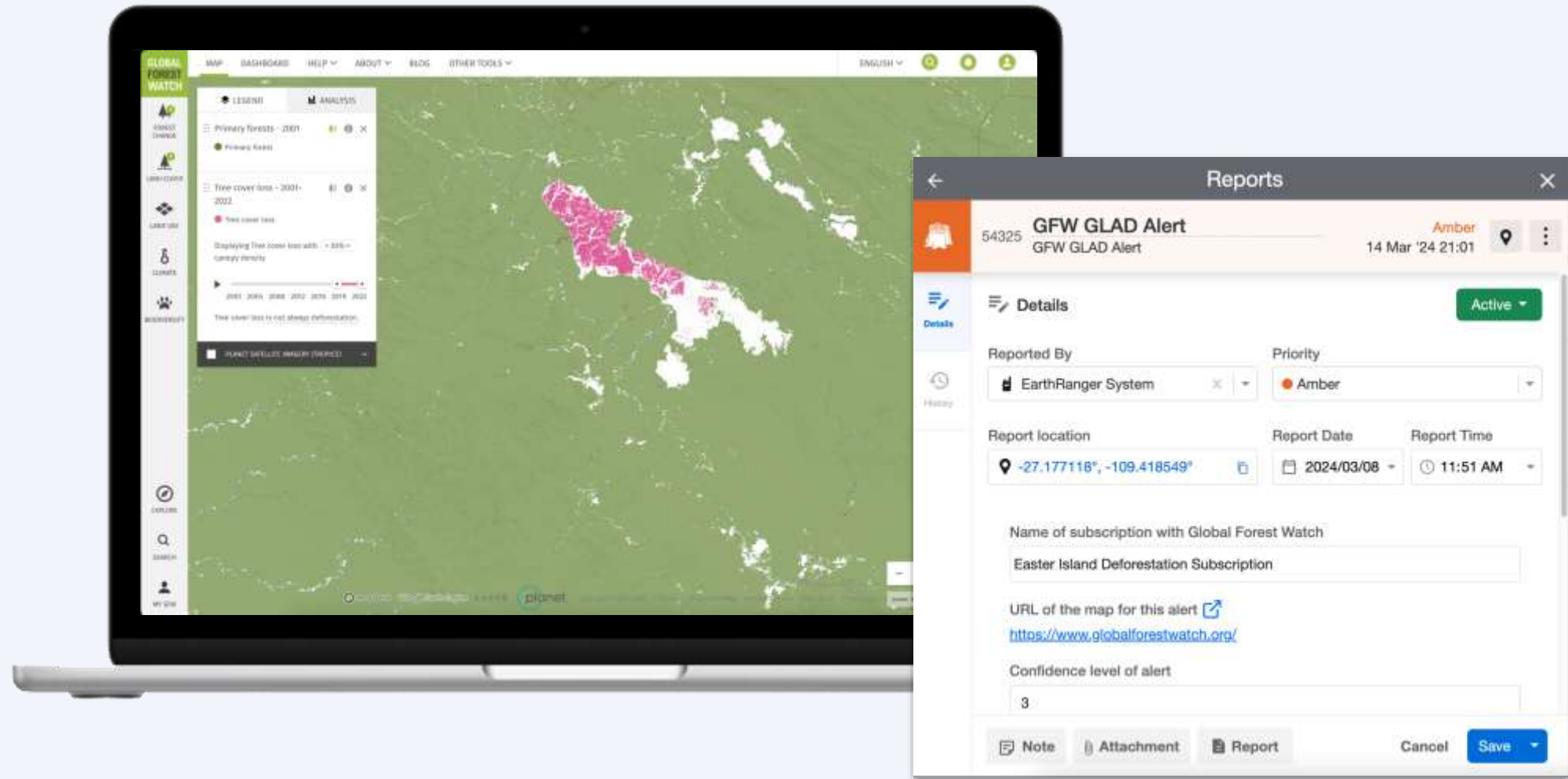
History Time ↓

External Analyzers 19 Apr 24 06:02

Save Marked Event Cancel Save



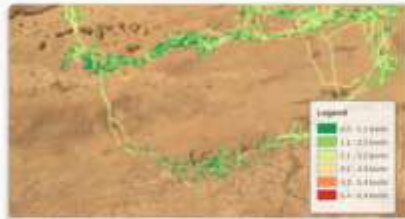




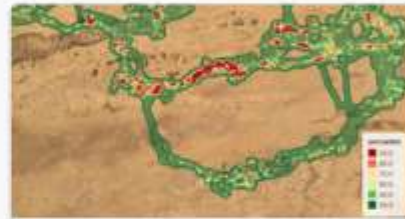
New Workbook

[Dashboard Templates](#)
[Analysis](#)

Movement



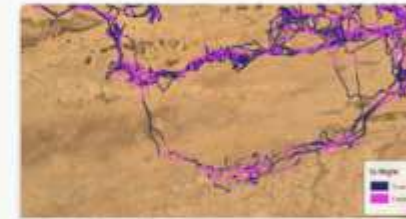
Wildlife Speed Map



Home Range Monitoring



Collared Subject Report

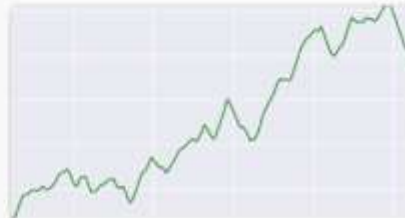


Covariate Labeling

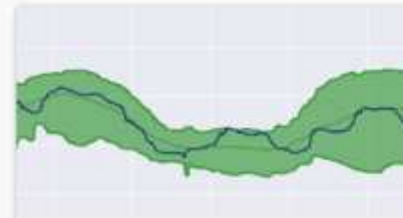
Environmental



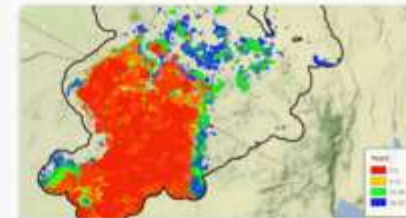
Rainfall Gradient



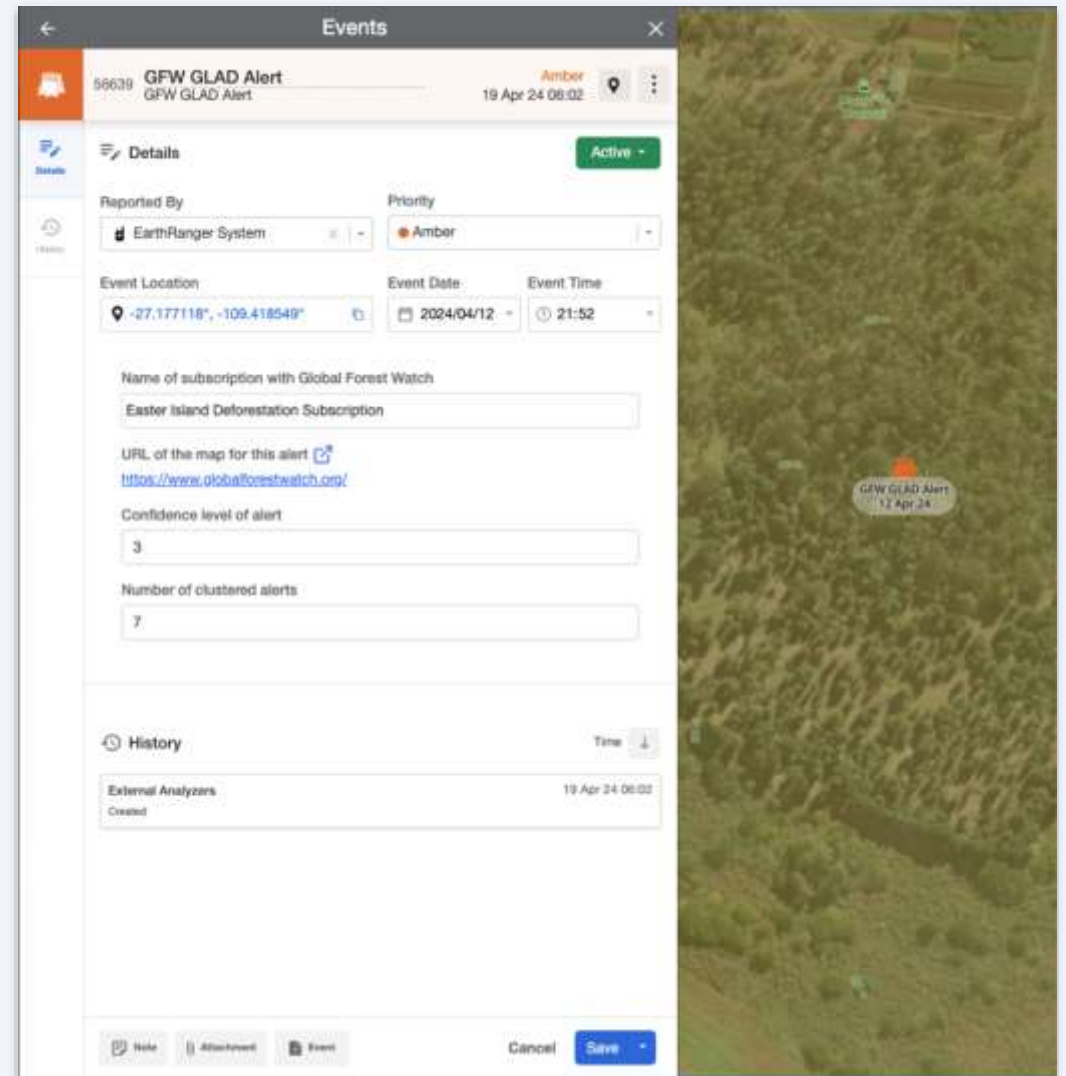
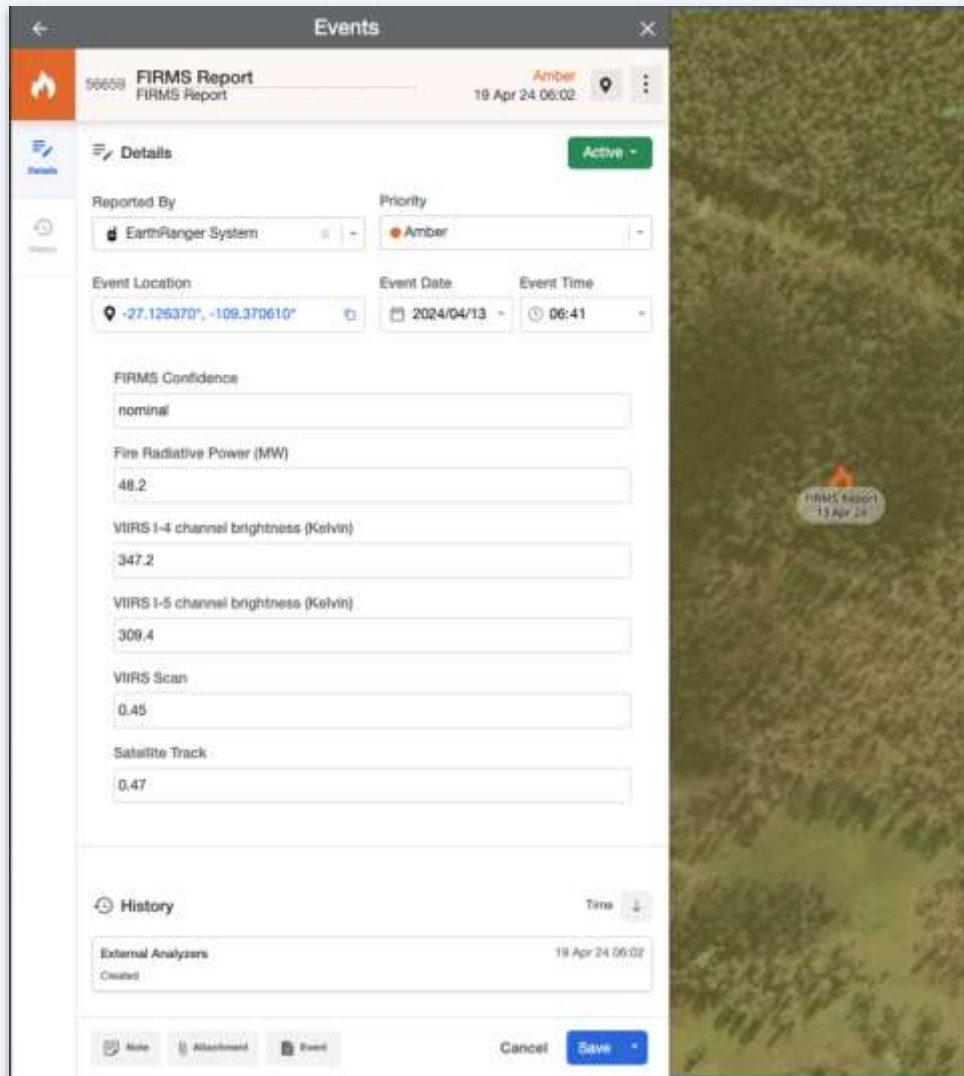
Surface Albedo Monitoring



NDVI Monitoring

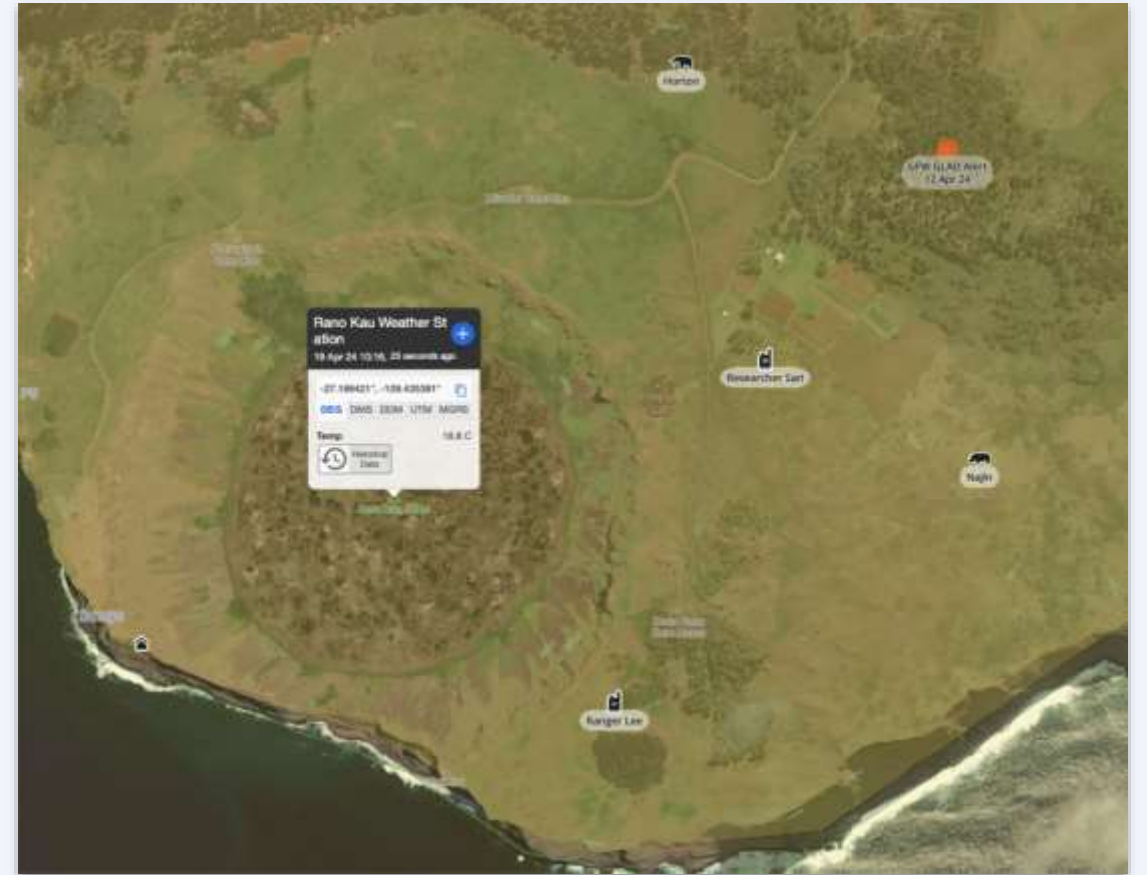


Fire Monitoring



Combo Alerts: Fire & Deforestation (Poachers? Encroachment?)







EARTH RANGER

Thank you

www.EarthRanger.com | brucej@earthranger.com | [@EarthRangerTech](https://www.instagram.com/EarthRangerTech)



Sarah Olson

Director of Health Research for the Health Program,
WCS





Wildlife
Conservation
Society

by the
numbers



Founded in
1895



Conserves habitat for
~50%
of Earth's biodiversity



350+
protected areas WCS helped
create since our founding



WCS works in
50+
countries



4,000+
scientists, conservationists, animal
experts, and other dedicated staff



400+
peer-reviewed scientific
publications each year



205
Indigenous community partners



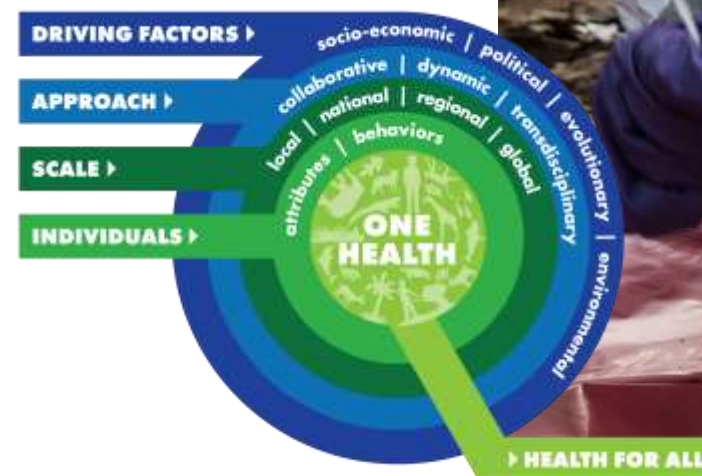
2,000+
local community partners



30X30
Partnering with governments,
communities, and others to protect
30% of the planet by 2030

Health Program

- Only global conservation NGO with robust health program
- 100+ years wildlife health
- One Health founder
 - 2004 “Manhattan Principles”
- Multidisciplinary and Cross-Sectoral at core
 - Field-based conservationists
 - Communicable and non-communicable health threats
 - Counter Wildlife Trafficking
 - Indigenous Peoples and local communities

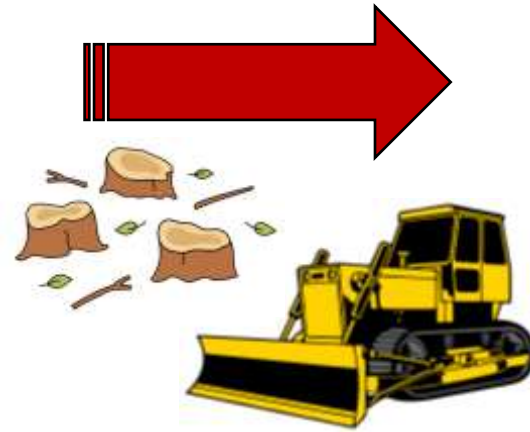
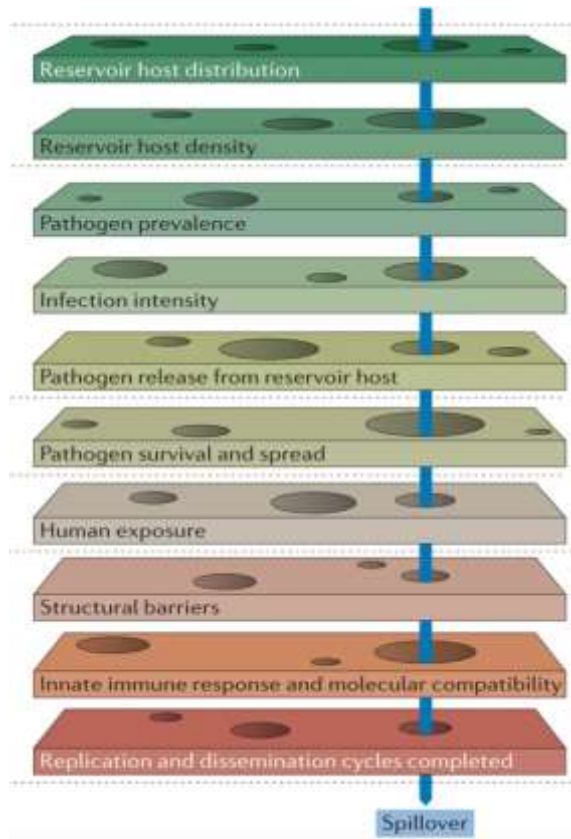


A yellow bulldozer is shown in the foreground, working on a cleared hillside. The bulldozer is positioned on a dirt path, and its blade is visible. The background features a range of blue mountains under a clear sky. The ground is covered in dirt and some sparse vegetation. The text "ZOO NOTIC INTERFACES" is overlaid in white, bold, sans-serif font across the center of the image.

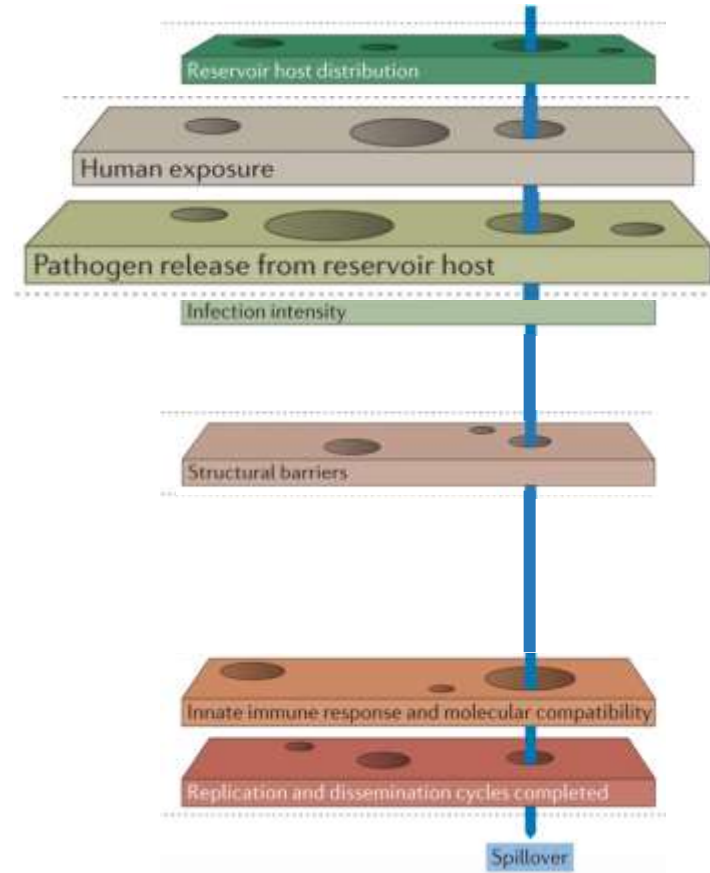
ZOO NOTIC INTERFACES



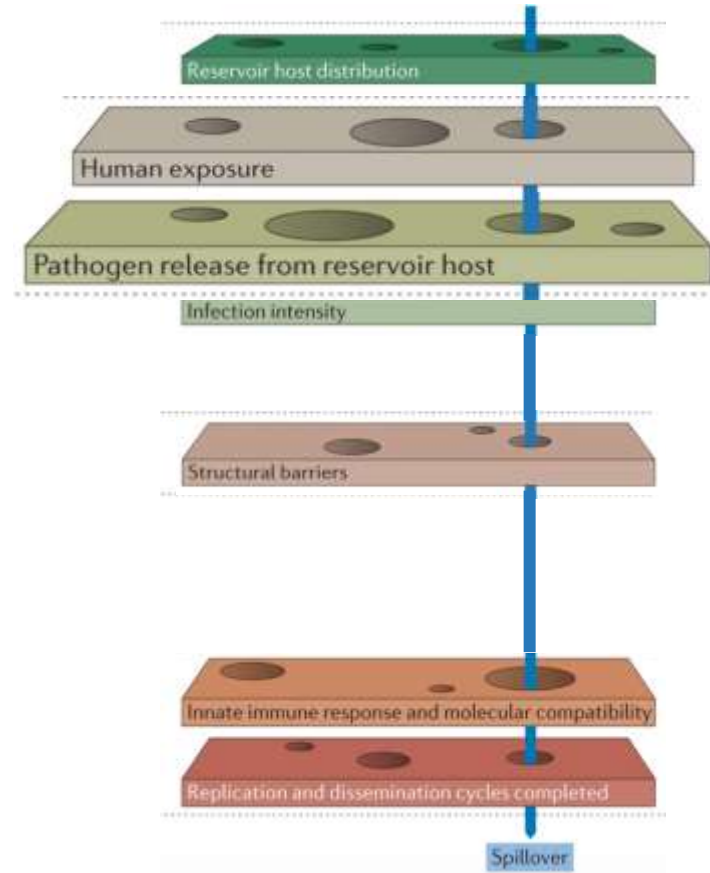
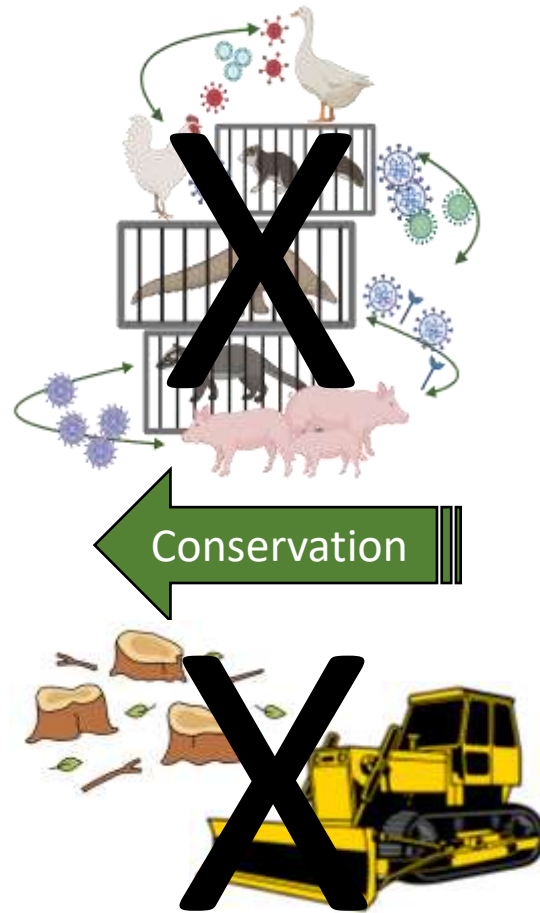
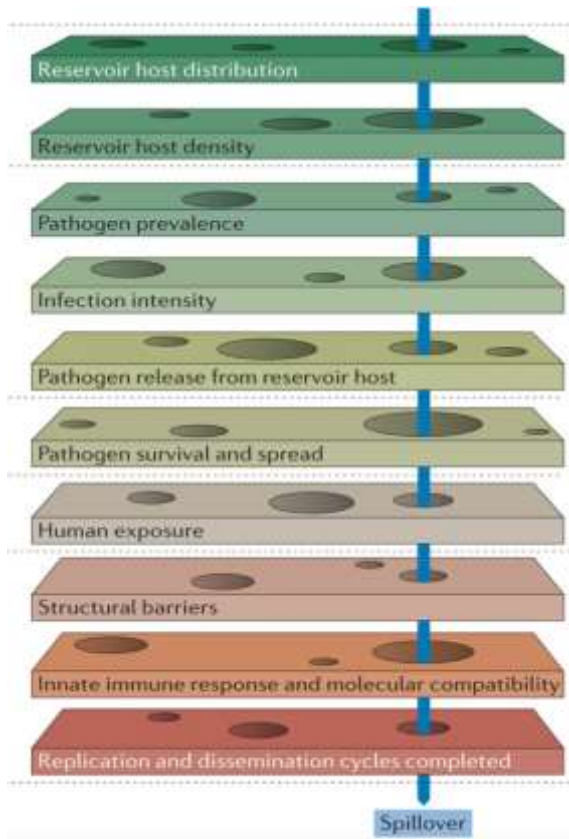
Dynamic barriers and interface permeability



**ECOLOGICAL STRESSORS
& INTERFACES**



Surveillance creates health intelligence



Wildlife Health &
Environmental Surveillance

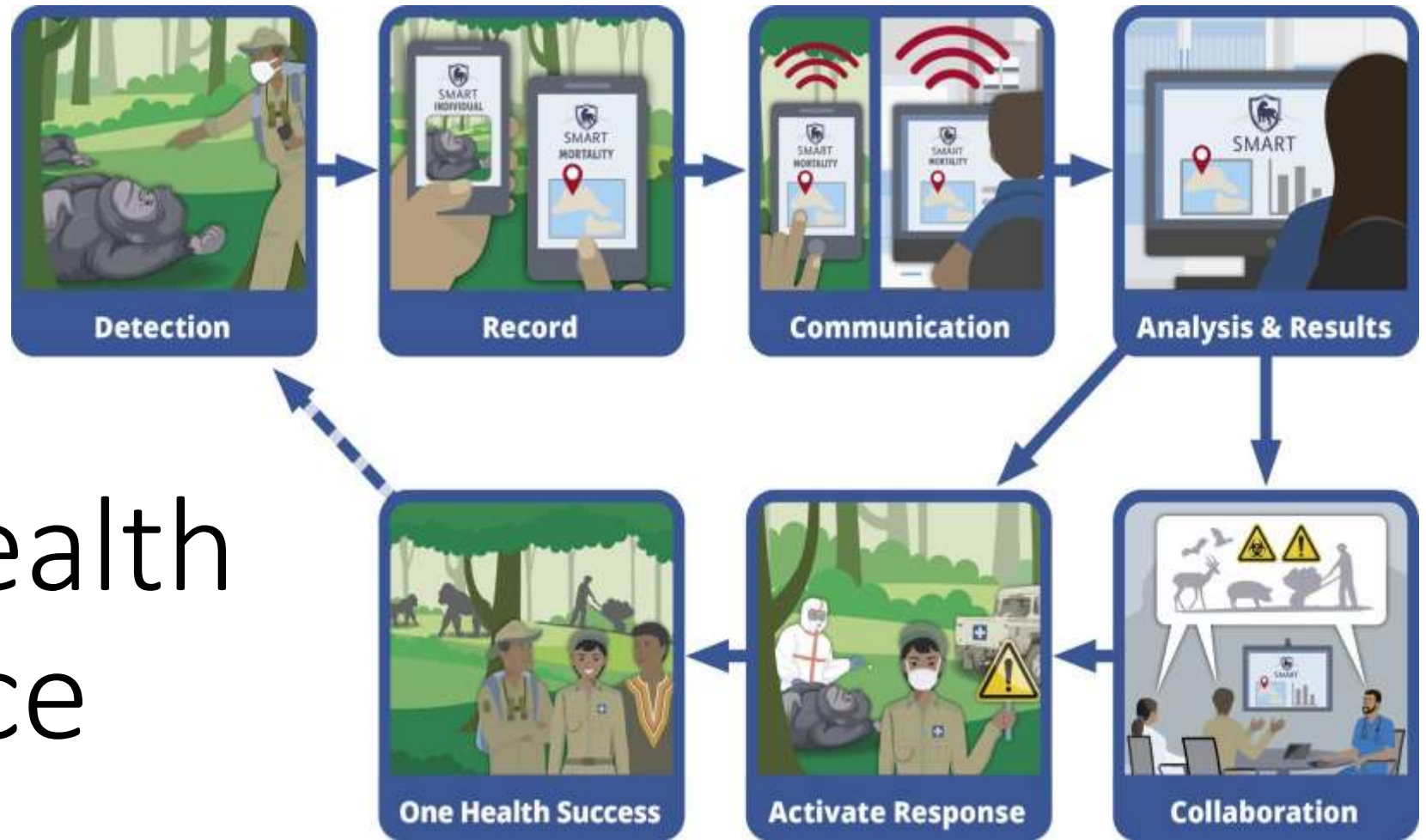
Outline

Wildlife Health Surveillance

- Background
- Build
- Skills
- Tech
- Response

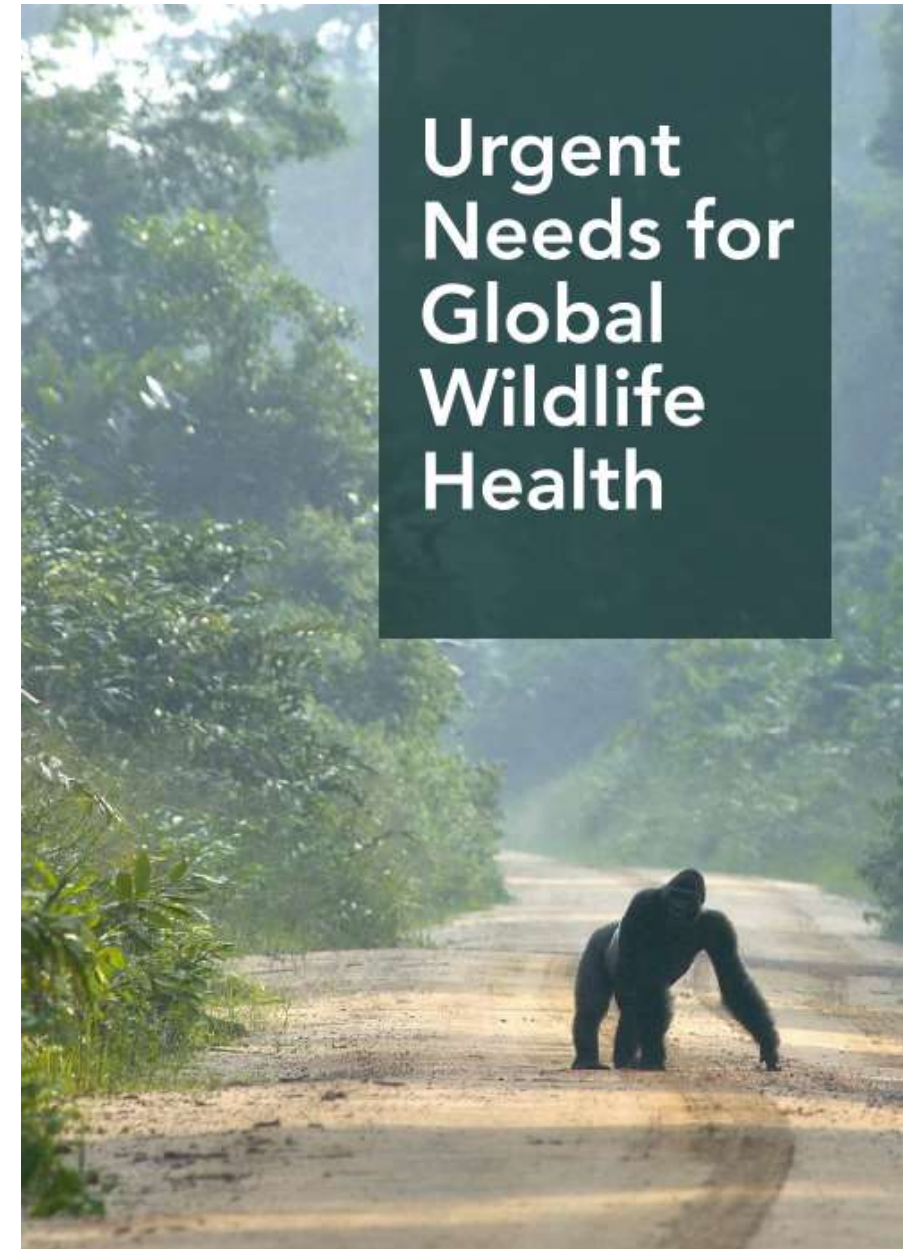


Wildlife health surveillance



Urgent need for wildlife health surveillance

- No disease monitoring for vast majority of species
- No requirement for wildlife disease reporting except WOAHA listed (mainly livestock) diseases
- No mention of wildlife health/zoonotic disease activities in 94% of National Biodiversity Strategy and Action Plans (NBSAPs)
- Response to mortality events are reactive, not preventative



Challenge: Cross-sectoral bottom-up engagement



Global

- International organization
- National organizations with international mandates



National

- National Laboratories
- National Parks & Preserves
- Universities



Ministerial

- Livestock, Forestry, Animal Health, Environment Departments & Ministries



Provincial

- Provincial Offices
- Wildlife Rescue Centers/Zoos



Local

- Community Members
- Local NGOs
- International NGOs



Challenge: Cross-sectoral bottom-up engagement



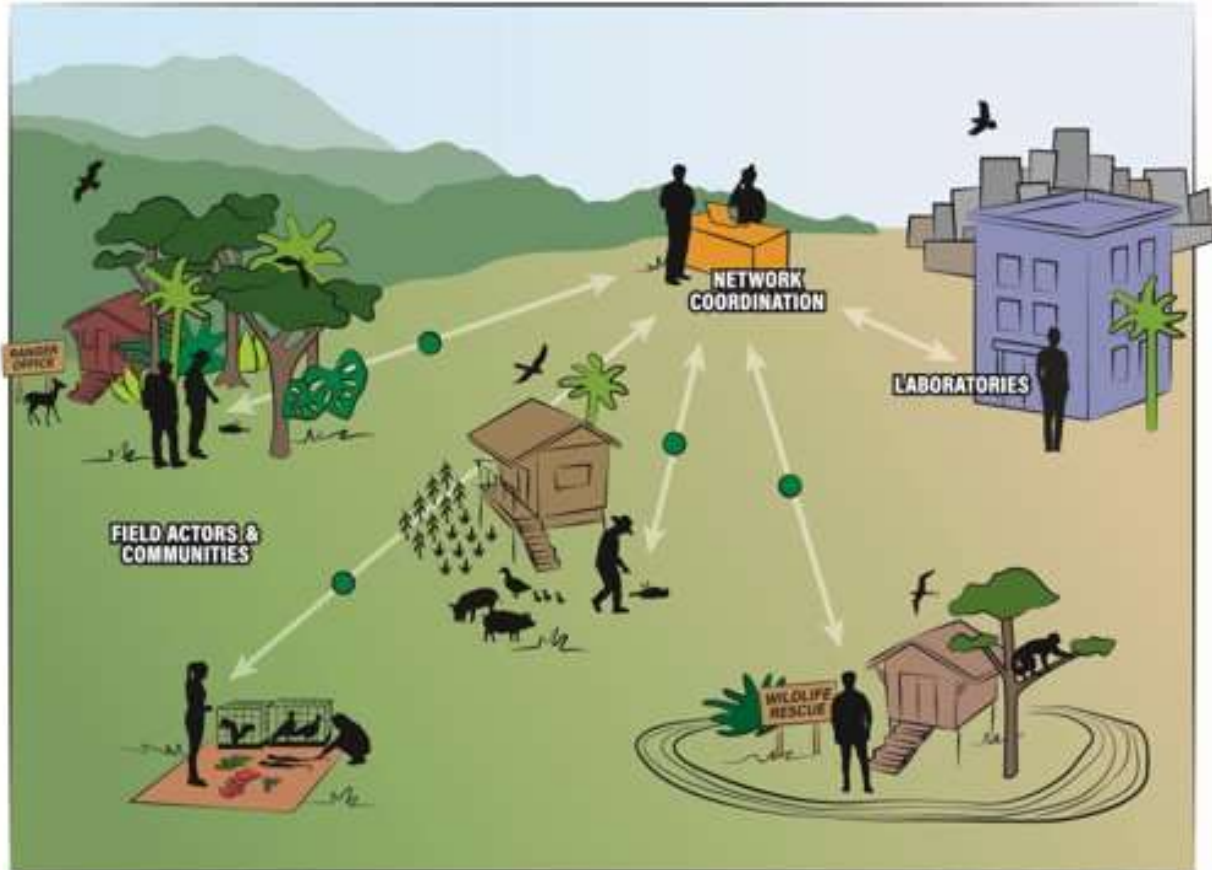
Building Local-to-National surveillance networks



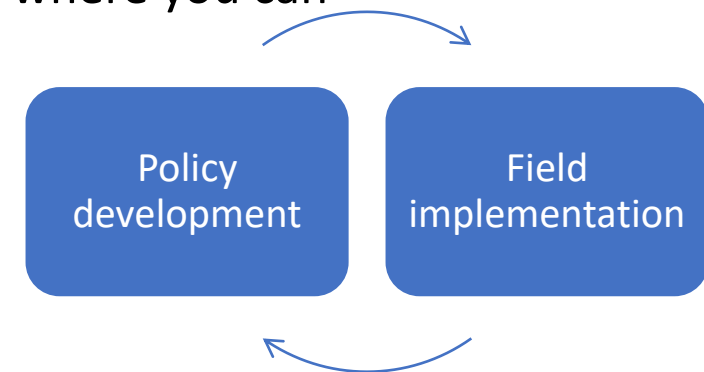
- WildHealthBuild
- WildHealthSkills
- WildHealthTech
- WildHealthResponse



Build:



- ✓ Identify, connect, and integrate actors into operational networks
- ✓ Map communication and build durable relationships among network actors
- ✓ Formalize responsibilities – SOPs (e.g., Lao PDR, Cambodia)
- ✓ Start where you can



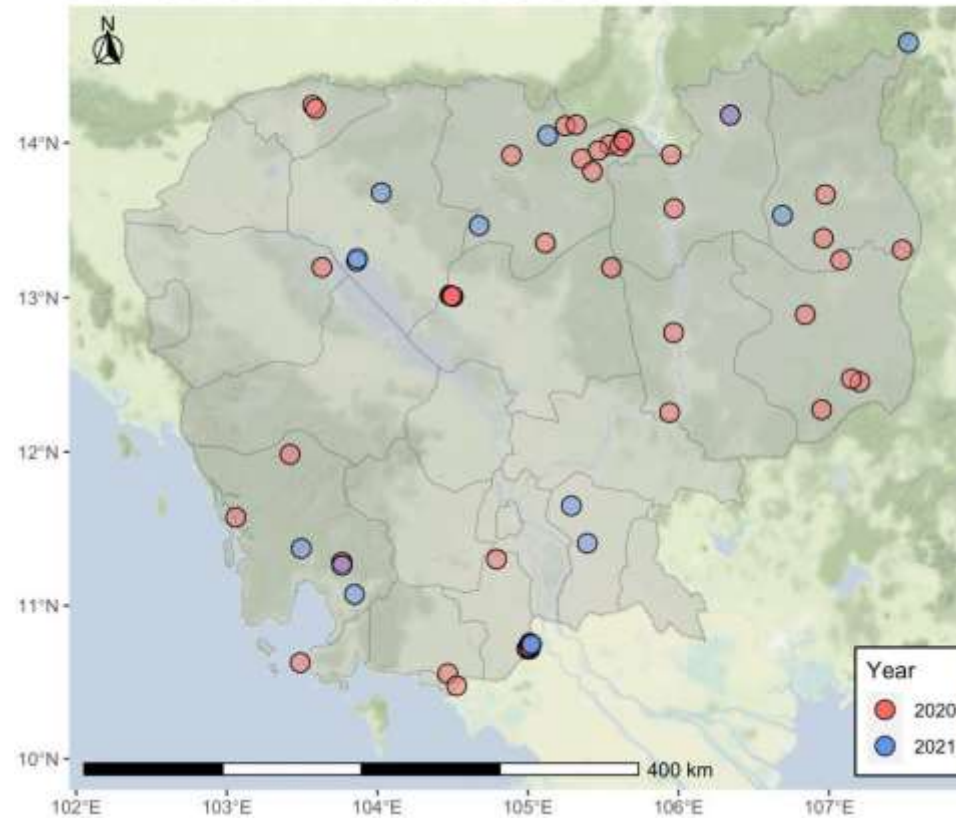
National event-based Surveillance Network



WildHealthBuild
WildHealthSkills
WildHealthTech
WildHealthResponse



Events in Cambodia



Detected:

- African Swine Fever
- Highly Pathogenic Avian Influenza H5N1
- Nipah virus

107 morbidity and mortality events; 97 carcasses collected

Protected Area Event-based Monitoring Network in Peru



Moving towards a national system

1. Wildlife health monitoring conducted by rangers in 72 protected areas (SMART for Health)
2. Action plan to construct a national wildlife health surveillance system



ASOCIACIÓN DE MUNICIPALIDADES DEL PERÚ



Skills:



- ✓ Identify existing capacity, knowledge gaps, and available human resources across network
- ✓ Deliver targeted and context-specific training
- ✓ Evaluate training effectiveness
- ✓ Train the trainers and provide teaching resources



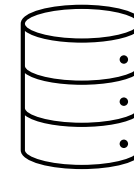
Tech:



- ✓ Identify technology needs
- ✓ Deploy appropriate and sustainable solutions
- ✓ Facilitate field data collection
- ✓ Support effective and standardized data management and analysis to supports decision making



National data base & data model



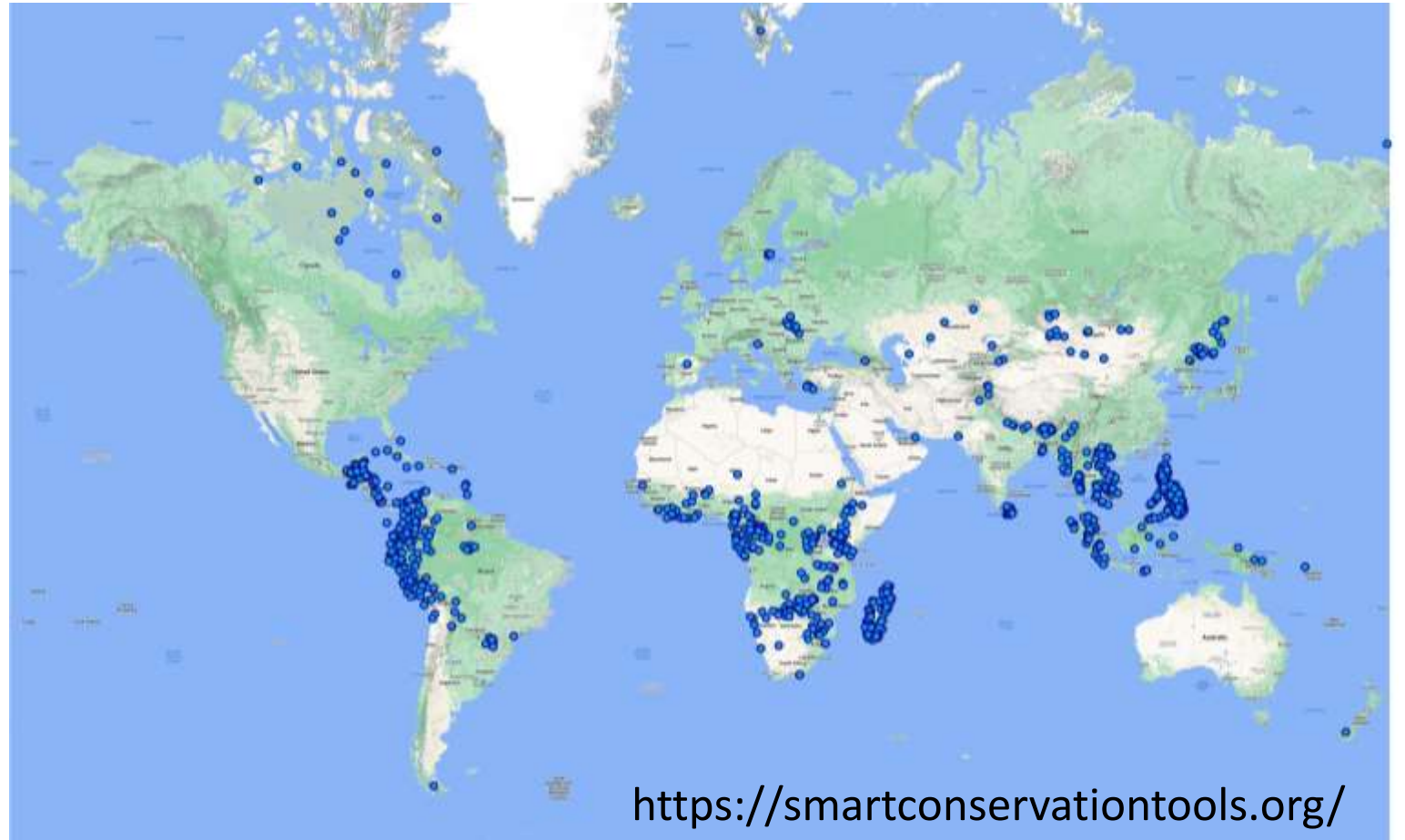
Project
Surveillance Objective
Field Activity
Location
Incidents
Sources and Source Records
Specimens
Diagnostics
Data Dictionary

Coming 2024 [IUCN WCPA Task Force on One Health]



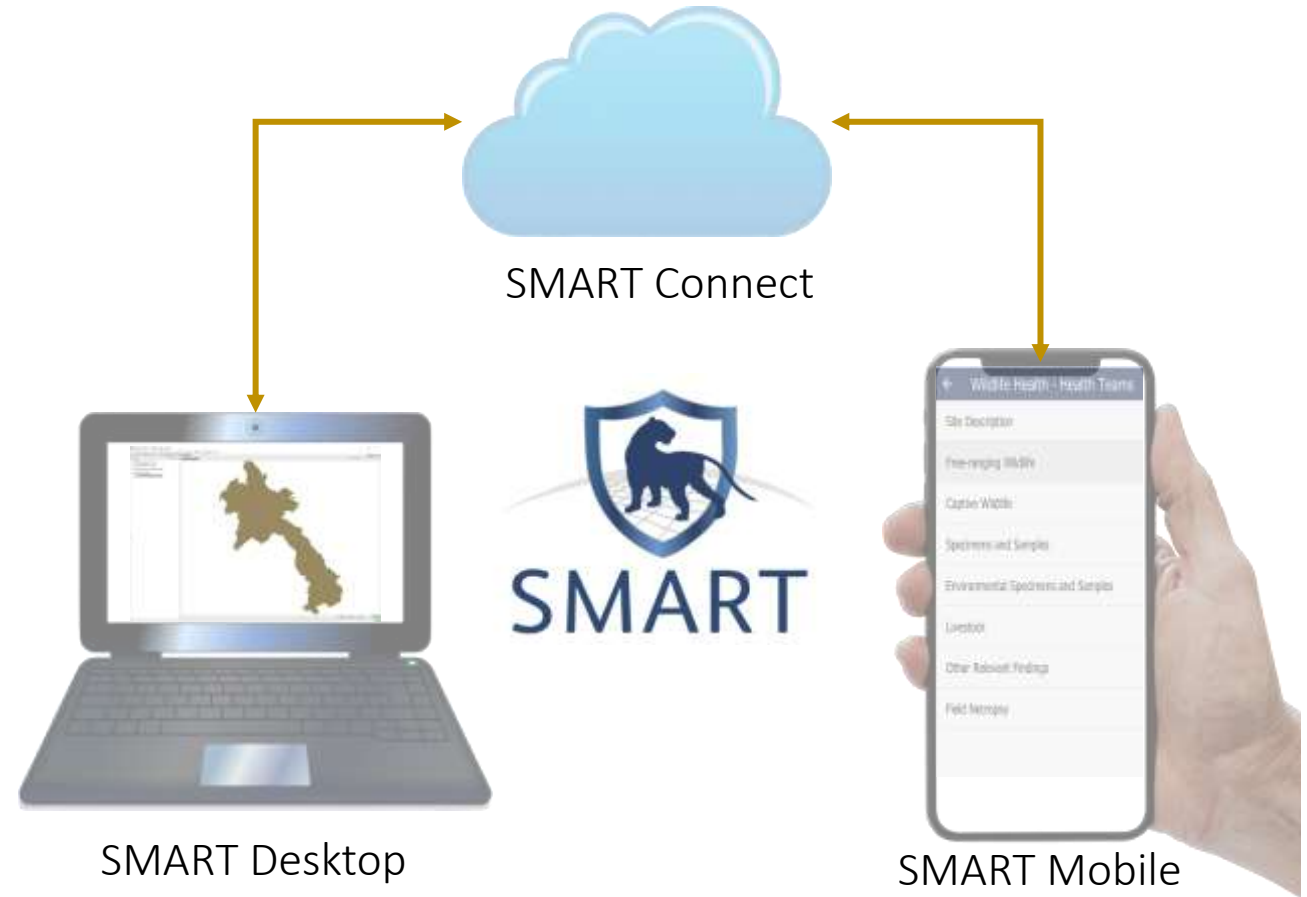
Why SMART?

- Created in 2011, now in v.7
- Supported by 9 major conservation organizations (WCS)
- Used in more than 1,100 protected areas ->
- In 100 countries multiple languages
- At least 55k rangers trained
- Adopted and sustainable
- Flexible: add monitoring targets (wildlife health event data)





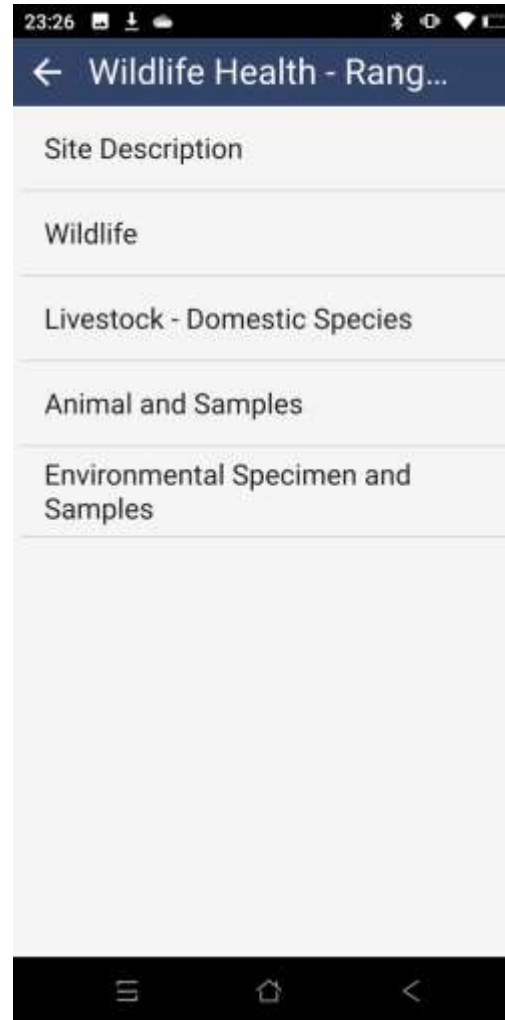
SMART Version 7





SMART for Health

- Set of fields to record health data in a standardized manner
- Adaptability for specific needs and users
- Alerts
- SMART for Health continuously improved based on field trials
- Multiple languages
- Integrated into the Patrolling Data Model



Descriptions of

The event site

Observed Species

Observed domestic animals

Individual animals sampled & samples

Samples from unknown animal/abiotic source

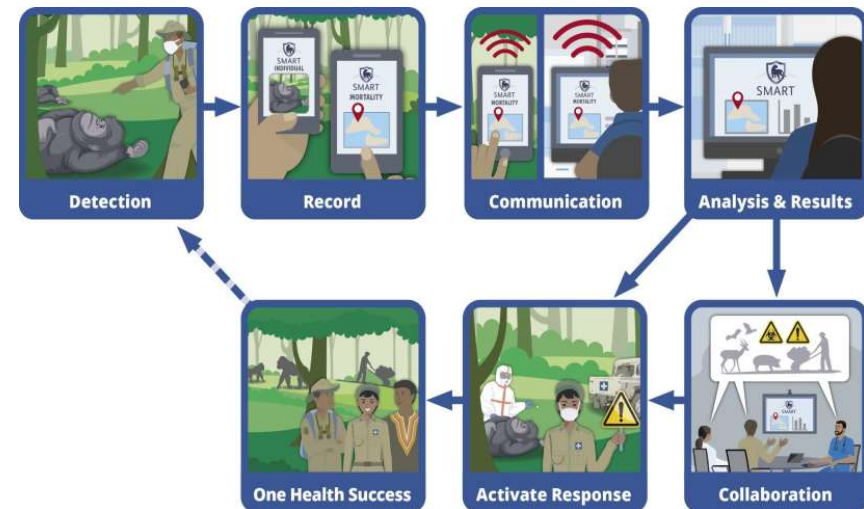


Comprehensive
description of
the event

Response:



- ✓ Support use of WH intelligence in formulating appropriate response
- ✓ Facilitate integration of WH network to local and global One Health community, in both action and policy
- ✓ Build a global community of practice supporting local needs around response



Lumpy skin disease (LSD) in endangered banteng in Preah Vihear, Cambodia



Thailand: wildlife sanctuary camera trap – 9 banteng suspected with LSD (July 2021)



Cambodia: wildlife sanctuary ranger reports and confirmed LSD banteng (*Bos javanicus*) (September 2021)



LSD vaccination of domestic cattle targeting Preah Vihear and Mondulkiri



Sharing & learning together



WildHealthBuild
WildHealthSkills
WildHealthTech
WildHealthResponse



SPECIAL ISSUE ARTICLE | [Open Access](#) |

Detection of African swine fever virus in free-ranging wild boar in Southeast Asia

Emily Denstedt , Alice Porco, Jusun Hwang, Nguyen Thi Thanh Nga, Pham Thi Bich Ngoc, Sokha Chea, Kongsy Khammavong, Phonesavanh Milavong, Sreyem Sours, Kristina Osbjør ... [See all authors](#)

First published: 22 December 2020 | <https://doi.org/10.1111/tbed.13964> | Citations: 27

Science of the Total Environment 863 (2023) 160748



WildHealthNet: Supporting the development of sustainable wildlife health surveillance networks in Southeast Asia

Mathieu Pruvot ^{a,b,*}, Emily Denstedt ^{c,1}, Alice Latinne ^d, Alice Porco ^e, Diego Montecino-Latorre ^a, Kongsy Khammavong ^c, Phonesavanh Milavong ^c, Souchinda Phouangsouvanh ^c, Manoly Sisavanh ^c, Nguyen Thi Thanh Nga ^d, Pham Thi Bich Ngoc ^d, Vo Duy Thanh ^d, Sokha Chea ^e, Sreyem Sours ^e, Phouvang Phommachanh ^f, Watthana Theppangna ^f, Sithong Phiphakhavong ^f, Chhuon Vanna ^g, Kry Masphal ^g, Tum Sothyra ^h, Som San ⁱ, Hong Channan ^j, Pham Thanh Long ^k, Nouven Thi Dien ^k, Vu Trono Duoc ^l, Patrick Zimmer ^m, Kevin Brown ^m, Sarah H. Olson ^{a,1}, Amanda E. Fine ^{a,1}

Article | [Open access](#) | Published: 07 September 2023

Highly pathogenic avian influenza A (H5N1) in marine mammals and seabirds in Peru

[Mariana Leguia](#) , [Alejandra Garcia-Glaessner](#), [Breno Muñoz-Saavedra](#), [Diana Juarez](#), [Patricia Barrera](#), [Carlos Calvo-Mac](#), [Javier Jara](#), [Walter Silva](#), [Karl Ploog](#), [Lady Amaro](#), [Paulo Colchao-Claux](#), [Christine K. Johnson](#), [Marcela M. Uhart](#), [Martha I. Nelson](#) & [Jesus I. Escano](#)

[Nature Communications](#) 14, Article number: 5489 (2023) | [Cite this article](#)

11k Accesses | 22 Citations | 184 Altmetric | [Metrics](#)

Commentary

Ground zero for pandemic prevention: reinforcing environmental sector integration

Sarah Helen Olson , ¹ Amanda E Fine , ¹ Mathieu Pruvot , ^{1,2} Lucy O Keatts , ¹ Chris Walzer

PERSPECTIVE article

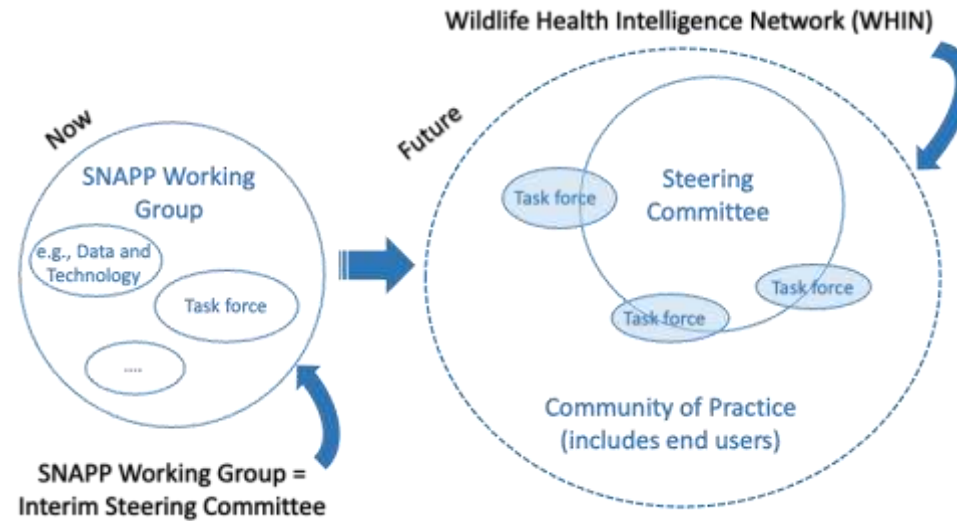
Front. Vet. Sci., 13 March 2020
Sec. Veterinary Infectious Diseases
Volume 7 | 2020 | <https://doi.org/10.3389/fvets.2020.00150>

Eradication of Peste des Petits Ruminants Virus and the Wildlife-Livestock Interface

Amanda E. Fine ^{1*}, Mathieu Pruvot ^{2*}, Camilla T. O. Berfield ³, Alexandre Caron ^{4,5}, Giovanni Cattoli ⁶, Philippe Chardonnet ^{7,8}, Maurizio Diot ⁹, Thomas Dutoit ¹⁰, Martin Gilbert ¹¹, Richard Koch ¹², Juan Lubroth ¹³, Jeffrey C. Mariner ¹⁴, Stephane Ostrowski ¹⁵, Satya Parida ¹⁶, Sasan Feridouni ¹⁷, Erkhutshin Shlegeldamba ¹⁸, Jonathan M. Stoeckmann ^{19,20}, Claudia Schulz ²¹, Jean-Jacques Soule ²², Yves Van der Stede ²³, Berhe G. Tolaie ²⁴, Chris Walzer ²⁵, Steffen Zuther ^{26,27}, Felix Njiru ²⁸ Meeting Participants

Wildlife Health Intelligence Network

- A community of practice to collaboratively work on the implementation of wildlife health surveillance
- Bridge the gap between international standards and field implementation
- Move forward on pathways of change



Working group participants, July 2023 at WOA offices in Paris



Stay tuned!

- Upcoming GWP technical support for GEF-8 National Projects
- Integration of zoonotic spillover risk interventions in project designs

Sarah Olson
Director, Health Research
WCS Health Program
solson@wcs.org



**Wildlife
Conservation
Society**

oneworldonehealth.wcs.org



Henrik Cox

Project Lead, Sentinel and Conservation X Labs

CONSERVATION X LABS

SENTINEL



AI at the Frontlines
of the Biodiversity Crisis

Sentinel Device



Species Detection



Images: Florida Wildlife Commission, Osa Conservation, SPAC (Odzala NP)





27.52 inHg | 26C | 09/03/2023 09:21PM | BATKHYZ8



AI Models: Videos and Imaging



Object Detection



Behavior & Disease



Individual re-ID



Anomaly Detection





British Columbia, Canada



Virginia, USA
Seabird Research



Páramo de Santurbán, Colombia
Ecological survey of keystone species for biodiversity credits



Florida, USA
Neurological disease research in big cats



Hawaii/California
Invasive Species Monitoring



Odzala-Kokoua NP, Republic of Congo
Gorilla Behavior Research



Osa Peninsula, Costa Rica
Anti-poaching + Jaguar Research



Galapagos Islands, Ecuador
Island restoration +
invasive species



New Zealand
Invasive Species
Monitoring

Online User Dashboard

CONSERVATION X LABS

Admin Admin

- Dashboard
- My Devices
- Device Groups
- My Models
- Insights
- Map
- Admin
- Account

GETTING STARTED

- Model Marketplace
- Documentation

3,000 km

68782 Red Brocket Deer spotted

Class Name

Red Brocket Deer

Confidence

83

Device Name

ixsng-lab3a

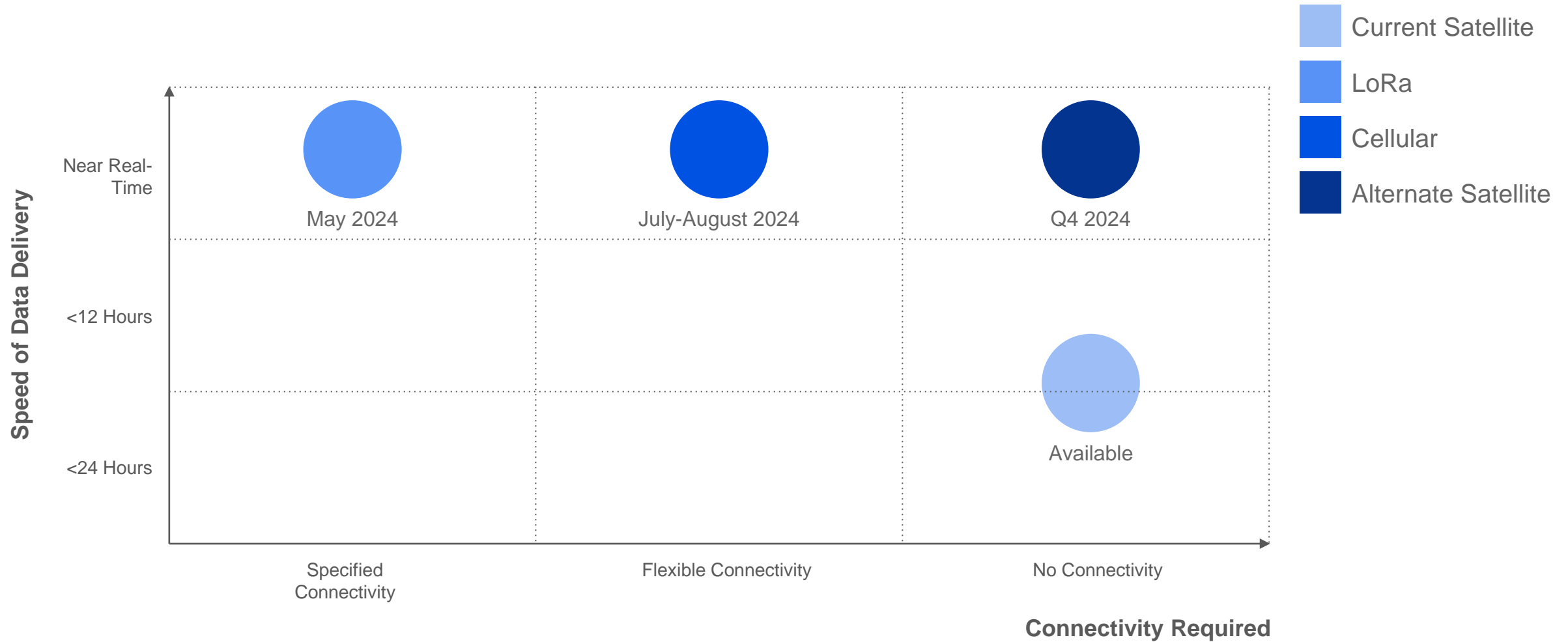
Add Photo Add Attachment Add

Save

CONSERVATION TEAM

Sentinel Device Product Roadmap

How they enable impact







Admin Admin

deer 2226 TEST - Matt's Backyard (250) 64% 1 2024-03-26 08:12:26 2024-03-26 08:12:30 38.854012 -77.196869

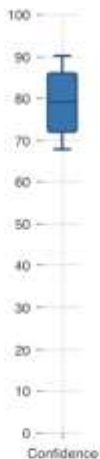
Class Name: rat

Species: rat

Start: 2024-03-15 20:01:18

End: 2024-03-15 20:01:22

Duration: 4 Seconds



< PREVIOUS 1 / 1 NEXT >

CLOSE

Class Name: deer

Species: deer

Start: 2024-03-26 00:44:10

End: 2024-03-26 00:44:14

Duration: 4 Seconds

Location: 38.854012, -77.196869

[OPEN MAP](#)



< PREVIOUS 1 / 2 NEXT >

CLOSE

Class Name: cat

Species: cat

Start: 2024-03-15 20:01:18

End: 2024-03-15 20:01:22

Duration: 4 Seconds



< PREVIOUS 1 / 8 NEXT >

CLOSE

other_animal 2212 281 - indigo-shrimp

other_animal 2212 296 - jumbo-pig 87% 1 2024-03-25 14:30:16 2024-03-25 14:30:20 0 0



Community



Humbolt Institute, Norte de Santander, Colombia

Rangers



Galapagos, Ecuador

Researchers



Bear ID, Knight Inlet, British Columbia, Canada



Thank you!

Website: <https://www.worldbank.org/en/programs/global-wildlife-program>.

Email: gwp-info@worldbank.org



SUPPORTED BY



LED BY



IN PARTNERSHIP WITH

