



NEW IT TOOLS FOR BIOACOUSTIC AND ECOACOUSTIC ENVIRONMENTAL MONITORING

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UNIVERSITÀ
DI PAVIA

Species recognition



Ecosystem quality
by species id



Biodiversity
Complexity
Richness



Ecosystem quality
by indices

Biophony



Anthropophony
Technophony



Noise pollution / Alerting



Geophony

Streams, rain, wind



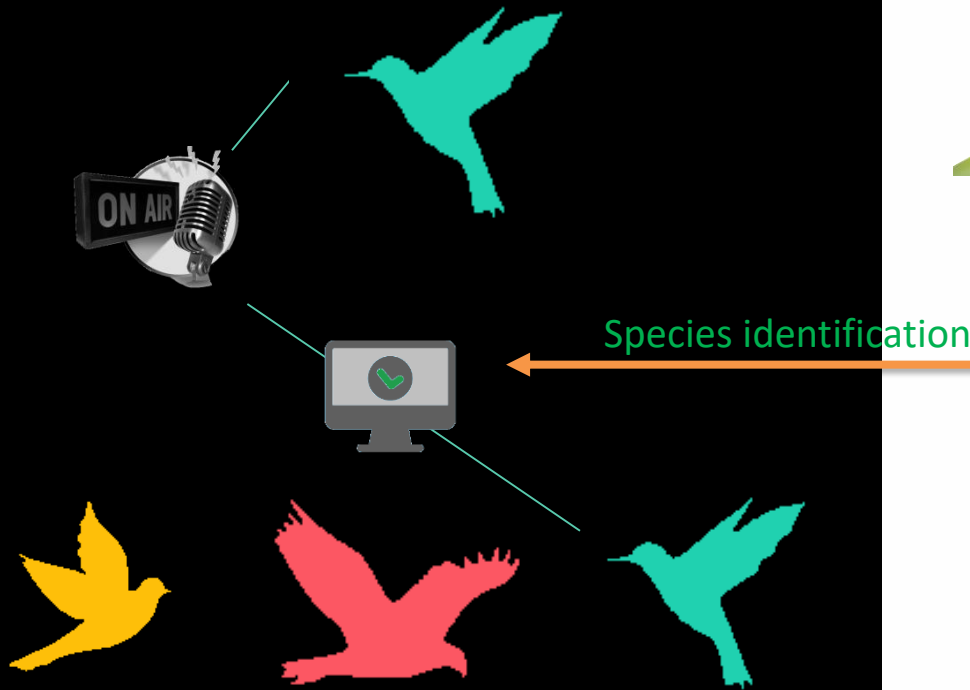
Soundscape



Acoustic
environment

BIOACUSTICS

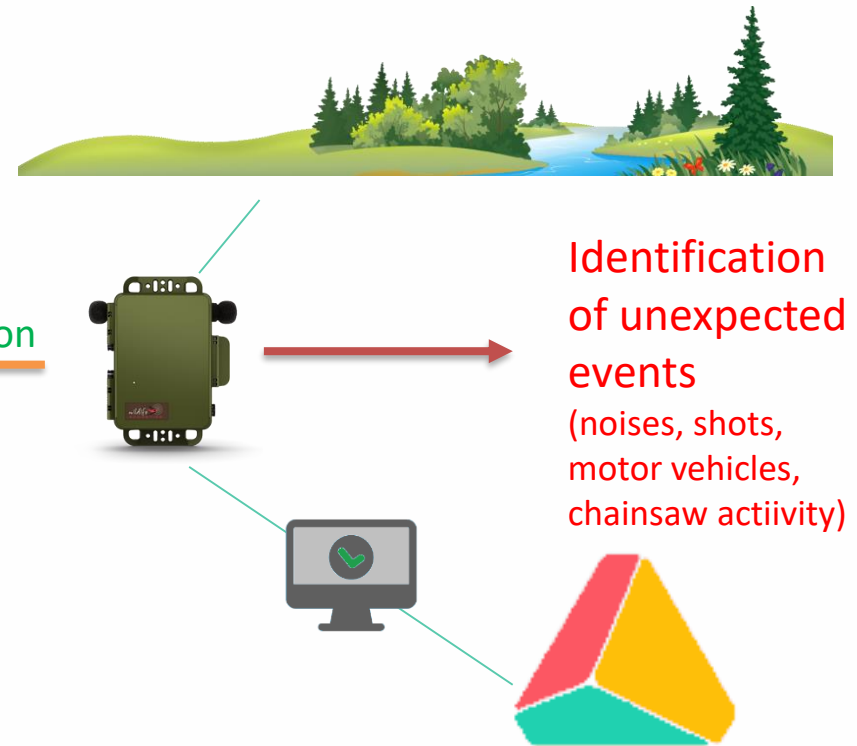
Analytic approach
at species level



Species behaviour and identification
(manual and/or automatic)
Identification of alien and invasive species

ECOACUSTICS

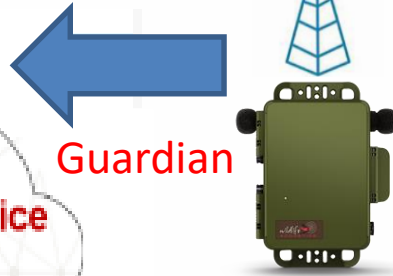
Global description approach



Monitoring ecosystem quality by sound diversity and richness, monitoring anthropic noise and impacts



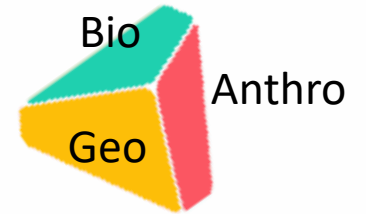
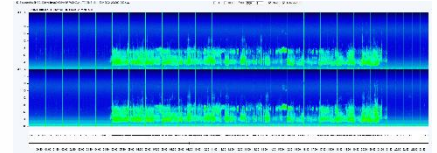
ECOACUSTICS



EDGE



Global approach



Evaluation of biodiversity and richness >> habitat quality

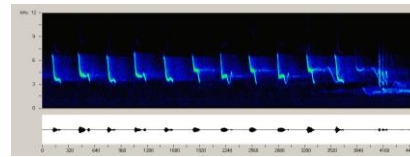
Sound Event Recognition



Acoustic Events ID
Surveillance
Shots - Vehicles



Species ID



Bioacoustics & Artificial Intelligence

TECH
4ALL

Nature Guardians Project



WWF

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per tutelare
la natura
italiana con
la tecnologia.



HUAWEI

Key challenges of Italian Nature

Italy is one of the most biodiverse countries in Europe, but also has one of the highest rates of wildlife and environmental crime.

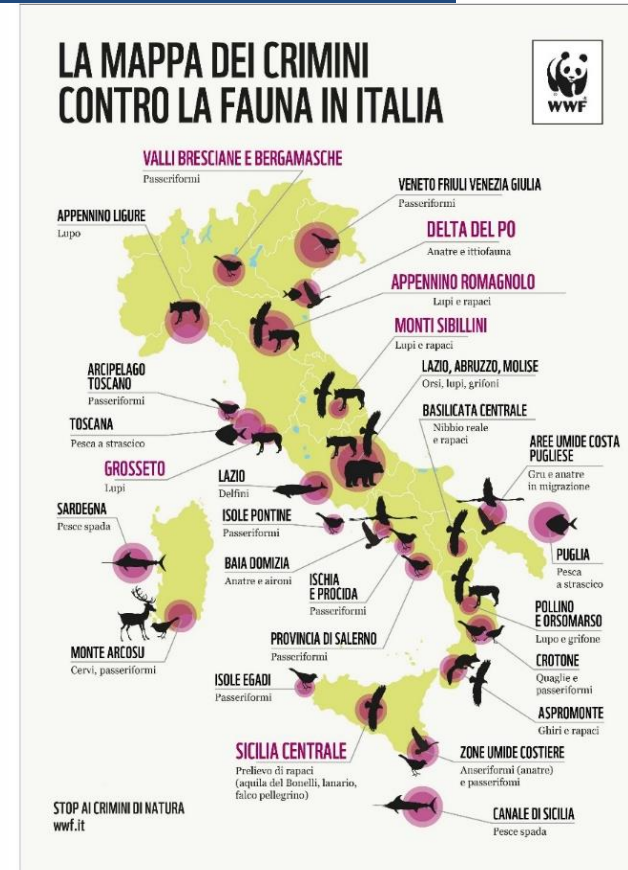
Biodiversity

More than 250 species are in danger of extinction in Italy. The extinction of certain animal species poses a great threat to biodiversity. Beyond poaching, climate change is a major cause of animal extinction, so biodiversity monitoring is one of the top priorities to protect our planet.

Poaching

Of the 25 million birds illegally killed each year in the Mediterranean, about 6 million are killed only in Italy. In addition to this there is the poaching of dozens of other protected species, such as wolves, bears, sturgeons, etc., for a total illegal business estimated in 3.2 billion Euro.

Map of Crimes Against Animals in Italy



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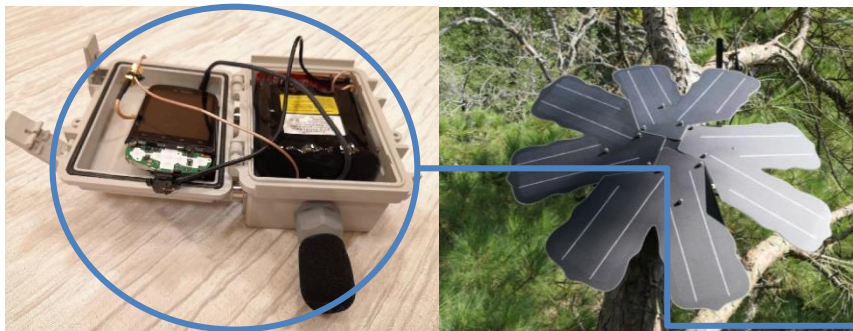
Real-time monitoring by the Guardians and immediate alerts

Technical solution

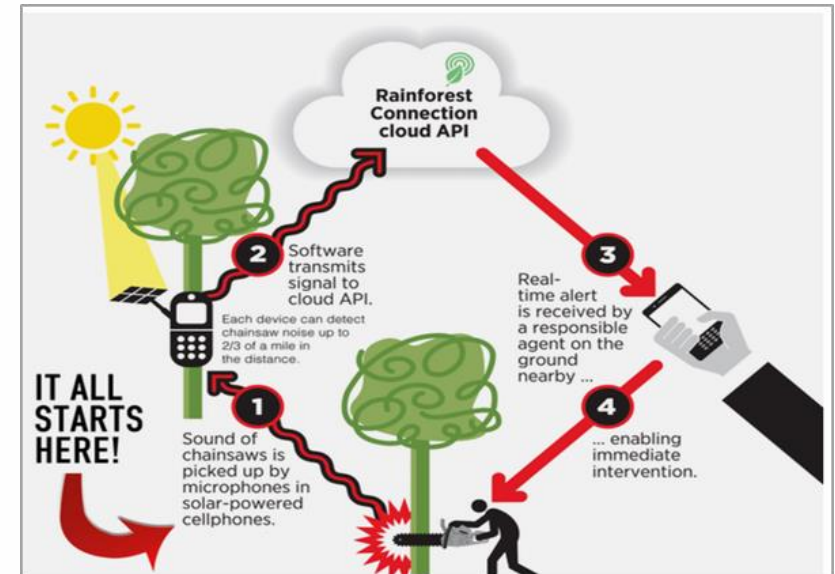
RFCx will work with the WWF team to **install 10 real-time monitoring Guardian devices to continuously collect acoustic data at the three State Reserves & WWF OASI: Burano, Orbetello, and Astroni.**

Guardian's detection range is up to 3 square kilometers.

All collected data will be archived for use in the study. When gunshots are detected, real-time alerts are sent to the online control platform and the guardian's app to instantly notify illegal activity.



- 2G/3G/4G signal access to the Internet and backhaul audio data (7x24h)
- Each Guardian will use 180-200MB of traffic per day



- Smartphones (motherboard, high-energy stable battery, operating system)
- Solar panels (special customization, working under the canopy)
- transformer circuit board
- Antenna (improves the signal capability of the mobile phone and supports a signal tower 20 km away)
- External microphone (improves the quality of sound collection)



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The three State Reserves – WWF Oases

Protected Areas



Astroni Park

History: At a workshop in Naples in 1987, the environment minister proposed the creation of a national nature reserve at Astroni. In the same year, the Astroni National Park was established with the support of the Campania region.

Area: 2.50 km²

Location: Campania Region, 8 km away from the city of Naples

Illegal activities: Poaching, illegal logging, illegal entry of motorcycles and SUVs, fireworks

History: Founded in 1971, it was one of the first WWF OASIs and discovered the already extinct stilt cod nesting grounds a few years ago

Area: 15 km²

Location: Orbetello, Tuscany Region

Illegal activities: Poaching, Motorcycle Illegal Entry



Orbetello Park



Burano Park

History: The earliest WWF OASI, the lake is actually a coastal salt pool and is the remain of an ancient lake measuring 140 hectares with an average depth of about 1 meter.

Area: 4.1 km²

Location: Capalbio Town, Tuscany Region

Illegal activities: Poaching, Motorcycle Illegal Entry



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Edge Offline Monitoring Device to Collect Biodiversity Sound

Technical solution



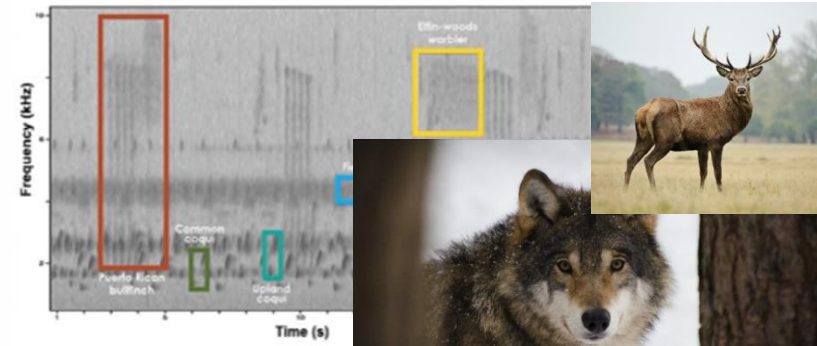
Thanks to 35 Edge offline monitoring devices we seek to obtain detailed species distribution data for developing species identification models. The Edge device will first be used to collect data in 3 Reserves where Guardian is deployed for initial analysis. In addition, according to the importance of biodiversity, **WWF has selected 9 other protected areas across Italy to deploy Edge devices:**

Le Cesine, Valle Averno, Valpredina, Ghirardi, Monte Arcosu, Valtrigona, Capo Rama, Gole del Sagittario and Levadina.

These areas, ranging from alpine grasslands to the rocky coasts of Sicily, will allow WWF to use Edge devices in many different species and environmental conditions in order to:

- 1. Update the list of target species and compare it with existing lists;**
- 2. Assessing trends in species based on human influences and environmental changes;**
- 3. Study animal behavior patterns, especially during the breeding season.**

In addition to birds, other major target species will include wolves, red deer, bats and amphibian species.



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Deployment Sites and AI analysis platform (Arbimon): first results

Technical solution

Name	No. of recordings	Latitude	Longitude	Altitude	Last updated
Burano_1	0	42.404	11.376	2.00	Oct 13, 2021...
Valtrigona_1	0	46.148	11.438	1,580.00	Oct 13, 2021...
Arcosu_site3	0	39.171	8.845	600.00	Sep 17, 2021 9...



870.000 recordings

+2.000 alerts

49 species validates

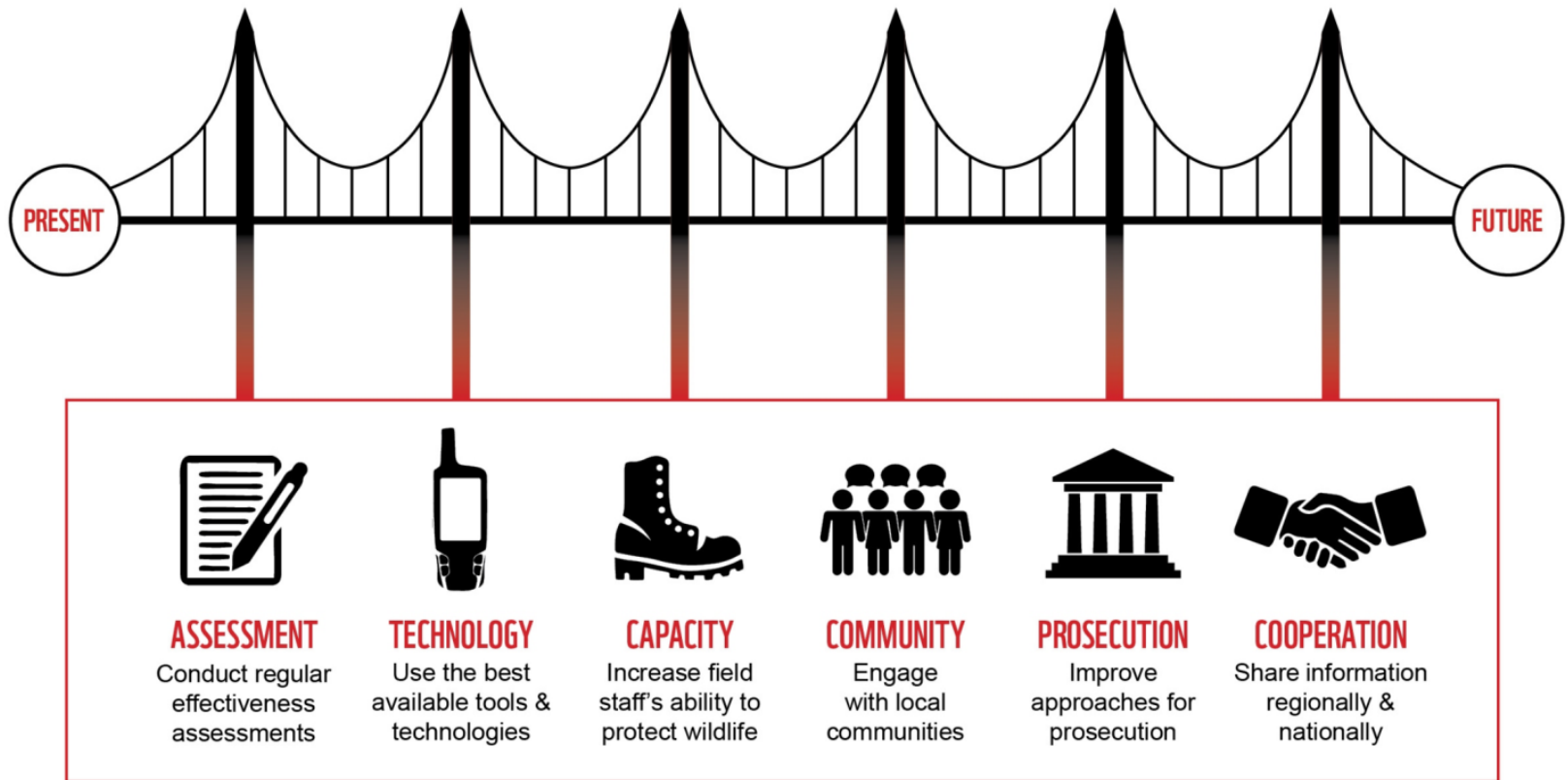
1 seizure

+30 real time controls



A NATURE AND CLIMATE POSITIVE WORLD

BRIDGING THE GAP TO ACHIEVE ~~ZERO POACHING~~



THANKS!