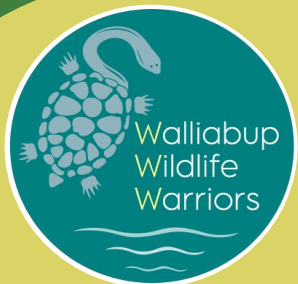


13 September 2026

FOX MONITORING & FERAL MANAGEMENT

A Community Briefing Session

The Wetlands Centre – Bibra Lake



~ SESSION PROGRAM ~

10:45

Fox monitoring at the Beeliar Wetlands

– a citizen science approach

Paul Markendale – WCS Volunteer Fox Monitoring Coordinator

11:45

Urban Fox Management

– Current solutions & limitations in the urban environment

Courtney Kelly – Resting Reds Detection Dogs & Feral Animal Control Specialist

12:15

Peri Urban Foxes

– Data interpretation & future directions

Dr Scott Thompson – Terrestrial Ecosystems

12:45

Panel Q&A

FOX MONITORING AT THE BEELIAR WETLANDS

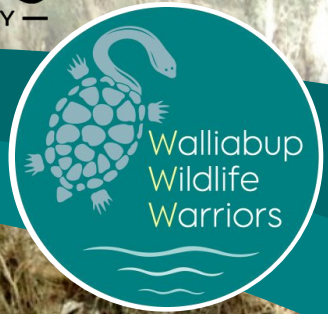
- a citizen science approach

*Launch of the election-funded fox
monitoring program expansion
at the Beeliar Wetlands*

13 September 2026



WETLANDS
— CONSERVATION SOCIETY —



ELECTION-FUNDED FAUNA MONITORING CAMERAS

- \$12,000 DBCA grant awarded to expand and enhance current volunteer monitoring program.
- Funding allowed procurement of hi-spec. trail cameras & essential accessories - long-term solution.



WALLIABUP WILDLIFE WARRIORS



- 2019 ► Turtle Tracker (TT) program began at Bibra Lake - Murdoch Uni. & City of Cockburn partnership.
- 2022 ► SOSNT project formed by Murdoch Uni. from expanded TT program - including new partners.
- 2024 ► WWW formed by Bibra Lake TTs - operating under the Wetlands Conservation Society.

Aim to improve protection and conservation of the wildlife across the Beeliar wetlands and beyond - particularly the southwestern snake-necked turtle

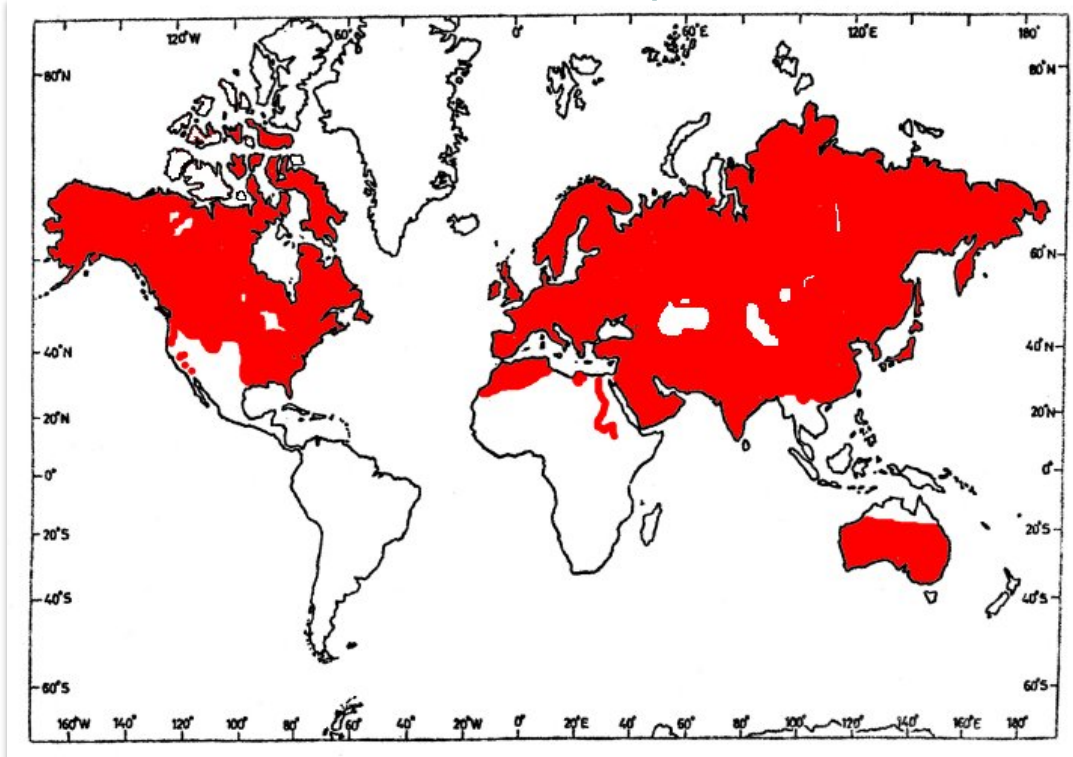


RED FOX - BACKGROUND

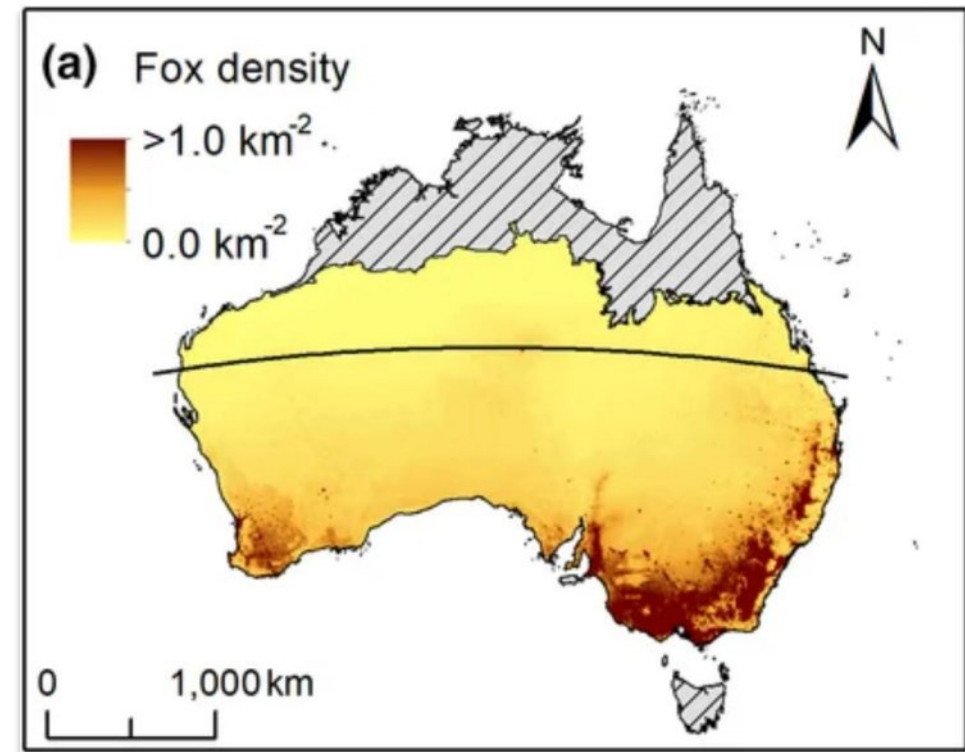


- Largest global distribution of any non-human wild land mammal.
- 1845: foxes released in Australia – 1.7m foxes now dispersed across 80% of country.

Global red fox distribution map



Map of modelled fox density in Australia



WHY ARE FOXES AN ISSUE?



West Bibra Lake trail-cam – October 2025



2022 Australian National University research study quantified the impact of foxes on Australian wildlife -

- Kill ~300 million native mammals, birds & reptiles each year.
- One of the key reasons Australia's biodiversity is suffering major declines.
- Foxes and cats have played a major role in most of our 34 mammal extinctions.

WHAT HAPPENED AT BIBRA LAKE?

- ~130 dead turtles were found by turtle tracker volunteers in April 2024 as Bibra Lake experienced a severe drying event.
- Analysis of the carcasses by Murdoch University identified at least **96 were killed by foxes**.
- Foxes were able to access the dry lakebed and excavate and kill aestivating turtles.



NEWS
Turtles easy prey for foxes, victims of Perth's hot summer
Posted on
Thursday 2 May 2024



The carcasses of at least 96 southwestern snake-necked turtles (*Chelodina oblonga*), likely killed by feral foxes, have been found at Bibra Lake in a devastating hit to the local population.

The remains, most with legs and/or heads missing, were discovered by Turtle Tracker volunteers over the past week. The volunteers usually monitor and protect nesting females and their eggs as part of the [Saving Our Snake-Necked Turtle \(SOSNT\)](#) project.

Turtle ecologist and project lead Dr Anthony Santoro, from Murdoch University's [School of Environmental and Conservation Sciences](#) and the [Centre for Sustainable Aquatic Ecosystems](#) at the [Harry Butler Institute](#), said the deaths represented around 10–15 per cent of the Bibra Lake's southwestern snake-necked turtle population – which has been the heart of [significant conservation efforts](#) since Murdoch University and the City of Cockburn began efforts to protect them in 2019 by establishing the Turtle Trackers pilot project.

“This is a devastating finding, the loss of almost 100 turtles from the population will have a major impact on the future survival of the species in Bibra Lake.” *Dr Anthony Santoro*

FURTHER SURVEYS



- In addition to the 96 turtle deaths, an additional 68 remains were found in 2023-2024 = **164 total**
 - 47 more found in April-May
 - 21 found during prior nesting season (Sep-Jan)
 - **82% recent** = 134 remains < 1year old
- All sightings recorded in TurtleSAT with photograph, description and geo-location.

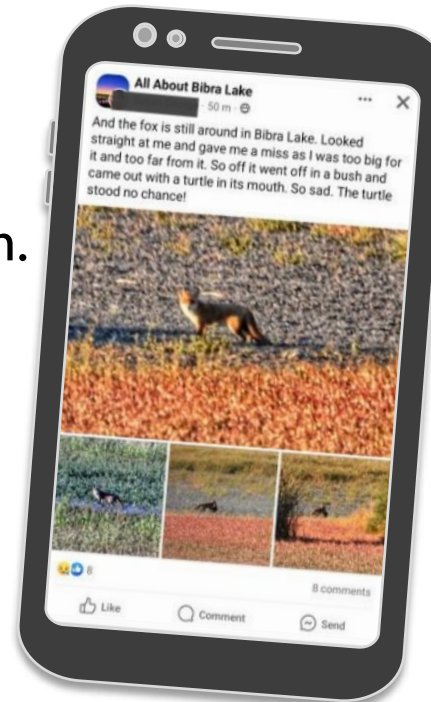


Photo credits – Susan George

CAMERA MONITORING



- Volunteer camera monitoring program began Aug-2024.
- Main aim to inform & improve local feral control program.
- Land manager agreement to install and operate cameras:
 - Undertaken through WCS
 - Photos or short duration video with audio off
 - Weekly report with record of sightings
- Self funded 4 x Campark trail cameras (~\$250)
- Cameras withdrawn from service in mid-December - high summer temperatures resulted in 2 camera failures.
- 76 fox sightings recorded in 136 days.



North Bond Swamp trail-cam – August 2024



HISTORY REPEATING



- Another mass turtle death event occurred the following year = **84 total**
 - 58 found in dry lakebed (Feb-May)
 - 26 found in nesting season (Sep-Dec)
 - **70% recent** = 59 remains < 1year old



6PR interview (abridged): **Eddie Juras** – FISEM (Mar-2025)



2ND MONITORING ROLLOUT



WETLANDS
— CONSERVATION SOCIETY —



- Wider-scope camera monitoring program began Mar-2025.
- Self funded 8 x Campark trail cameras (~\$500).
- Purchase of 2 x higher-spec. Reconyx cellular cameras provided by generous WCS member donation (~\$2000).
- Cellular cameras placed at strategic locations where fox controller operates - improve transfer of information.
- Learnings from 2024 survey program used to improve camera placement to increase captures of sightings.



Photo credit –
Ken Browning



CAMERA SET-UP



WETLANDS
— CONSERVATION SOCIETY —



- Best placement based on visual evidence :



Fox scat (fresh / old)



Kills (hunting grounds / dens)



Fox trails / footprints
(regular transit routes)

North Yangebup lake trail-cam – February 2026

2026/02/22 22:38:32 13°C 55°F 0005

North-east Little Rush lake trail-cam – January 2026

02:06:07 22°C 71°F

CAMERA SET-UP



- Narrow corridors in bushland provide the best chances of capturing foxes on camera – 20m clearance.
- Non-invasive monitoring – not reliant on lures / decoys.
- If no sightings for 3-4 weeks, camera location reviewed - foxes may be transiting nearby but outside the FOV.
- 10-minute interval between sightings for logging.
- Photos less data intensive than video footage.
- Cameras require ongoing maintenance – fallen branches, vegetation overgrowth, spider webs, wind-blown seeds.



Favourable monitoring location at cross-roads of transit routes with natural bushland funnels

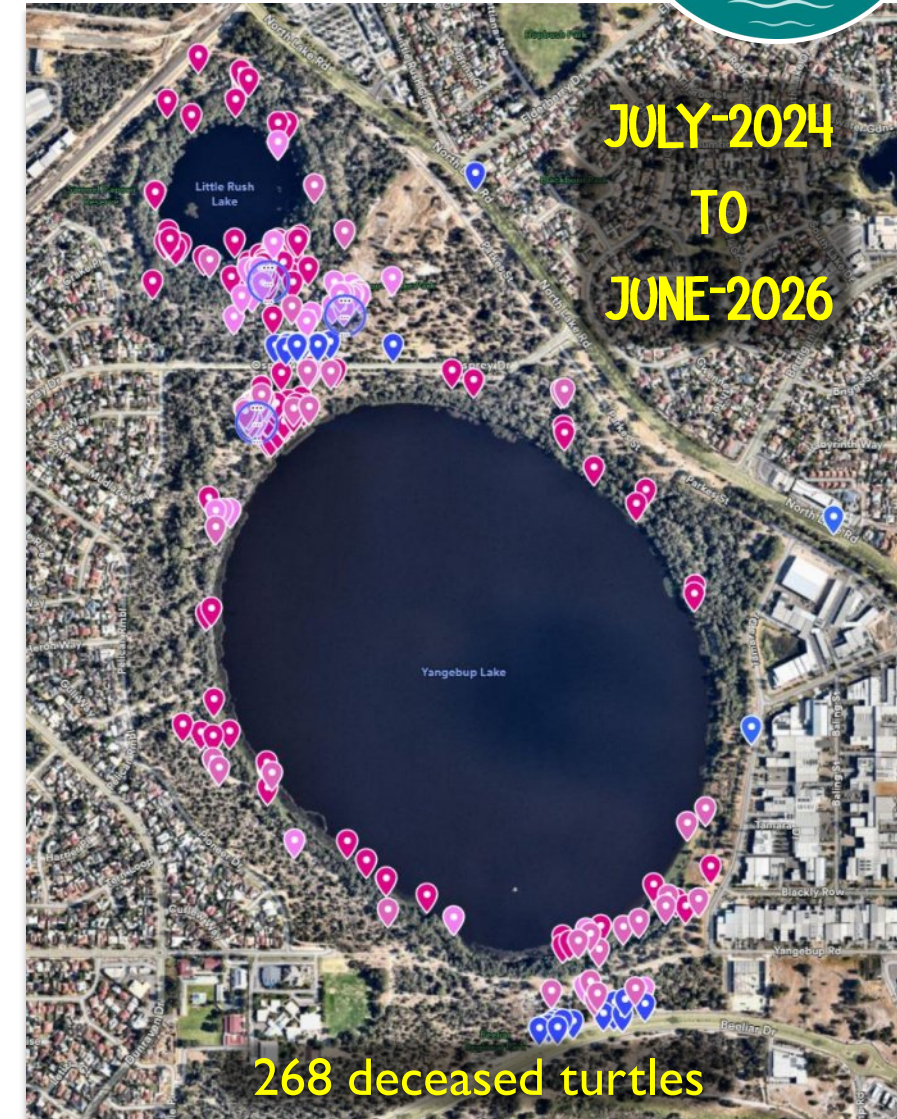
FOX ISSUES AT OTHER LAKES



- Turtle Tracker program expanded to Yangebup and Little Rush Lakes from September 2024.
- **268 turtle** remains found in 2 years (2024 to 2026).
 - **59% recent** = 159 remains < 1year old
 - Majority (72%) found in turtle nesting season (Aug-Jan)



- Yangebup is a permanent waterbody - does not dry in summertime.
- No issues with foxes accessing the lakebed.



FOX DENS

- 2024 – two fox dens found at Little Rush lake:
 - 51 dead turtles
 - 4 dead quendas
 - 1 dead brushtail possum
 - Multiple dead birds
- Reported to the City – 1 active + 1 non-active



FOX DENS

- 2025 – active fox den found at east Bibra Lake
- Camera confirmed at least 7 resident cubs
- 9 turtle remains + rabbits and birds found



FOX DENS



perth **now**



Two fox cubs have been blamed for the deaths of 68 South-western snake-necked turtles found dead in Yellagonga Regional Park. Credit: Supplied

City of Joondalup plans fox control action amid savage turtle attacks at Yellagonga Regional Park

Liam Murphy | PerthNow - Joondalup | 3 April 2025, 2:00am

Two fox cubs have been blamed for the deaths of 68 south-western snake-necked turtles found dead in Yellagonga Regional Park.

It has sparked warnings from conservationists that if feral fox numbers aren't more aggressively controlled, the consequences for native wildlife could be devastating and want urgent Government action to combat them.

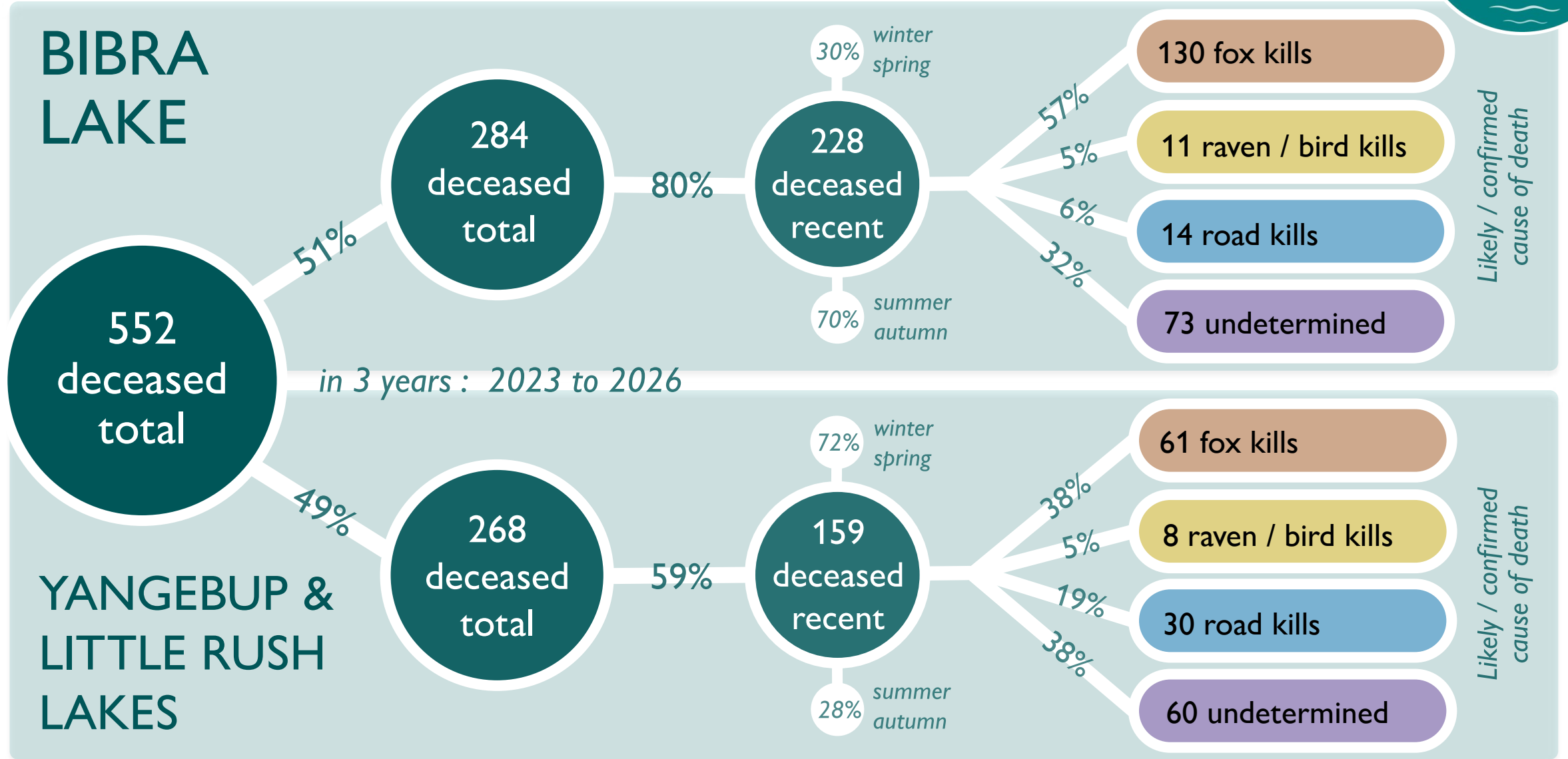
The discovery, along with reports of a fox attacking a Jack Russell, has put pressure on the cities of Joondalup and Wanneroo, as well as the Department of Biodiversity, Conservation and Attractions, to take stronger action on fox control.

- Fox dens close to wetlands have a material impact on local turtle populations.
- In 2025, two cubs at Yellagonga Regional Park were the likely cause of 68 turtle deaths.
- Fox cubs are born Aug-Sep in a dry, sheltered den and weaned after ~6 weeks.
- Compound effect – cub lifecycle coincides with peak turtle nesting season from Sep to Dec.
- Turtles are slow moving and have no natural defences against foxes – easy prey for cubs.

TURTLE DEATHS



WETLANDS
— CONSERVATION SOCIETY —



HOW WE ASSESS EVIDENCE



- Photo-timeline showing visual decomposition of a fox-killed turtle at Little Rush lake:

26 December 2025



+ 17 days

Killed overnight by fox - fresh

11 January 2026



+ 53 days

Minimal soft tissue (dessicated)
+ decomposing insects present.

16 February 2026



Most soft tissue gone
– largely skeletonised

+ 106 days

30 August 2026



+ 248 days

Exposed bones becoming brittle. Scutes in advanced delamination.

11 April 2026



Remains more dessicated. Scutes starting to delaminate



BIBRA LAKE



**YANGEBUP LAKE &
LITTLE RUSH LAKE**

3RD MONITORING ROLLOUT



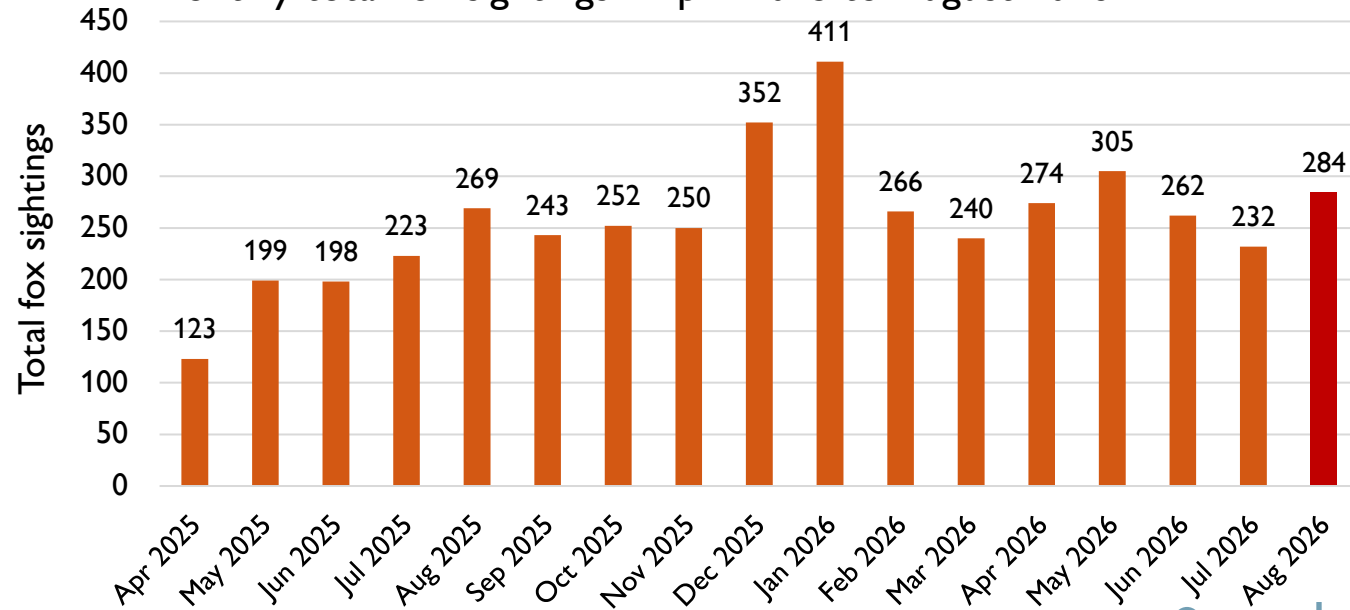
- ✓ Grant covered purchase of 9 Reconyx cameras, safebox/locks, memory cards + rechargeable batteries.
- ✓ Long-term solution – direct replacements for the 5 cheaper cameras which are prone to failure / theft.
- ✓ Expanded fox activity data – 4 cameras monitoring new locations from Aug-2026.
- ✓ Improved performance allows better capture (trigger speed, range, flash etc) and better resolution footage.
- ✓ Cellular enabled – can be utilised for remote monitoring if operational costs are funded in future.



RESULTS FROM 18 MONTHS



Monthly total fox sightings - April 2025 to August 2026



New cameras rolled-out - **Aug-2026**

Dec/Jan : large increase due to roaming juveniles

May-2025 to Jul-2026 : locations consistent

April-2025 : 10 cameras deployed

East Bibra Lake trail-cam video – Dec to Jan (compiled)



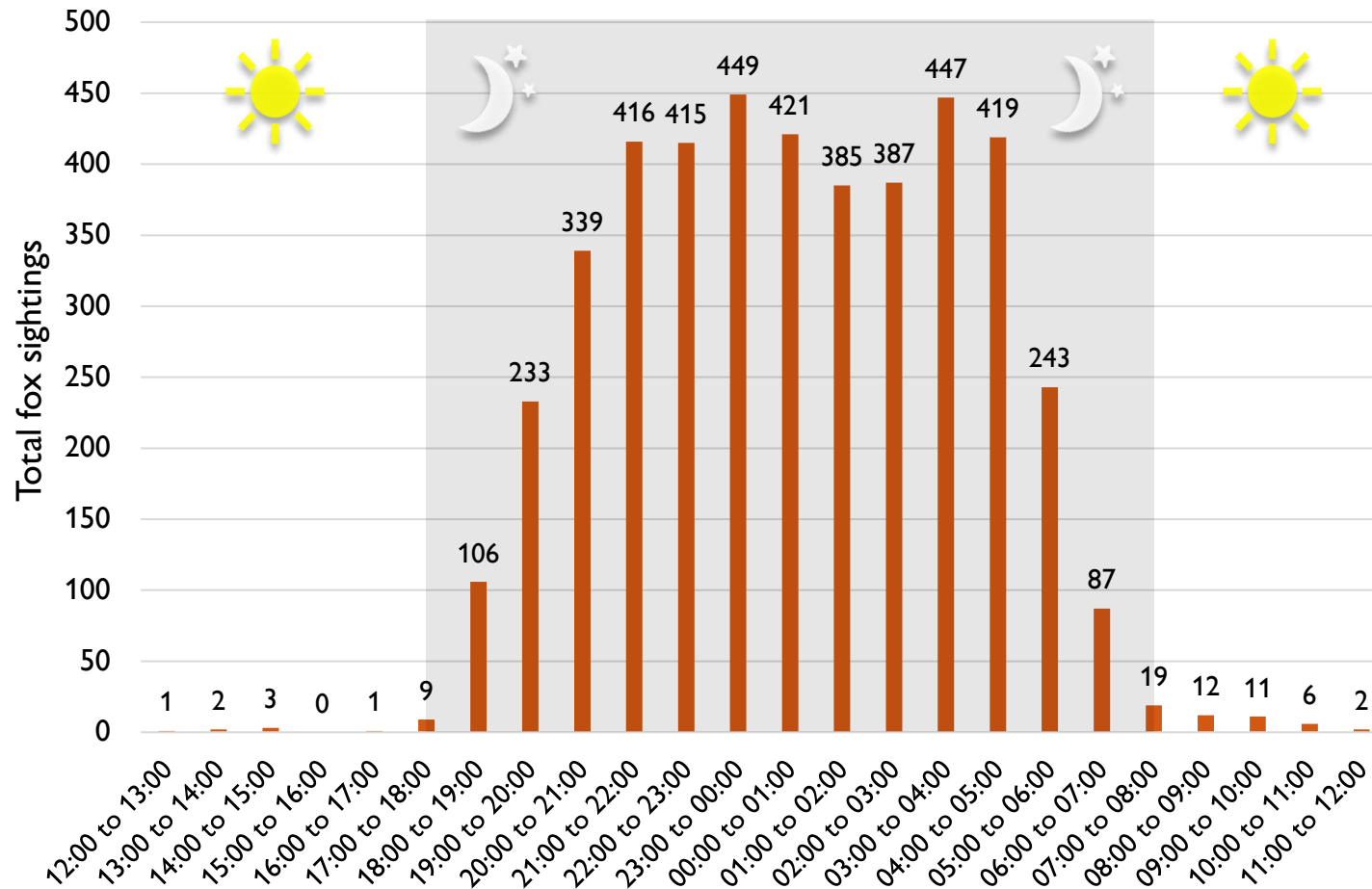
Pioneer Dr. fox cub – Dec-2025

No visible reduction in
overall sightings following
control programs
(ave. ~250 per month)

TIMINGS OF FOX SIGHTINGS



Fox sighting profile by time observed - April 2025 to August 2026



- 9pm to 5am : ~ 75% of sightings
- 6pm to 9pm: ~ 15% of sightings
- 5am to 7am: ~ 8% of sightings
- Other times : < 2% of sightings



LAKE COMPARISONS



- Long-term (2nd program) and short-term (3rd program) fox sightings are consistent.
- Average daily fox captures per camera within 15%.
- Bibra Lake has almost double the number of sightings per camera than Yangebup and Little Rush lakes combined.

2nd Program : 1-Apr 2025 to 31-Jul 2026 (487 days)

Monitoring area	Cameras	Total fox sightings	Average fox sightings per camera		Ave. foxes per camera per day
Bibra Lake	4	2844	711	63%	0.8
Yangebup Lake	3	450	150	13%	
Little Rush Lake	3	804	268	24%	

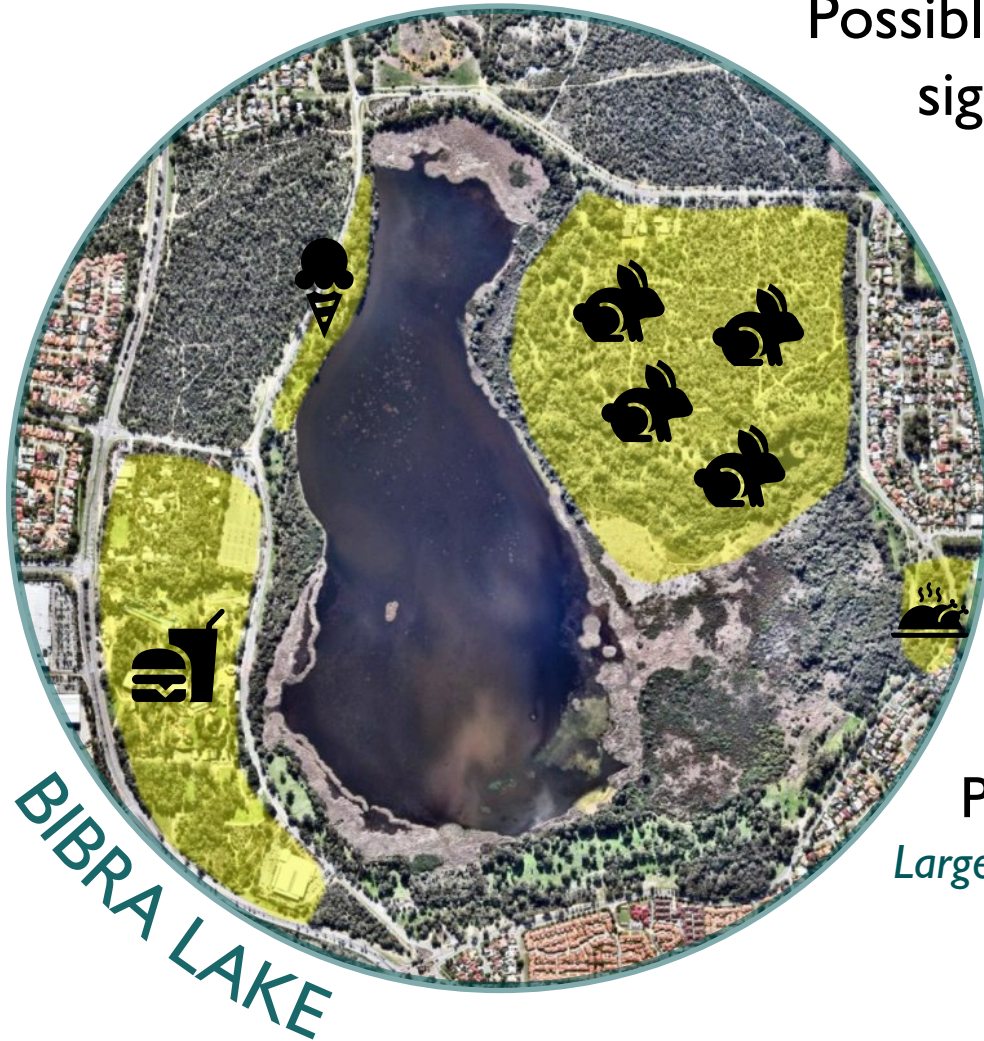
3rd Program : 10-Aug 2026 to 6-Sep 2026 (28 days – to date)

Monitoring area	Cameras	Total fox sightings	Average fox sightings per camera		Ave. foxes per camera per day
Bibra Lake	8	226	28	62%	0.7
Yangebup Lake	3	30	10	22%	
Little Rush Lake	3	23	8	17%	

LAKE COMPARISONS



Possible reasons for higher fox sightings at Bibra Lake



1

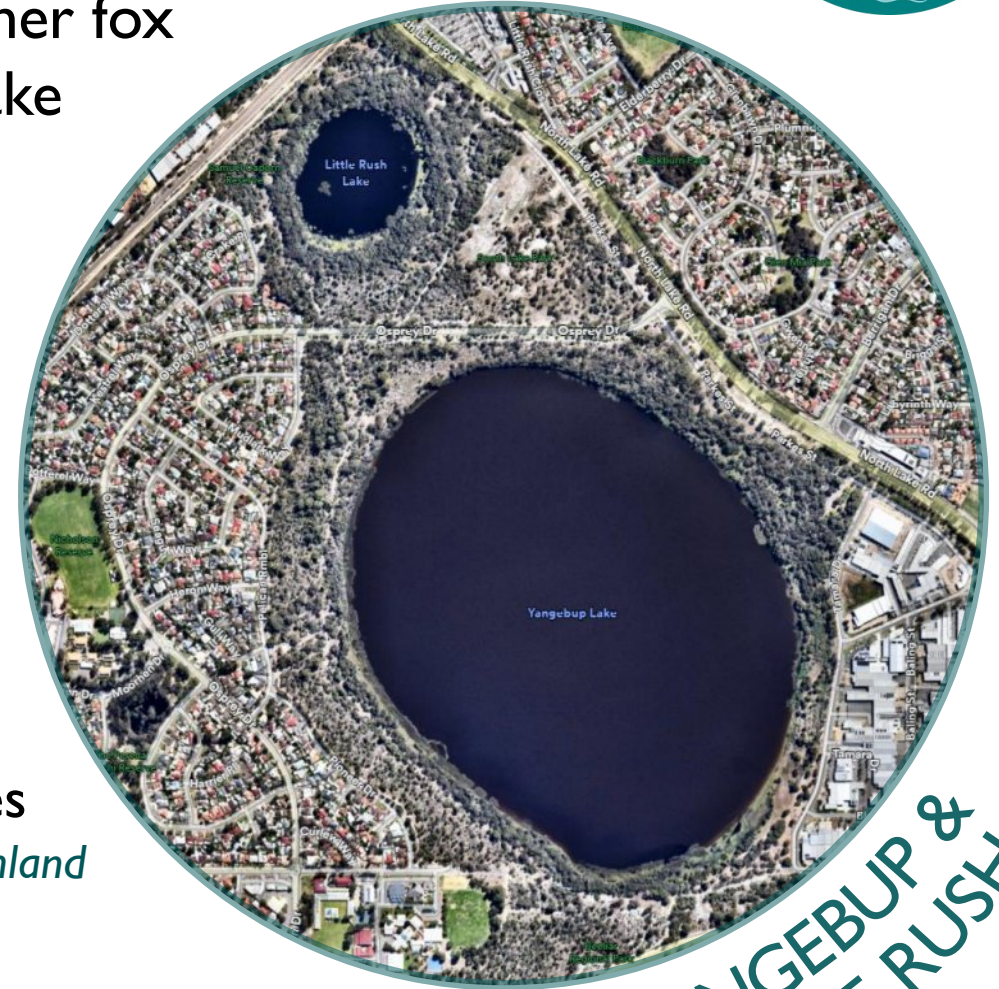
More visitors /
discarded food
Skatepark
Ice Arena
Adventure World
Regional Playground

2

Plentiful shelter sites
Larger areas of adjacent bushland

3

Large rabbit population



BIBRA LAKE RABBITS



- The eastern side of Bibra Lake has a large rabbit population – a magnet to draw foxes in.

“Over 300 native species that are on the pathway to extinction in terms of being assessed as threatened, rabbits are one of the key reason for that”

“When [rabbits] are breeding and building up their numbers, foxes follow them. Then the foxes have built up because of the rabbit numbers and they just hammer the native wildlife”



Compiled video footage – East Bibra Lake rabbit warrens and foxes (Aug-Sep 2026)

2026/08/14 21:55:52

3°C 37°F



6PR interview (abridged)
February 2025

**Failure to fund
biocontrol puts WA
native species on
extinction pathway**

Jack Gough

CEO - Invasive Species Council

OTHER FAUNA MONITORING



- Cameras can give valuable insights into ecosystem dynamics and biodiversity health.



- Quenda common + possums occasional sightings at Yangebup & Little Rush lakes.
- No quenda or possum sightings on Bibra Lake cameras in past year – apart from road underpass at west. Bibra Lake.
- Cats sometimes sighted – also reported to the City.



OTHER FOX IMPACTS



Hungry foxes are having a 'catastrophic' impact on Australia's juvenile freshwater turtles. There's a push to change that

Turtle's long lives may be masking extent of loss of young and eggs, experts say, with estimates that one species has declined in population by 90% or more



📷 Foxes often take and kill reproductive female turtles when they come out of the water to nest.
Photograph: Narelle Black

A wily red fox with a turtle in its jaws is a stark illustration of the "catastrophic" situation affecting Australia's freshwater turtles.

Along the Murray, foxes are digging up and eating entire nests of turtle eggs, and grabbing reproductive females.

The fact the reptiles live so long, while the young are so vulnerable to predators, has led to an ageing population that is masking the extent of problem, University of Sydney professor emeritus Mike Thompson says.

Thompson, a professor of zoology whose turtle obsession began in the 1970s, has semi-retired to the Adelaide Hills where he works on the 1 Million Turtles citizen science project.

He says the population of the most common species in the Murray, the eastern long-necked turtle, has declined by 90% since 1980 - and possibly by more than that in South Australia. The federal government is now considering listing it as vulnerable.

- Foxes have impacts on multiple turtle lifecycles.
- One of main predators of turtle nests in Australia.
- Impact the viability of future generations as well as current.
- At Bibra Lake – 58% of turtle nests recorded by volunteers 2023-2025 were destroyed.
- Even protected nests are vulnerable to fox predation.



Fox-predated turtle nest at Bibra Lake – Nov-2024 ►

OTHER FOX IMPACTS?



- Foxes identified as significant H5N1 bird flu superspreader risk.
- Scavenge on deceased animals and aid in distributing the virus to other areas.
- H5N1 was recently detected in a deceased fox in South Australia.
- Foxes are also one of the main vectors for transmission of sarcoptic mange to native mammals.



Fox predation/scavenging on deceased swan at Bibra Lake



OTHER FOX IMPACTS?



- May 2025 - a fox followed a dog walker from Yangebup Lake to her car at Mater Cristi school at 7am.
- This fox was suspected of breaking into the back garden of 2 local residences and killing pet ducks and chickens.



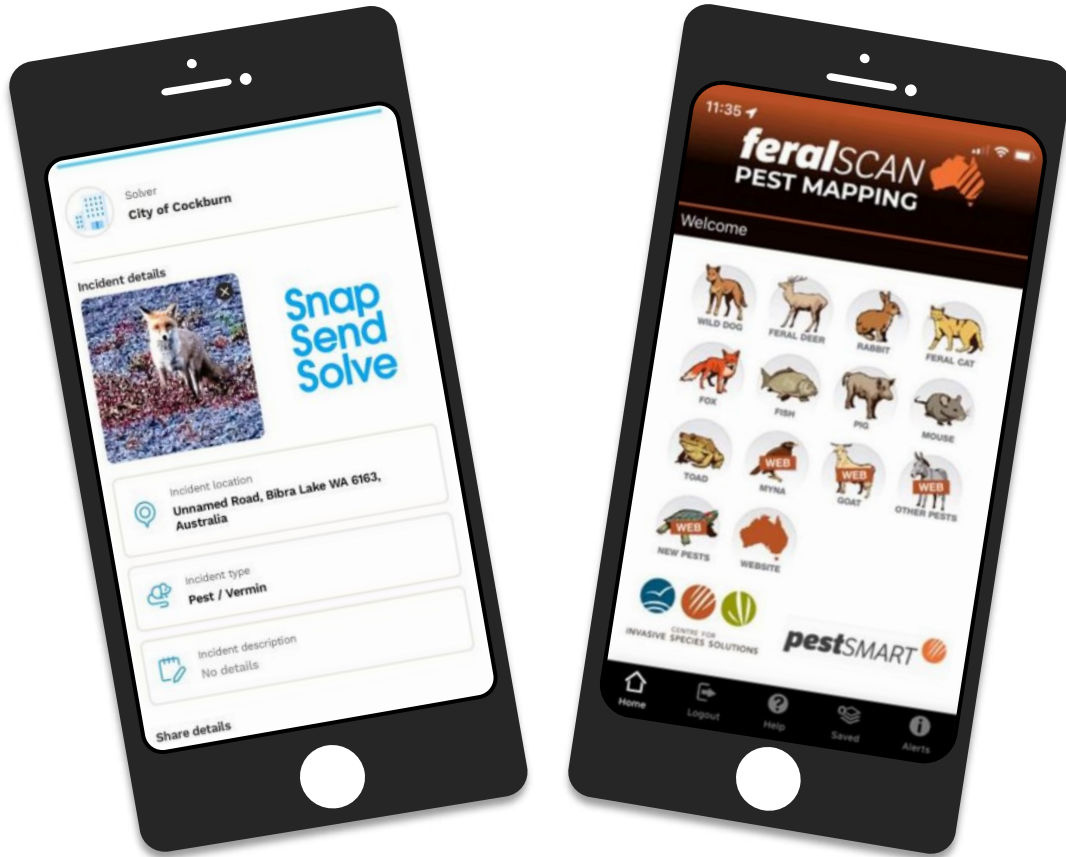
◀ 12-Sep 2026

We have already
discovered one freshly
fox-killed turtle at
Yangebup Lake early in
this nesting season.



Video credit Samara Fry

COMMUNITY IS IMPORTANT



Reporting issues to the relevant authorities is an important first step to improve outcomes

- Community interaction with the environment provides unique insights in understanding biodiversity and ecological challenges.
- Local communities are closely connected to nature - wildlife holds cultural and spiritual value.
- Engagement strengthens conservation efforts, empowers individuals and forms pathways to sustainable livelihoods.
- Integrating both local community and indigenous knowledge builds stronger cooperation and commitment to protecting natural resources.

WHAT NEXT FOR MONITORING?



West Bibra Lake trail-cam – Mar-2026



- Camera monitoring data is a valuable tool
 - Measure fox activity levels & observe behaviour
 - Assess impacts of control programs
 - Help to define targeted focus areas
- Camera management very resource intensive.
 - Our current array requires ~7-8hrs per week
(field checks & maintenance, data screening & reporting)
- Remote operation requires extra funding
 - Cellular subscription ~\$350 per camera/year
 - Increased battery depletion + extra cost for solar.

IN CLOSE-OUT...



North Yangebup lake trail-cam – Aug-2026



- ! Monitoring has shown that fox activity is prevalent throughout our wetland reserves.
- ! The impacts of foxes on our ecosystems and biodiversity are visible on an ongoing basis.
- ? Is camera monitoring data being used by decision makers to develop solutions?
- ? What management strategies can be utilised for more effective conservation outcomes?

Urban Fox Management - Current solutions & limitations in the urban environment

A fox in the hen house

What are are options?

What is best practice?

What are we currently doing?

What can we do close the gap between best practice and current management?

Courtney Kelly

Director, Terana Environmental, trading as Resting Reds

Detection dog: Jagdsaison Live For Adventure (Oswald)

Fox Monitoring and Conservation Community Briefing, The Wetlands Centre, Bibra Lake, 13 September 2026



BACKGROUND

My background

- Director, Terana Environmental, Terana Wildlife Management, Resting Reds, & The Foot Studio Podiatry
- Vertebrate pest management, ground culling and integrated pest management across the Perth metropolitan area and rural WA
- Conservation detection dog handler
- Biosecurity reporting and compliance programs for exporters of commodities (Hay, Grain)



Roe 8 corridor, City of Cockburn. Courtney Kelly and Oswald.

General principles of pest management

Pest is a human defined idea

People decide whether an animal is a pest or not. Pest status can vary depending on the location, land use, values and attitudes of the people concerned.

Pests rarely eradicated

Only successful if the controls can remove pests faster than they can reproduce, immigration from other sources can be prevented, all reproductive individuals can be taken by available controls

Whole of system approach

Pest animals are only one of many problems that can affect agricultural production & Biodiversity. Mallee fowl - foxes baited, no recovery. Needed grazing mx to restore feed.

Monitor and Evaluate

Monitor effects of pest management actions and evaluate whether these effects are producing the desired outcomes. What is measured, frequency of collection, where its collected, how it's collected.

Stakeholder engagement

Different groups and individuals will have different attitudes towards how pests should be managed.

Outcome Focus

If eradication not possible, management switches from pest itself to asset protection or reducing damage from pests to an agreed, acceptable level. A balance of management costs and benefits gained.

Incomplete knowledge of ecosystems

Many factors impact complexity of pest management. Biology, behaviour of pest and affected wildlife, livestock and people, availability of controls, cost benefit ratio of mx actions.

Plan, Manage, Improve

Crucial for any pest animal management to have oversight and planning to ensure meaningful and consistent outcomes. Follow the plan, review results and continue to refine management over time.

Expanding on incomplete knowledge of ecosystems. Macquarie island case.

Rabbits fed the cats, cats ate the birds

Cats arrived around 1820 and the endemic parakeet and rail lived alongside them for 70 years without too much trouble. Rabbits were released in the 1870s as a food source for sealers. Cat numbers boomed on the new food supply, and both birds were extinct within twenty years. Rabbits fed the predator that caused the extinction.

Remove the cats, rabbits explode.

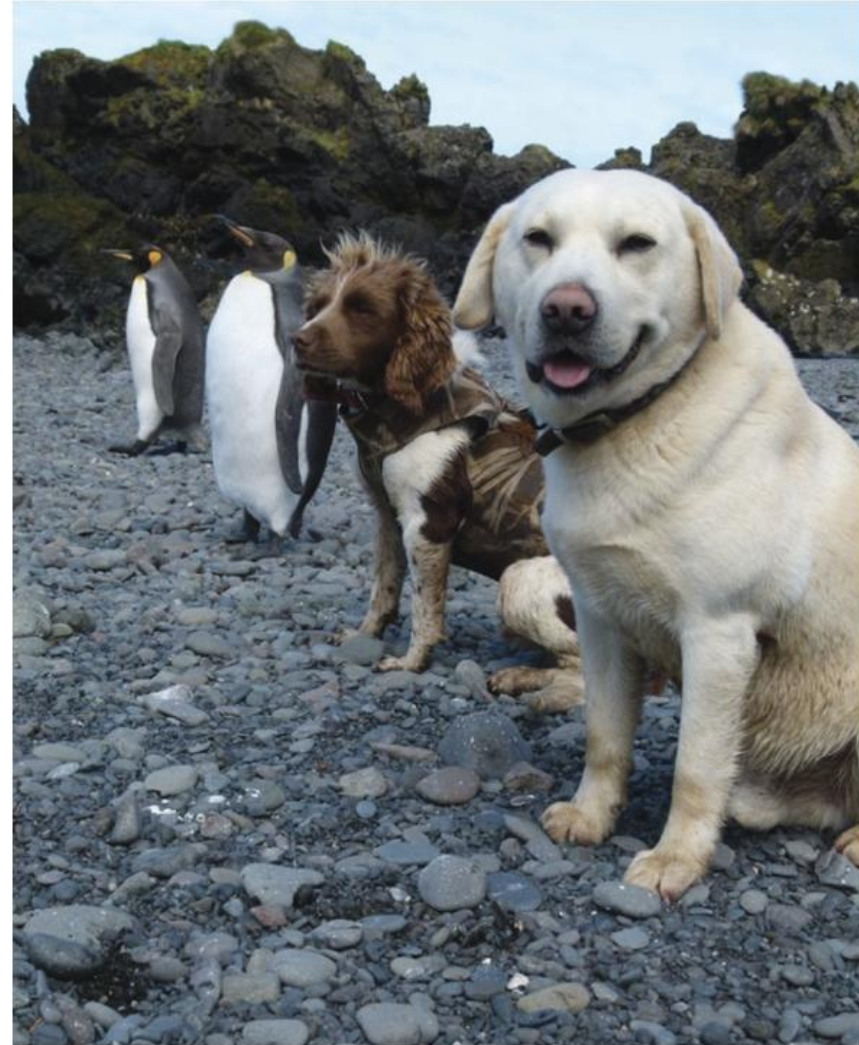
Cats were eradicated between 1985 and 2000. With the cats gone, rabbits population exploded and caused devastating damage to the islands vulnerable vegetation, wildlife and geology.

Fix the cats, lose the plants

Widespread erosion followed, damage to the nesting habitat the seabirds depended on. No plant species were lost, but decades of vegetation recovery were. The current plan removes rabbits, rats and mice together, at about \$24 million.

Rabbit and rodent invasion

European rabbits were introduced to Macquarie Island in the 1870s, while ship rats and house mice were first recorded on the island in the 1890s. Following the eradication of feral cats in 2000, rabbits and rodents became the dominant pest species on the island. A dramatic increase in their populations caused devastating damage to the island's vulnerable vegetation, wildlife and geology.



King penguins and detector dogs. (Photo: Dana Boyte)

The programs that work all look the same

Cross Tenure

Foxes can move great distances in one night controlling pest animals in isolated areas will not yield meaningful results. EG Scotts work in 2020 Leeming to Henderson in a night, approx 15km trip.

Duration

Foxes are here long term, so management needs to be long term.

Frequency of control

This changes for each method, need to correct frequency to get the required results, adaptive with review.

Mortality %

65 percent removed a year holds the population. Over 75 percent is what a successful program achieves. (NEED TO HAVE POPULATION DATA)

Buffered

The edges of the protection zone are managed, or populations are refilled from next door.

Timed

Different controls throughout the year based on efficacy and welfare.

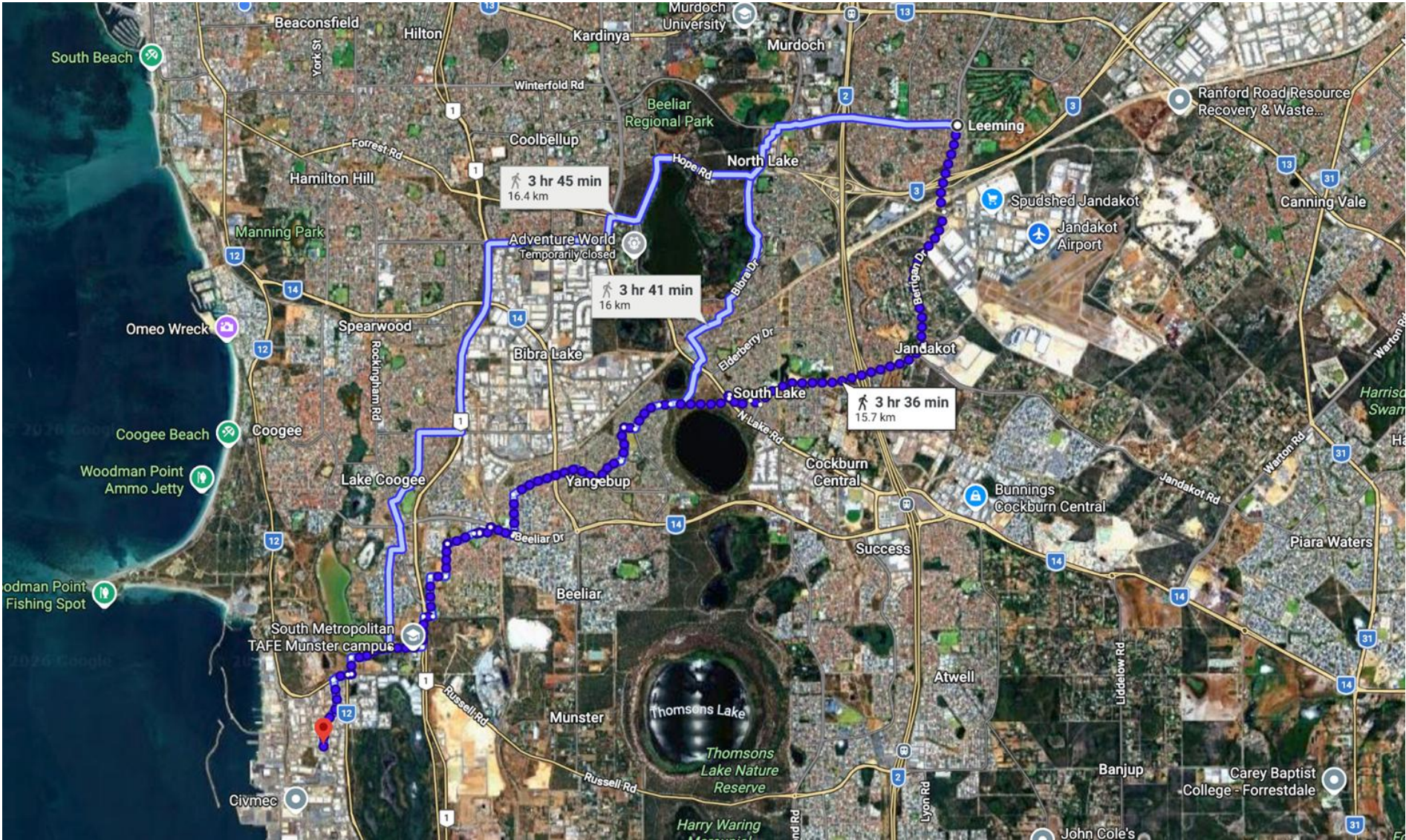
Integrated

Foxes, cats and rabbits together, with every category of control in play.

Measured & Reviewed

Effort and outcome recorded, objective measurements for success driving future management.

15km one night



Scott Thompson's research demonstrated foxes can move :)

Every control method removes the portion of the population most susceptible to it.

1

Shoot only

You remove the foxes that can be shot, often younger 'uneducated' foxes.

2

Trap only

You remove the foxes that enter traps. What's left is the trap shy population.

3

Bait only

You remove the animals happy to take a bait. What's left are the population wary of baits, new objects and new smells.

4

Den fumigation exception

A fox cannot learn its way out of needing a den. A vixen must go underground to raise a litter, and the den holds odour whether she is wary or not. There is no detection shy fox.

Highlighting multi modal approach

Each method above leaves a different remainder. The foxes that beat the gun are not the same foxes that beat the trap, and neither are the ones that will not touch a bait.

Run one method and you are selecting for the animals it cannot reach, season after season. Run several, rotate them, and the gap each one leaves is covered by the next.

Detection and fumigation sit outside that problem, which is why they belong in the rotation rather than instead of it.

Four categories of control

1

Chemical

1080 baits & canid pest ejectors, den fumigation with carbon monoxide.

2

Physical

Trapping, shooting, exclusion fencing, den destruction.

3

Cultural

Things we can do as a community to impact pest management outcomes. Think Food water, shelter.. Eg Bins and waste, roadkill clean up, pet foot not left out, dogs kept on leads, cats contained, report sightings, protect turtle nests.

4

Biological

Disease or an agent that suppresses the pest itself. Rabbit Calicivirus and Myxomatosis. For foxes in Australia there is nothing registered and nothing available. Fertility control being researched.

And three that cut across

Strip the resources and the habitat holds fewer foxes. Every control above works better against a population the landscape can no longer support. Complicated by foxes ability to adapt to urban environment, switch food sources and ample access to harbourage and water.

What we keep, and what can't?

Control	Category	Status	Why
1080 baiting	Chemical	No	National SOP: not in urban or residential landscapes. High risk to domestic non targets (Pet dogs)
Trapping	Physical	OPEN	Very labour intensive, specialist and an adjunct to other methods. Excellent operators working under constant public pressure. Foxes often trap shy, dogs off lead are non targets. Cage trap poor results compared to soft Jaw. Landing a foxes foot on a 20c coin in an entire bushland reserve in an art in itself, made a lot more complicated if you need to do it undetected and have large quantities of non target domestic animals in the same area you are trapping.
Biological	Biological	No	No agent registered for foxes in Australia. Nothing to deploy.
Exclusion fencing	Physical	OPEN	Effective, and excludes unowned cats as well as foxes. Expensive set up, requires ongoing inspection and maintenance to ensure integrity, and a fox proof fence is a turtle proof fence, so it trades predation for isolation and needs assisted movement to hold the genetics.
Shooting	Physical	OPEN	Very labour intensive, specialist and an adjunct to other methods. Excellent operators working under constant public pressure.
Roadkill, food waste availability.	Cultural	OPEN	Rabbit control, bins, no outdoor pet feeding, dogs on leads. Depends on the same compliance negatively impacts the other rows.
Den fumigation	Chemical	OPEN	Detection work generally unhindered by public, working dogs safety risks with public dogs off lead and out of control. DEN-CO-FUME carbon monoxide, the only fumigant registered for foxes in Australia. No secondary poisoning risk, nothing left in the environment. Licensed operator, active natal den, cubs over four weeks.
Harbourage denial	Physical	OPEN	Collapse the structure after treatment so it cannot be reoccupied. Same visit, same job. limitation, foxes can re dig den sites next year.

Lots of opportunity to enhance the existing program by adding den detection and fumigation. Public perception of working dogs is more accepted than working with firearms and poisons. Meaning less public hindrance to programs and more public support.

DPIRD (2025) Options for fox control; NATSOP-FOX001; WA Code of Practice (June 2025); Terrestrial Ecosystems (2020) section 5.13; fencing cost from the Commonwealth fox threat abatement plan (2008).

We know what works, why don't we do it?

Operating in urban areas severely restricts the tools that can be used, the most effective and cost effective control is 1080, this is not an option in urban areas to my understanding due to the risk to non-targets and the public. Shooting and trapping are done with great restrictions and safety controls.

- Dogs off lead venture into trap sets
 - Members of the public walking into an active operational areas (trapping or shooting)
 - Trap sets interfered with, sprung, moved or vandalised
 - Damaging and sometimes defamatory claims on social media, which gain momentum quickly and make the whole program politically harder
 - Benefit to Management cost. Hard to land this on a clear number, much easier of its spend 5K on fox control if return is increase in 15K of livestock survival. No clear financial ROI for land managers outside Ag space.
 - Fox = C3 pest, "Land owner to control" Eg, sheep farmer and the wheat farmer.... Most people have never seen a fox in urban areas.. no problem?
- If the KPIS for successful programs are not moving, I don't believe it's a question of the contractors skillset. It's a question if the program gives anyone the tools, the time and the coverage to achieve meaningful outcomes.*

What can we add into the existing program?

Fox den detection and fumigation



*Otto, in training, nose into a burrow entrance under fallen timber.
Location withheld.*

Why?

1

Static target

Everything else in fox control is aimed at an animal that is mobile, nocturnal and actively avoiding you. A den sits still and waits to be found.

2

One action, whole litter

Fumigation of an occupied natal den takes the vixen and the pups together, before dispersal.

3

Harbourage denial

Collapsing the structure after treatment removes it from the landscape. It cannot be reoccupied next season.

4

It compounds

Foxes reuse the same ground. Once you have a mapped register for a reserve, every subsequent survey is faster and more targeted than the first. Data feeds and supports other control methods.

When to do it?

Late June to early August

Mating. Vixens are receptive for about three days.

August to September

Cubs born after 52 to 53 days, three to six in the natal den.

September to November

Litter in the den. Late winter and spring. Fumigation needs cubs over four weeks. The window to take vixen and litter together.

December

Nearly every litter has left the den. Survey still finds the dens, but the cubs are on the surface.

January to March

Independence by January or February. Dispersal from March. The chance to take a litter together is gone.

Taking the vixen and the litter together, in the den, is a welfare case as well as the efficacy case. No orphaned litter, and no litter breeding next year.

Roe 8 Corridor



The first den detection survey on the corridor.

Five blocks, one dog. City of Cockburn, 3 to 6 September 2026.

The City is working with Resting Reds to improve our understanding of the location of fox dens in the Roe 8 corridor. The works are subject to strict conditions to manage dieback and manage impacts to flora and fauna. The City is very pleased with the initial results and is grateful for the significant time and expertise that Courtney has contributed. Given the success of the survey in the Roe 8 corridor, the City is looking to facilitate Courtney's work at other reserves the City manages.

City of Cockburn, September 2026

RESULTS

What came out of it

6

burrow systems located and mapped

8

separate entrances recorded

2

sites with fox sign at the entrance

3

blocks returning nil detection

- All six sites fell within two of the five blocks. Denning resource in the corridor is concentrated, not spread evenly
- Twenty five incidental observations were recorded alongside the survey: fauna including quenda and shinglebacks, a live cat with no collar, several weed observations, all reported with GPS data for action.
- Every site now sits on a register with coordinates, entrance counts, species basis and status, ready for camera deployment

The City now has Cameras on these sites monitoring for use



19:18



22:30

Same entrance, same night. One rabbit, one Quenda. This is the site where I recorded a fox print and fresh excavation on 4 September. The City put a camera on it, and by 8 September it had recorded a native animal & Rabbit using the burrow.

LIMITATIONS

Limitations



Dog indicates on odour

The indication on odour only confirms the scent is present, it does not definitely tell us what's currently using the burrow/den/warren. Can train specific indications



The handler makes the call

Species attribution comes from what I find at the entrance: prints, scats, food stores, spoil, entrance form. It is recorded as a likely species with the basis stated. Camera observations are the only way to confirm what's in the hole at that point in time. It is known use can and does change throughout the year.



A nil result can change

It means no detectable den or fox sign on the ground searched, on that date. Foxes are seasonal and mobile and can dig new dens each year in new locations.



It is a survey tool

The dog finds and I collect data. Confirming occupancy needs cameras. Reduction in numbers requires fumigation w/ integrated plan. Detection is the front of a chain, not the whole chain.

Why fumigation works in urban areas

1

Safer

Carbon monoxide into a sealed burrow, then gone. DPIRD lists no risk of secondary poisoning as the advantage. No residue, nothing left for a dog, a child or a scavenger to find.

2

Applied to a confirmed target

One located den, occupancy confirmed on camera, native fauna excluded first. Not broadcast into the environment and risk to non targets.

3

Takes the litter with her

The vixen and the cubs together, underground, before dispersal. No orphaned litter left in the den to starve.

4

Permitted

Heavy restrictions on use of 1080 means fumigation can be used in areas 1080 cannot.

5

Harbourage destruction

Collapse the den or warren afterwards and it cannot be reoccupied next season.

Where it sits on humaneness

The national assessment scores two things: suffering before death, and the mode of death.

Fumigation is mid range on the lead up and among the best on the mode of death. A headshot scores better. 1080 has the worst mode of death on the chart. Trapping carries the highest welfare impact of any method, because the animal is restrained and conscious.

What the assessment cannot score is the litter. Take the vixen at the den and the cubs go with her. Take her anywhere else in spring and they starve underground.

One den can hold a vixen and six or seven cubs, taken in a single visit.

A perfect program in one reserve still fails

One night

A collared fox from Leeming around the southern edge of Bibra Lake, through Spearwood, and settled at Henderson. More than 15 km in one night, across two local governments. Nothing on the ground marks a boundary to a fox.

One August

Near Carnarvon in 1995, aerial baiting killed all 45 collared foxes, better than 95 per cent of the population. Reinvasion came the next year with dispersing juveniles. This was done in an area $\frac{2}{3}$ the size of perth, this is the rate at which these animals can breed and repopulate.

Every year, forever

Half the adults die each year anyway and the cubs disperse from March looking for vacant ground. They are an animal that naturally has a high turnover of adult population, and well adapted to replacement each year.

Remove every fox from Bibra Lake tomorrow. One pair over the boundary produces up to seven cubs, and those cubs walk into the ground we just cleared. That is why we have been bouncing around for years with no lasting change. It is not the tools and it is not the contractors. It is scale, consistency and time.

Working plan across all of Perth Metropolitan.

1

Perth metropolitan vertebrate pest working group

In all other regions large scale pest management is coordinated by registered biosecurity groups (RBGS) the same coordination, planning and funding is needed to get meaningful outcomes across the metropolitan area.

2

Write one plan that meets best practice

Broad scale, ongoing, timed to the breeding calendar, every category of control in play possible. Not separate fragmented programs across different stakeholders.

3

Resource it to the number, and keep resourcing it

Sixty five per cent a year holds the population. Over seventy five per cent reduces it. Anything less is money spent on a result that undoes itself.

4

Measure, Review, Adapt

Are we putting resource into the correct places? Is what we are doing having a meaningful impact? Are we driving the numbers we need to?
Management needs to be driven by the data.

THANKYOU



TERANA
ENVIRONMENTAL



Thank you

Scott Thompson from Terrestrial Ecosystems to follow :)

Courtney Kelly, Director

Terana Environmental

0450 303 434

courtney@teranaenvironmental.com.au

WITH THANKS

- Joyce Gadalón and the Walliabup Wildlife Warriors, for organising and for the years of work behind this program.
- Paul Markendale and the volunteer fox monitoring team
- The Turtle Trackers and the Beeliar community, who find the turtles, protect the nests and report what they see.
- Sook Yee Lai MLA, whose \$12,000 State Election commitment funded the additional monitoring cameras
- The City of Cockburn environmental team, Claire Raphael and Adam Peck, for backing this work on the Roe 8 corridor

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Peri-urban foxes

Dr Scott Thompson
Dr Graham Thompson

Terrestrial Ecosystems



Foxes

- * Cunning – human avoidance (out of sight, out of mind)
- * Wary – difficult to trap, catch and shoot
- * Omnivorous
 - * Prey on native fauna
 - * Keep rabbit abundance down
- * Widespread in the Perth urban and peri-urban area*
- * Could transmit bird flu



- * * 3-16 foxes km⁻² in Melbourne, Marks and Bloomfield (1999) Distribution and density estimates for urban foxes (*Vulpes vulpes*) in Melbourne: implications for rabies control, *Wildlife Research*, 26, 763-755.

Bush Forever Sites

Source and sink populations

- Annual dispersal of pups
- Foxes can travel long distances quickly
- Foxes will readily move through urban areas
- Home ranges will often incorporate multiple bushland areas

Localised programs are short-term and of little value!



Fox movement

Some foxes have high site fidelity

Some foxes shift their activity areas:

- temporarily into adjacent areas
- permanently

Many foxes undertake forays into adjacent areas

Some foxes undertake long-distance forays into other areas

Roads, highways, train lines and bridges are not barriers to movement



Fox management

- * 13 peri-urban foxes
- * Southern suburbs of Perth, Western Australia
- * Home range and activity area



GPS collar #	Date captured	Local government area	Location	Sex	Mass (kg)
1AAD0B7A	27/04/2019	Cockburn	Yangebup Lake	female	4.4
Number of Fixes	End Date	Days Tracked	AKDEs 50% (km ²)	AKDEs 95% (km ²)	
1855	1/10/2019	157	0.74	2.59	



What to look for:

- Uses the surrounds of Yangebup Lake
- Uses the southern part of Little Rush Lake
- Rarely moves into Kogolup Lake
- Regularly crosses Osprey Drive
- Rarely moves into the residential area



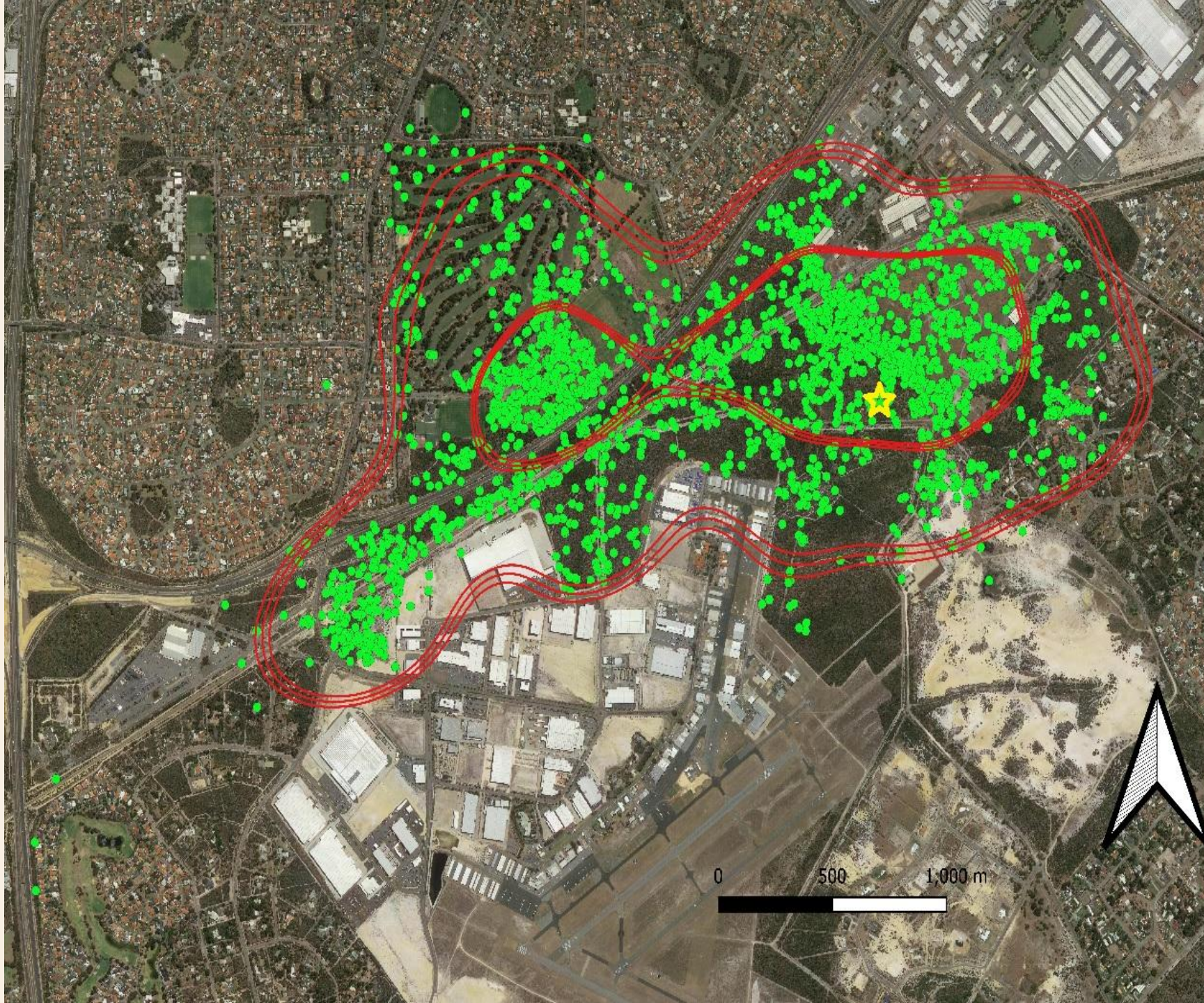


GPS collar #	Date captured	Local government area	Location	Sex	Mass (kg)
1AB47BEF	27/02/2020	Melville	Ken Hurst south	male	5.6
Number of Fixes	End Date	Days Tracked	AKDEs 50% (km ²)	AKDEs 95% (km ²)	
3001	5/09/2020	191	1.21	4.7	

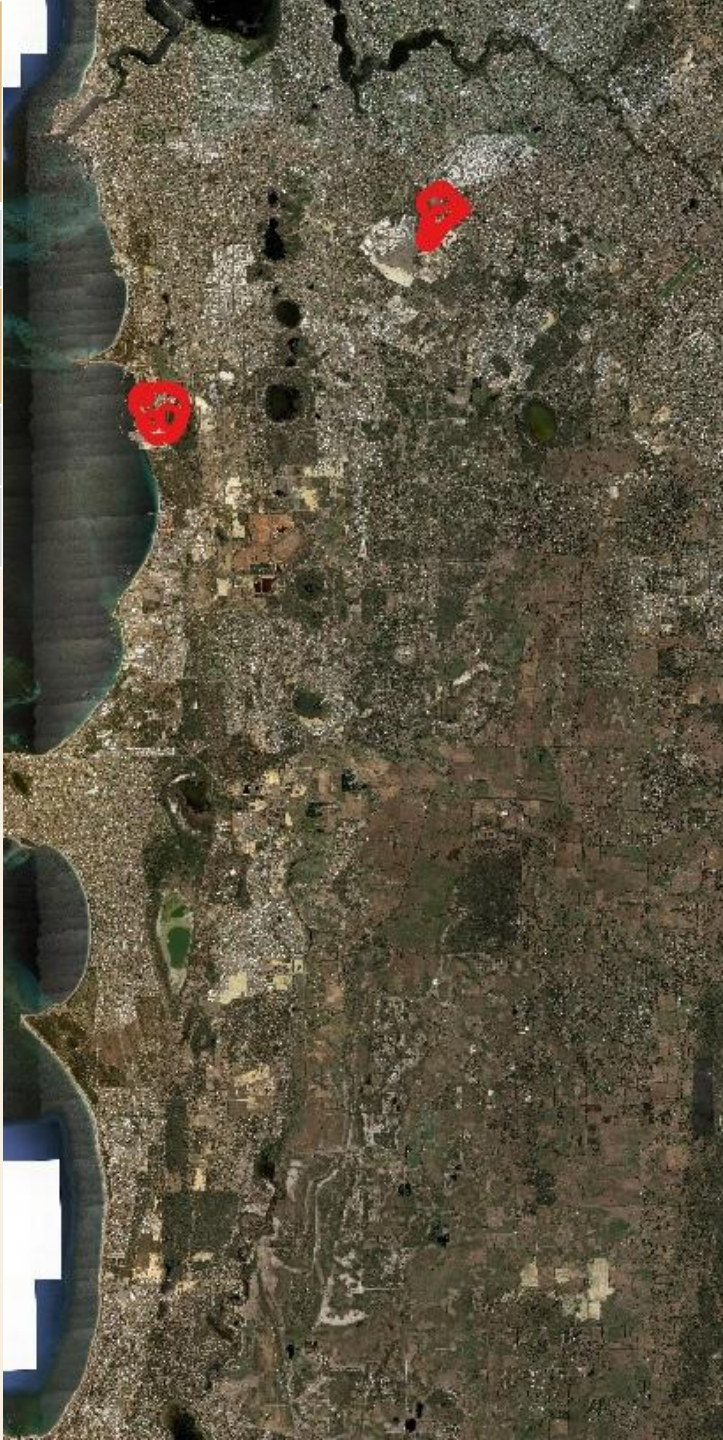
What to look for:

- Increase in home range size:
 - Ken Hurst south
 - Ken Hurst north
 - Down the railway line
 - Movement down the railway line eventually to the freeway
 - Finds the tunnel under Roe Highway
 - John Connell Reserve
 - Melville Glades Golf Course



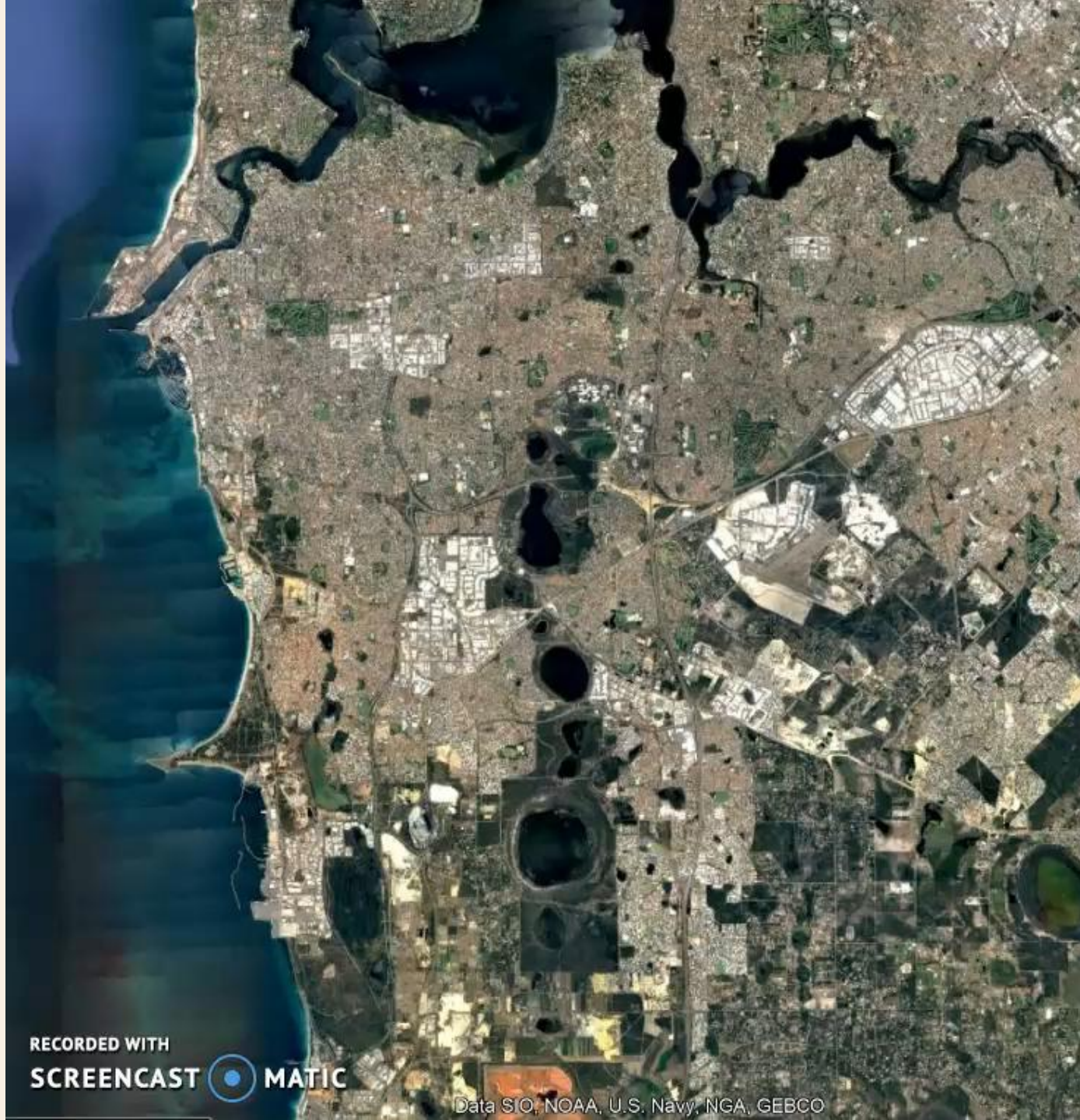


GPS collar #	Date captured	Local government area	Location	Sex	Mass (kg)
1AAD2D30	29/02/2020	Melville	Ken Hurst south	male	5.1
Number of Fixes	End Date	Days Tracked	AKDEs 50% (km ²)	AKDEs 95% (km ²)	
1030	28/04/2020	59	0.66	2.57	
635	30/07/2020	66	0.82	3.51	



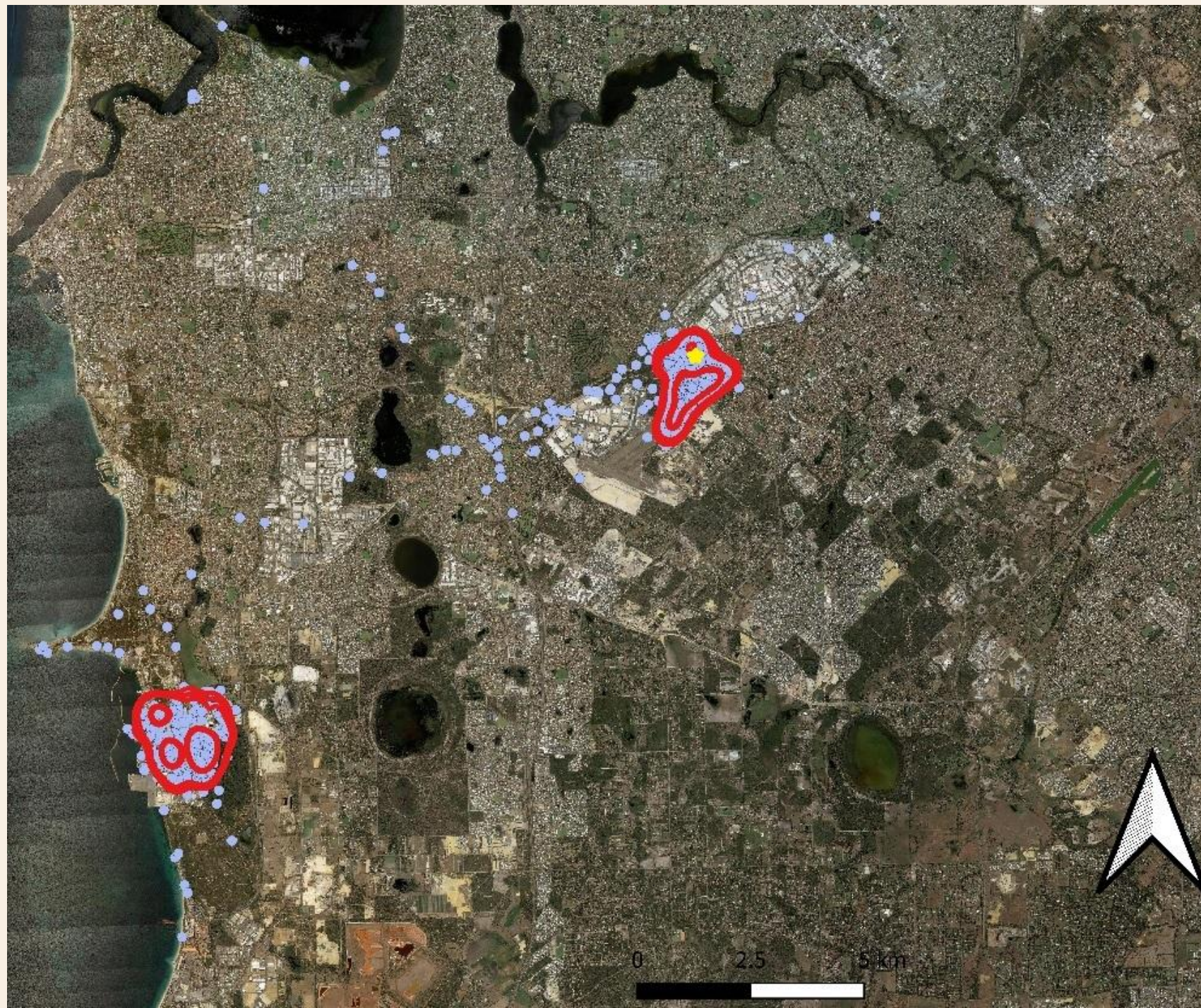
What to look for:

- Increase in home range size
 - Ken Hurst South
 - Ken Hurst North
 - Canning Waste Management Facility
 - Up and down the railway line
 - Long range movement – Pt Walter, Applecross, Wireless Hill
 - Long range movement – Bibra Lake, Beelie Regional Park, Spearwood swamps, Woodman Point, Henderson Industrial estate



RECORDED WITH
SCREENCAST  **MATIC**

Data SIO, NOAA, U.S. Navy, NGA, GEBCO



Compensatory response to a population reduction

- * Vixen ovulation, and the implantation rate increase in response to a reduction in the local fox population*
- * Small-scale fox control and removing a few foxes are of little long-term value



- * * Marlow's et al. (2016) Compensatory responses by a fox population to artificial density reduction in a rangeland area in Western Australia, *Conservation Science Western Australia*, 10(3), 1-10

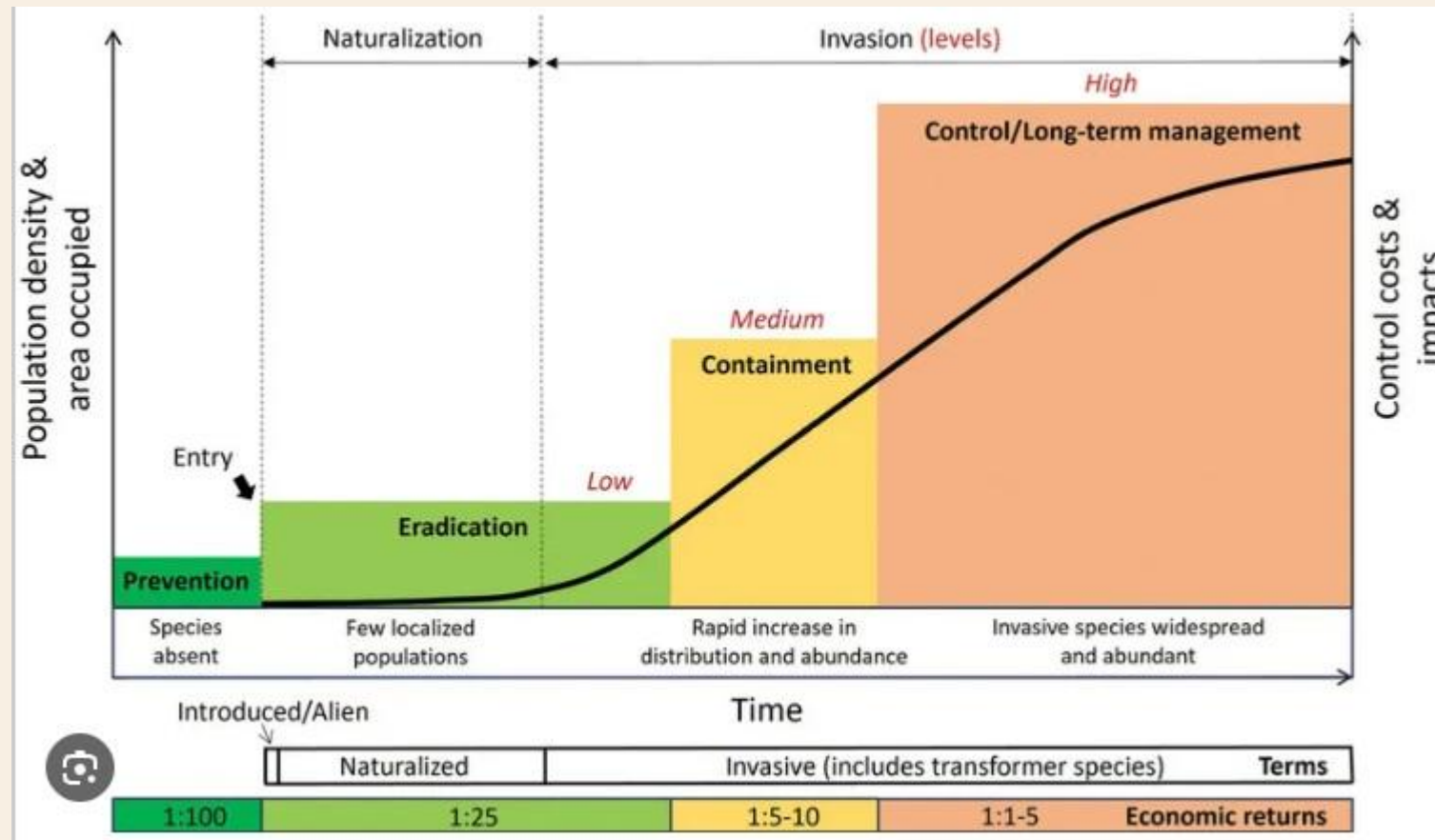
Population reduction rate

- * About 65% of the population must be removed annually to prevent population increase under the maximum observed population growth rate
- * i.e. $\lambda < 1$, the removal rate needs to be **greater than 65% per year**



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Invasion curve



Eradication is no longer an option, but a significant reduction on a regional scale is possible

Urban fox control

- * Little value if:
 - * localised
 - * a small number of foxes are caught
- * Can be effective if:
 - * regional scale
 - * all major land managers participate
 - * sustained
 - * well funded
 - * achieves a significant population reduction



Foxes captures by contractors

- * Based on data provided by Councils and DBCA the total number of foxes managed were:

* 2015	24
* 2016	29
* 2017	51
* 2018	66
* 2019	54
* 2020	21
* Total	245

- * Foxes were caught in multiple bushland areas, often with multiple foxes caught in the same reserve in the same year, and in successive years
- * On average 40 foxes were being caught per year
- * Data are not recorded in a consistent fashion nor is there adequate information on trapping effort or foxes caught
- * There is no measured benefit to the native fauna as a result of this cost and effort
- * There is no regional approach to management nor data collection or analysis
- * There is no appreciation whether 40 foxes per year represents 1% or 50% of the fox population

Fox management approaches

* Existing

- * Trapping
- * Den fumigation
- * A little bit of shooting



* Future

- * Trapping
- * Den fumigation
- * Greater shooting effort using night vision and thermal detection
- * Fox whistles and electronic callers
- * Detection dogs used to determine fox presence and den sites



Fox Management approaches

- * Trapping period

- * 10 day trapping period enables foxes to move through all of their activity area, probably on multiple occasions, and if a trapping site is on the periphery of its home range it improves that chance of trapping that fox
- * Brief trapping periods could be removing the 'dumb' and less wary foxes and leaving the 'bright' and cunning foxes to educate the next generation, making it more difficult to trap foxes in the future

Fox management approaches

- * High abundance of foxes
 - * Limited culling results in compensatory increase in the ovulation rate in vixens (Marlow et al. 2016)
 - * To get the numbers down, a sustained and greater management effort is required
 - * More bushland areas need to be managed
 - * Focus on the high density and source populations
 - * State government, local government and private landowners must all play their part

Camera trapping

- * Why???
- * We know that foxes are:
 - * widespread
 - * killing native fauna
 - * difficult to identify individuals (so it is difficult to measure abundance)
 - * here today, gone tomorrow
- * Is there a purpose for the camera trapping program that will make a difference?



Getting some action

- * Compile a fact sheet
- * Collect some useful images
- * Be very clear on what you want done (dot points, written)
- * Be very clear on whom you want action from (i.e. who are you targeting?)
- * Have a spokesperson(s)
- * Get a list of the target media (names, emails, etc)
- * Issue press releases (the web has lots of advice on writing good press releases)



Getting some action

- * Advocacy – sustained and targeted (and repetitive)
 - * What is your message – concise and clear (have written talking points)
 - * What do you want done
 - * Whom do you want to do it
- * Western Australian – talk to the journalist
- * Local paper – talk to the journalist
- * Social media
- * Radio – talkback
- * TV

Getting some action

- * Have a clear strategy for how you will turn the camera trapping program into action
- * Write it down
- * Assign specific tasks to individuals



REC 0.11



Questions

Dr Scott Thompson
Terrestrial Ecosystems
scott@terrestrialecosystems.com
Ph 0407 385 239

