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Module 09: Human-Animal Interactions

Urban EcoLab

May 2021

Domestication - Dr. Eric Strauss

Center for Urban Resilience

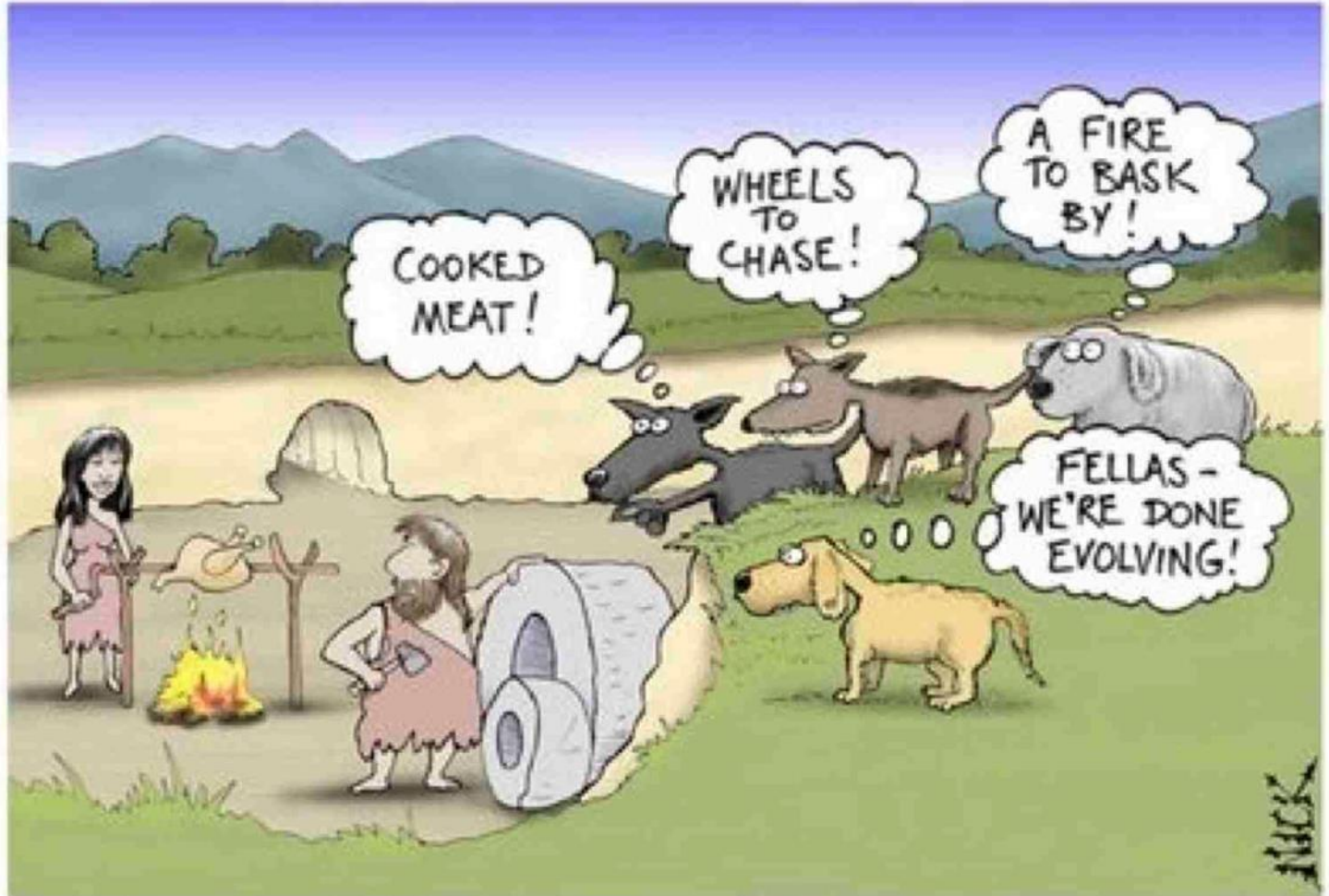
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Forget the experts; domestication of the dog only took about 8 seconds.

Today
for understanding humans and domestication of animals.

Theory of Change

An aerial photograph of a city, likely Los Angeles, showing a complex multi-level highway interchange with several lanes of traffic. In the background, a dense urban landscape leads to a prominent skyline of skyscrapers under a hazy sky. The image is used as a background for the text overlays.

Social & environmental well-being are inextricably linked

What does that really mean?

Healthy cities are only possible if its human residents are also healthy and safe in their neighborhoods! Social Infrastructure includes resilient relationship with nature – both wild and domestic

What is Urban Ecology?

- Emerging and interdisciplinary science, uses tools of natural and physical sciences and social sciences to study cities – to understand urban resiliency
- Urbanization is a dominant demographic trend and the most important component of land-transformation processes
 - Large populations of underrepresented population live in urban areas
 - Wonderful opportunity to envision the approach to engaging underserved stakeholders and reimagining the boundaries of collaboration





Humans and Domestication

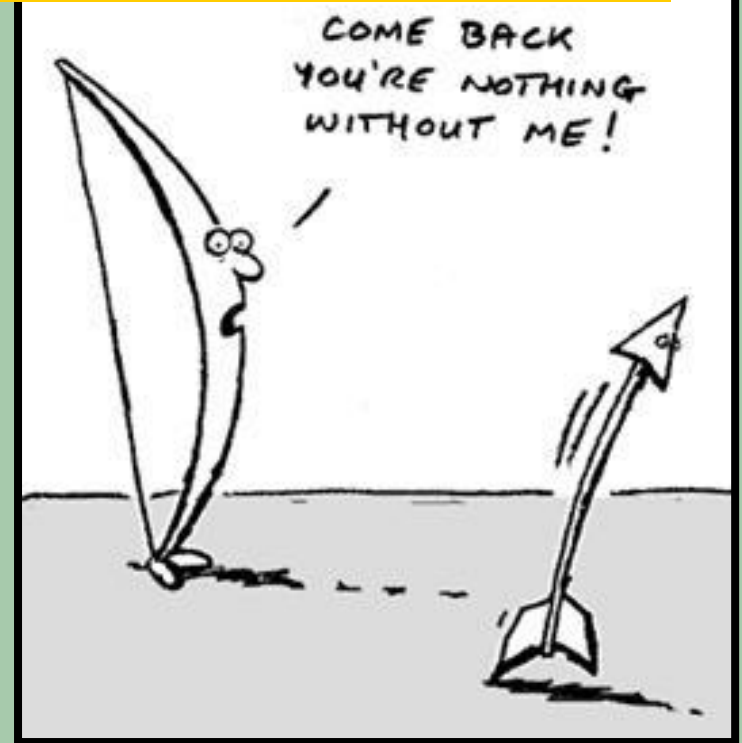
A Co-evolutionary History

A long process of adapting plants and animals for human uses that include food, hunting, companionship and protection:

- 10,000 ybp – plant domestication
- 8000 ybp – sheep, chickens, goats
- Coevolution lead to excess food production, increased human population density and accelerated cultural development
- Domestic animals dependent upon humans
- Genus *Canis* – perhaps 15,000-50,000 ybp

Symbiotic Relationships: Long term interactions that can shape an ecosystem

- *Commensalism*
- *Mutualism*
- Consumer/Victim relationships that include predation, pathogens and *parasitism*



Symbiosis	Species A	Species B
Commensalism	POS +	NEU +/-
Mutualism	POS +	POS +
Parasitism	POS +	NEG -

Clownfish and Sea Anemones are Commensal symbionts



Many species of clownfish, including *Amphiprion perideraion* from Guam, gain protection and food from their association with anemones. The fish do not provide a fitness advantage to the anemones, nor do they impose a cost. However - some researchers suggest that the clownfish may drive away predatory fish...

Ants and aphids are mutualistic symbionts

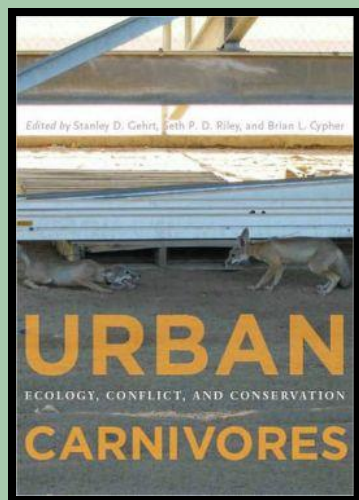
These ants and aphids are in a mutualism that benefits both species. The ants tend the aphids and protect them from predators in exchange for a share of the nectar (called honeydew) they have harvested.



Cuckoos are parasitic symbionts of many species of song birds, including pipits.

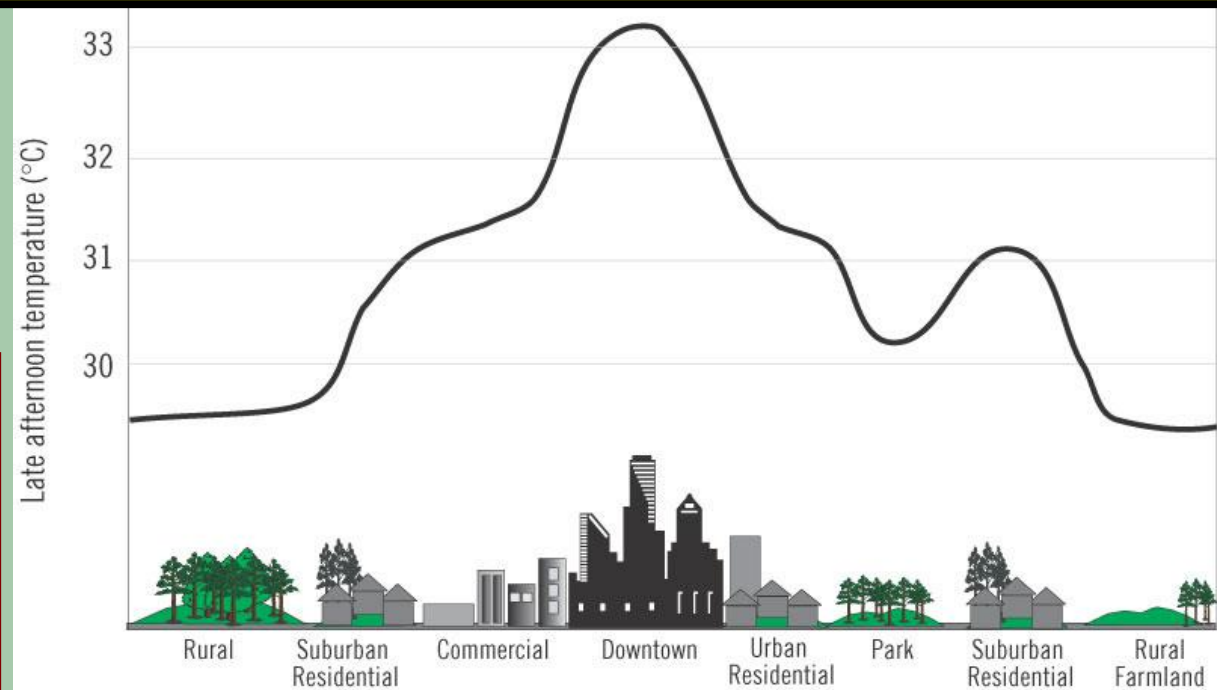


Cuckoos exploit the parental behavior of allospecific birds in order to raise their young. Female cuckoos lay eggs in other nests that are raised by songbird species such as pipits. Figure A & B depict a baby cuckoo being fed by an adult pipit. Upon hatching baby cuckoos instinctively remove the eggs of the host parents thus increasing the amount of food and attention that they receive, improving their fitness (Figure C).



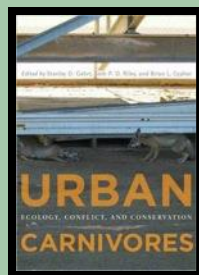
Characteristics of the Urban Ecosystem: *Climate*

Late afternoon temperatures across an urban to rural gradient clearly demonstrate the impact known as “Heat Island Effect”



1. Generally elevated ambient temperatures (heat island effect), 6-12 degrees Centigrade in larger cities such as Atlanta, GA
2. Flowering dates likely 4-7 days earlier
3. Growing season 15 days longer for cities bigger than 10km²
4. City climate footprint 2.4 times larger than the city

(Gehrt, S.D., Riley, S.P. and Cypher, B.L, 2010. *Urban Carnivores: Ecology, Conflicts and Conservation*. Baltimore: Johns Hopkins Press (ISBN 13:978-0-8018-9389-6)

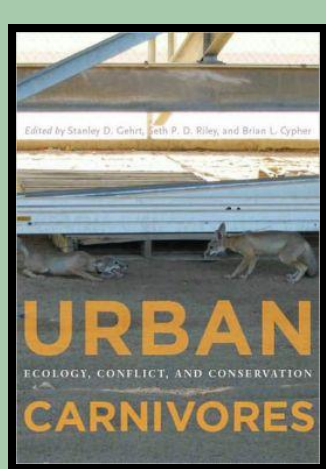


Characteristics of the Urban Ecosystem: *Water*

The channelization of urban water flow speeds the movement of water through the city and reduces its retention time



1. Contextual - dependent upon rural matrix – if core climate is arid, then urban environmental will have more water available
2. Usually adjacent to a major water body
3. Water flow through urban landscapes normalized through detention ponds and channelization
4. Water travels further in urban areas as a result of urban stream structures.
5. Water has a higher probability of being polluted



Characteristics of the Urban Ecosystem: *Light*

Swallowtail butterfly lethal interaction with an “energy efficient” white light. The switch from yellow to white lights have had a negative impact on urban insect species



1. Impact of Urban Glow – never really dark
2. Natural cycles of light resulting from moon phases are obliterated by existing urban light
3. In Chicago, this glow is visible from 60 miles away
4. Astronomical light Pollution – disruption in detecting cues from the night sky as a result of ambient light
5. Ecological light pollution – direct impacts associated with generated light – altered navigation and predatory behavior

Characteristics of the Urban Ecosystem: *Noise*

The pallid bat relies upon prey-generated noise to catch its prey.
Data suggest that hunting capacity is severely disrupted by noise



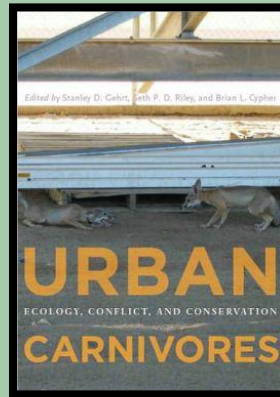
1. Noise is generated from many sources and is generally at a low frequency
2. Most noise associated with transportation networks
3. Challenge of acoustic masking – disproportionate burden on the listener for adventitious sounds
4. 83% of the land in the U.S is within 1061m of a road and projects an average of 20-40db of low frequency noise up to a kilometer away
5. Study in the Netherlands reported a reduction in population density of 60% of woodland bird species (n= 43) when measured near roadways

Characteristics of the Urban Ecosystem: *Habitat Fragmentation*

Unlike this black bear in Yellowstone National Park, most urban bears are unable to deal with traffic and thus cities are ecological sinks for this species and many others.



1. Increased distances between areas of green infrastructure compared to rural settings
2. Homogenization of prey species
3. Challenge of negotiating roads
4. Paradox of roads
5. Potential for an ecological *sink*

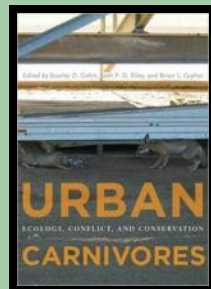


Characteristics of the Urban Ecosystem: *Biota*

Reconstructed dune scrublands in the Australian City of Port Phillip provide habitat diversity that often increases biotic diversity in urban landscapes



1. Relatively high plant diversity high in urban areas
2. Preponderance of alien species
3. Heterogeneity of habitat types
4. Biotic diversity highest at urban fringe
5. Homogenization of animal diversity



Data from the Human-Environment Research laboratory: Benefits of open space & parks

- Frances Kuo & William Sullivan
@ UICB
- Lower levels of fear
- Less violent and aggressive behavior
- Fewer reported crimes
- More self-discipline for girls
- Reduced ADHD symptoms
- Better neighbor relations



**A scene along the Chelsea Creek in Boston.
In inner city neighborhoods, the greener
the area, the lower the crime rate.**

The Challenge:



The core idea in urban ecology, *that environmental and social wellbeing are inextricably linked*, requires a thoroughly integrated approach to the development and implementation of curriculum, research and service.

The curricular elements include a broad sweep of seminars, content-based courses, capstone gatherings, research opportunities and internship experiences – all within a *community-centered framework of social justice*.

This type of program is difficult to implement in a typical university setting that is organized into independent departments of *traditional disciplines and legacy metrics*.

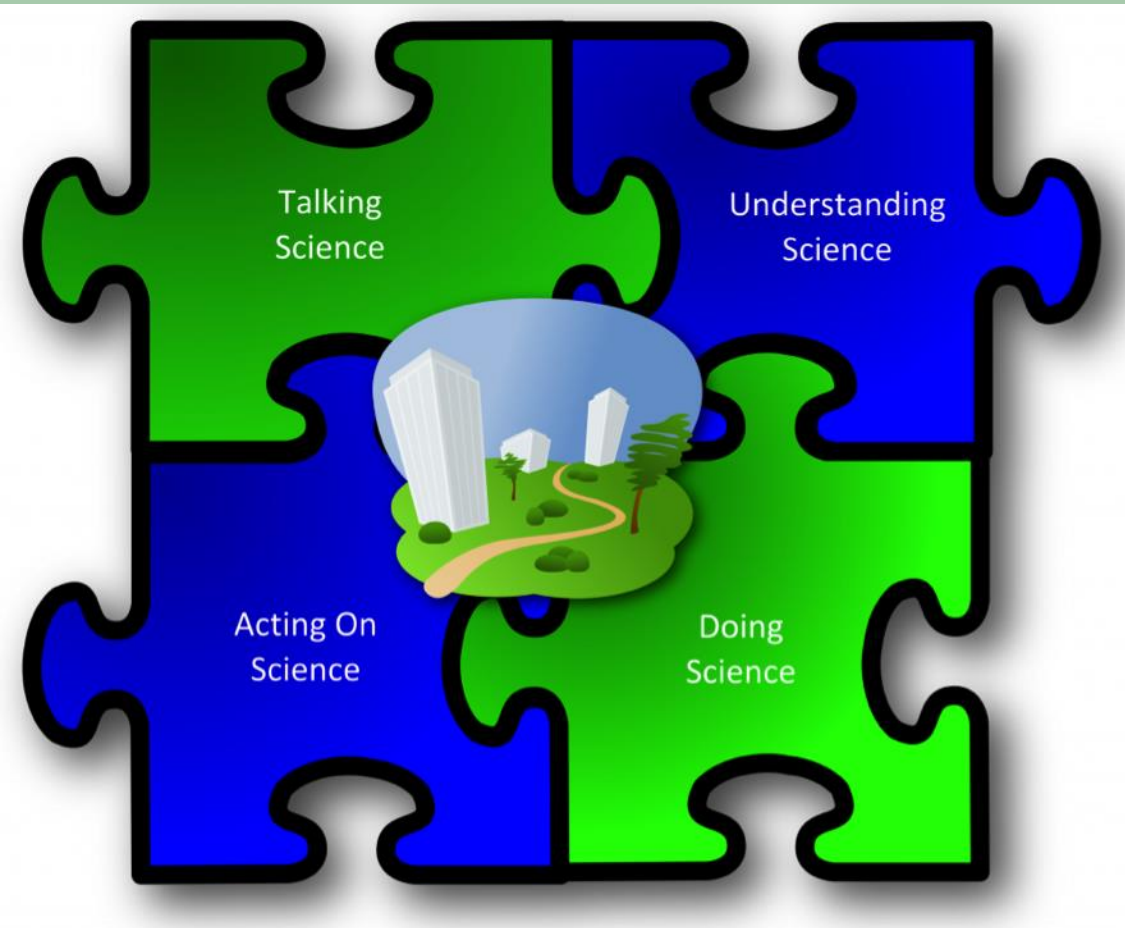
Urban Ecology Curriculula

<http://cures.lmu.edu/for-instructors/urban-ecolab-curriculum/>

Eight Core Modules

1. Introducing Urban Ecology
2. Land Use
3. Energy and Climate Change
4. Global Garbage
5. Public Health
6. Urban Biodiversity
7. Adaptation and Behavioral Plasticity
8. Planning and Doing Urban Ecology

Framework for Urban Ecology Curriculum

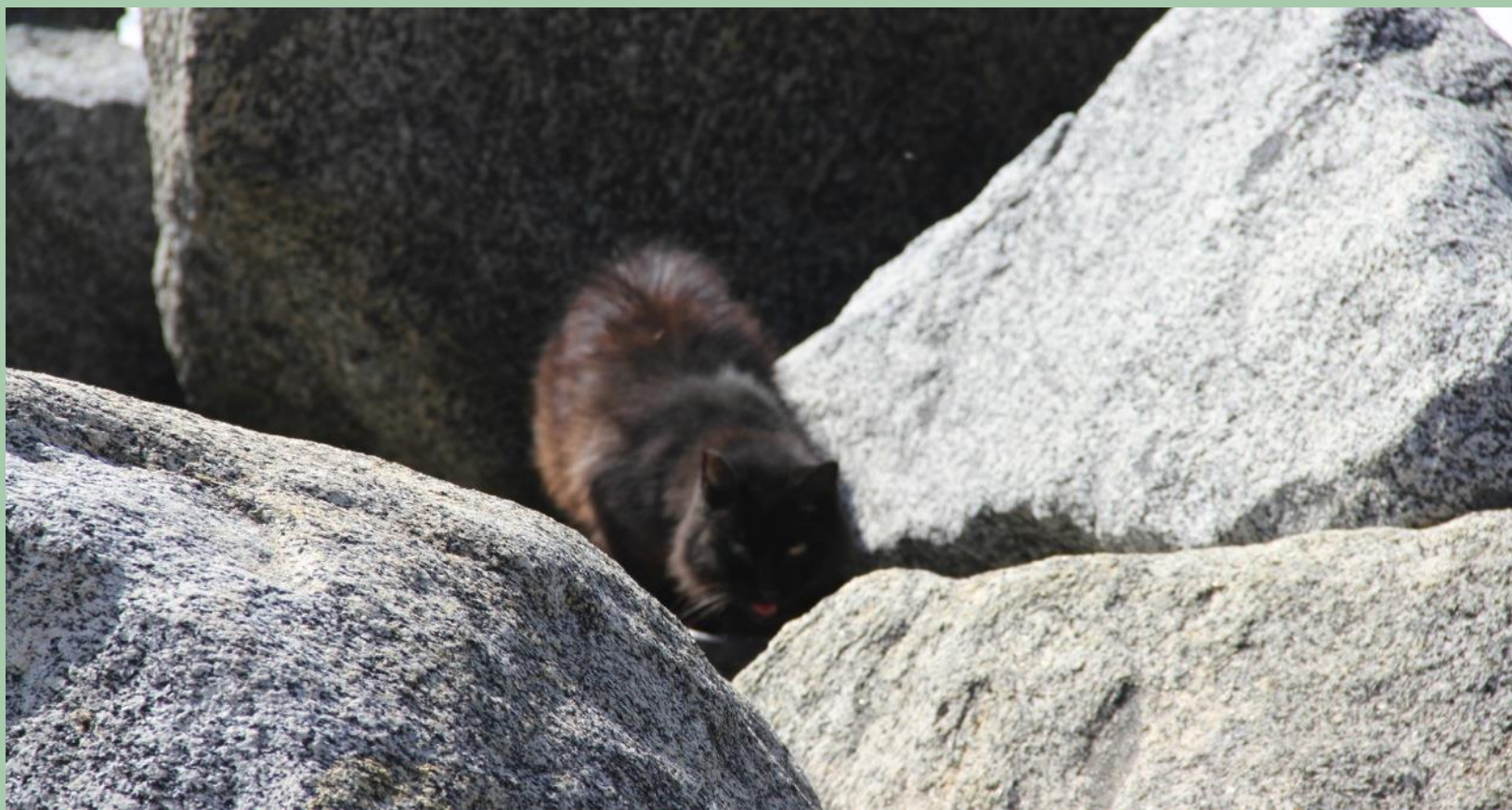


Each unit includes

- In Class Activities including labs, mini-class discussions, etc.
- Written Narratives tied to specific lessons
- Environmental Justice Case Study
- Field-based Study
- Action Project









1. What is Behavior?

**Behavior is what
an animal does
and how it does it.**



Basking painted turtle
(*Chrysemys picta*)



Japanese Carrion Crow
cracking walnuts

2. Behavioral has both proximate and ultimate causes

- *Proximate* questions (how questions)
 - behavioral mechanisms
 - genetic and physiological mechanisms underlying a behavioral act
 - concerned with the environmental stimuli that trigger a behavior
- *Ultimate* questions (why questions)
 - function of behavior
 - address the evolutionary significance for a behavior
 - why natural selection favors this behavior
 - affect on fitness

"Cinnamon" – cream/grey blotched tabby, eye condition causing one eye to be white, and other eye is green.



"Button Nose" – Neutered, grey matted coat (lightened from the sun) with a distinctive white mark on nose, white patch on chest, front and back legs partly white.



"Sparkles" – Neutered _____. Orange tabby with a white mark on the nose, white patch on the chest, white front and back paws.



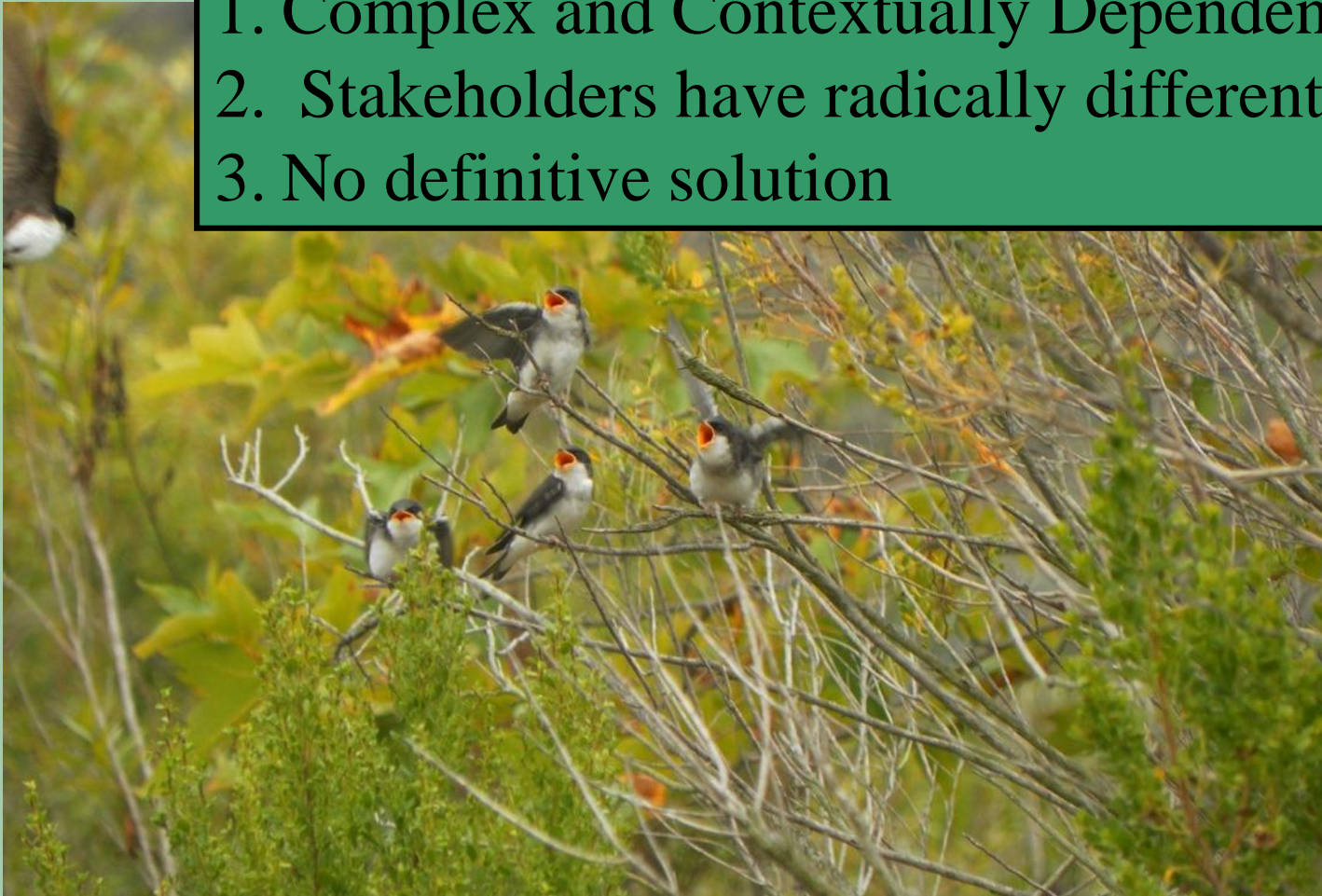
Cats as Little People?
... or invasive species?
... or as legacy?
... wild animals?
... Synanthropes?

*A New Guild of Urban
Meso-Predators:
The Very Essence of a
“Wicked Problem”*

Understanding Outdoor
Cat Movement and
Behavior using Remote
Sensing Cameras.

Cats as a Wicked Problem?

1. Complex and Contextually Dependent
2. Stakeholders have radically different world views
3. No definitive solution



Moving Towards Solutions?

Three Models towards an outcome:

1. Authoritative – *turning to a single or few select experts to decide on a solution*
2. Competitive – *pitting alternative solutions against one another in order to test veracity*
3. Collaborative – *engaging all stakeholders in the process of compromise*

The challenge of managing outdoor and feral cats is human centric



An integrative conceptual framework for socio-ecological research in human-dominated landscapes.

