

Beyond the Numbers: The Hidden Fragility of Animal Societies



[Gosia Bryja, PhD](#)

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Wolves, Grizzlies, and Black Bears still roam our landscapes, yet beneath the surface, fractures appear: knowledge slips away, social bonds unravel, and cultures vanish. This is how it is. Change unfolds quietly, unnoticed until the foundation cracks, and what once held steady begins to break apart.

Predators as Animal Societies

[Traditional conservation](#) has focused solely on preserving species, habitats, and ecosystems. It aims to avert population declines and prevent extinctions. To achieve these goals, it has largely relied on quantitative measures, such as population abundance and geographic distribution. The assumption has been that, as long as a certain number of individuals remain, the [survival of a species](#) is secure.

Nowhere is this reductionist approach to wildlife more evident than in predator management. The lives of social species such as bears, wolves, cougars, and coyotes are distilled into data points and fed into statistical models to calculate “*harvestable surpluses*” — figures that serve to advance political, economic, and consumptive interests rather than ensure the long-term stability of species.

This perspective is rooted in the North American Model of Wildlife Conservation (NAMWC), formally articulated in 2001. The model [sanctioned](#) wildlife as “*public trust resources*” that are

considered “*renewable*” if managed “*wisely*.” It thus legitimized lethal management practices, including hunting and trapping, under the assumption that populations remain stable as long as overall numbers are maintained.

This is an inherently arrogant approach. Predators are not clusters of interchangeable items that can be reduced, increased, or reshuffled at will. They constitute [complex societies](#) composed of individuals who cooperate, transmit knowledge, and learn behaviours from one another that enable them to adapt to ongoing environmental pressures. Conservation efforts, therefore, are not only about managing numbers but also about protecting the social structures of wild animals. Their [social groups](#) form the foundation of populations, and their resilience and relationships are the cornerstone of species survival.

Tipping Points in Animal Societies

All animal societies have their breaking points. The bonds that hold their groups together — kinship, mentorship, cooperation — are not infinitely elastic. Resilience and relationships are at the heart of species survival, but they are fragile phenomena. A population may persist in numbers, yet be hollowed out from within. Indeed, bears and wolves are not just statistics to be adjusted on a spreadsheet; they are part of communities with thresholds, the crossing of which endangers a population’s survival.

Tipping points, a concept from ecosystem science, signify sudden and often irreversible ecological transitions that occur when a system is pushed beyond a [critical threshold](#). Just as coral reefs collapse or forests turn into grasslands, animal societies can also unravel, leading to population declines, species extinctions, and broader ecological shifts. Many of these societies are currently struggling against multiple stressors — climate change, habitat loss, fragmentation, and declining food sources — making them more acutely vulnerable to any additional pressures.

These additional pressures manifest in different forms, with hunting being one of the most salient. Here, again, the [NAMWC](#) comes to the forefront. It greenlights hunting as long as wildlife population numbers remain stable. Moreover, the NAMWC's emphasis on "*science [as] the Proper Tool to Discharge Wildlife Policy*" has often been applied selectively, favouring data that supports population control through hunting while overlooking scientific evidence about the fragility of the social dynamics among species such as wolves and bears. Not surprisingly, therefore, given the NAMWC's approval, [hunters](#) feel justified in engaging in lethal "management" approaches. They argue that species declines — such as those of grizzly bears — are primarily driven by habitat destruction rather than hunting.

When individuals are lost, cooperation may break down, survival strategies may fail, and populations may dissolve.

Moreover, by erasing animals' individuality and their social relations, even extreme slaughter is justified. For instance, the BC government approved reducing [wolf populations](#) by up to 80% in parts of central British Columbia, a massacre carried out under the guise of caribou conservation. The proponents of the plan claim that [wolves reproduce quickly](#) and that their populations can sustain severe reductions without lasting harm.

This perspective, however, ignores, a crucial reality: hunting can remove key individuals: leaders, problem-solvers, or knowledge-holders. This, in turn, can destabilize social groups and push populations past a tipping point. A vicious cycle unfolds. When individuals are lost, cooperation may break down, survival strategies may fail, and populations may dissolve.

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Grizzly Bear Family ©Tony Campbell

Social Properties That Affect Tipping Points in Social Systems

Keystone Individuals: Leaders

Certain animals, so-called [keystone individuals](#), play a crucial role in maintaining the stability of animal societies and preventing tipping points. Their loss can destabilize social groups and, consequently, entire populations. For example, in wolf families, the [breeding pair](#) is the glue that holds the group together, leading the pack during travel, initiating group activities, and often introducing new behaviours that shape survival strategies. When hunters kill these key individuals, the whole group suffers; the cooperative structure of the group breaks down, mortality rises, and reproductive success declines. [Research](#) confirms this correlation: a study across five U.S. national parks found that after the loss of a family leader, the likelihood of a group of wolves staying together dropped by 73%, and reproductive success decreased by nearly 50%.

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Wolf family ©Kjetil Kolbjornsrud

The timing of these losses is also critical. When wolves are killed during key life-history stages — such as breeding, denning, or parental provisioning — the adverse effects on pack stability become even more severe. Pups may not survive, food becomes harder to secure, and young wolves lose opportunities to learn essential survival skills. Unfortunately, this is the reality — both profound and subtle. Since these disruptions occur at the [social group level](#), their importance is often lost in the appearance of stability at a larger population level.

The loss of keystone individuals not only destabilizes but also alters how the remaining animals interact with their environment. Again, it is the change that can evade a perfunctory analysis. To wildlife managers

driven by population numbers, a given habitat may appear intact. Not to the affected animals, however. They may no longer perceive it as safe due to the loss of key leaders, rendering it functionally lost. Real-life examples support this claim. In [Banff National Park](#), wolves adapted to using a highway underpass, but after the death of their leader, they abandoned the crossing. Leadership, inescapably, shapes group-wide risk assessments, and losing a keystone individual can fundamentally change habitat use.

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A lone grey wolf ©Jim Cumming

Keystone Individuals: Innovators

Moreover, innovators, or “eccentric” individuals, as [Stephen Stringham](#) refers to them, contribute to creating buffers against tipping

points. These keystone animals exhibit novel behaviours, unconventional survival strategies, and problem-solving skills that help their groups and populations adapt to rapidly changing environments. This is particularly relevant today, as climate change, habitat fragmentation, and urban encroachment force wildlife into environments where traditional behaviours may no longer ensure survival.

For instance, bears that navigate fragmented landscapes and urban neighborhoods possess higher [problem-solving skills](#) than their wild counterparts. Entering an unknown world, after all, requires openness to innovation. In a changing world, it is a critical skill. As [Safina](#) states, “Conformity might work fine when the world you’re in is stable. But the world is changing very quickly now.” When innovators are lost, populations lose much more than individual animals; they lose those most likely to quickly find ways to adapt.

Eccentric individuals thus act as catalysts, sparking changes that can spread through a group or population like a “[butterfly effect](#).” They foster new cultural traditions that enhance resilience in novel environments. Cultural transmission — the transfer of behaviours and mutual understanding within a social group — allows innovations to take root. Unlike genetic inheritance, [cultural transmission](#) enables rapid adaptation to environmental changes and novel challenges, reducing the costs of trial-and-error learning.

Cultural Transmission: Mother to Offspring

Among bears, the cultural transmission of knowledge and behaviour occurs between mothers and their offspring. It shapes survival strategies and unique traditions within a population. Most social learning happens during the long period of [mother–cub association](#), during which cubs acquire essential life skills by observing and imitating their mothers.

One striking example of this process occurs in grizzly bears, where maternal instruction leads to the development of unique foraging behaviours that define cultural traditions within small groups. In the [Rocky Mountains](#), certain matrilineal groups of grizzly bears have learned to dig through alpine talus slopes to find army cutworm moths, a high-energy seasonal food source. Every summer, a mother grizzly leads her cubs across snowy slopes, using her long claws to traverse icy areas. They scale peaks as high as 13,000 feet and dig through the rocky terrain to consume tens of thousands of moths each day. [Cubs learn this technique](#) from their mothers and but require years of practice to master it.

This specialized knowledge — unknown to other grizzlies in the same region — is not an innate instinct but rather a behaviour passed from mother to offspring through [cultural learning](#). Bear foraging strategies are, thus, not purely instinctual but are instead deeply influenced by social learning and cultural inheritance. Nor are they universal. Only a small portion of the bear population engages in certain behaviours, demonstrating how distinct cultural traditions can emerge within a

species through mother-to-offspring learning, and how consequential the killing of an individual might be to the resilience of a population's subgroup.

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Mama bear with her little cub fishing ©Roussien

Cultural Transmission: Social Copying

Cultural transmission is not limited to vertical learning (parent to offspring). It can also occur [horizontally within groups](#), allowing knowledge to spread through social interactions and the [copying](#) of innovative problem-solving behaviours. This broader form of social learning enables animals to adapt dynamically to changing environments and refine their survival strategies based on collective experiences.

For example, in Katmai National Park at the Brooks River, grizzly bears learn from one another through observation and imitation, mutually shaping their foraging techniques. While some behaviours, such as fishing techniques, may originate from maternal learning, these skills continue to evolve through social interactions. Some male bears develop specialized fishing methods distinct from those commonly used by females. Rather than being fixed, the learned behaviours are adaptable to environmental conditions and social dynamics. A bear whose mother fished from a particular location may modify his approach if conditions change. This adaptability was observed in '[Bear 909](#),' who, during her first year raising a cub, struggled to fish from her usual location. By closely watching other bears, she discovered alternative techniques, such as dashing and grabbing fish — an approach she then successfully adopted.

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Bears fishing for salmon at Brooks Falls in Katmai National Park ©Grayfoxx1942

Social learning has been particularly well documented among wolves. In Yellowstone National Park, researchers studying the first reintroduced wolves observed how they adapted their hunting techniques to take down bison, which are far more challenging to hunt than elk due to their size, strength, and defensive behaviour. Successfully hunting bison requires specialized skills and coordinated family strategies. Initially, only two of the 41 reintroduced wolves had prior experience hunting bison. However, over time, wolves who were [‘naïve to bison’](#) learned by observing and copying the strategies of more experienced individuals.

Each time a hunter's rifle kills an eccentric individual or a knowledge-bearer, a population risks losing critical potential for adaptation.

The ability of wolves to adopt ambush hunting strategies further supports the role of social learning in shaping their predatory behaviours. In boreal forests, where [wolves hunt beavers](#), they do not rely on chasing but instead strategically position themselves downwind and wait for hours or even days for the right moment to strike. This tactic, used consistently across multiple packs, indicates that wolves not only develop problem-solving skills individually but also share and reinforce effective techniques within their social groups.

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As mentioned earlier, such group knowledge is fragile and susceptible to external pressures. Each time a hunter's rifle kills an eccentric individual or a knowledge-bearer, a population risks losing critical potential for adaptation — whether to cope with new threats or to find alternative food sources. On a larger scale, this could mean the difference between survival and extinction in a rapidly changing world.

Behavioural and Genetic Diversity: A Buffer Against Extinction

It is not only cultural knowledge and leadership that disappear with the loss of keystone individuals. Also endangered is the behavioural diversity within a population that ensures its resilience. Animals exhibit a wide range of [personality traits](#), with some individuals being bold and exploratory, while others are cautious, shy, and risk-averse. These personality differences shape how individuals respond to risks and allocate resources. They also [correlate](#) with survival rates, reproductive performance, and effective life-history strategies.

Bold individuals often pioneer new territories, exploit novel food sources, and facilitate gene flow between isolated populations. In essence, they assist in maintaining genetic diversity and increasing the likelihood of reproductive success. In our increasingly humanized world — where habitat loss and climate change fragment landscapes — these [individuals](#) serve a critical ecological function. [Research](#) has shown that risk-takers and exploratory personalities are strongly linked to innovation and problem-solving, making them essential for adapting to the environmental changes discussed above.

The significance of individual personalities highlights, again, the fallacy of viewing wildlife conservation purely in terms of population numbers. Ironically, the most inquisitive individuals are also the most likely to [perish](#). Hunting disproportionately targets bold, risk-taking individuals, as these are the animals an opportunistic hunter is most likely to encounter. Killing bold individuals — whether intentional or

an unintended consequence of hunting and trapping — exemplifies how anthropogenic forces affect wildlife populations. By [eroding genetic and behavioural diversity](#), humans accelerate the decline of species already at risk, pushing them closer to the point of no return. Press enter or click to view image in full size



Wolf foot prints in soft mud ©StephenPietzko

The First Collapse Happens Below the Surface

Where does all this knowledge leave us? If anything, it should make us more appreciative of the complexity of ecosystems. Wildlife species do not exist as isolated individuals; they live in complex social groups, teach their young, and pass down survival strategies accumulated over generations. The stability of these social groups and populations is directly tied to the balance of entire ecosystems.

Therefore, hunting and trapping do not merely “*sustainably*” reduce population numbers — they unravel the very fabric of animal societies. Although, by quantitative measures, a population may appear stable, its foundation is already crumbling. A wolf family missing its breeding pair. A bear cub orphaned before learning to forage. A bear society losing its risk-taker or innovator. Seemingly tiny losses accumulate over time like invisible hairline fractures on a vase. Each additional loss — whether of a family leader or a bold individual — adds another crack, another fracture, until, suddenly, an entire living system shatters beyond repair.

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Written by Gosia Bryja, PhD