

Vanishing Edens: Biodiversity from A to Z  
by Dr. Michael R. Jeffords and Susan L. Post

“In recording my observations of the natural scene I have striven above all for accuracy, since I believe that there is a kind of poetry, even a kind of truth, in simple fact.”

Edward Abbey

While putting this course together for OLLI, we have attempted to combine our lifetime of observations as scientists, images created as nature photographers, and text produced as descriptive writers. If there is a single mantra for *Vanishing Edens*, it is the above quote from Edward Abbey. We are going to cover many topics from a broad horizon of subjects over the eight weeks of this course, and we felt that a list (poetry, if you will) of simple facts from and about each lecture would be an appropriate way to enhance each week. Come along and enjoy with us the simple facts about the world's *Vanishing Edens*.  
Michael Jeffords and Susan Post, Champaign, IL, 2020

**Also, we offer an OLLI Challenge for the class. Embedded in the eight lectures are examples of the classical elements of art—line, color, space, shape, tone, and texture. How many of them will you notice during the next 8 weeks?**

**Lecture #1—Arthropods as Art: Arizona During the "Hot" season**

- The bulk of all animal life, whether measured by biomass, numerical abundance or numbers of species, is comprised of invertebrates such as insects, spiders, worms and so on.
- In the last fifty years, we have reduced the abundance of wildlife on Earth dramatically. Many species that were once common are now scarce. Much attention focuses on declines of large, charismatic animals, but recent evidence suggests that abundance of insects may have fallen by 50% or more since 1970. This is troubling, because insects are vitally important, as food, pollinators and recyclers amongst other things. Perhaps more frightening, most of us have not noticed that anything has changed. Even those of us who can remember the 1970s, and who are interested in nature, can't accurately remember how many butterflies or bumblebees there were when we were children.
- Southern Arizona receives ~12 inches of rain per year, and half of that falls during the monsoon season from July through September.
- Cacti are the quintessential desert plants. They dispense with water-expensive leaves and perform photosynthesis with chlorophyll in their thick stems. Spines reflect sunlight and defend the succulent tissue.
- The American southwest is home to an amazing diversity of Arthropods, from bizarre spider-like creatures (Vinegaroons and wind spiders) to giant lubber grasshoppers, to fastidious dung beetles.
- Under UV light scorpions fluoresce, giving a greenish glow, and betacarboline in the cuticle is one substance that contributes to that effect.

- Vinegaroons have added protection from predation (besides their intimidating claws and hard exoskeleton) as they can spray almost pure acetic acid from their abdomen in a directed flow!
- Wind spiders have massive chelicerae (but no venom) to subdue and dismember their prey. They almost literally create a "prey smoothie" which they can easily ingest.
- Most people suffer from Arachnophobia . . . but to put the mind of any Arachnophobe to rest, there are no truly huge spiders on the scale of those seen in horror movies. They are limited in size due to the fact that delivering oxygen to cells is by simple diffusion, too inefficient to allow giant spiders (and insects)!
- The century plant takes many years to mature (~10), puts up a large flower stalk, blooms once, then dies.
- Southwest Arizona is not flat, but has a collection of 40 forested mountain groups called "sky islands" with many canyons. They are surrounded by deserts or grasslands.
- Green lynx spiders are ambush predators. During the monsoon season, female lynx spiders construct an egg sac, usually amidst the spines of a prickly cactus.
- Giant mesquite bugs characterize the monsoon season, often clustering in large numbers of their favorite host plant, mesquite.
- Patagonia is a birding and butterfly mecca for nature enthusiasts from around the U.S. and the world.
- Over 200 species of predaceous robber flies inhabit the deserts of the southwest U.S.
- The giant saguaro cactus is the universal symbol of the desert southwest. They usually do not branch until they are 50+ years old and can live up to 300 years. They have been in southwest Arizona only for the last 8,000 years. A pleated stem allows them to expand with water when it is available.
- Several desert beetles mimic the pinnate beetle, because it has a unique protection mechanism. They forcibly excrete a foul, oily fluid (at near the boiling point of water) from their abdomens that deters most predators.
- Giant lubber grasshoppers sequester toxins from the plants they eat and are unpalatable. Their coloring is called "aposematic" advertising their distastefulness. These species are flightless, even though they have wings.
- The Gila monster is one of only two toxic lizards in the U.S. and is most commonly found in mountain foothills. It may use burrows dug by other animals.

## **Lecture #2—In Search of Big Cats: From Snow Leopards to Tigers**

- The current human population of India is 1.37 billion people. Delhi/New Delhi has a population of 18,000,000.
- The Himalayas are 2,000 miles long and run from east to west.

- Ladakh is a remote trans-Himalayan region, lying within the state of Jammu/Kashmir in northern India, part of the vast Tibetan Plateau of China.
- Hemis National Park is located south of the Indus River in the Zaskar mountain range and covers 1600 sq. miles.
- Snow leopards main prey are wild sheep and goats which they kill by a suffocating throat bite.
- Himalaya is derived from Sanskrit and means "abode of snow." They are the source of three major rivers—the Indus, Ganges, and Brahmaputra.
- Here the Earth's crust is effectively 2 continents thick, which accounts for the dramatic topography that rises five vertical miles in a distance of 50 miles.
- The Chambal River is 600 miles long, 400 miles of which is part of the National Chambal Sanctuary.
- Chambal Sanctuary supports one of the largest populations of *Gavialis gangeticus* (Gharial)—a rare species of crocodiles which are critically endangered. The fish-eating crocodile is estimated at fewer than 235 individuals, which are threatened by loss of riverine habitat and depletion of fish resources.
- Keoladeo National Park is the former waterfowl hunting preserve for the Maharaja of Bharatpur, and is a RAMSAR (wetlands of international importance) site.
- Construction of the Taj Mahal began in 1632 and took 20,000 laborers 17 years to complete. It is the tomb/memorial for Emperor Shah Jahan's beloved wife Mumtaz Mahal.
- Bandhavgarh National Park is located in the Vindhya Mountains Range of Central India. The park is world famous as a place to see wild tigers and over 250 species of birds. It is the former hunting reserve of the Maharaja of Rewa.
- Tigers have a clearly defined 'personal space' which they object to having invaded.
- Kaziranga National Park, Assam, has 75% of the entire global population of one-horned Indian rhinoceros.
- The Burma monsoon forests of Kaziranga lie in the flood plains of the mighty Brahmaputra River.
- India is:  
A vast and varied canvas  
Temples rising out of pancake flat deserts  
Towering icy peaks of North  
Big jungle cats

Blood pumping treks high in the Himalayas

A wild culinary trip of your traveling life you will fry, simmer, sizzle, knead, roast and flip across a diverse repertoire of dishes.

Poverty is confronting; bureaucracy exasperating; crush of humanity can turn simplest task into a frazzling epic.

### **Lecture #3—Alaskan Sojourn: As the Tundra Melts**

- Tundra is a word that describes an area, a kind of vegetation, and a specific ecosystem. Characterized by dwarf shrubs, sedges, grasses, mosses, and lichen, tundra occurs where temperatures are low and the growing season short. Under most of it is permafrost.

- Eider ducks are sturdy, outfitted in the finest down underwear. Males are ornately plumaged while females are modestly patterned in shades of brown.

- Shorebird is a term denoting members of the sandpiper and plover families. Most wear a muted palette of grays and browns, while some are more brightly patterned in the breeding season.

- Walrus are animals of shallow seas that feed on invertebrates on the ocean floor. They will haul out on dry land only if summer winds have blown all ice away. Walrus terms include:

polynyas—frequent openings in sea ice;

thigmotaxis—bodies in close contact when hauled ashore

pagophilic—ice-loving.

- The musk ox is the soul surviving member of ice age oxen. They do not seek shelter during winter blizzards as they are wrapped in six-inch thick under fur and snow proof guard hairs that nearly drag the ground.

- Anchorage is the northernmost major city in the United States. Turnagain Arm, which forms the southern boundary, has some of the highest tides on earth.

- Barrow is the northernmost community in the U.S. and sits 1300 miles south of the North Pole.

- Nome is 540 miles northwest of Anchorage, on the coast of the Bering Sea, and only 160 miles east of Russia.

- Only three roads lead out of Nome, and all end in the bush.

- The Pribilof Islands are called the "Galapagos of the North," a misty, fog-bound seabird nesting paradise.

- Alaska comprises one fifth the area of the contiguous U.S., has six distinct geographical regions—each with differing climates, topography, plants and animals—and accommodates over 100 million acres of protected land.
- The arctic fox can be a hunter, scavenger, berry eater, or hoarder. In summer, they are known to cache surplus catches of seabirds and rodents to eat when the lean season comes.
- Polar bears are so closely associated with the sea—especially sea ice—that they are classified as marine mammals.
- The common eider is the largest wild duck in the Northern Hemisphere, weighing in at six pounds.
- Lupines add more than beauty to the Alaskan landscape. The roots of this legume has nodules on its roots that contain bacteria that fix nitrogen in the soil. On the Pribilof's the species in the Nootka lupine.

#### **Lecture #4—Serengeti Rules: Seeking the Soul of Africa**

- The “Serengeti Rules” began to flower when a few biologists began asking some simple, seemingly naive questions: why is the planet green? why don' animals eat all the food? what happens when certain animals are removed from a place?
- “These rules apply much more widely than to the Serengeti . . . they have been observed to work around the world . . . these rules determine nature’s ability to produce the animals, plants, trees, and clean air and water on which we depend.”<sup>SEP</sup>
- The Serengeti Rules are:
  1. Not all animals are equal.
  2. Some members of food webs have stronger top-down effects (trophic cascades).
  3. Some species compete for common resources.
  4. Body size is important in food webs.
  5. The regulation of some species depends on their density.
  6. Migration increases animal numbers.
- Nairobi (means *cool water*) is the starting point for safaris since the days of Teddy Roosevelt and Ernest Hemingway, but in those days was little more than a water depot for the notorious train the "Lunatic Express."
- Despite its proximity to the city, Nairobi National Park boasts over 100 species of mammals.
- Kenya's rift valley is part of a continental fault system than runs nearly 4,000 miles across the middle east and Africa and is seen as a vast trough of grasslands older than humanity and teeming with wildlife.

- Many travellers to the Rift Valley from Nairobi travel the Escarpment Road, originally built by Italian prisoners of war during WWII.
- Lake Naivasha is freshwater with floating islands of water hyacinth and papyrus.
- Lake Nakuru NP, though small, is thought to be one of the country's two "premier" national parks due to its abundance of wildlife.
- Tanzania is the quintessential Africa of your dreams and includes Serengeti National Park and the adjacent Ngorongoro Crater, one of the wonders of the world.
- Serengeti NP is 5,791 sq. miles of pristine wilderness, a primeval Eden par excellence. Serengeti means "endless plain."
- Ngorongoro Crater is the world's largest intact volcanic caldera and Africa's most spectacular natural arena. It encompasses 156 sq. miles surrounded by 1650 feet tall cliffs.
- The crater highlands peaked in volcanic activity 2-3 million years ago when Ngorongoro stood taller than Mt. Kilimanjaro (19,341 ft.). Its eruption created the flat, grassy plains of the Serengeti.
- The crater's population of black rhinos is unusually pale in color because they bathe and roll in saline Lake Magadi and its surrounding salt flats.
- Tarangire NP has many enormous baobab trees, mostly between 500 and 900 years old. The part is centered on its eponymous Tarangire River, a magnet for wildlife.
- Lake Manyara National Park is surrounded by ground water forests, bush plains, baobab strewn cliffs, and algae-streaked hot springs. It has incredible ecological variety in a small area, rich in wildlife and incredible numbers of birds.
- Kenya has over 30 species of weaver birds, and each has a unique style of woven nest.
- Hyenas have a classic sloping back and a long, thick neck and can digest ones, horns, hooves, and teeth of their prey within 24 hours. They are very efficient predators.
- The diet of a hippopotamus is 90-95% grass that is cropped short with the hard edges of wide lips.
- A giraffes tongue is blue (colored with melanin) to prevent sunburn (they feed 18 hours/day) and is 18 inches long.

## Lecture #5—The Illinois No One Sees

- Illinois is divided into 14 natural divisions based on glacial history, topography, soil type, climate, and distribution of native plants and animals.
- Illinois is 440 miles long, 165 miles wide and contains over 53,000 square miles.
- Illinois' outline is visible from space because the state is mostly outline by bodies of water: Wabash (east), Mississippi (west), Ohio (south), and Lake Michigan (northeast).
- Illinois has the distinction of being the furthest south the great continental glaciers of the Pleistocene reached in North America. That edge is approximately where I-57 and I-24 split in far southern Illinois.
- Illinois has over 90 different types of habitats, and over 54,000 species of described species of plants and animals.
- Originally Illinois was 60% tallgrass prairie and 40% forest. Today, it is 99.93% developed landscape (farms, towns, cities, highways, etc.).
- Illinois, therefore, has less natural lands left that reflect pre-European settlement than any state except Iowa.
- However, Illinois has perhaps the best system of Nature Preserves (lands that reflect the various habitat types found in early Illinois) of any state. Currently, there are 596 dedicated and protected Nature Preserves across Illinois.
- The goal of the Illinois Nature Preserves Commission is to protect and preserve examples of all the vegetation/habitat types that occurred in Illinois.
- Included with the preserve Nature Preserves are Land and Water Reserves, State Parks, and other types of locally protected lands.
- Illinois has a RAMSAR site—the Cache River Watershed—that is "a wetlands of international importance," so designated by the RAMSAR Convention held in Ramsar, Iran in 1971. Worldwide, 2,331 sites were so designated, and include such areas as Keoladeo NP in India, the Florida Everglades, and the St. Lucia Wetlands of South Africa.
- Larue Swamp/Pine Hills Ecological Area is a national preserve in Union County that has nearly as many plants as is found in Great Smoky Mountains NP. It is also the site of the famous Snake Road, closed each spring and fall to allow snakes to migrate to and from their overwintering and feeding sites.

- Illinois also has an extensive forest (Shawnee National Forest) stretching across much of far southern Illinois with 289,000 acres of deep forest, woodlands, rocky outcrops, and deep, cool ravines.
- Illinois also has five state forests: Big River State Forest, Hidden Springs State Forest, Lowden-Miller State Forest, Sand Ridge State Forest, and Trail of Tears State Forest.
- The highest point in Illinois is Charles Mound, near Galena, at 1253 feet, and its lowest point is the confluence of the Ohio and Mississippi River, near Cairo, at around 340 feet (depending on the time of year.)

### **Lecture #6—On Antarctica's Edge: Wildlife of the Falkland Islands**

- Stanley is the most remote and smallest capital city in the world; 85% of the islands' population lives here—approximately 2,200 people.
- The geological history of the Falkland Islands began more than a billion years ago, before they existed as separate islands. The breakup of Gondwana led to the formation of a large number of minor crustal fragments, including the Falkland Islands.
- A classic feature of the Falklands landscape is a stone run. A stone run (called also stone river, stone stream [Darwin] or stone sea) is a conspicuous rock landform, result of the erosion of particular rock varieties caused by myriad freezing-thawing cycles taking place in periglacial conditions during the last Ice Age.
- Penguins were first discovered in 1520 during Magellan's global circumnavigation; the historian of the expedition called them "strange geese."
- Over 770,000 penguins live in the Falkland Islands.
- There are over 700 islands in the Falklands archipelago.
- The second largest penguin, King penguins take 3 years to mature completely, but initiate breeding from the age of 6 years. This species is serially monogamous.
- King penguins were almost wiped out in late 1800s by sealers for their oil. It took five penguins to make a gallon and they were cooked alive.
- Courtship and nest building are periods of intensive agonistic behavior (combative, argumentative, aggressive) and social interaction in penguins.
- The Falkland Skua nests singly or in small colonies near to sources of prey, such as penguin and cormorant colonies from which it steals eggs and young. Skuas are often persecuted for taking penguin chicks, but their role is important, and their world populations is small and fragile.
- Gentoo penguins are commonly found to breed across sub-Antarctic islands and build nest from stones or with diddle-dee (dwarf shrub heath). They often steal stones from their neighbor's nests.
- Oceanic Heath covers most of the islands; called diddle-dee (dwarf shrub heath) it is the dominant plant of this habitat.

- The snowy sheathbill is the only bird, other than penguins, native to Antarctica. They patrol the edges of penguin colonies feeding on everything from penguin feces to dead and discarded chicks.
- The Magellanic penguin is a South American penguin, breeding in coastal Argentina, Chile and the Falkland Islands, with some migrating to Brazil. It is the most numerous of the penguin species. Its nearest relatives are the African Penguin, the Humboldt Penguin and the Galapagos Penguin.
- The striated caracara (Johnny Rook) is the southernmost bird of prey and is a near threatened species. An estimated 500 pairs breed on the Falklands. Johnny Rook is the “rogue” of the bird world. It is extremely inquisitive and captures interesting objects for a better look, i.e., hats, gloves, watches, lens caps, etc.
- The southern elephant seal is the largest seal in the world and is bulky with a large head. The name comes from its size and trunk-like proboscis found in bulls. Males acquire harems by fighting and are five times larger than females.
- The king cormorant (Imperial shag) is a year-round resident that breeds in close-packed colonies on clifftops, sometimes in mixed colonies with rockhopper penguins and albatross. Each nest is a substantial pillar of grass, mud, and seaweed.
- The kelp gull is the largest Falkland gull, and a resident on the islands. They feed on ducklings, eggs of shags and ducks, and scavenge on marine mammals and dead sheep.
- Rockhoppers are the smallest and most agile of the penguins and derive their name from their gait. They breed and 4 years old and live for 25 years. They feed on krill.
- No penguins live north of the equator, nor have they ever.
- Penguins are the only avian order in which all species are flightless. They are birds "wanting to become fish." They often spend five months at sea.
- Overheating in penguins is a bigger problem than keeping warm.
- The black-browed albatross returns each year to their mudpot nests situated high on the cliffs. Once fledged, the young will wander the southern oceans before breeding in their 5th year of age. The term for this wandering is *perpatetic*.
- After wiping out the seals in the early 1800s, people turned to penguins for oil in the 1860s; mostly rockhoppers with an occasional gentoo were used. In 1864 seven vessels were in operation for penguin oil and between 1864 and 1866, 63,000 gallons of penguin oil was shipped from Stanley.
- Eight rockhopper penguins boiled (alive) to produce one gallon of oil and an estimated 500,000 birds killed during this period. The industry ended in 1880, replaced by whaling. Someone noted that it was likely that penguins were used as fuel for boiling blubber for whale oil as trees were absent.

- Antarctic skuas harass other birds to drop their food, attack and devour young birds, and swoop on anything they do not like.
- The South American sea lion is perhaps the archetypal sea lion in appearance. Males have a very large head with a well-developed mane, making them the most lionlike of the eared seals.

### **Lecture #7—The Most Biodiverse Place on Earth: Manu NP, Peru**

- The Manu Road is famous worldwide. It runs along the edge of the largest National Park in Peru, Manu National Park, starting at a high pass, over 11,000 feet, in the Puna (dry highland grass and shrub land) and descending through a series of elfin forest slopes and cloud forest valleys to the lowland foothill rain forest along the Manu river...some 50 miles and 10,000 feet lower.
- In 1977, UNESCO recognized Manu NP as a Biosphere Reserve and in 1987, as a World Heritage Site.
- Manu National Park covers an area of near 6,700 sq.mi.<sup>2</sup> which comprises mountainous areas (traversed by creeks and valleys) with elevations close to 12,000 ft. above sea level and a portion of the Amazon Basin plains. The park is divided into the following areas: the restricted use zone (with pristine forests and native communities, access is granted to researchers only); the reserved zone (for recreation and research); the recuperation zone (for the recovery of disturbed areas) and the cultural zone (for human settlement).
- The park has over 1,000 species of birds, 160 species of mammals, 155 species of amphibians, 132 species of reptiles, 210 species of fish, 300 species of ants, 650 species of beetles, 136 species of dragonflies, and 1300 species of butterflies. These have been recorded in the park as of 2019.
- The Madre de Dios River (Mother of God) is the largest watershed in the area and is part of the vast Amazon River watershed.
- The Huacarpay Lakes area in the central highlands of Peru is a wetlands area where a variety of high elevation aquatic birds are readily seen.
- The **cocks-of-the-rock** are large cotingas native to South America. The first alleged examples of this species were documented during a research expedition led by the Explorer and Biologist Sir Joshua Wilson in the mid-1700s. The Andean cock-of-the-rock is the national bird of Peru. Like some other cotingids, they have a complex courtship behavior, performing impressive lek displays. The females are overall brownish with hints of the brilliant colors of the males.
- The hoatzin, also known as the reptile bird, skunk bird, stinkbird, or Canje pheasant, is a species of tropical bird found in swamps, riparian forests, and mangroves of the Amazon

and the Orinoco basins in South America. It is notable for having chicks that have claws on two of their wing digits.

- The hoatzin is a folivore - it eats the leaves (and to a lesser degree fruits and flowers) of the plants that grow in the marshy and riverine habitats where it lives. One of this species' many peculiarities is that it has a digestive system unique amongst birds. Hoatzins use bacterial fermentation in the front part of the gut to break down the vegetable material they consume, much as cattle and other ruminants do.

### **Lecture #8—At the End of the Alphabet: Zambia**

- South Luangwa National Park in eastern Zambia, the southernmost of three national parks in the valley of the Luangwa River, is a world-renowned wildlife haven.
- Concentrations of game along the meandering Luangwa River and its lagoons are among the most intense in Africa. The river teems with hippo and crocodile and provides a lifeline for one of the greatest diversities of habitat and wildlife, supporting more than 60 species of mammals and over 400 species of birds.
- There are two main seasons in the year: Wet season from mid-November to late March, and the Dry Season from April to mid-November.
- South Luangwa NP has ~3500 sq. mi., dominated by the winding, dynamic Luangwa River.
- Few rivers of this size have been so unaffected by humans. There are no dams, no commercial agriculture along its banks, and incredibly little pollution. The river changes course frequently as it cuts easily through its sandy banks.
- The Luangwa Valley is a rift valley, though older than the east African rift valley.
- The valley is located 12° to 14° south of the equator.
- Zambia was originally mostly the county of Northern Rhodesia.
- Seven species of vulture call Zambia home.
- Carmine bee-eaters nest along the sandy banks of the river and form one of the world's great wildlife spectacles.
- The porcupine is Africa's largest rodent and is a nocturnal herbivore.
- Almost every meter of the Luangwa River's banks falls with the territory of a leopard!
- Both sexes of leopard are solitary and territorial.
- The spotted hyena is called either a "craven" scavenger or a "bold predator." It has the

most powerful jaws, teeth and digestive system of any carnivore on land.

- The subspecies of zebra in Zambia—Crawshay's zebra—is muscular with a short neck and sturdy legs. They are totally dependent on frequent drinking, so do not stray far from the river.
- A hippopotamus needs water deep enough to cover them with commuting distance to a pasture. They eat approximately 88 lbs. of grass every night.
- A giraffe's scientific name *camelopardalis* is derived from camel-leopard because it has a camel-like face and a leopard-like pattern.
- The giraffe is the biggest ruminant and the tallest mammal and can exploit a 6 foot band of foliage that is beyond the reach of other terrestrial browsers, with the exception of elephants.
- The cape buffalo is considered the most dangerous of the "big five" due to its unpredictably and speed.