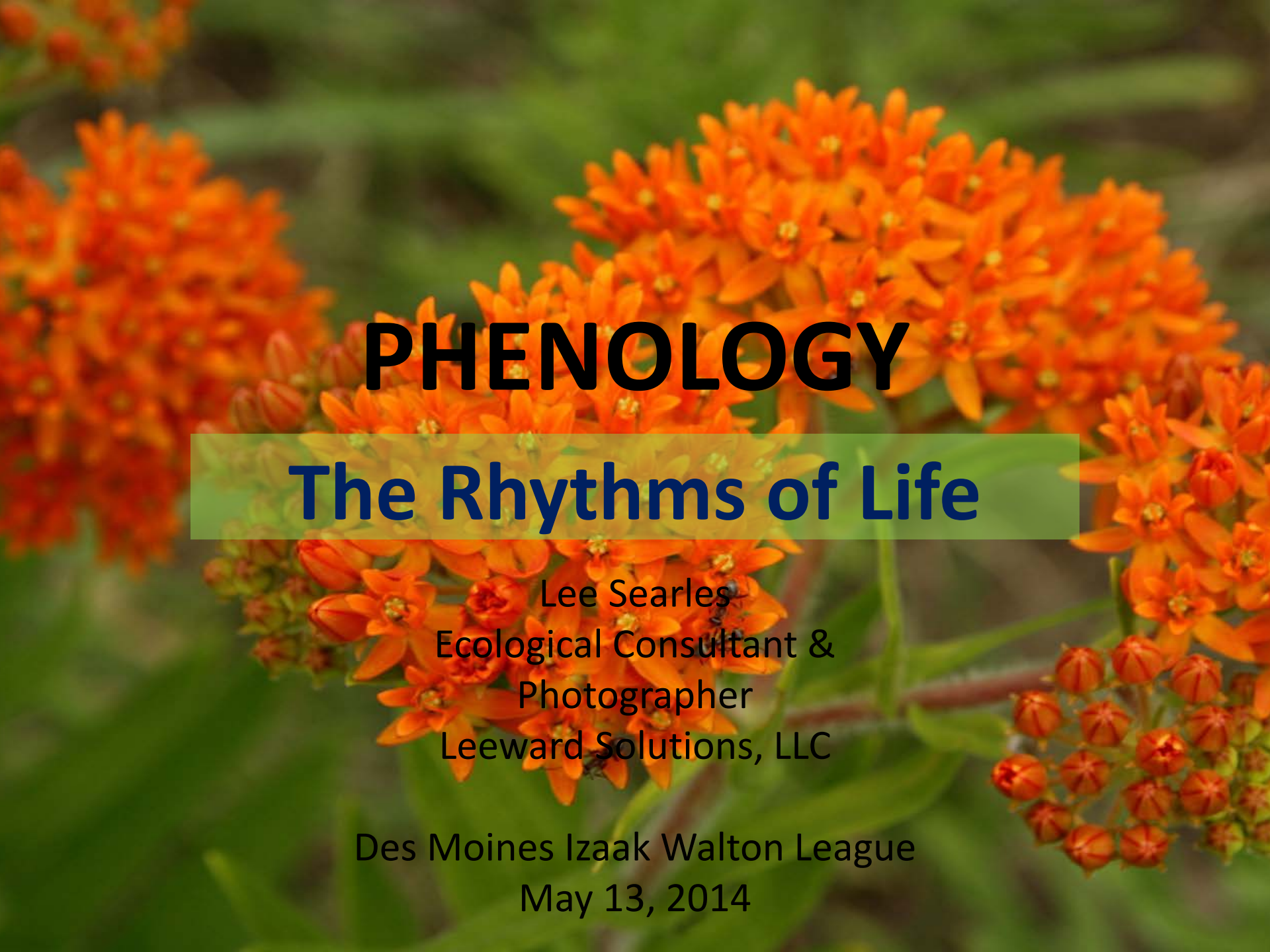

PHENOLOGY

The Rhythms of Life

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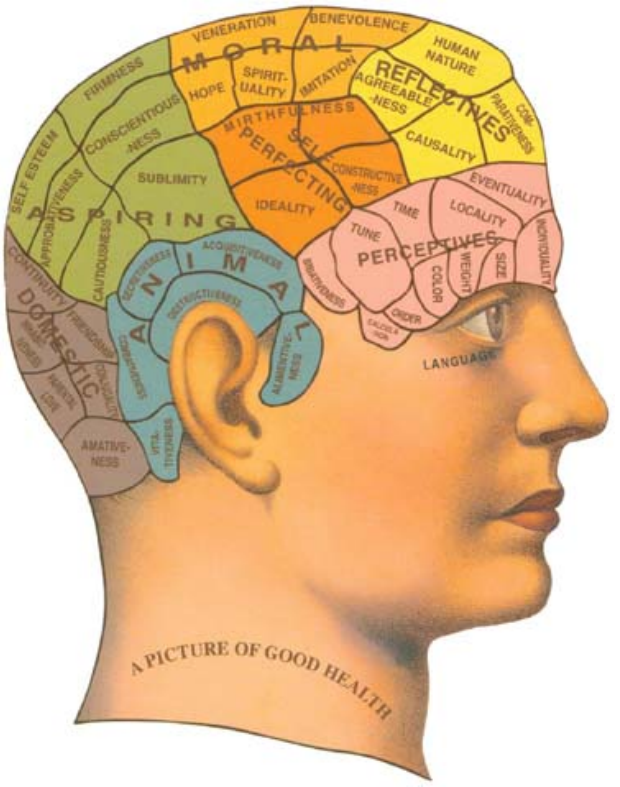
Des Moines Izaak Walton League
May 13, 2014

What is “phenology”?

- It’s <u>not</u> phrenology:
  - A quack science of the 1840s
  - Shape of the skull tied to differences in character, abilities
  - “Reading the skull”

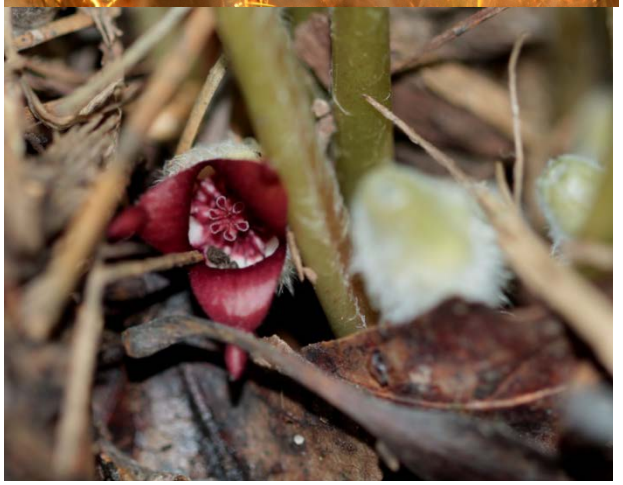


- **Phenology**: the study of the life cycles of living things
  - And their responses to climate, habitat, & seasons

- A part of the study of **ecology**

- Aldo Leopold, *A Sand County Almanac*: "a record of the rates at which solar energy flows to and through living things"

- Examples
  - Predator-prey interactions often occur in cycles
    - Mink & muskrat in the Midwest & Plains (Paul Errington)
  - Bird migrations, mating, nesting, wintering
    - March: waterfowl
    - April: shorebirds, gulls, terns
    - May: songbirds, including neotropical species



- Animal reproductive cycles
  - Deer rut
  - Fish spawning
- Plant flowering & seeding by season
  - Woodland wildflowers in spring: hepatica, bloodroot, mayapple
  - Tallgrass prairie: goldenrods, big bluestem

– Insect hatching & maturation
  - Monarch caterpillar dependence on milkweed plants
  - Mayflies, stoneflies, midges, & other species used as models for fly fishing tackle

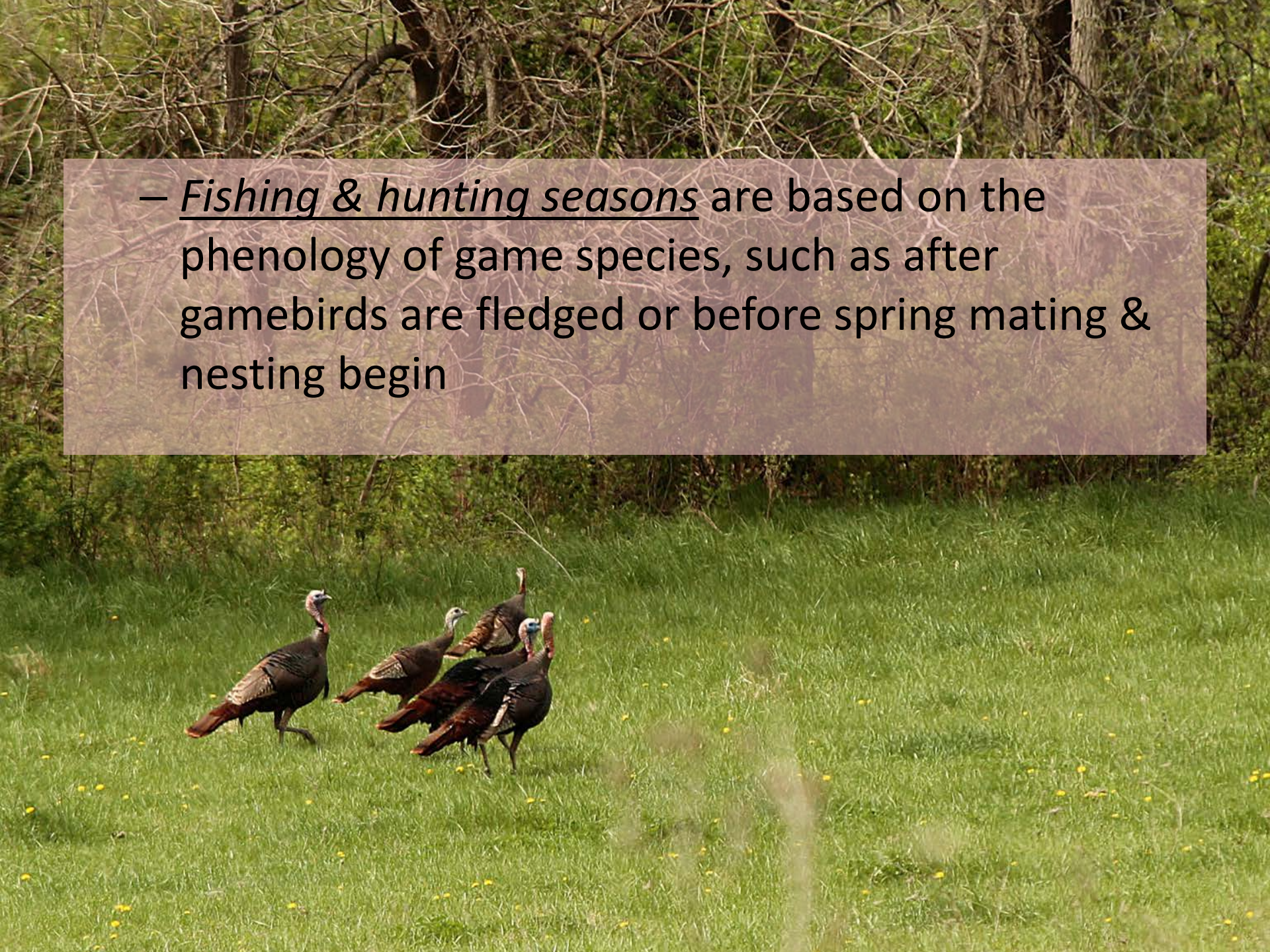
- *The bigger picture*: each of these is affected by
  - **Climate & weather patterns**, including disruptions
  - **Circadian or day-night cycles**
  - Availability of **preferred & alternate food** sources
  - Species **population sizes** & changes
  - **Diseases**: mange, tree fungus
  - **Human presence & impacts**

Phenological Calendars & Records

- Why phenology calendars?
  - Ecological information in an accessible, easy-to-use form
  - Allows comparison of expected dates of occurrence with actual observations
    - Local differences
    - Annual variations
    - Longterm changes

- Records of seasonal cycles have been kept for thousands of years, wherever humans have lived
  - Inuit/Eskimo:
    - Connection of seasons, ice formation, & seal hunting
    - Caribou herd migrations
  - Native American farmers & the timing of spring planting, fall harvest, & seasonal bison hunts
  - Maya/Aztec calendars based on astronomy: agricultural timing & other social events

- Flooding of the Nile River in Egypt
  - Renewal of the fertile floodplain soils
  - From 1950s, dams at Aswan and elsewhere have led to soil loss and degradation
  - A few decades of worsening agriculture, versus thousands of years of a naturally renewed resource
- *Farmer's Almanac* contains phenology information



- *Fishing & hunting seasons* are based on the phenology of game species, such as after gamebirds are fledged or before spring mating & nesting begin

- Modern records & calendars
- Robert Marsham's "indications of spring," Norfolk, England, 1700s
- Aldo Leopold, on his farm near Baraboo, Wisconsin, 1936-1948

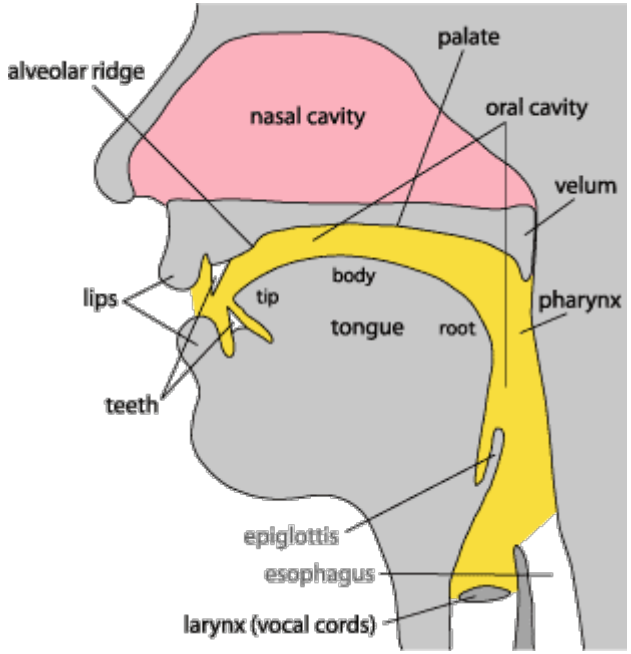
The Importance of Phenology

- Sensitive indicators of obvious & subtle changes
  - Seasons
  - Species populations (wildlife biology)
  - Longterm climate changes
  - Soil conditions, such as soil temperature
  - Stream conditions, such as food supplies, species interdependence, erosion cycles
- Ecological awareness
  - Willingness to act to preserve the environment on which we rely for our existence

- Ecological problems
  - Timing of animal gestation or migration with food resources (*climate & weather pattern changes*)
  - Severity of floods & habitat destruction
  - Climate shifts favoring non-native & invasive species
  - Human land use practices that affect habitats, food supplies, cycles
  - Destruction of microscopic life forms in soil

Don’t confuse phenology with…

- … <u>phonology</u>: the study of sounds that are used to make up a language



iː READ	ɪ SIT	ʊ BOOK	uː TOO	ɪə HERE	eɪ DAY	John & Sarah Free Materials 1930
e MEN	ə AMERICA	ɜː WORD	ɔː SORT	ʊə TOUR	ɔɪ BOY	əʊ GO
æ CAT	ʌ BUT	ɑː PART	ɒ NOT	eə WEAR	ɑɪ MY	ɑʊ HOW
p PIG	b BED	t TIME	d DO	ʧ CHURCH	ʤ JUDGE	k KILO	g GO
f FIVE	v VERY	θ THINK	ð THE	s SIX	z ZOO	ʃ SHORT	ʒ CASUAL
m MILK	n NO	ŋ SING	h HELLO	l LIVE	r READ	w WINDOW	j YES

Phenology in the Raccoon River Watershed

- Calendar production & distribution
- Encourages RRWA members to collect observations on species, events, timing
  - Bird migrations, courtship, hatching, fledging
  - Photography to record familiar & unfamiliar species, seasonal changes

RACCOON RIVER WATERSHED PHENOLOGY CALENDAR

2014


YELLOW-BILLED CUCKOO
Photo by Ray Harden, Perry

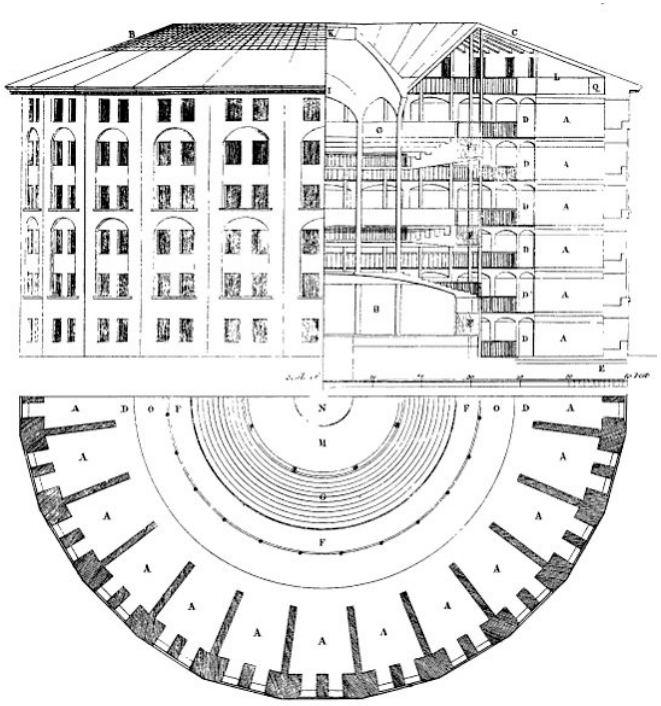
May 2014

Yellow-Billed Cuckoo, one of two cuckoo species in Iowa. The Black-Billed lacks the yellow lower bill and has less noticeable white patches in the tail.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Bobwhites & Pheasants nest & lay eggs. Cuckoos (2 species) & Least Bitterns arrive.	2 Late warblers arrive. Most Meadowhawks begin to fly, some through late Oct. or Nov. Date of late snowstorm, 2013.	3 Butterflies appear in numbers: Azures, Blues, Coppers, Pearl Crescents, Sulphurs, Swallowtails, & others.
4 Baltimore Orioles begin nesting. Early Hobomok, Peck's, & Silver Spotted Skippers fly.	5 Average date of last frost at Storm Lake. Tree Swallows return.	6 Peak of neo-tropical bird migration, next ten days.	7 Blue Flag & Prairie Ragwort bloom.	8 Yellow-Headed Blackbirds arrive.	9 Great Horned Owls & Marsh Wrens begin laying eggs. Wood-Pewees begin nesting.	10 American Vetch, False Indigo, Ground-Plum, & Wild Garlic bloom.
11 Beaver kits leave lodges. Most Mayflies begin to emerge, as subadults, sometimes in large swarms.	12 Striped Skunks give birth.	13 Bats give birth through July. First brood of Eastern Bluebirds hatches.	14 Skimmers & Saddlebags fly to mid- or late Sept. Full or Flower Moon.	15 Late Rough-Legged Hawks depart. Wild Roses bloom.	16 Mourning Doves mate & call. Late Spring prescribed burn season, through mid-June. Dark-Eyed Juncos depart.	17 Bobolinks return. Orioles lay eggs.
18 Fritillaries begin flying.	19 17-year cicadas of Brood III emerge in central Iowa	20 Pheasant eggs begin hatching. Wood-Pewees lay eggs. Kinglets depart.	21 Deer fawns born. Purple Finches leave.	22 Migratory bats begin moving north.	23 Lightning beetles numerous on warm evenings.	24 Canada Anemone, Indigo Bush, Leadplant, & Prairie Larkspur bloom.
25 Beardtongues, Ground-Cherries, Purple Coneflowers, & Wild Quinine bloom.	26 Eastern Pondhawks fly to mid-Oct. Horned Clubtails fly to mid-Aug.	27 Blue Dashers fly to late Sept. Birthday of Rachel Carson, 1907.	28 Dedication of Backbone State Park, 1928, Iowa's first state park.	29 	30 Monkeyflowers bloom in wet areas, to Sept. Painted Turtles lay eggs.	31 Late White-Throated Sparrows depart.

Another Distinction:

- Phenology also is <u>not</u> penology: the study of punishments for crime & the management of prisons



Making Phenology Observations

- **Place and time:**
  - Observe species & processes in the same place over several seasons or years
    - Six years of bird sightings at my address in Des Moines
- *Common Grackle arrival dates:*
  - 2008: March 19
  - 2009: March 3
  - 2010: March 12
  - 2013: March 20
  - 2014: March 16
  - (first sightings for 2011 & 2012 aren't useful)
- *2014 RRW Phenology Calendar*: no date for Common Grackles
  - Use my observations & those of others in the watershed to determine one
  - Consult the Iowa Ornithologists Union "Early/Late" Bird Migration records

– Watch living things & related events at the same time point across a geographical region
  - *National Audubon Society winter bird counts*: solid evidence that supports major planetary climate change
  - *Great Backyard Bird Count*
  - *Formal species census-taking* as a scientific procedure

– Focus on one species or one grouping (“taxon”), such as Blue-Winged Teal, Smallmouth Bass, all ducks, all cyprinid minnows
  - Limited by kinds of food resources used, or
  - By habitat, or
  - By species behavior, such as mating

March 10, 2010: one day after ice-out & bankfull flow

March 15, 2010: high early spring full, at bankfull


March 26, 2010


April 2, 2010


April 15, 2010


April 23, 2010: healing & weathering


May 14, 2010


May 21, 2010

June 13, 2010: highest yearly flow, over bankfull


July 18, 2010


September 12, 2010


November 13, 2010


Jumping ahead: October 19, 2011: very low autumn flow

- What can be concluded from these photographs?
  - Changes in river level over a year's time
  - With a longer, multi-year series, yearly fluctuations in the timing & extent of high- & low-flow conditions
    - General habitats: changes in river structure of pools & riffles, cutting of banks & deposits of sandbars, silt deposits on the floodplain

- Probable effects on Canada geese, Mallards, smallmouth bass, channel catfish, wood ducks, other game species
  - And their food supplies: flushing of debris from the channel, destruction & re-making of habitats for aquatic insects
  - Plant communities: dispersal of seeds by flowing water, creation or destruction of seedbeds
  - Large streams as barriers to wildlife movement, such as deer & other mammals
- Responses of riparian wetlands to changes in water table