

# Phenology: What Is It? Why Is It Important? Are You Doing Phenology Now?

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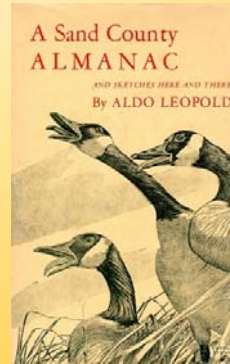
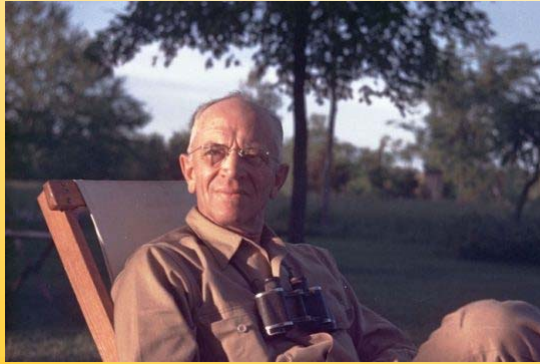
IOWATER Volunteer Water Quality Monitor



## PHENOLOGY: THE RHYTHMS OF LIFE

- Natural cycles
- The timing of interactions & activities of living things
  - Determined by
    - Adaptations to sunlight & seasons: climate, weather
    - Resource availability
    - Landforms
- Understanding of these cycles or rhythms is a key to the study of **ecology**.
- Life on the planet depends on these cycles & resources
- Humans haven't "liberated" themselves from natural limits
- Phenology is an ecological approach
  - The whole is greater than the sum of its parts
  - Interdependency: "butterfly effect"
  - Means of reintegrating ourselves with natural processes

- Aldo Leopold, *A Sand County Almanac*: “a record of the rates at which solar energy flows to and through living things”
  - Leopold kept a journal of the phenology of his farm in central Wisconsin



- The study of phenology can tell us:
  - If major changes to cycles are occurring
  - What likely causes are behind the changes
  - How bad the changes will be
- Is climate change really happening? If it is, what's causing it?
- Is the natural world around is healthy? What problems does it face? What problems do WE face if nature isn't doing well?
- Answers to these require years of data and observation. Next, an example

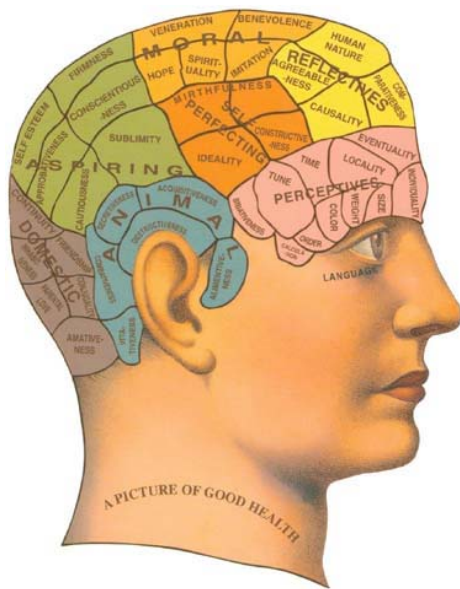


- National Audubon Society analysis of 40 years of winter bird count data
  - All-volunteer effort by “citizen scientists,” in other words, birders
  - Entire North American continent, covering all major regions and ecosystems
  - One result: several species face sharp population declines
    - Northern Bobwhite Quail
    - Evening Grosbeak
    - Northern Pintail Duck
    - Herring Gull: once the most common gull in Iowa, now scarce & replace by Ring-Billed Gulls



- Another result: several species have shifted their populations northward
- Once common in Iowa, but now found less often:
  - Purple Finch
  - Black-Capped Chickadee
  - Red-Bellied Woodpecker
  - Tufted Titmouse
  - Carolina Wren
  - Northern Cardinal
  - White-Breasted Nuthatch
  - Wood Thrush
- Two explanations: (1) habitat loss, and (2) warming temperatures in the southern ranges of these birds





- It's not phrenology:

- A quack science of the 1800s
- Shape of the skull tied to differences in character, abilities
- "Reading the skull"



- 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

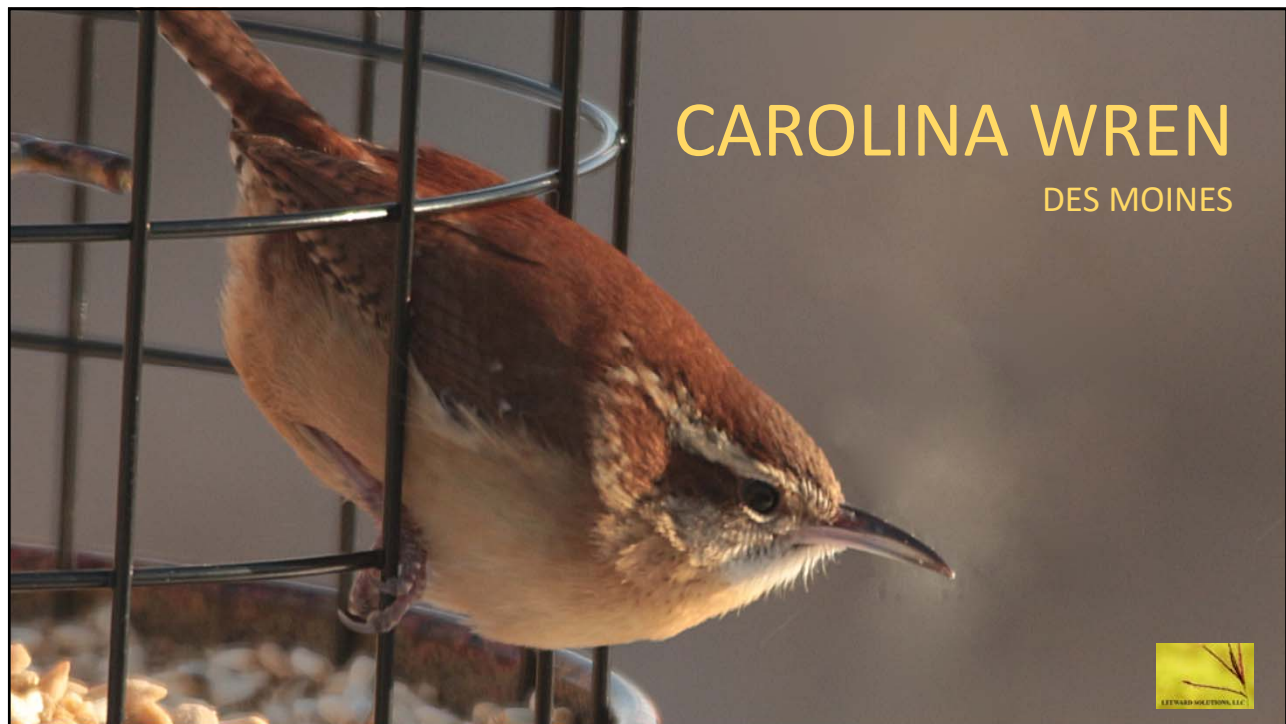


- *The bigger picture:* each of these is affected by
  - **Climate & weather patterns**, including disruptions
  - **Circadian or day-night cycles**
  - **Irregular cycles:** floods
  - Availability of **preferred & alternate food** sources
  - Species **population sizes** & changes
  - **Diseases:**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

## THE ANNUAL OR SEASONAL CYCLE

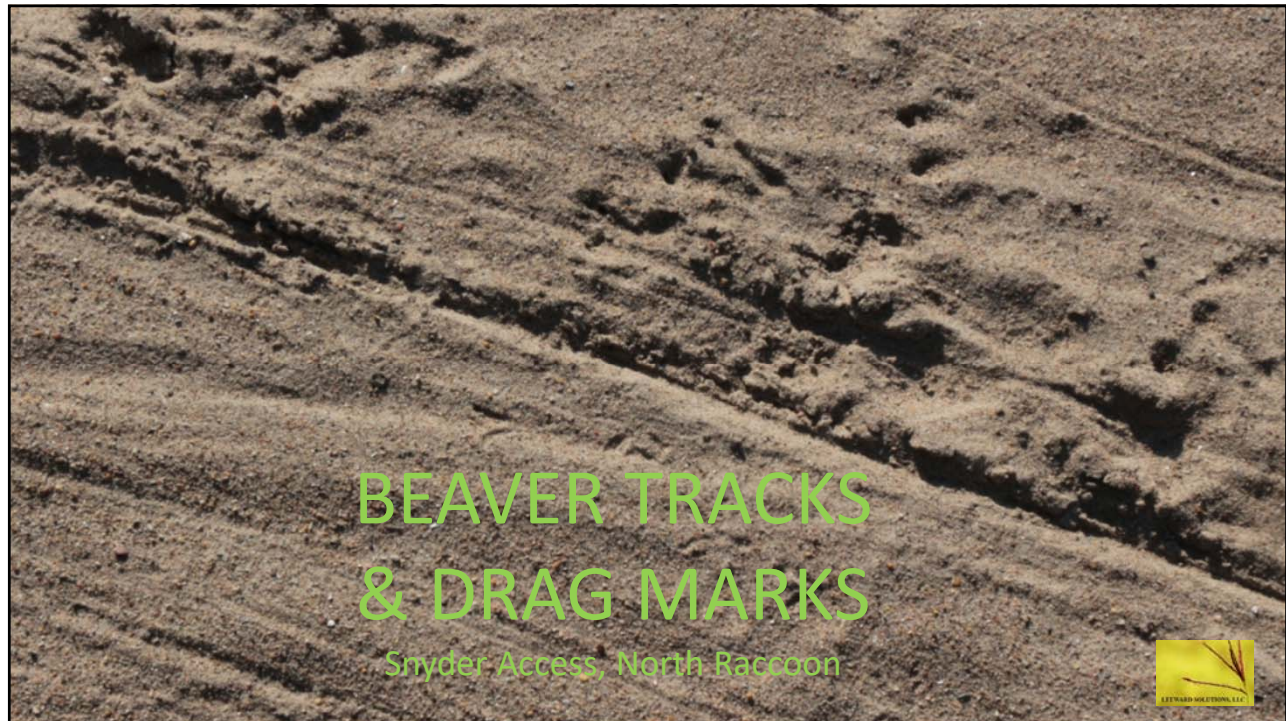












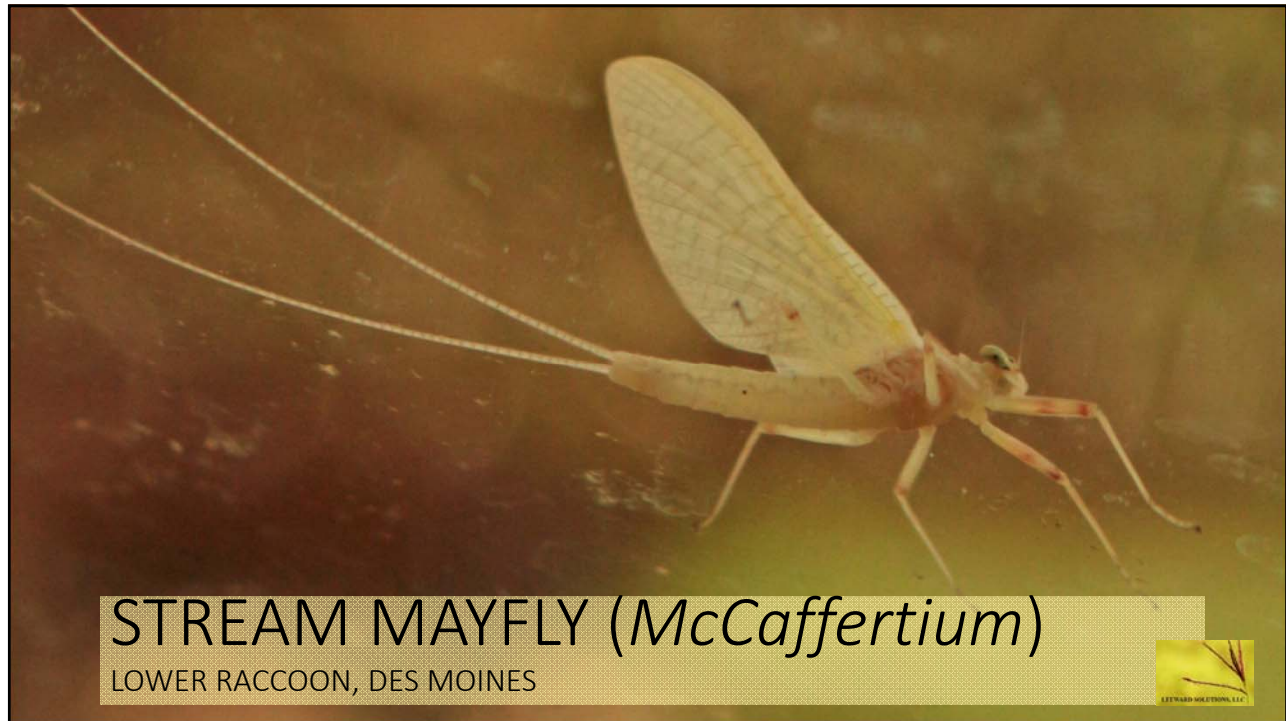




















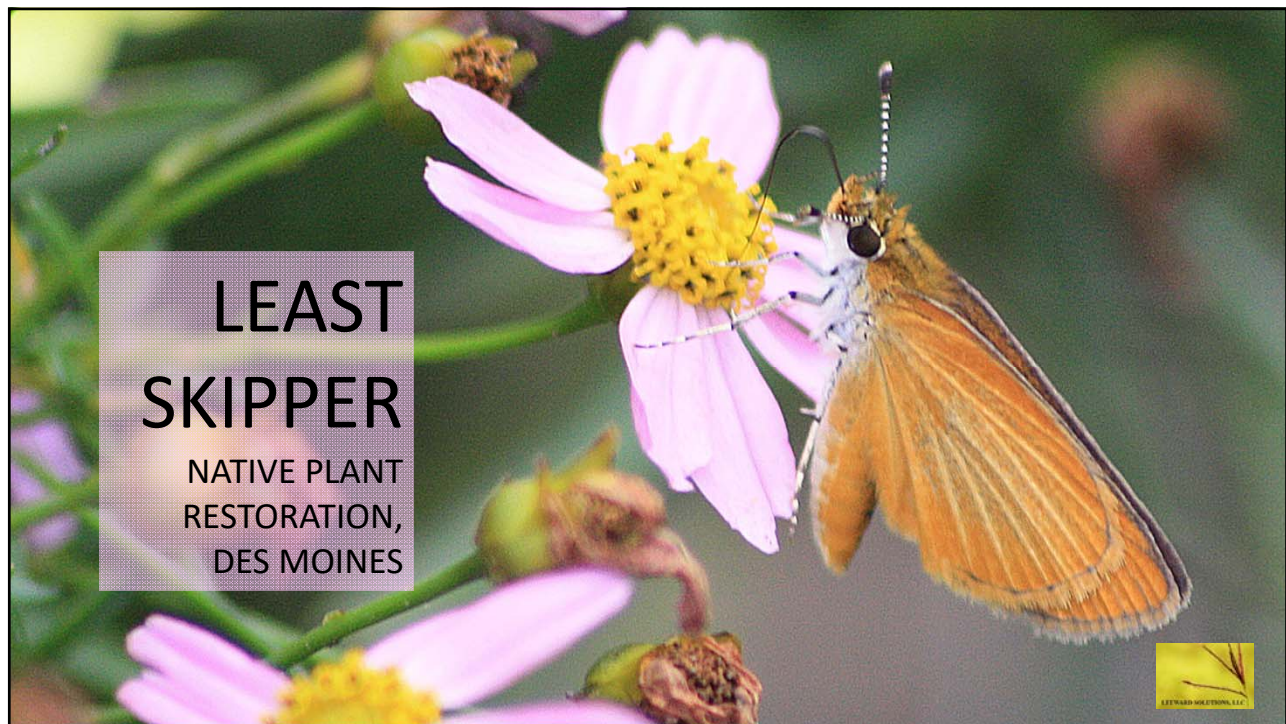














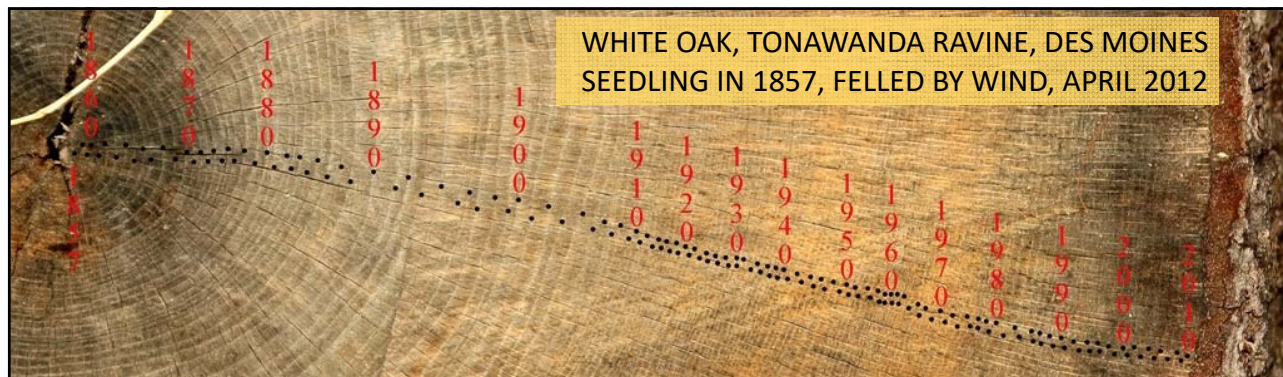








			
<b>JUVENILE &amp; FIRST YEAR</b> <ul style="list-style-type: none"> <li>• Mostly dark: head, chest, tail, flight feathers</li> <li>• Dark brown belly</li> <li>• Some white in underwing coverts</li> </ul>	<b>SECOND WINTER</b> <ul style="list-style-type: none"> <li>• Uneven trailing edge from molt</li> <li>• White shows in face, on belly, &amp; in tail</li> <li>• Mostly dark chest</li> </ul>	<b>THIRD WINTER</b> <ul style="list-style-type: none"> <li>• Mostly dark chest, belly, underwings</li> <li>• Trailing edge even or with fewer old feathers</li> <li>• Mostly dark chest</li> <li>• Osprey-like head pattern</li> </ul>	<b>FOURTH WINTER</b> <ul style="list-style-type: none"> <li>• Bill usually all yellow</li> <li>• Head &amp; tail almost all white</li> <li>• Body &amp; wings nearly all dark</li> <li>• FIFTH WINTER: adult color pattern</li> </ul>



**DENDROCHRONOLOGY:** study of the annual rings of trees to determine the ages of the trees & associated human & natural events.

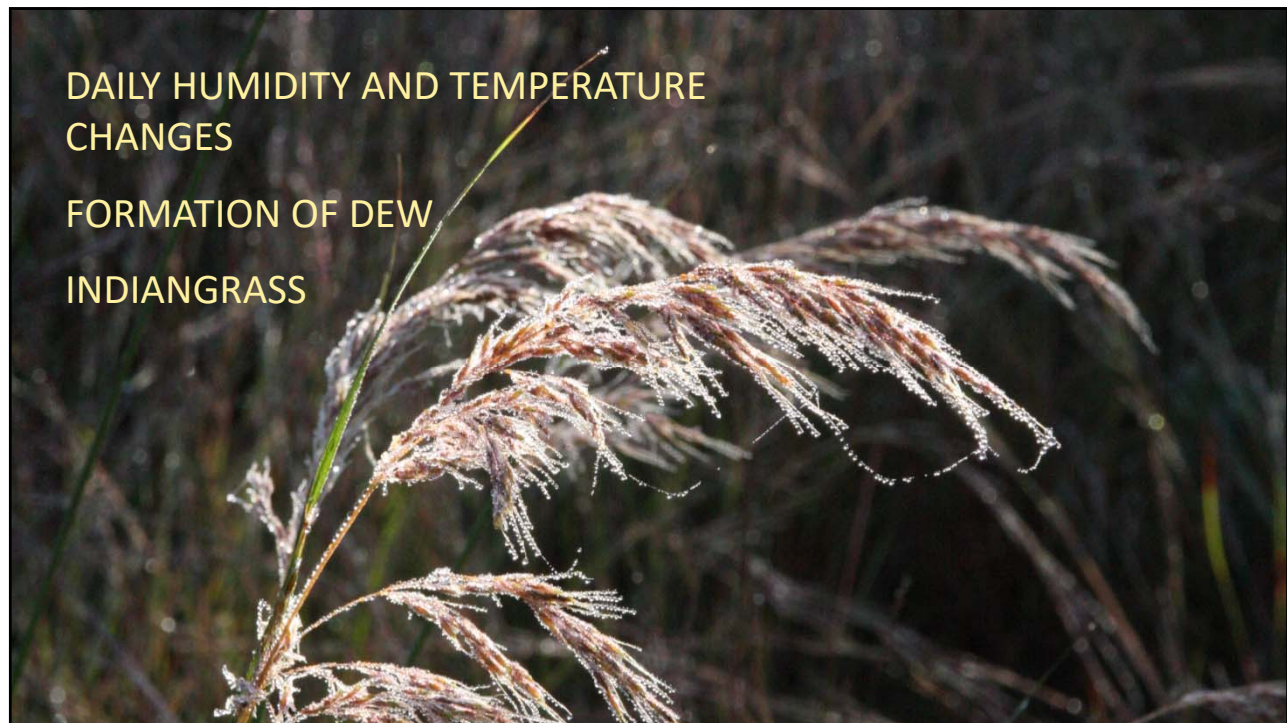
- One example of phenology, the cycles and processes of living things

**Desert Southwest:** used to develop tree ring sequences going back several thousand years, starting with live trees. Helps archaeologists determine age of archaeological sites.





## Daily or Circadian Cycles









IRREGULAR CYCLES



## OKAY, NICE PICTURES. SO WHAT?

- We haven't managed to alter the sun's cycles – yet – but...
- Annual, daily, irregular, & other cycles are tremendously disrupted on this planet.
- Is such disruption survivable?
  - Stream damage from heavy rains, floods, and poor land management practices
  - Continued erosion of crop lands & habitat: wild, flashy stream flows in flood, extension of gullies into once-productive land
  - Suburban sprawl: removal of topsoil (can't be farmed ever again), disruption of water storage in the soil, increased runoff/erosion/flash flooding
  - Agricultural & urban chemical use harms pollinators, thus our food supply
- We continue to abuse the land. Will technology alone save us?



- Many answers come from the study of cycles of climate, weather, bird & insect migration, stream function, surface water flow, groundwater, storm intensity, frequency of intense floods, and more
- All these impact living things, and they involve phenology.
- What you can do:
  - Keep records of birds and bird numbers at a bird feeder.
  - Note the date of the first hard freeze in the fall and the last hard freeze in the spring.
  - Record the blooming dates of flowers.
- Are these changing significantly?

