Using fire throughout the year

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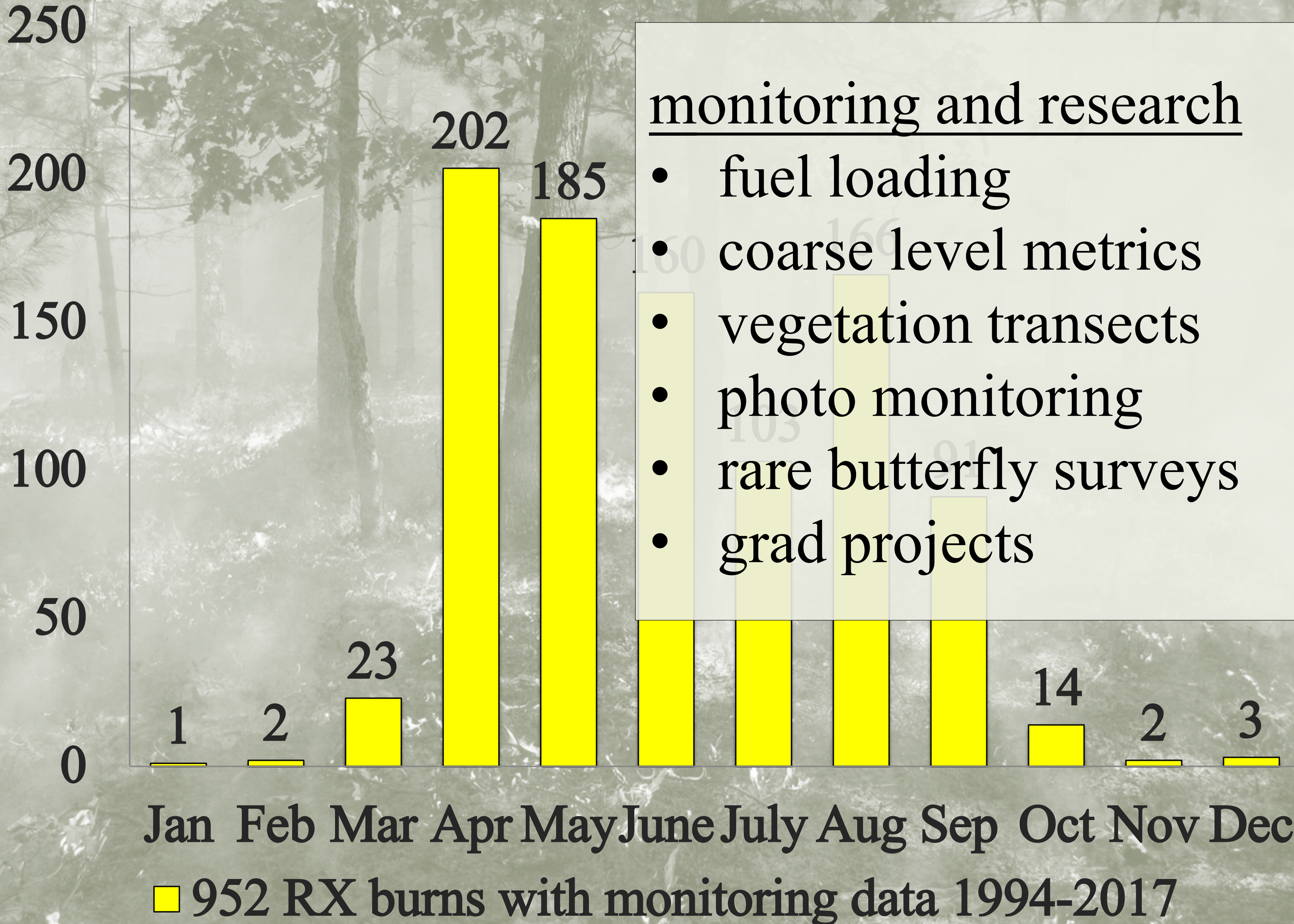
Lake States Fire Science Consortium

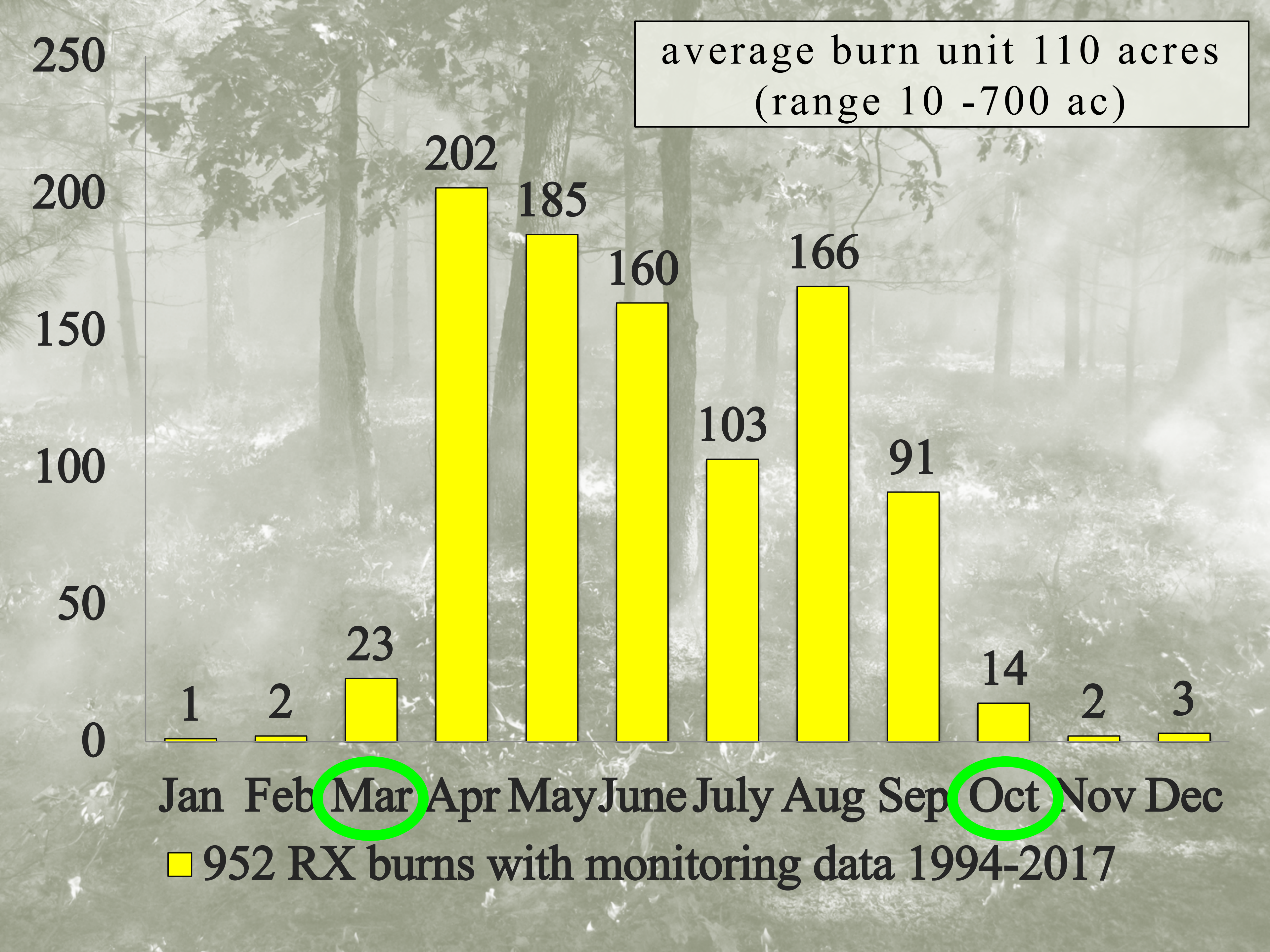
Using fire throughout the year - *thoughts on a paradigm shift…*

My paradigm shift…
and beginning to
"think like a fire-dependent ecosystem"

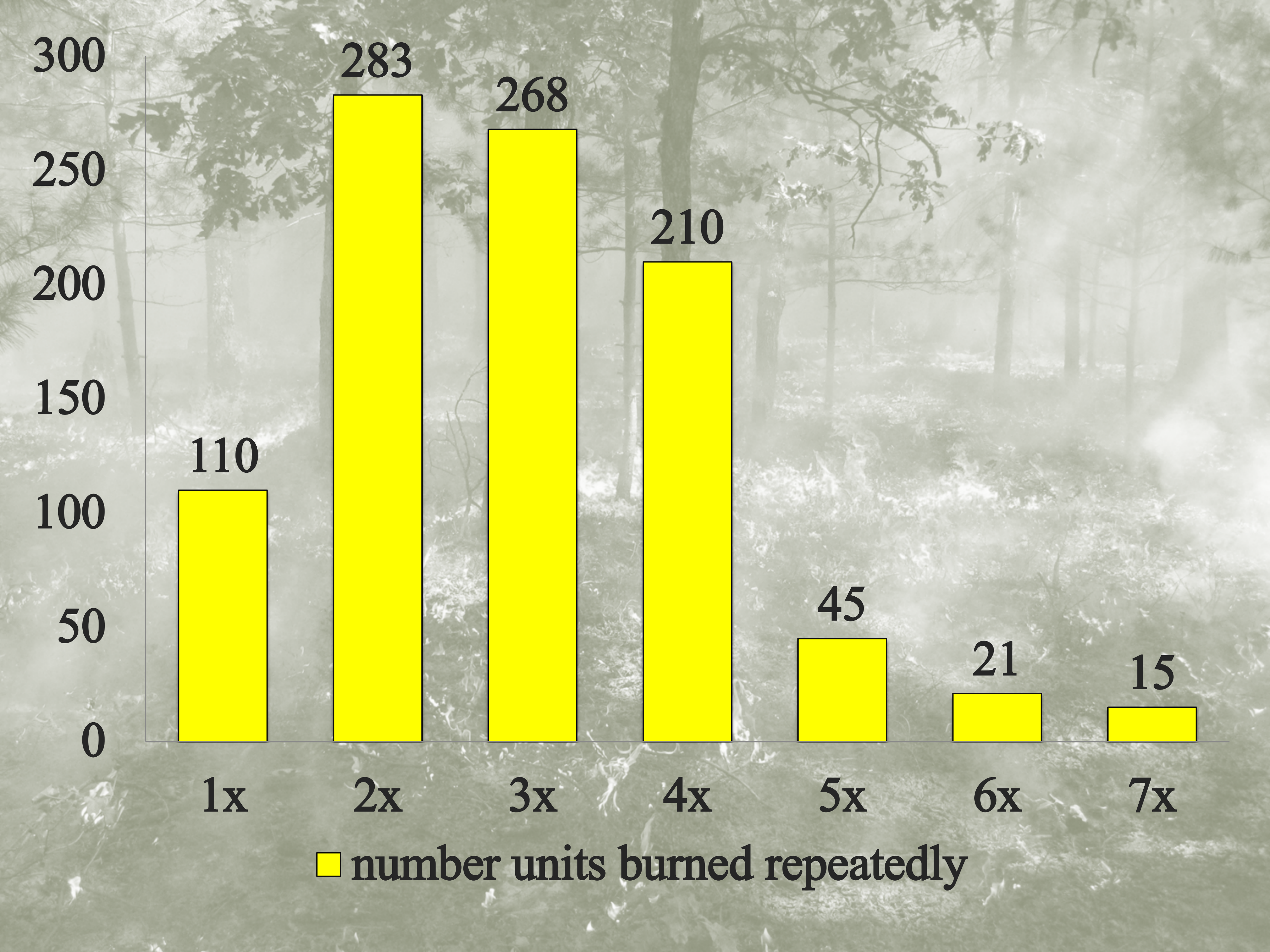


monitoring and research

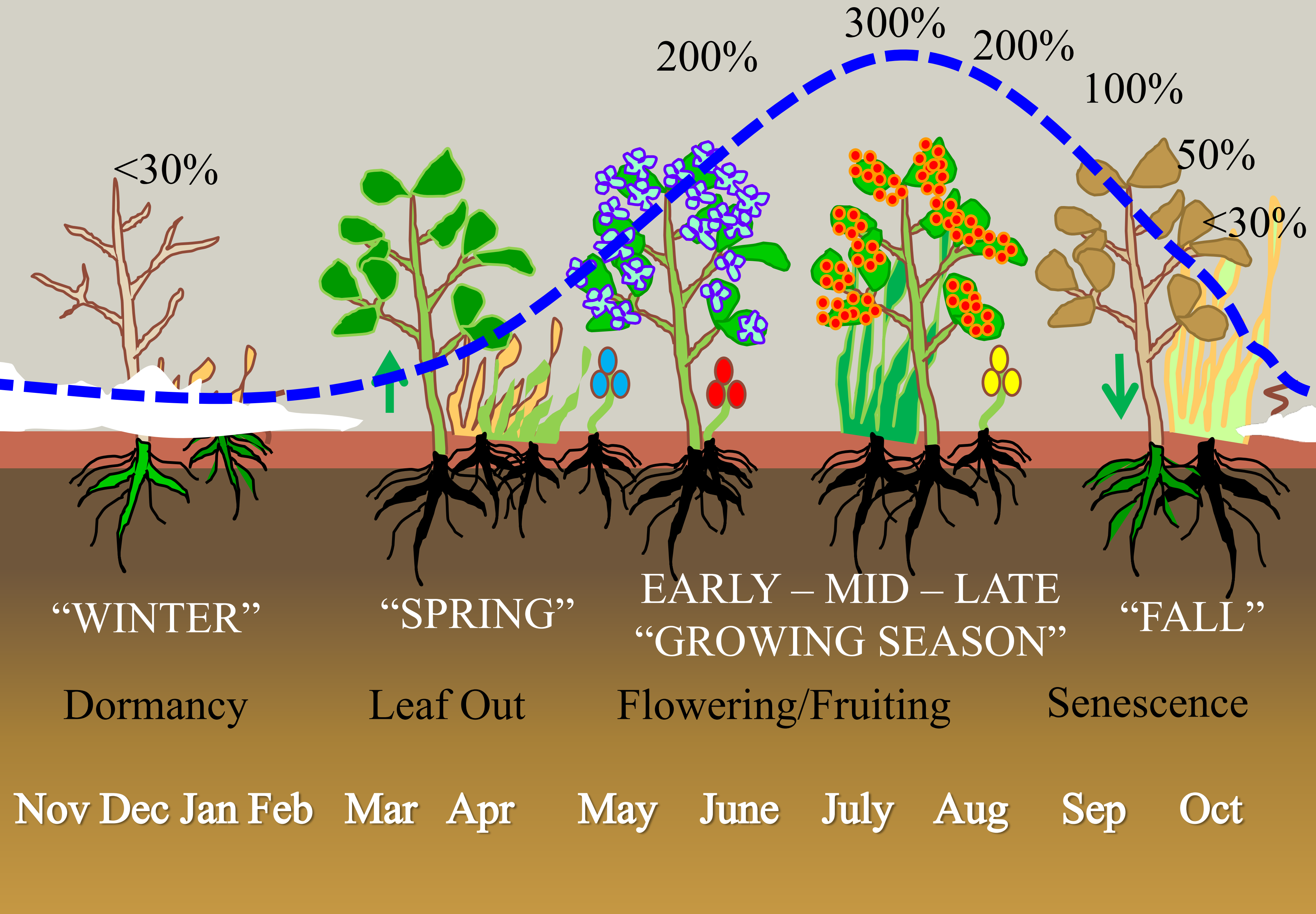
- fuel loading
- coarse level metrics
- vegetation transects
- photo monitoring
- rare butterfly surveys
- grad projects



average burn unit 110 acres
(range 10 -700 ac)
250
200
150
100
50
0
1
2
23
202
185
160
103
166
91
14
2
3
Jan
Feb
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Dec
952 RX burns with monitoring data 1994-2017


300
250
200
150
100
50
0
110
283
268
210
45
21
15
1x
2x
3x
4x
5x
6x
7x
number units burned repeatedly

PHENOLOGY & PHYSIOLOGY



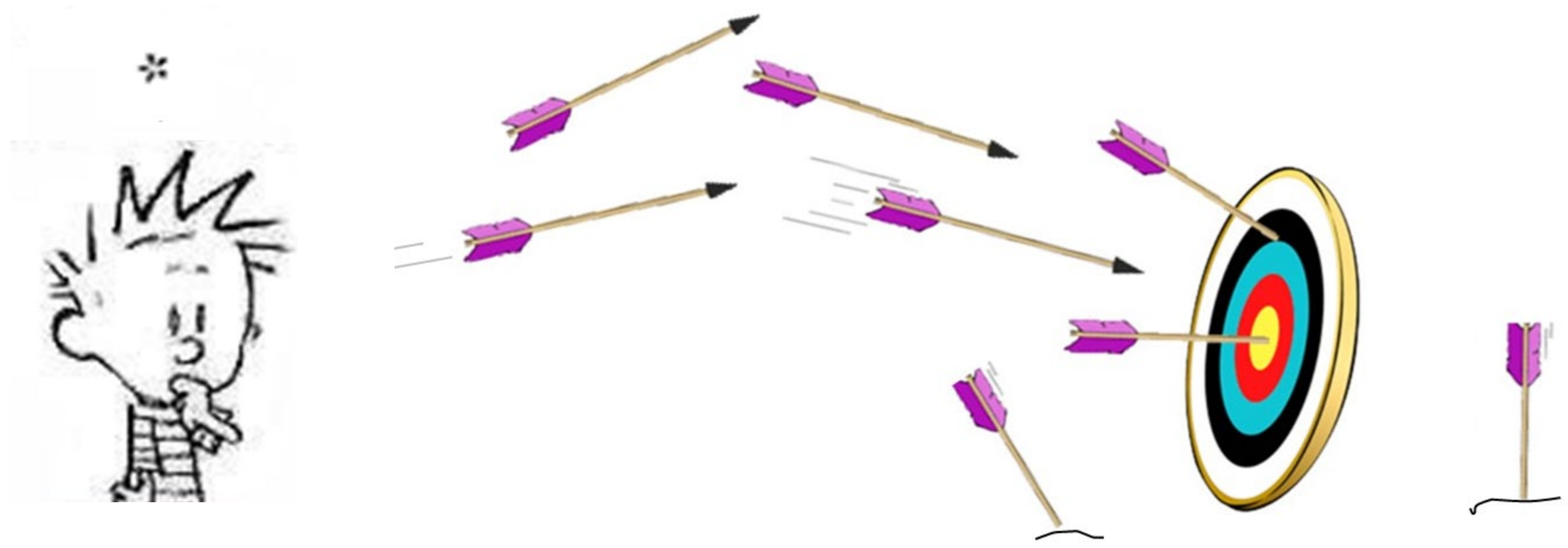
Prescribed Fire Effects Practitioner…

Goals
Objectives
Values
Vision

Prescriptions
Weather
Implementation

Fire Effects

Prescribed Fire Effects Practitioner…



Prescriptions
Weather
Implementation

Goals
Objectives
Values
Vision

Fire Effects


"Goal is not the flames,
but what the flames do…
… achieving desired fire
effects"

July
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
NO Burn
OK to Burn


Apr
Mar
Feb
Jan
Dec
Nov
Oct
OK to Burn


Jul
Apr
Mar
Feb
Jan
Dec
son of
a ....


July
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
NO Burn
Winter Burning?

July
Aug
Sep
Oct
Jan
Feb
Mar
Apr
May
June
NO Burn

“Spring” & “Fall Burn Windows” = ~ 60 total days

minus (burn ban/wildfire risk days plus rainy/windy days) =

About 30 operational days (ignition/ patrol)

Dormant Season Fire Effects – Native Plants

	April-May	June-Aug	Sept	Oct-Nov
Grasses and sedges				
Warm season	↑			↑
Cool season	↓			↓ ?
Forbs				
Early-flowering forbs	↓			↓ ?
Mid-flowering forbs	↓			↑ ?
Late-flowering forbs	↑			↑ ?
Legumes (*Fabaceae*)	↑			↑

Population Increase ↑ Decrease ↓ ~Same ↔

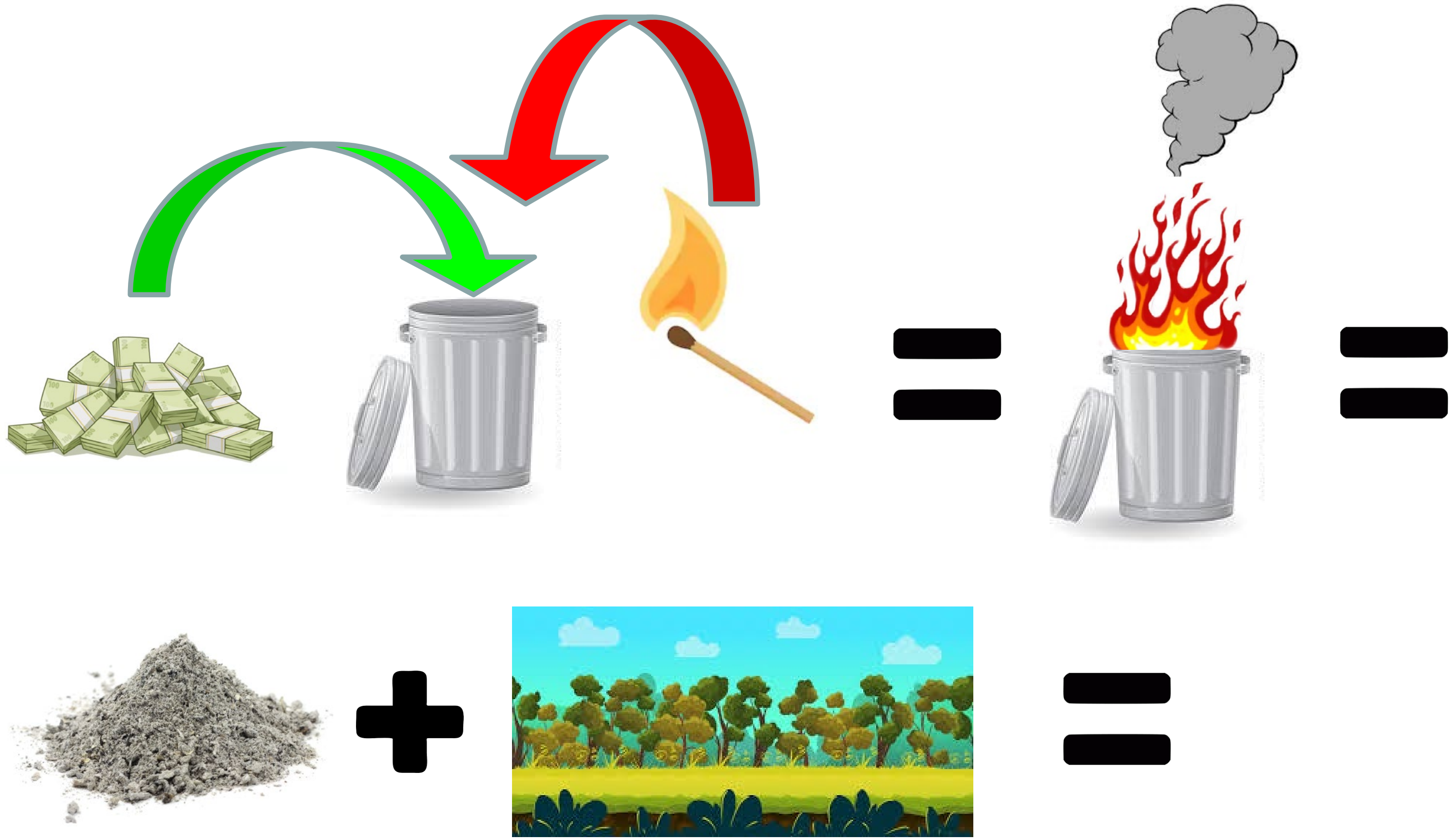
Note: it is better to use yearly Phenology, but illustrated above in general terms with calendar dates in N. Midwest

Dormant Season Fire Effects – non-native or competitive

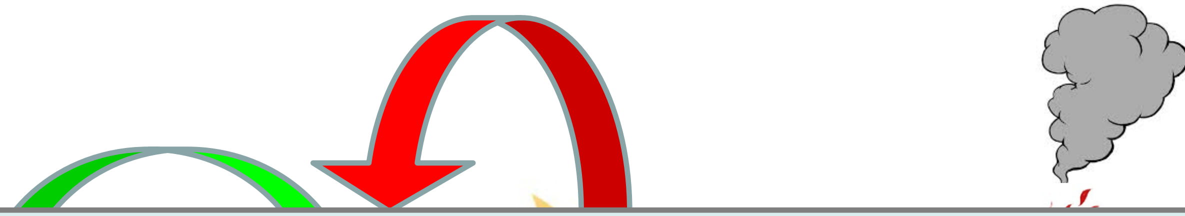
	March-April	May	June-Aug	Sept	Oct-Nov
knapweed	↑				↑
sweet clovers	↑				↑
garlic mustard	↔				↑
St. Johnswort	↑				↑
bouncing bet	↑				↑
buckthorn	↑				↑
autumn olive	↔				↔
honeysuckles	↑				↑
bracken fern	↑				↑
red maple	↑				↑
penn sedge	↑				↑

Population Increase ↑ Decrease ↓ ~Same ↔

Note: it is better to use yearly Phenology, but illustrated above in general terms with calendar dates for N. Midwest



crew safe + acres achieved + spent fire budget & had flames + smoke & if spread the ash over acres = acreage “burned” = fire effects??



- what fire effects are achieved?
- quantity versus quality “measure of success”?
- “outcome-based investment strategy”?
- traditional-based organizational thinking or learning-based organizational thinking?

crew safe + acres achieved + spent fire budget & had flames + smoke & if spread the ash over acres = acreage “burned” = fire effects??

"Spring"
season

- rare species-wildlife concerns-permitting
- weather-prescriptions-air quality-smoke
- capacity - staff doing something else
- social acceptance-public perception
- investment in time-labor-money-learning

"Fall"
season

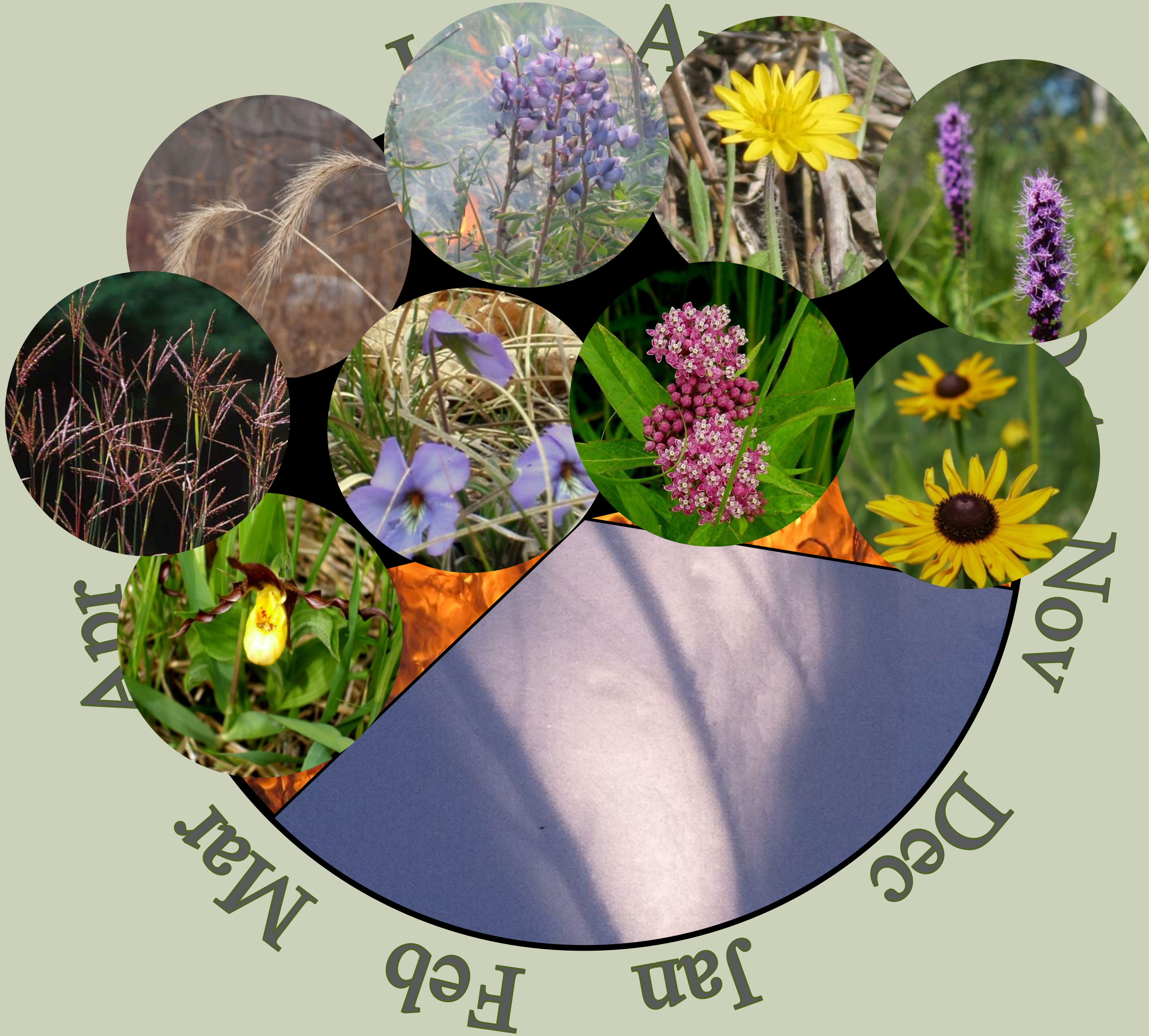
Mar Apr May June July Aug Sep Oct

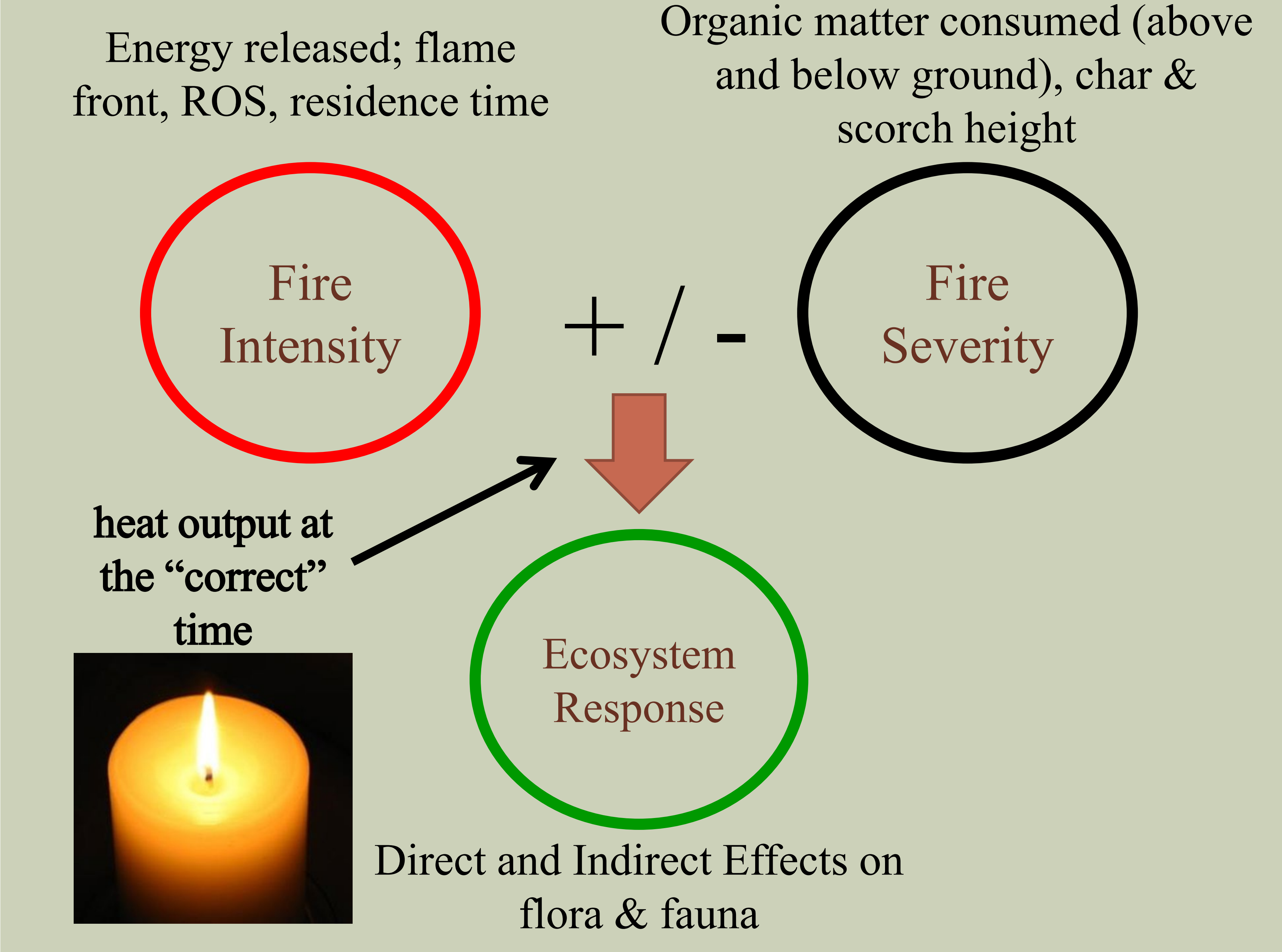
Growing Season Fire Barriers - or Opportunities…

1. Lack of knowledge, or available information, on seasonal fire effects

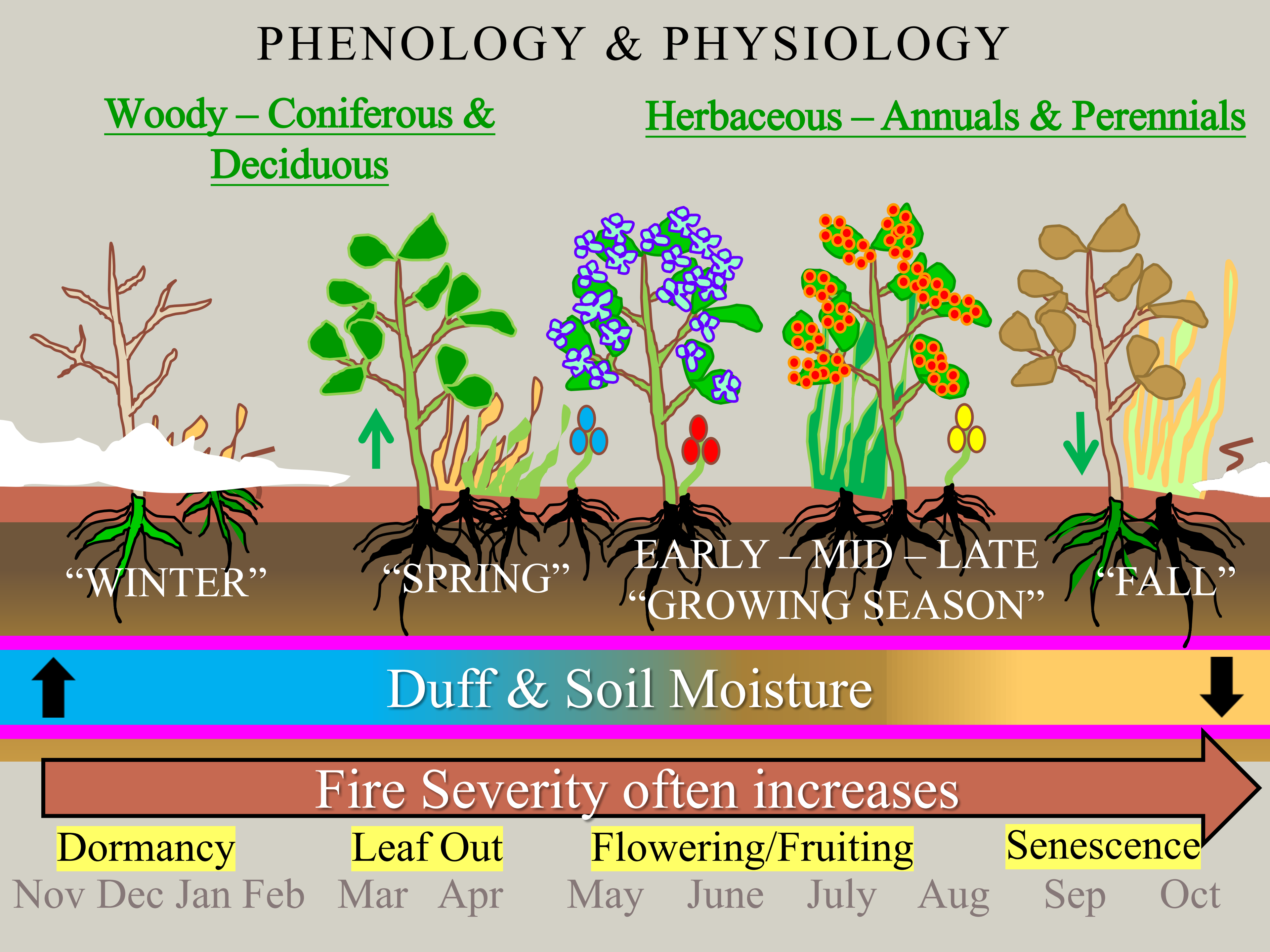
2. expectations for growing season burns based only on past dormant season burn experience (fuels, fire behavior, weather, prescriptions, mop-up, capacity)

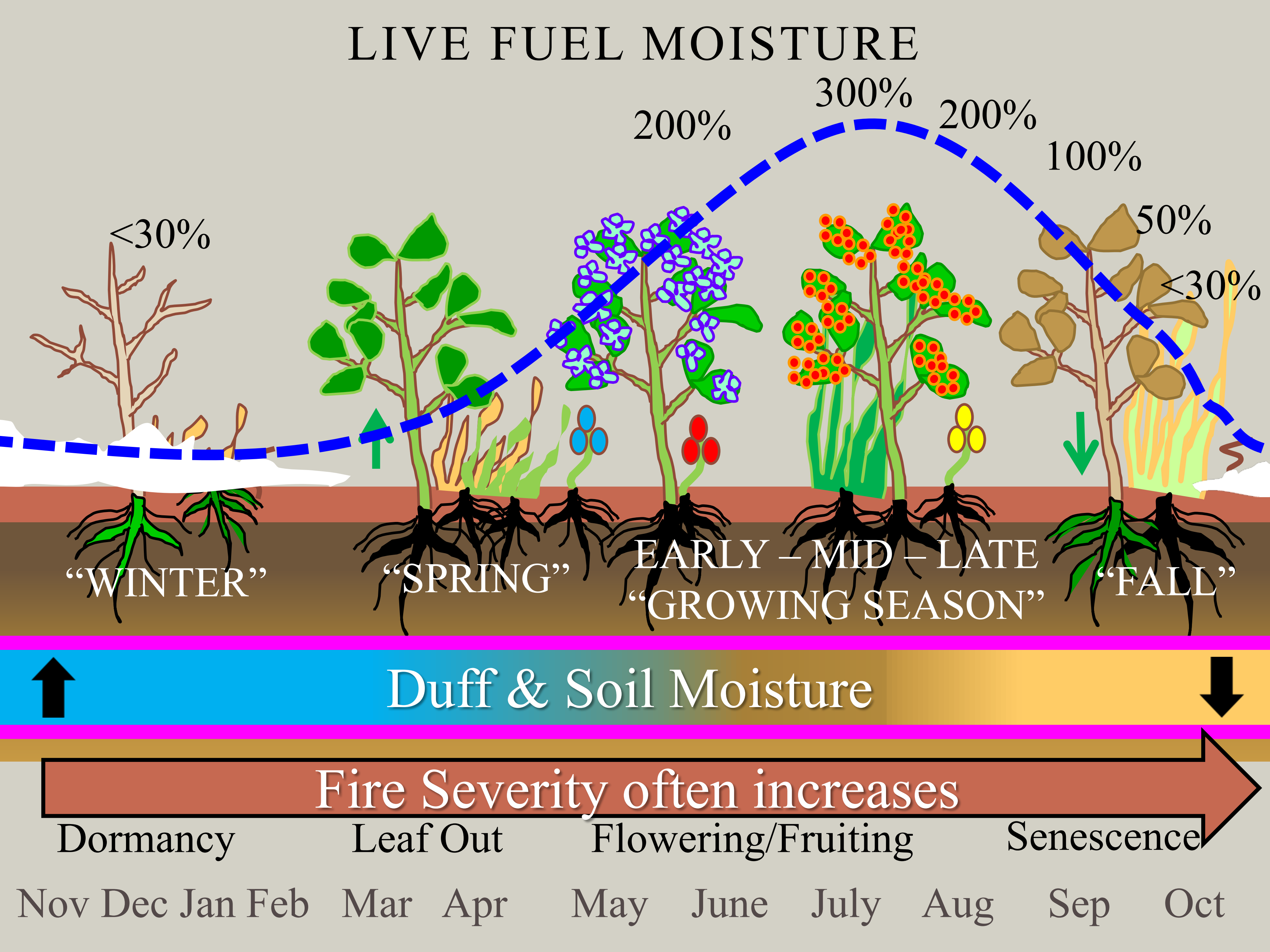

photo credit Jack McGowan-Stinski


Apr
Mar
Feb
Jan
Dec
Nov


Energy released; flame front, ROS, residence time
Organic matter consumed (above and below ground), char & scorch height
Fire Intensity
+ / -
Fire Severity
heat output at the “correct” time
Ecosystem Response
Direct and Indirect Effects on flora & fauna


"- the burn plan did NOT restrict us to a specific type of ignition pattern, but allowed us to adapt ignition, rate of spread, and residence time to help adjust intensity & severity of this burn"


PHENOLOGY & PHYSIOLOGY
Woody – Coniferous & Deciduous
Herbaceous – Annuals & Perennials
"WINTER"
"SPRING"
EARLY – MID – LATE "GROWING SEASON"
"FALL"
Duff & Soil Moisture
Fire Severity often increases
Dormancy
Leaf Out
Flowering/Fruiting
Senescence
Nov Dec Jan Feb
Mar Apr
May
June
July
Aug
Sep
Oct



LIVE FUEL MOISTURE
<30%
200%
300%
200%
100%
50%
<30%
"WINTER"
"SPRING"
EARLY – MID – LATE
"GROWING SEASON"
"FALL"
Duff & Soil Moisture
Fire Severity often increases
Dormancy
Leaf Out
Flowering/Fruiting
Senescence
Nov Dec Jan Feb Mar Apr May June July Aug Sep Oct

using seasonality not just to open the burn window…. but to narrow it - deliberately using seasonality and phenology to define or refine prescriptions

*in the N. Midwest

The timing of the fire determines which species will be positively or negatively impacted (native plants)

	April-May	June-Aug	Sept	Oct-Nov
Grasses and sedges				
Warm season	↑	↓	↔	↑
Cool season	↓	↑	↑	↓ ?
Forbs				
Early-flowering forbs	↓	↑	↑	↓ ?
Mid-flowering forbs	↓	↑	↑	↑ ?
Late-flowering forbs	↑	↓	↑	↑ ?
Legumes (*Fabaceae*)	↑	↑	↑	↑

Population Increase ↑ Decrease ↓ ~Same ↔

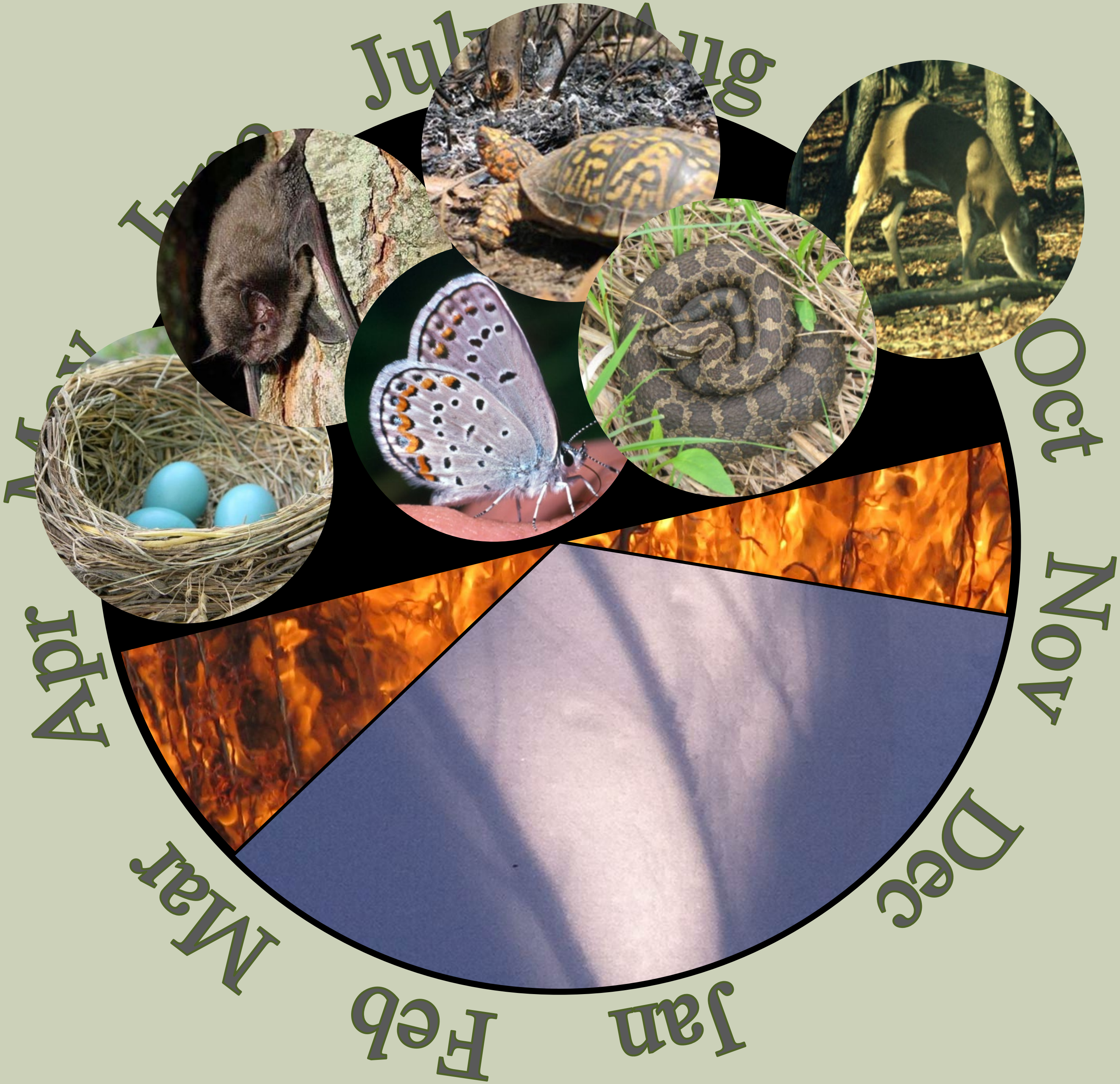
Note: it is better to use yearly Phenology, but illustrated above in general terms with calendar dates for N. Midwest

seasonal fire effects – non-native & competitive plants

	March-April	May	June-Aug	Sept	Oct-Nov
knapweed	↑	↔	↓	↓	↑
sweet clovers	↑	↑	↔	↔	↑
garlic mustard	↔	↓	↓	↑	↑
St. Johnswort	↑	↔	↓	↔	↑
bouncing bet	↑	↑	↔	↔	↑
buckthorn	↑	↔	↓	↓	↑
autumn olive	↔	↓	↓	↓	↔
honeysuckles	↑	↓	↓	↔	↑
bracken fern	↑	↔	↓	↔	↑
red maple	↑	↓	↓	↑	↑
penn sedge	↑	↔	↓	↔	↑

Population Increase ↑ Decrease ↓ ~Same ↔

Note: it is better to use yearly Phenology, but illustrated above in general terms with calendar dates for N. Midwest



Oct
Nov
Dec
Jan
Feb
Mar
Apr

Competing values = restoration **paralysis** because we will not 'accept' actions that harm animals

- fire-dependent wildlife species versus habitat -

what do you - as an animal - need to live ?

air, water, food

shelter
(protection from
predators & environment)

space to survive

photo credit Matt Cross

What might kill or injure me today??

predators?

fire?

Other abiotic /biotic disturbances?

climate change?

mowing?

timber harvest?

vehicles?

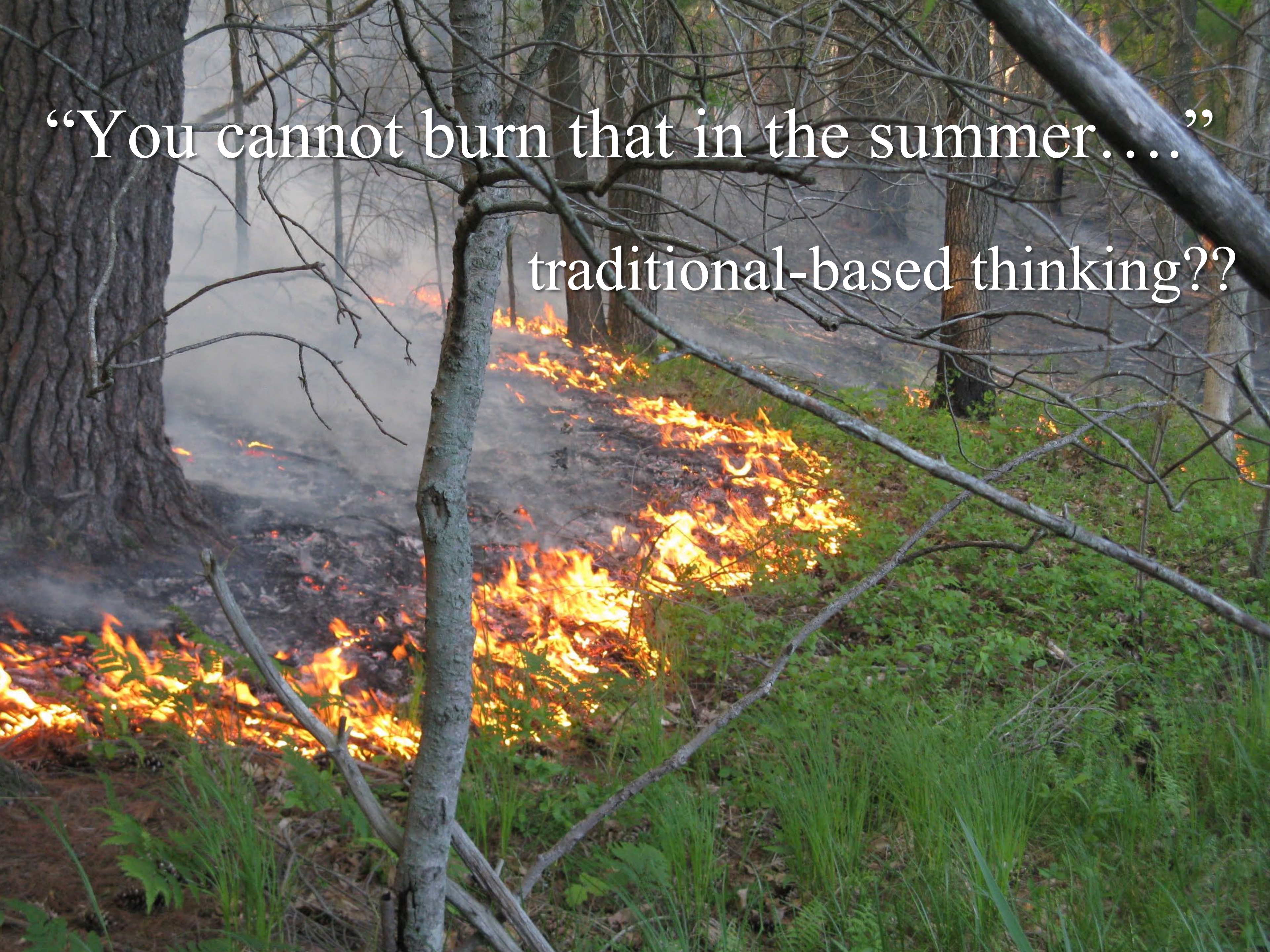

Without Fire….

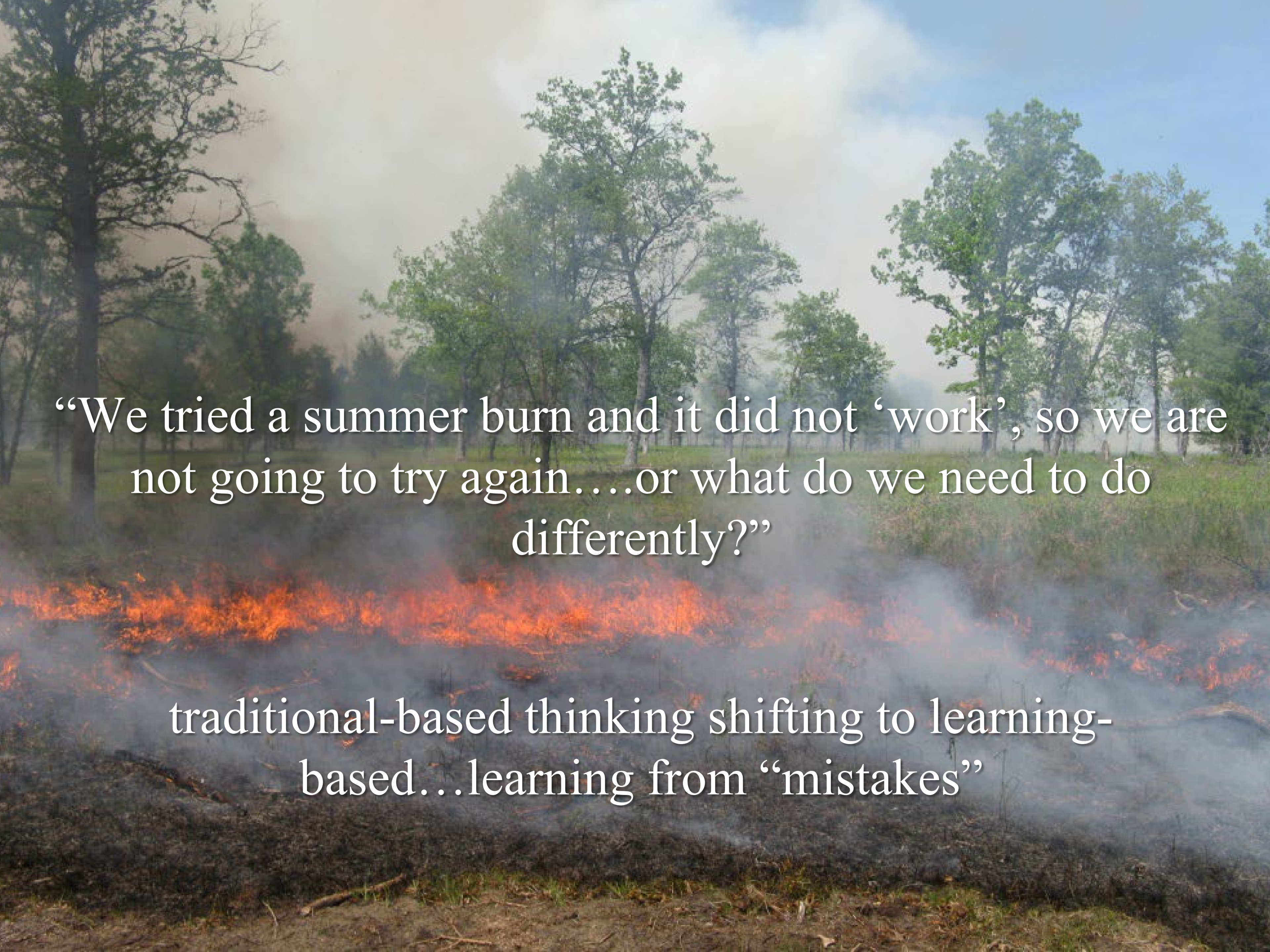

Fire Effects

Growing Season Fire Barriers - or Opportunities…

1. Lack of knowledge, or available information, on seasonal fire effects

2. expectations for growing season burns based only on past dormant season burn experience (fuels, fire behavior, weather, prescriptions, mop-up, capacity)


"You cannot burn that in the summer…."
traditional-based thinking??


"We tried a summer burn and it did not 'work', so we are not going to try again….or what do we need to do differently?"
traditional-based thinking shifting to learning-based…learning from "mistakes"

"we will never do a summer burn because it will be too smoky…."


July
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
implement burns & future burn unit prep
do burn plans & equipment & hiring/ training

Average Number Days Weather met Prescription Parameters 1994-2012

April 1 - May 10 (40 total days)	May 11 - June 15 (36 total days)	June 16 - Aug 31 (77 total days)	Sept 1 – 30 (30 total days)
26	25	40	16

Example: 2011 priority proposed burns

ESTIMATED maximum totals across the entire season:

- 114 operational days
- 79 burn units

Time Period	April 1 – May 10	May 11 – June 15	June 16- Aug 30	Sept 1- 30
Sites	11	10	7	3
Units	30	18	26	6
Operational Days	12 to 29	20 to 35	30 to 40	6 to 10
Estimated operational days per unit	0.4 to 0.97 days	1.11 to 1.94	1.15 to 1.54	1 to 1.67

Example: 2011 actual burns

ACTUAL maximum totals across the entire season:

- 106 operational days - 8 less than estimated
- 78 burn units - 1 less than estimated

Time Period	April 1 – May 10	May 11 – June 15	June 16-Aug 30	Sept 1- 30
Sites	11	10	7	3
Units	27	18	25	8
Operational Days	22	25	44 (4 above estimate)	15
Estimated operational days per unit	0.4 to 0.97 days	1.11 to 1.94	1.15 to 1.54	1 to 1.67
Actual days per unit	0.81	1.39	1.76	1.8

Example: 2011 completed burns

Time Period	April 1 – May 10	May 11 – June 15	June 16-Aug 30	Sept 1- 30
Sites	11	10	7	3
Units	27	18	25	8
Operational Days	22	25	44 (4 above estimate)	15
Actual days per unit	0.81	1.39	1.76	1.8

1+ operational days per burn to multiple operational & patrol days (“consumptive mop-up”)

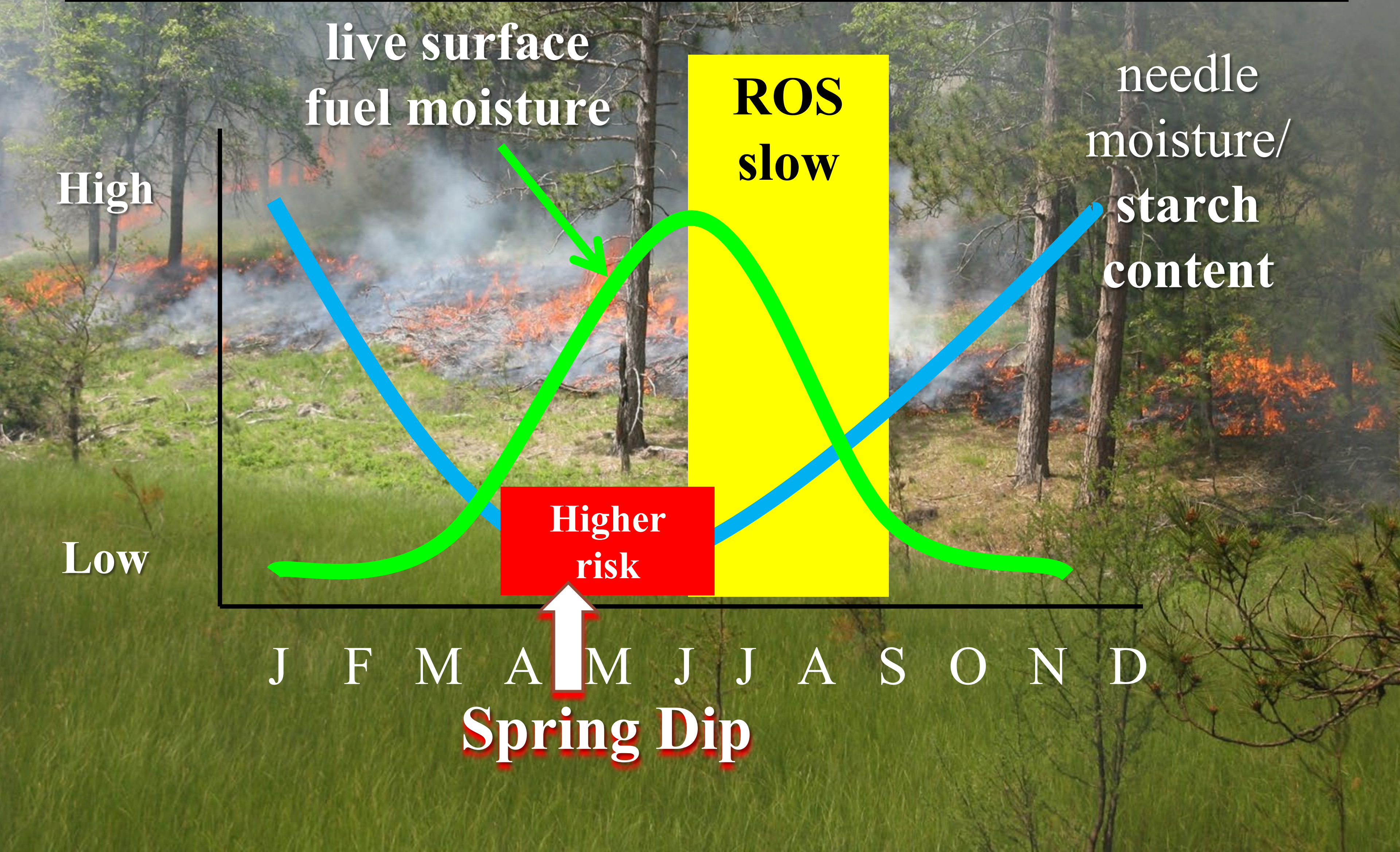
Implementation Costs, Fire Effects and Objectives

Which is more cost effective? 6 consecutive days following one growing season ignition, or 1 additional day after each spring burn but for 6 or more years?

Time Period	April 1 – May 10	May 11 – June 15	June 16- Aug 30	Sept 1- 30
Sites	11	10	7	3
Units	27	18	25	8
Operational Days	22	25	44 (4 above estimate)	15
Actual days per unit	0.81	1.39	1.76	1.8

1+ operational days per burn to multiple operational & patrol days
("consumptive mop-up")

Reducing Risk: finding some “safer” times to burn with a pine component – burn after Spring Dip and when live fuel moisture highest…



fire across an expanded burn window
& repeated burns

“building the new fire regime – & the new tradition - beyond your career….

Vary the way fires are conducted each time....

Vary the timing, intensity, severity and frequency….

Focus on long-term = learn from short term

=

⬆ reduce the state of high fire deficit

⬆ native plant diversity

⬆ rare species – plant & animal

⬇ non-native plant & competitive species

⬆ achieving a shifting mosaic of habitat types

⬆ promote resilience