HILDA / ACADIA VALLEY / BURSTALL
POST-FIRE GRASSLAND FORAGE RECOVERY

UNIVERSITY OF ALBERTA
FACULTY OF AGRICULTURAL,
LIFE & ENVIRONMENTAL SCIENCES
Rangeland Research Institute

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— HENRY MARSHALL TORY, FOUNDING PRESIDENT, 1908

Research Team

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Thank you

Funding from:

Alberta Agriculture and Forestry

Environment and Climate Change Canada

Environnement et Changement climatique Canada

SCA Saskatchewan Cattlemen's Association

Support from:

Hilda Fire Recovery Association
Hilda Community Association
Cypress County
MD of Acadia
Saskatchewan Stock Growers Association

Agenda

6:30 Coffee and snacks

6:40 Presentation: Fire ecology and Management in the Mixedgrass Prairie (Carlyle & Lamb)

7:15 Questions and Discussion

7:25 Presentation: Forage Recovery Monitoring Program (Carlyle)

7:45 Questions and Discussion

8:00 Sign-up for Monitoring program

FIRE ECOLOGY AND MANAGEMENT IN THE MIXEDGRASS PRAIRIE

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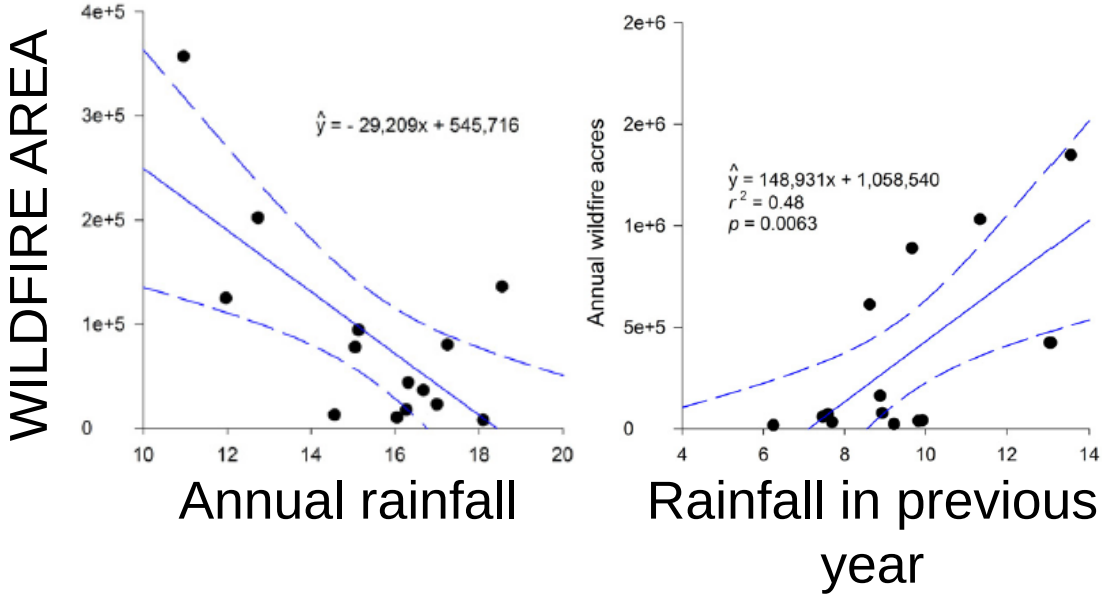
Fires are part of the Mixedgrass Prairie's History

- Historical return interval of 1 - 20 years
  - Lightning strikes, First Nations
- Prevent woody plants
- Releases nutrients from dead vegetation
- Important management tool

Fires will be part of the Mixedgrass Prairie's Future

Future climate predictions:

- Average rainfall is predicted to increase.
- More extreme weather, increased risk of drought.
- Fuel production plays an important role.
- Future wildfires will be larger, more frequent, longer fire season



Scasta et al. 2016

Rangelands and rangeland plants are adapted to fire

Many plant adaptations to grazing give grasses tolerance to fire:

- Perennial
- Grass biomass and growing points are below ground
- Rhizomatous

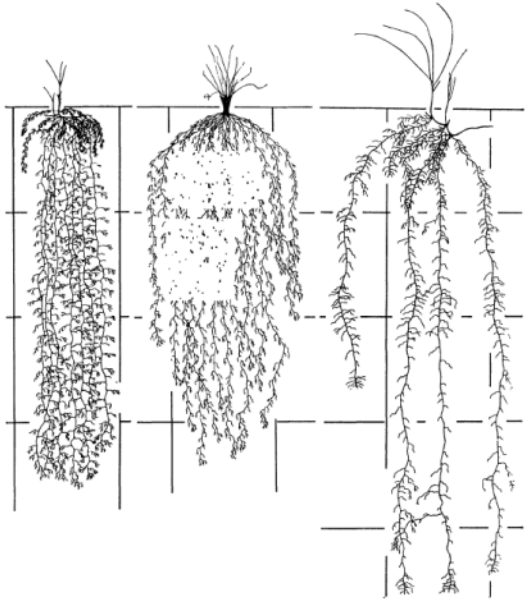
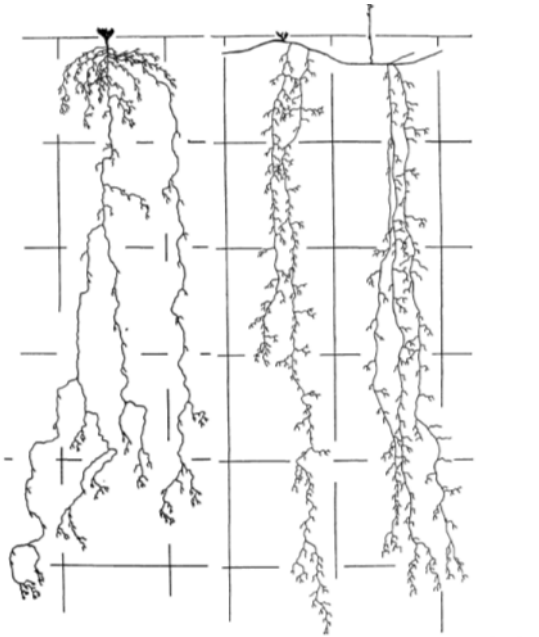


FIG. 4. Typical root systems of (left to right) *Calamagrostis montanensis*, *Stipa viridula* and *Calamovilfa longifolia*.



Haplopappus spinulosus (on left) from level brown loam and *Thermopsis rhombifolia* from a lower loamy slope in the dark brown soil zone.

Coupland and Johnson. 1965. Journal of Ecology **53:475-507.**

Factors Affecting Fire Effects: Season

Dormant plants are less affected

- Cool season grasses more affected with spring burn
- Warm season grasses by a summer burn

Factors Affecting Fire Effects: Conditions

- Fuel loads
- Moisture content of plants and soil
- Speed of fire movement
- Previous plant vigour

Factors Affecting Fire Effects: Temperature

- Soil surface temperatures can range from 100 ºC to 600 ºC
- Primarily driven by fuel loads, burn longer
- Less than 100 ºC 1 cm deep, and cools quickly with depth
- Lethal temperature for plant tissue ~ 55ºC
- Seeds are more tolerant of temperature

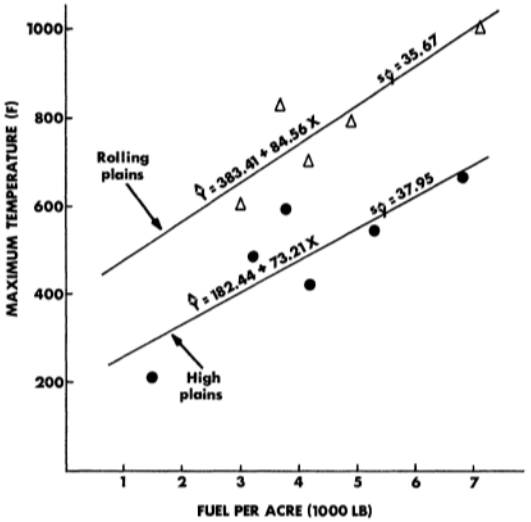


FIG. 1. Average maximum temperatures in relation to total yield of forage. Each point represents an average of 6 thermocouples.

Stinson and Wright 1969.

Negative impacts of fire

Impacts increase with fire frequency and higher fuel loads:

- Volatilization of nutrients
  - Offset by availability,
  - fertilization not recommended in most circumstances, benefits will be temporary
- Loss of litter, mulch and organic layer
  - Reduced water holding capacity
- Black soils and ash will be warmer
  - Higher evaporation
- Soil erosion
- 20 to 60 % forage loss in the year following a fire

Post-Fire Management: Current Recommendations

- Alberta Grazing Leases
  - Minimum 1 year deferral
  - Decisions based on vegetation assessment
- US Forest Service & Bureau of Land management suggest 2 years of grazing exclusion
  - Monitoring must demonstrate rehabilitation objectives have been met before grazing is allowed

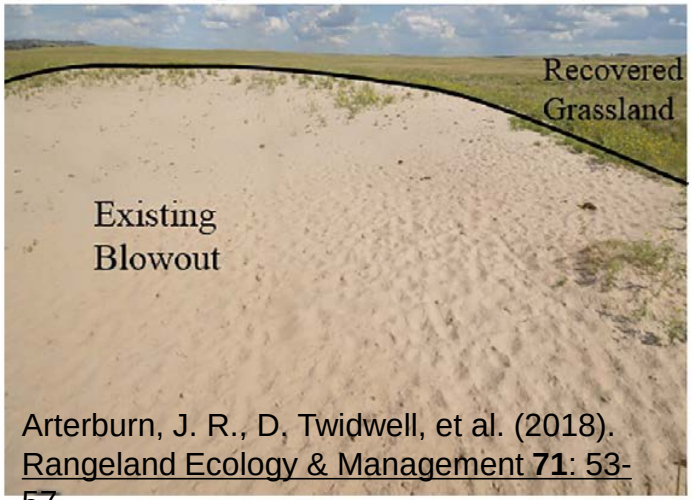
Examples of rangeland recovery from fire

Nebraska, 2012

- Sandhill rangeland
- Drought in 2012
- Average rainfall in years after
- Light stocking with bison before fire, reduced after fire
- Forage and litter recovered after 2 years

(A) 2013 April

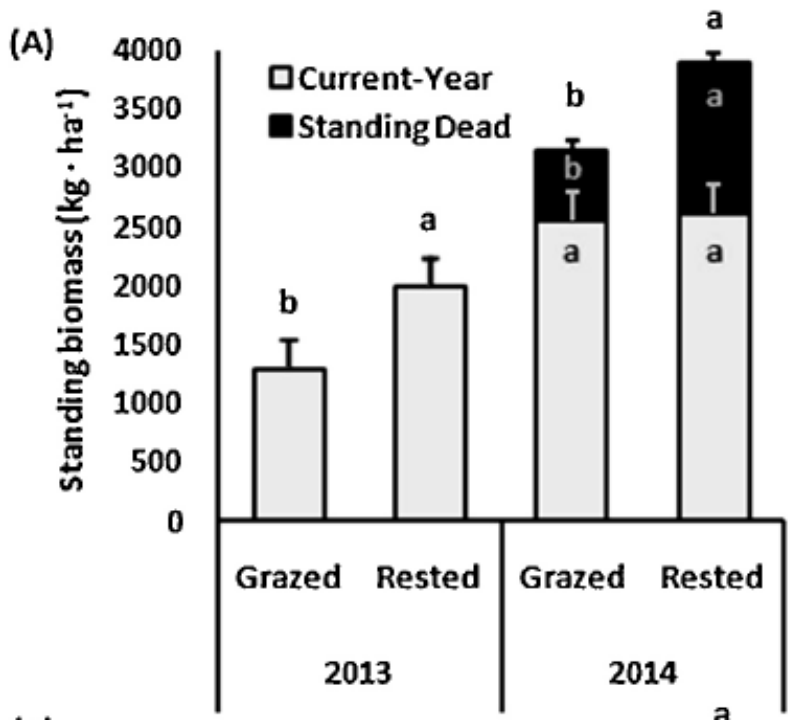
(B) 2015 August



Arterburn, J. R., D. Twidwell, et al. (2018). Rangeland Ecology & Management **71**: 53-57

Pautre Fire, South Dakota

- Deferral did not improve biomass 1 year after fire
- Precipitation was 190% of the long-term average
- Crested wheatgrass and needle-and-thread grass decreased with grazing
- Warm season grasses increased with grazing



Gates et al. 2017.

Granum, AB, 1997

- December 1997
- Foothills fescue
- Hot fire: high litter/ fuel loads
- 1998: +46% rainfall
- Forage production
    - 50% in 1998
    - Recovered in 1999
    - Litter was still low
- Forage quality increased

Bork et al. 2002

Buffalo, AB, 1994

- August 1994
- Mixedgrass prairie
- 15% below average precipitation for 3 years
- Cattle grazed in pasture
- Production reduced 40%
- Litter reduced 60%
- Bare soil increased 20%
- Preference by cattle caused over use on burned areas
- Native grasses reduced
- Production recovered in 1998

Erichsen-Arychuk et al. 2002.

Summary: Post fire management considerations

- Deferral is a safe bet.
- Rainfall will be key to recovery.
- Animal distribution may be an issue.
  - consider fencing off burned areas

Indicators of Grassland Recovery

- Forage production returns in 3 to 5 years
  - Faster in wet environments, slower in dry environments

- Litter holds moisture, protects soil, provides nutrients and increases production
  - In the dry mixedgrass, 57% loss of production when litter removed – especially in average rainfall year (Willms et al. 1986, 1993)

- Alberta Range Health
  - http://aep.alberta.ca/land/programs-and-services/rangeland/grazing-and-range-management/range-health.aspx

Thin break

Blowout

Loamy

Questions?

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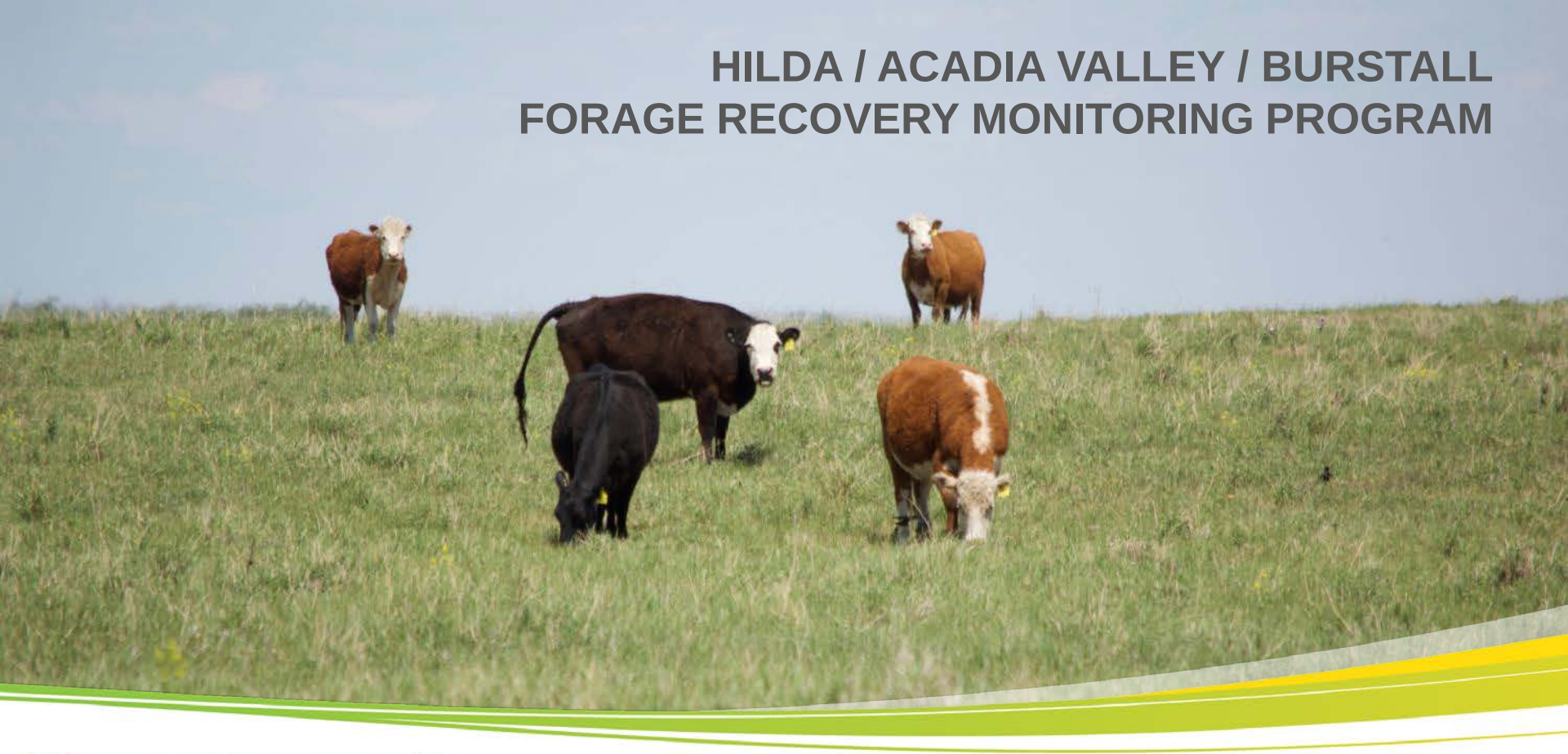
FORAGE RECOVERY MONITORING PROGRAM



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Monitoring Program Goals

1. Document the impact of the fire over the next 4 years
   - Provide feedback regularly to affected landowners

2. Provide recommendations for future fire recovery

3. Address research needs:
   - How long does recovery take?
   - What factors affect recovery time?
     - Pre- and post- fire factors
     - Deferral of grazing

Research Activities: Monitoring Exclosures

- 10 x 10 meters
- Burned and unburned areas
- 4 lines of barbed wire
- Located to minimize impact on operations
- One-call prior to post install
- Local contractor to build.

Research Activities: Clipping experiment

- Within exclosures
- 4 experimental plots will be clipped at different times of year in 2018

Research Activities: Range Cages

- Anchored to the ground
- 40 Inches in diameter

Research Activities: Vegetation Sampling

- Forage quantity
- Forage quality
- Species composition
- Non-native species
- Weeds
- Range health assessments

Research Activities: Soil Sampling

Characterize sites

- Texture
- Soil chemistry
- Core diameter ~3 cm
- Plant roots (larger core)
  - Fill holes with clean sand

Research Activities: Drones

- Measure area of pasture that burned
- NDVI: Measure of plant productivity and stress
- Satellite based remote sensing

Research Activities: Information on grazing history

- Stocking rates
  - Number of animals in pasture
  - Duration of grazing
- Timing of grazing

Minimizing risks associated with participation

Research Activities:

- we are guests on your property
- experience working on UofA, public and private pastures
- fire plan and preparedness

Data privacy: personal and specific location data will not be included in any reporting or shared.

Communication.

The universities are insured.

Can stop participating at anytime.

Reporting & Communication

- Will provide data back to landowners
- Annual newsletter on program progress
- Field days or workshops in future years

Questions, comments, concerns?

Monitoring Program Participation

Step 1: Find potential sites and participants

- Fill in information sheet

Step 2: Preliminary site selection

- Data compilation
- Site Selection

Step 3: Contact individuals who submitted sheets

- Confirm sites with site visit

Step 4: Confirm with owners of selected sites

- Site setup

Sign up sheet

Legal land location: if this is unknown please mark on map.

Own/ Rent/ Lease: please indicate whether you own, rent or lease the land. This is to help use ensure we have proper authority to access the land

Size: the size of the pasture.

Area burned: Did the entire pasture burn or only part of it? Indicate area or percentage burned, your best guess is OK.

Seeded: To the best of your knowledge has this piece of land ever been seeded.

Broken: To the best of your knowledge has this piece of land ever been broken.

of head: The typical number of cattle that typically graze this pasture.

Date in/ Date out: The typical time of year cattle go in and leave this pasture. If this changes from year to year, just write “changes”.

Thank you for participating

Follow up questions or comments:

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