



Post-Fire

Moose Management:

A New Approach for Managing
Moose for Harvest in Wildland Fires



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Overview

- Basic moose and fire theory
- Existing fire management for wildlife
- Factors affecting the Burn-Moose-Harvest connection
- Proposed framework for post-fire planning
- Research needs



Moose and Fire Theory



Fire regenerates habitat

- Burns away organic layer
- Releases carbon
- Re-sets vegetation succession
- Increases biomass of early-succession shrubs (e.g., willow, aspen, birch)



Moose and Fire Theory



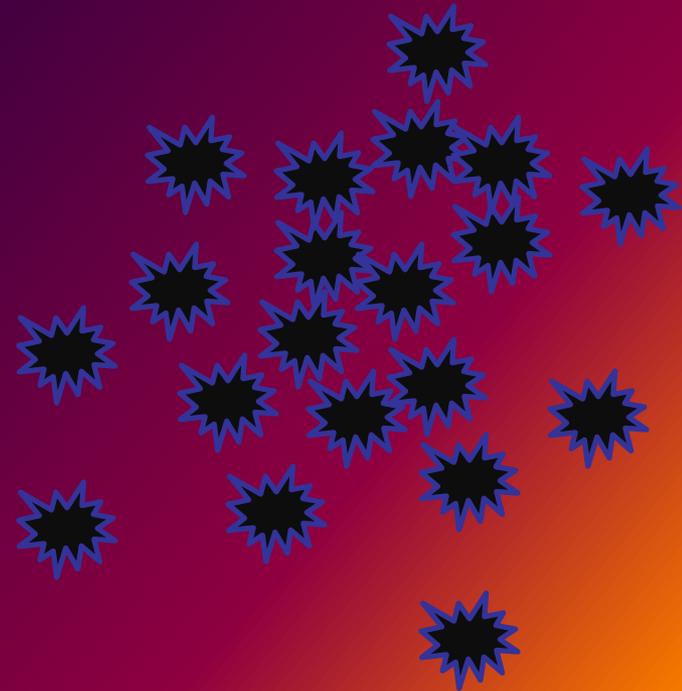
- Moose benefit from fire
 - Moose density positively associated with habitats burned 15-30 yrs ago (Maier et al. 2005)
 - Moose density increased rapidly 5-13 yrs post-fire, then declined 25-40 yrs post-fire (Loranger et al. 1991)
- More fire \approx more moose?
- More moose \approx more harvest?
- Managers want to increase sustainable harvest



Moose and Fire...Management?

How do we incorporate fire into moose management?

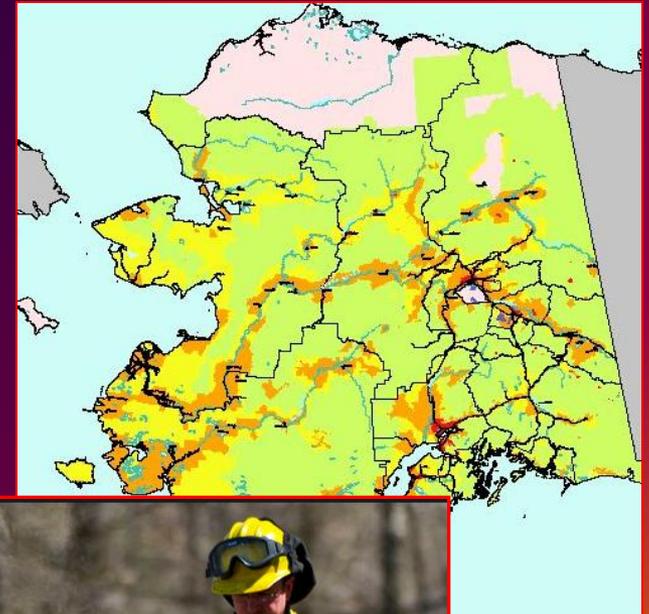
- Shotgun approach: Pre-fire
 - Widespread effort
 - > burned areas = > moose



Pre-Fire Planning Focus:

Influencing Fire Management Indirectly

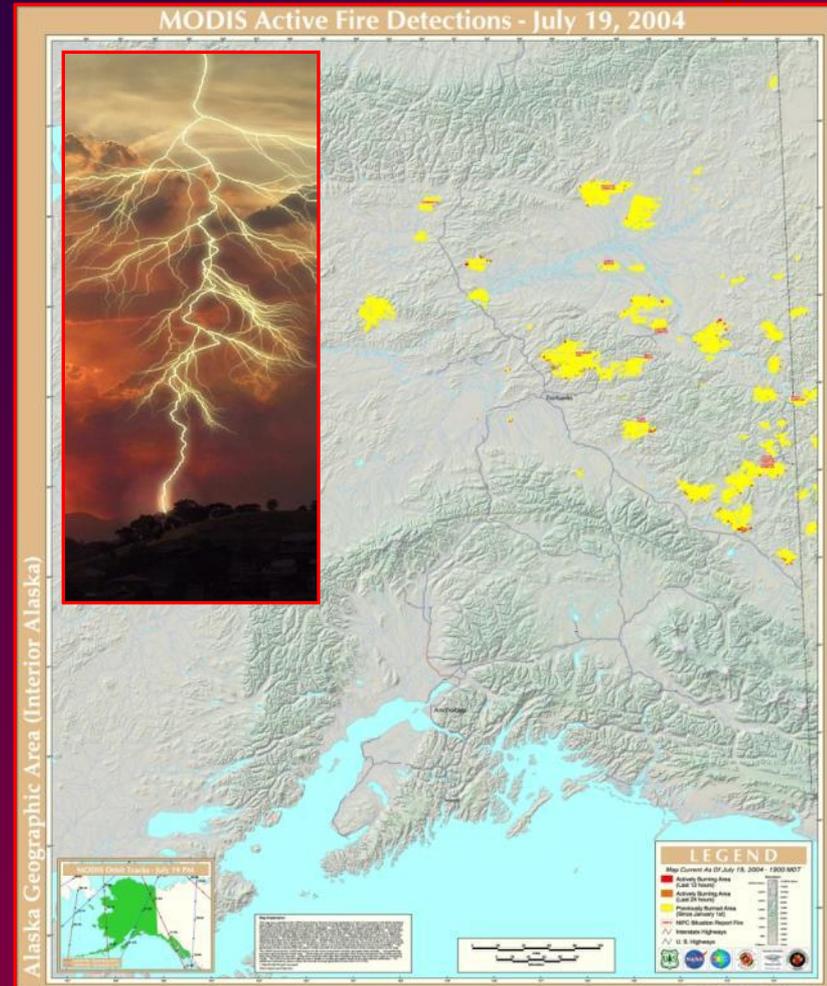
- Fire management options
 - Set by land managers
 - Moose are not usually first priority
 - Land ownership
 - Public health/safety
- Prescribed fires through cooperators
 - Difficult to achieve
 - Limited resources
 - Narrow prescription windows



Pre-Fire Planning Focus:

No Control Over Fire Variables

- Can't dictate occurrence of large fires
 - Random location: lightning strikes (90% of burned area)
 - Fires are clumped in time: 55% of area in AK burned in 6 of 40 yrs (Kasischke et. al. 2006)
- Can't dictate fire characteristics
 - Fire severity
 - Post-fire vegetation regeneration



Moose and Fire...Management?

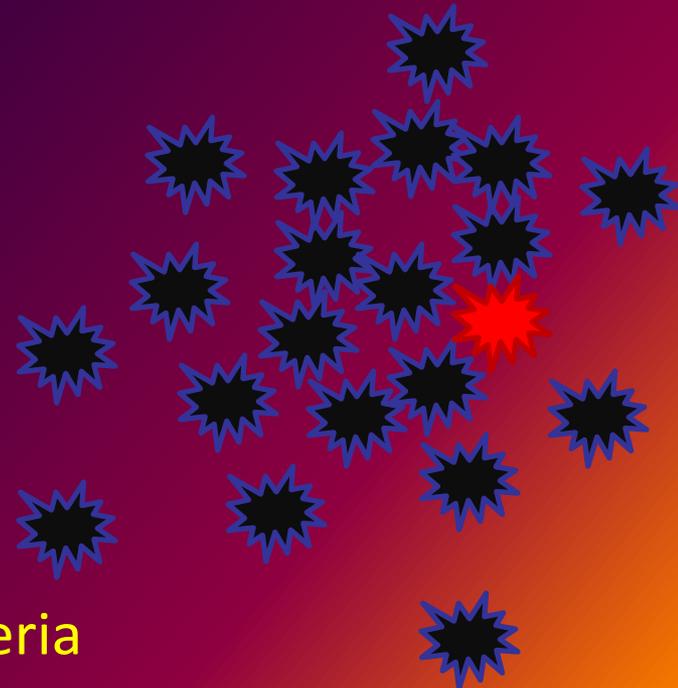
How do we incorporate fire into moose management?

– Shotgun Approach: Pre-fire

- Widespread effort
- > burned areas = > moose

– Targeted Approach: Post-fire

- Strategic effort
- Evaluate burns using specific criteria
- Allocate management effort to specific burns



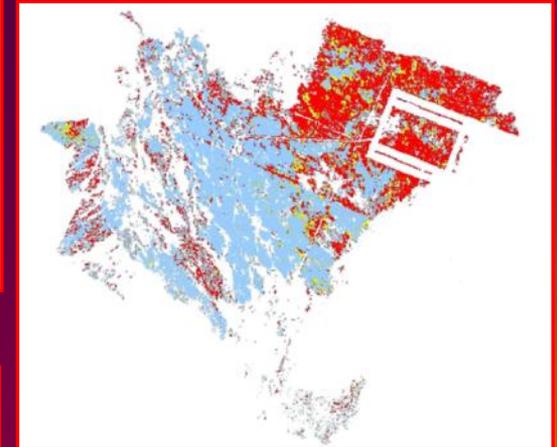
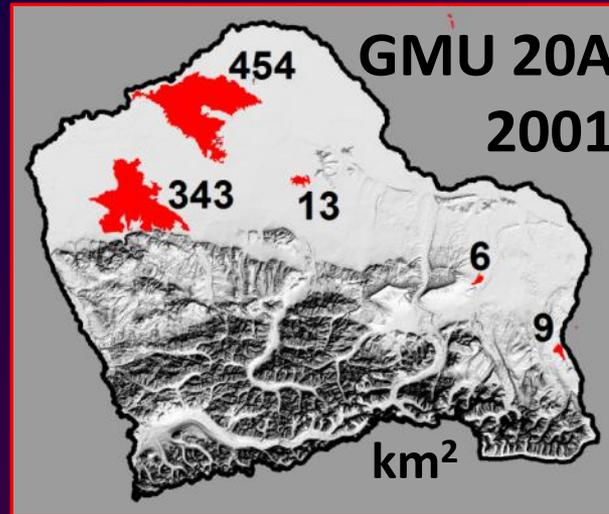
Post-Fire Planning Focus: *the Burn-Moose-Harvest Interaction*

- Fire = moose = harvest....when, where, how?
- Burn-moose-harvest interactions lack quantification
- Three types of variables:
 - Burn Characteristics
 - Moose Population Dynamics
 - Harvest Limitations
- Need prediction: where will burn-moose-harvest interactions result in successful moose management?



Burn Characteristics

- Fire size
- Fire severity
- Post-fire vegetation regeneration



Moose Population Dynamics: *Potential for Growth*

- Moose increase through *indirect effects* of a burn
- At least 1 of 3 things must occur:
 - More moose are born
 - Fewer moose die
 - New moose migrate into the area



Moose Population Dynamics: *Potential for Growth*



More moose born:

Nutrition and Fecundity

- High nutrition = high reproductive rates
- What if nutrition is already high?

Fewer moose die:

Mortality rate

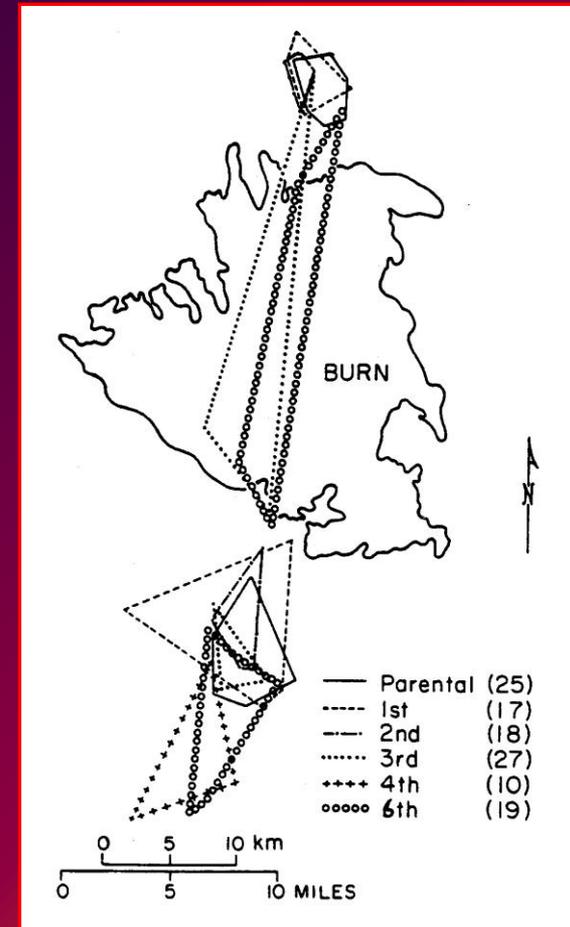
- What are the sources of mortality?
- Will these change post-burn?



Moose Population Dynamics: *Movement Patterns*

Moose move into the burn:

- Where home range overlaps
 - Shift range TEMPORALLY to use burn for more of the year
- Where home range separated
 - Moose did not encounter the burn and did NOT use the burn
- Dispersal through range shift changes population distribution but not abundance



Moose Population Dynamics:

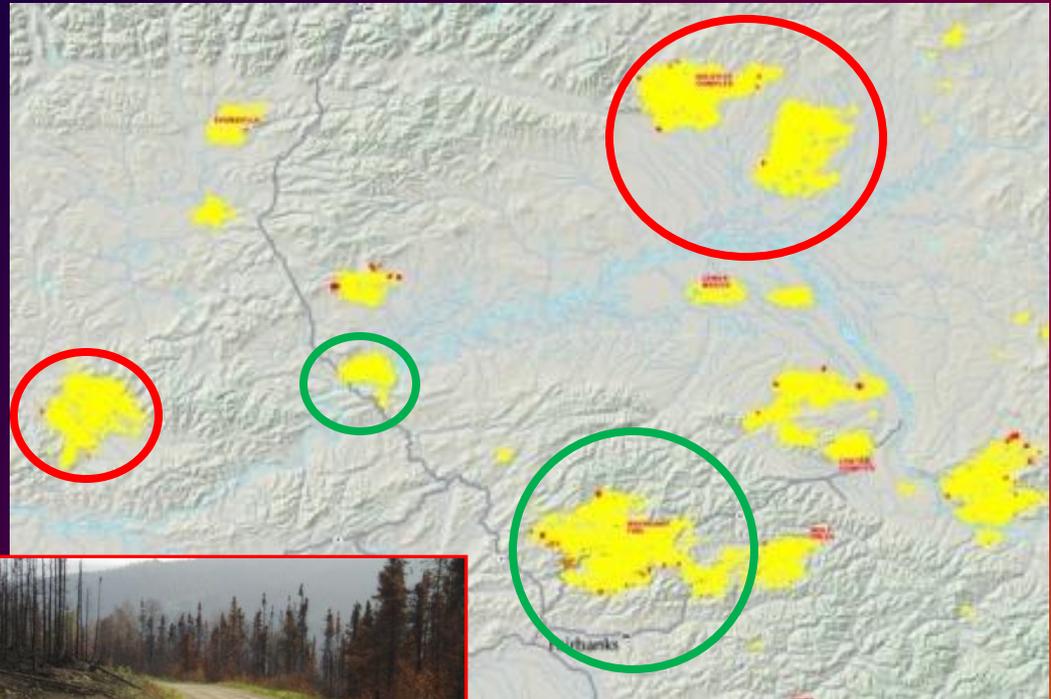
Moose Density: the “Sweet Spot”?

- Low density: plants quickly grow beyond the reach of moose
 - Willow canopy height almost out of reach at low-density, but within reach at high-density. Butler & Kielland 2008
- High density: alters/accelerates succession
 - Sandbars where moose density high were mostly alder, where low mostly willow (Butler & Kielland 2008)
 - Intensely-browsed areas quickly transitioned to spruce (Pastor et al. 2003, Mathisen et al. 2010)



Harvest Limitations

- Proximity to existing access
- Terrain (swampy, downed timber, dog-hair shrub)



Harvest Limitations

- Land ownership
 - Likelihood of increasing road/trail network
 - Pullouts and parking
 - Hunting allowed?
- Proximity of superior hunting areas



Post-Burn Focus:

Framework for Moose Management

Burn

Characteristics:

- Age
- Size
- Severity
- Post-Burn Veg
- Soil?
- Landscape Productivity?

POST-BURN PLAN

Moose Dynamics:

- Population Density
- Nutritional Condition
- Sources of Mortality
- Movement Patterns
- Browse Removal Rate

Harvest Limitations:

- Burn Proximity to Access
- Land Ownership
- Terrain Navigability
- Alternative Hunting Areas

Post-Burn Focus:

Framework for Moose Management

1. Low-cost initial prioritization
2. Field evaluation
3. Post-Fire Plan
 - Objectives for monitoring and active management
 - Cooperative or administrative action
 - Timeline for implementation

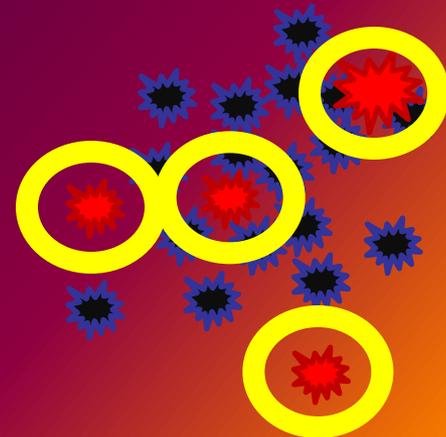


Step 1: Initial Burn Evaluation

Model Low-Cost Burn Information

- Burn Characteristics
 - Fire size (GIS)
 - Fire severity (GIS)
- Moose Population Dynamics
 - Current density (moose surveys)
 - Current limitations on growth (moose surveys)
- Harvest Limitations
 - Proximity to Access (GIS)
 - Terrain (GIS)
 - Land Ownership (GIS)

**Target Subset
of Burns for
Further
Evaluation**

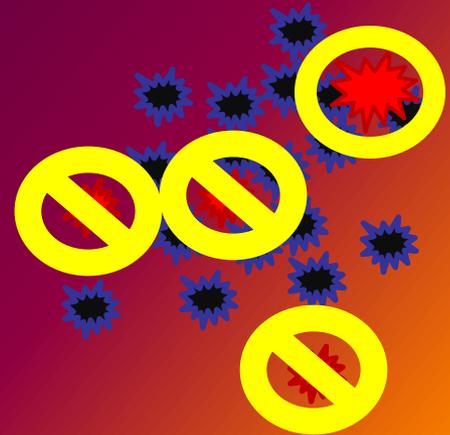


Step 2: Data Collection

Field Data to Evaluate Potential Management

- Fire Characteristics
 - Browse regeneration
 - Anticipated trajectory & timeline
- Moose Dynamics
 - Browse removal
 - Mortality levels/sources
 - Movement patterns
- Harvest Limitations
 - Public scoping
 - Cooperation scoping

**Choose burn(s)
for planning
active moose
management**

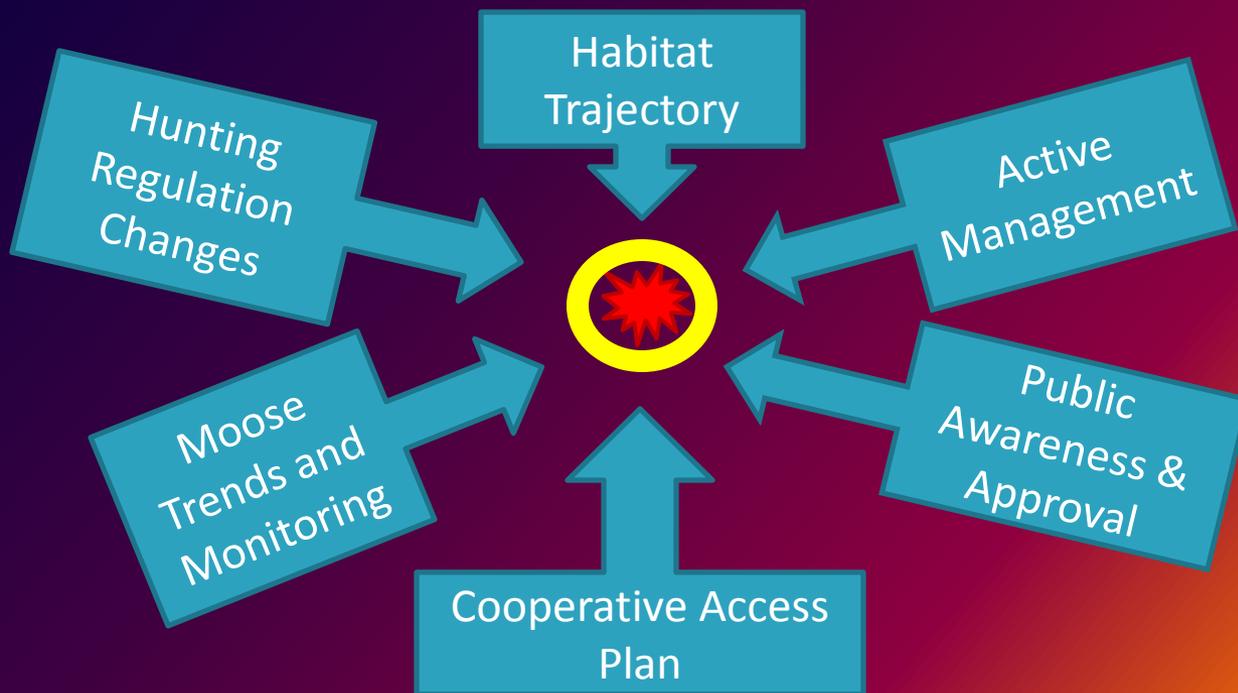


Step 3: Post-Fire Plan

Recommendations for Management

*Choose 1-2 burns based on
Field Evaluation:*

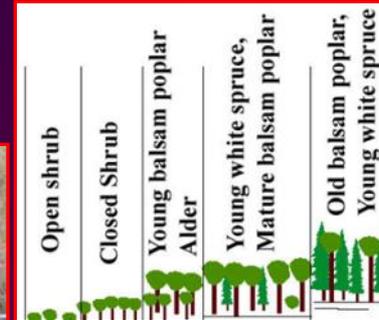
Active Management Plan



Step 3: Post-Fire Plan

Establish Timelines

- BURN: Forecasted window of optimal browse
- MOOSE: Timing of wildlife manipulations
 - Moose harvest
 - Predator harvest
 - Monitoring benchmarks
- HARVEST LIMITATIONS:
 - Public feedback
 - Public opinion/ Local advisory committee approval
 - Educational effort
 - Policy changes
 - ADF&G (personnel, policy, inter-agency cooperation)
 - Board of Game (intensive management, hunting regulations)
 - Cooperative agreements
 - Trail development
 - Land access



Post-Fire Plan *Example*

15-25 yr post-burn browse
"window"



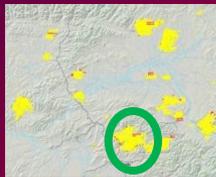
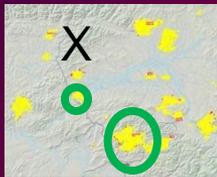
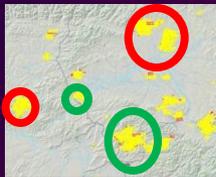
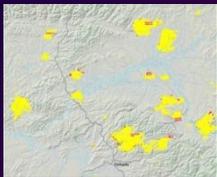
Big Fire Year:
45 new Burns

1 yr post-burn:
Initial Assessment
(GIS Model)

2-4 yrs post-burn:
Field Assessment
of Selected Burns

4 yrs Post-Burn:
Management Plan
for 1-2 burns

5-25 yrs post-burn:
Active
Management



Research Needs:

There's a Lot To Do.....

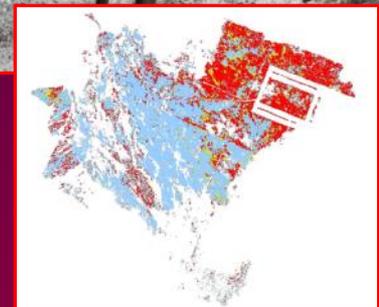
- Data for parameterization
- Model testing/validation
- Protocol for field evaluation
- Succession <-> browsing intensity
- Post-burn monitoring tools
- Trial run of a post-burn plan



Current Research:

Model Building/ Validation

- Hajdukovich Burn (1994)
 - Cooperative project with CSU and UAF: Brown, Ph.D. student
 - GPS-collared bull moose
 - 18-yr old burn near Delta Junction, AK
 - Successful burn-moose-harvest interaction
- Moose distribution & use of the burn
 - Moose Density → Burn severity? Veg class?
 - Moose availability during hunting season?
 - Over-winter browse removal rates & patterns?
- Model development
 - Use information from Hajdukovich moose-burn dynamics
 - Develop Interior-wide model predicting moose concentrations
 - Visit patches and evaluate model predictions



Future Research:

On the Horizon...

- Model Refinement
 - Add harvest/access to model
 - Spatial relationship between density, harvest and access corridors (Jen Schmidt, UAF researcher/SNAP program)
- Model Validation
 - Field validation of prioritization model
 - Stratify validation on model parameters
 - Burn age
 - Severity
 - Moose density



Future Research:

On the Horizon...



← ??? →

Quantify Moose Density \leftrightarrow Succession Dynamics

- Relationship between % removal & timing of succession
- Scale of management needed to sustain early succession stages: stand v. landscape
- Tools for monitoring succession and browsing pressure
- Cooperative projects with UAF?

Future Research:

On the Horizon...



- Combine research results:
 - Finalize initial prioritization model
 - Document field evaluation protocol
 - Template for Post-Fire plans
- Test the Framework:
 - Create a research project around testing the framework
 - Wait for fire...

Summary

- Successful burn-moose-harvest interactions occur when specific variables align
- Pre-fire strategies cannot control most variables
- Proposed post-fire strategy eliminates most of variation prior to active management
- Post-fire strategy incorporates process time:
 - Cooperative agreements
 - Regulation changes
 - Funding for research
 - Public approval and education
- Post-fire strategy promotes action over reaction



END

