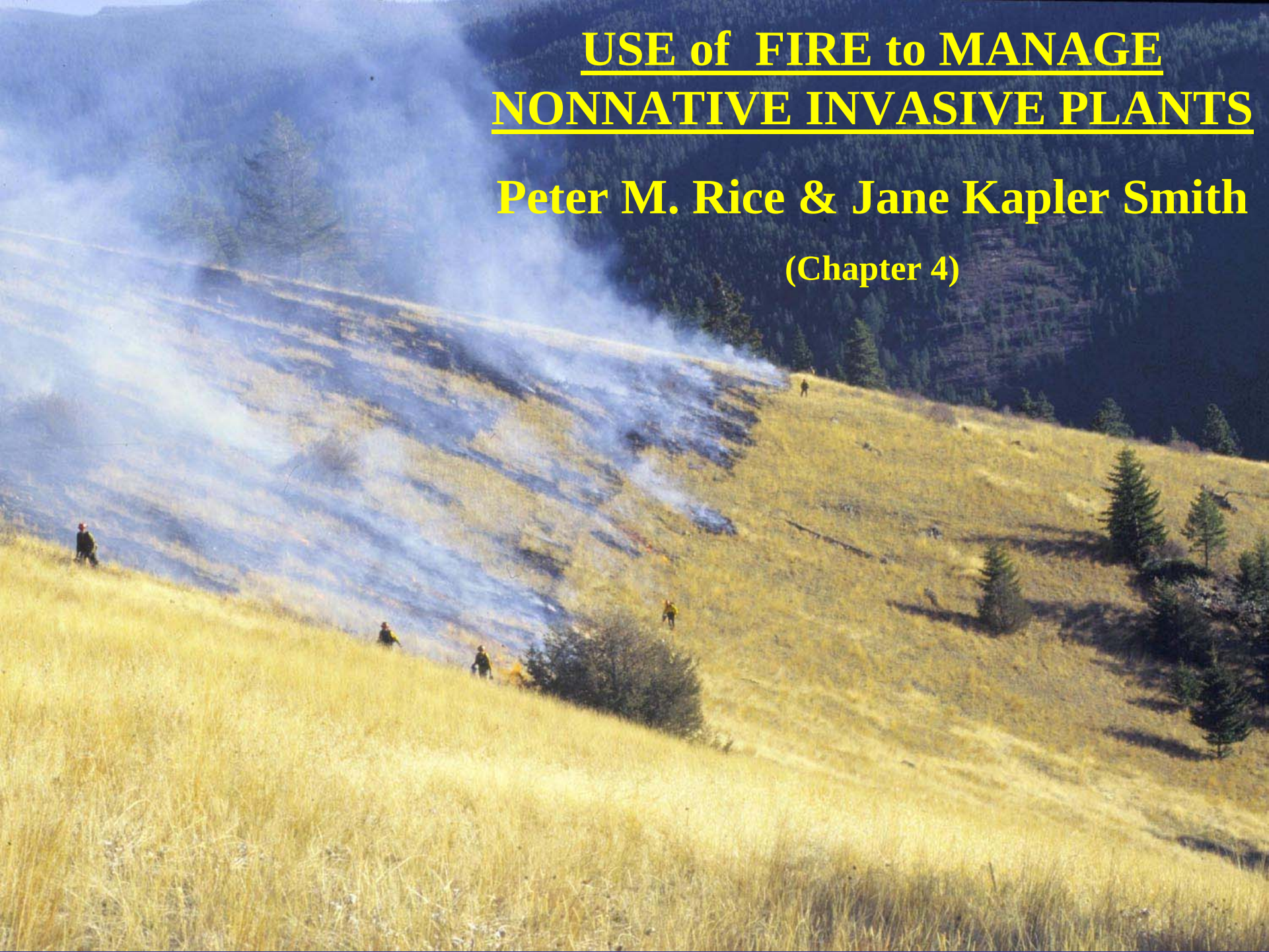


USE of FIRE to MANAGE NONNATIVE INVASIVE PLANTS

Peter M. Rice & Jane Kapler Smith

(Chapter 4)

~235 North American Papers & Case Studies Primarily Through ~2004

Fire Alone:
Preventing Flowering or Seed Set

- Yellow Starthistle in CA
- Early Flowering Stage
- Burned for 3 Years
- 99% Depletion Seed Bank
- 91% Reduction in Cover
- Recovered in 4 Years Without Treatments

Hastings & DiTomaso 1996; Kyser & DiTomaso 2002

Fire Alone:
Destroying Seed In Inflorescences

- Medusahead
- Soft Dough Stage
- Other Grasses Cured
- Desirable Seeds Shed
- Slow Moving Backfire
- Improved Up To 3 Years

Furbush 1953; Murphy & Turner 1959, McKell et al 1962

Fire Alone:
Destroying Seeds In Litter

- Cheatgrass
- Drops Seed Quickly After Culms Cure
- Seed Bank In Litter and At Soil Surface
- Highly Fecund Plants From Surviving Seed At Soil Surface
- Unburned Patches
- Short Term Suppression

Zouhar 2003; Many Others

Fire Alone: Depleting Seed By Fire Stimulated Germination

- Scotch & French Broom
- Fire Kill Aerial Tissues
- Persistent Seed Bank
- Hot Fire → Synchronous Germination
- Follow-Up Treatments
  - More Burns if Fuel
  - Herbicides
  - Cutting, Pulling
- 5-10 Year Program

Boyd 1996; Bossard 1993, 2000a, b.

Fire Alone: Direct Mortality and Prevention or Delay of Resprouting

- Underground Perennating Tissues Limit Direct Kill
- Burning To Deplete Carbohydrate Reserves
- Up to 5-6 Burns to Reduce Re-sprouting of Shrubs

- Efficacy Varies by Species
- Growing Season Burns More Effective Than Dormant Season Burns

Heidorn 1991; Grese 1992, Richburg et al 2001, 2003; Grace 1998, Grace et al 2001

Fire Alone: Burning to Favor Natives

- Varying Phenologies
- Invasive Cool Season Grasses in Warm Season Tall Grass Prairie
- Long Term Repeated Burns
- Burning Litter to Shift Species Composition
- Soil Heating Speeds Warm Season Grass Emergence
- Spring Burn Timing
- Drier Surface Soil Retards Germination of Exotic Annual Grasses

Ehrenreich 1959; Wilson 1992; Whisenant & Ursek 1999

Fire Combined With Other Treatments:

Treatments Increasing the Effectiveness of Fire

- Mechanical, Herbicide Pre-Burn Treatments
- Melaleuca in FL
- Pre-Treatments
  - Kill Largest Trees
  - Improve Fuel Quality
- Burn Seedlings 6-12 Months Later

Molnar et al 1991; Myers et al 2001

Fire Combined With Other Treatments:

Burning as Site Prep for Seeding

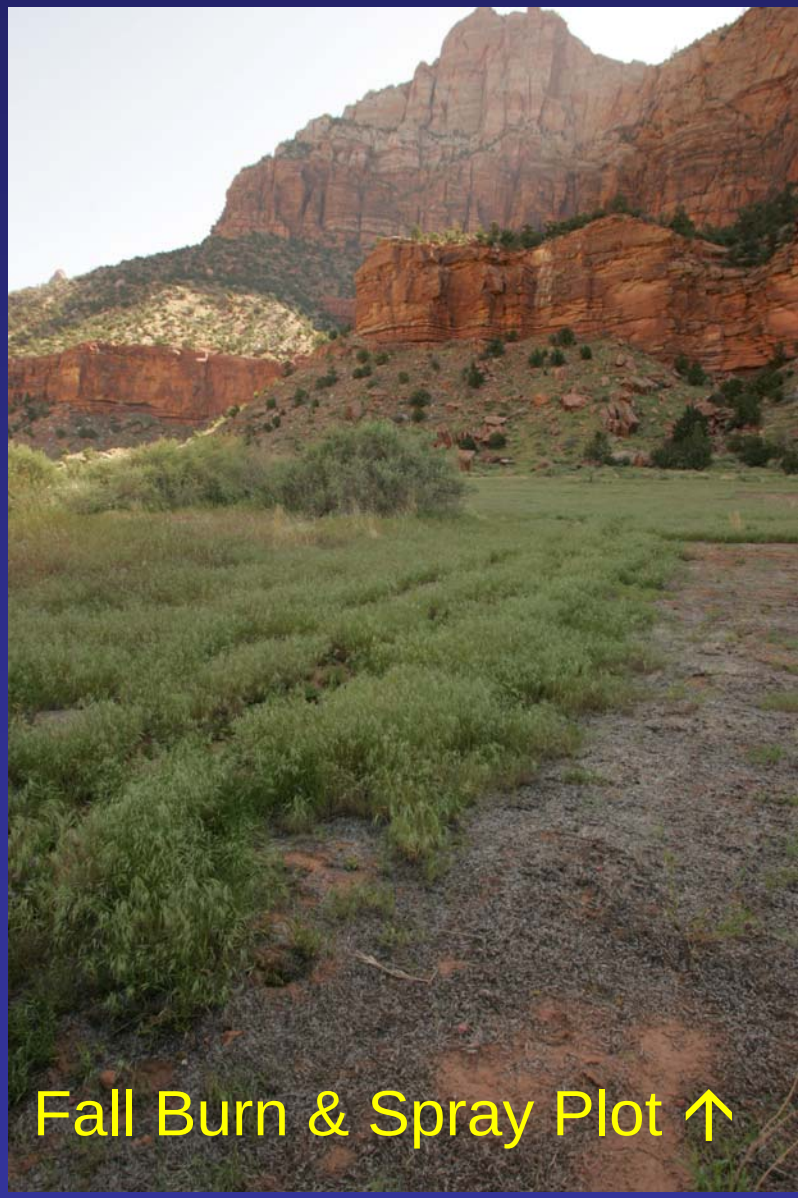
- Litter Reduction Burns
  - Improves Seed to Soil Contact
  - Facilitates Seeder Operation
- Cheatgrass Sagebrush Steppe
- Tall Grass Prairie

Masters & Nissen 1998; Masters et al 1996; Rasmussen 1994; Haferkamp et al. 1987

Fire Combined With Other Treatments:

Burning to Increase Herbicide Efficacy

- Cheatgrass Burn Then Fall Pre-emergent Spray
- Prepares For Perennial Grass Seeding
- Similar Burn, Spray, Reseed Sequence For Suppressing Invasive Tall Fescue in Kentucky



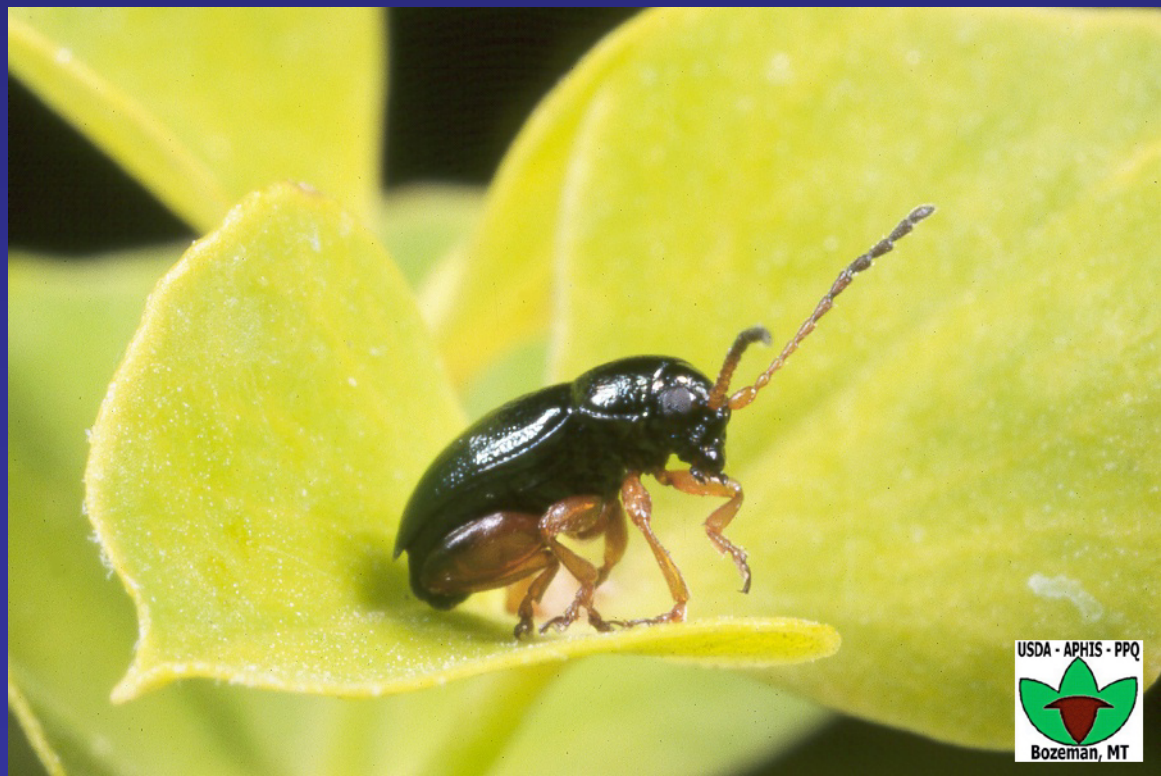
Fall Burn & Spray Plot ↑

Vollmer & Vollmer 2004; Washburn et al 1999

Fire Combined With Other Treatments:

Burning to Enhance Biological Controls

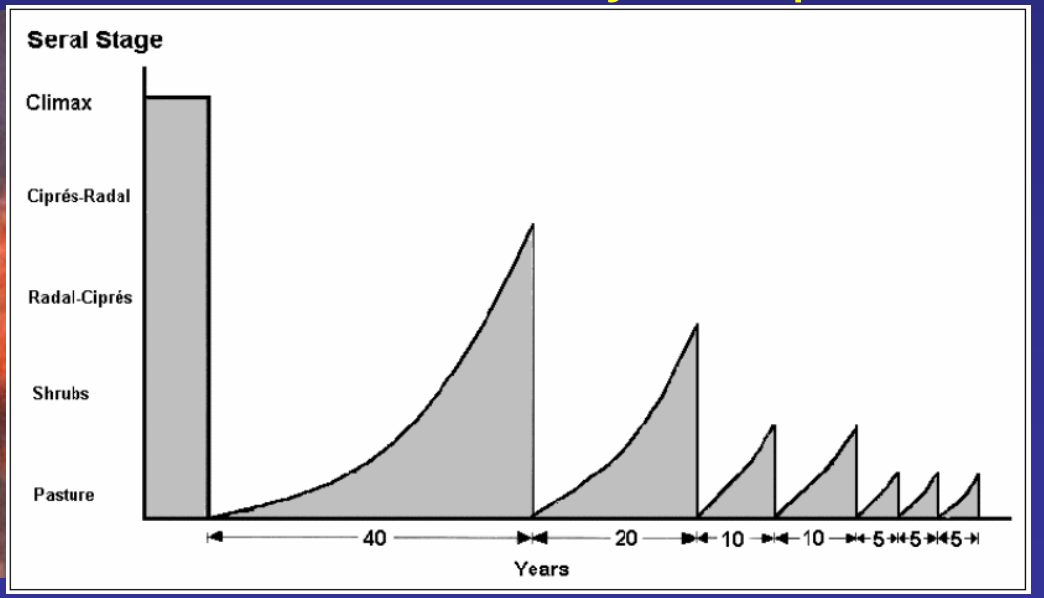
- Chrysolina Beetles on St. Johnswort
  - Patch Burns Improved Weed Nutrient Value = More Beetles
- Aphthona Flea Beetles on Leafy Spurge
  - Fire Bared Soil Favored Colonization
- Burn Timing Critical
  - Life Cycle Stages
  - Below Ground
  - Emerged to Feed



Briese 1996; Fellows & Newton 1999

Varying Prescribed Burn Prescriptions:

- Fire Severity in Relation to Season: Warm >> Cool
- Fire Severity in Invasives Dominated Fuel Beds:
  - Need to Manipulate Fuel Quality & Quantity?
- Extent and Uniformity of Burns: Re-infestation by Seed?
- Fire Frequency: Major Determinate of Community Composition



Tveten & Fonda 1999; Howard et al 1983); Glass 1991; Xanthopoulos 1990; Doren & Whiteaker 1990; various DiTomaso et al; Boyd 1996; George 1992; Whisenant & Bulsiewicz 86; Emery & Gross 03; Smith & Knapp 99, 01;Svesarsky et al 86; DiTomaso 06

PLANNING QUESTIONS FOR: WEED SUPPESSION and DESIRABLE SPECIES ENHANCEMENT		TARGET SPECIES	DESIRED SPECIES
POSTFIRE REGENERATION FROM SEED (production, dispersal, mobility, use of seed bank)		?	?
POSTFIRE VEGETATIVE REGROWTH STRATEGIES & LOCATION OF PERENNATING TISSUES		?	?
SEASON	Most Vulnerable to Fire	?	?
	Least Vulnerable to Fire	?	?
FIRE INTERVAL	Most Favorable to Regeneration	?	?
	Least favorable to Regeneration	?	?
PROBABLE FIRE EFFECT	Low-severity	?	?
	High-severity	?	?