

# **Spotted knapweed and songbirds: understanding the nature of invader impacts**

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**Rocky Mountain Research Station**



# Strong Invaders



**Spotted knapweed (*Centaurea maculosa*)**

# Targeted by Weed Control Programs



## WANTED

Found within Mountain View County



## Spotted Knapweed

(*Centaurea maculosa*)

**\$50.00 REWARD**

Must be left in ground until inspected by  
Mountain View County Agricultural Staff

For more information contact the  
Assistant Agricultural Fieldman at  
403-335-3311 ext 184



**Weed management goals often go beyond  
invader suppression to include relief of invader impacts**



**pre-invasion**



**invaded**



**pre-invasion**



**invaded**



# Suppressing the Invader Doesn't Ensure Relief of Impacts



pre-invasion



invaded



# Need to Understand Nature of Invader Impacts



**pre-invasion**



**invaded**



# Need to Understand Nature of Invader Impacts



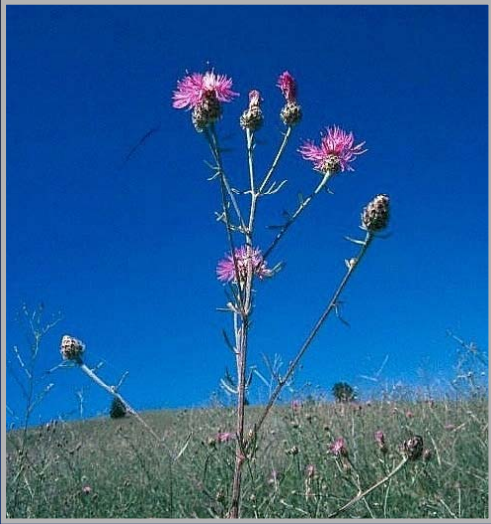
**pre-invasion**



**invaded**

**to identify management strategies that best address problem  
and ultimately measure effectiveness of our actions**

# Impacts of Spotted Knapweed



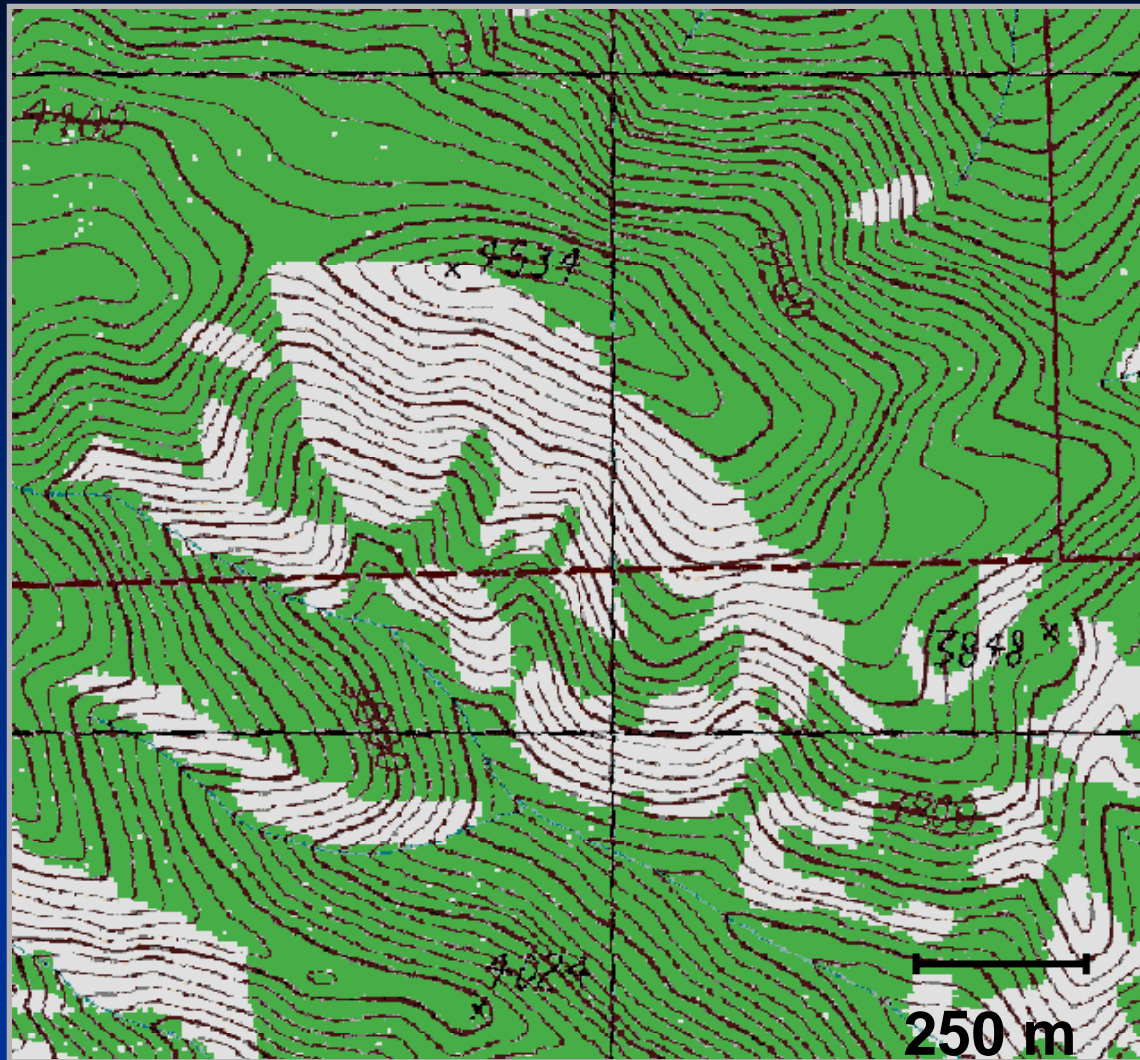
# Key Questions

**Which native plant groups are impacted by knapweed and to what degree?**

**How do shifts in plant communities affect higher trophic levels, including songbirds?**

**Do common weed control measures alleviate invader impacts?**

# Study Sites



# Study Sites



**Knapweed**



**Native**



# Insects



# Chipping Sparrows





# Pathways of Plant Invader Impact



**food**



**nest predation**



# Chipping Sparrows



**nest primarily in trees**







# Results

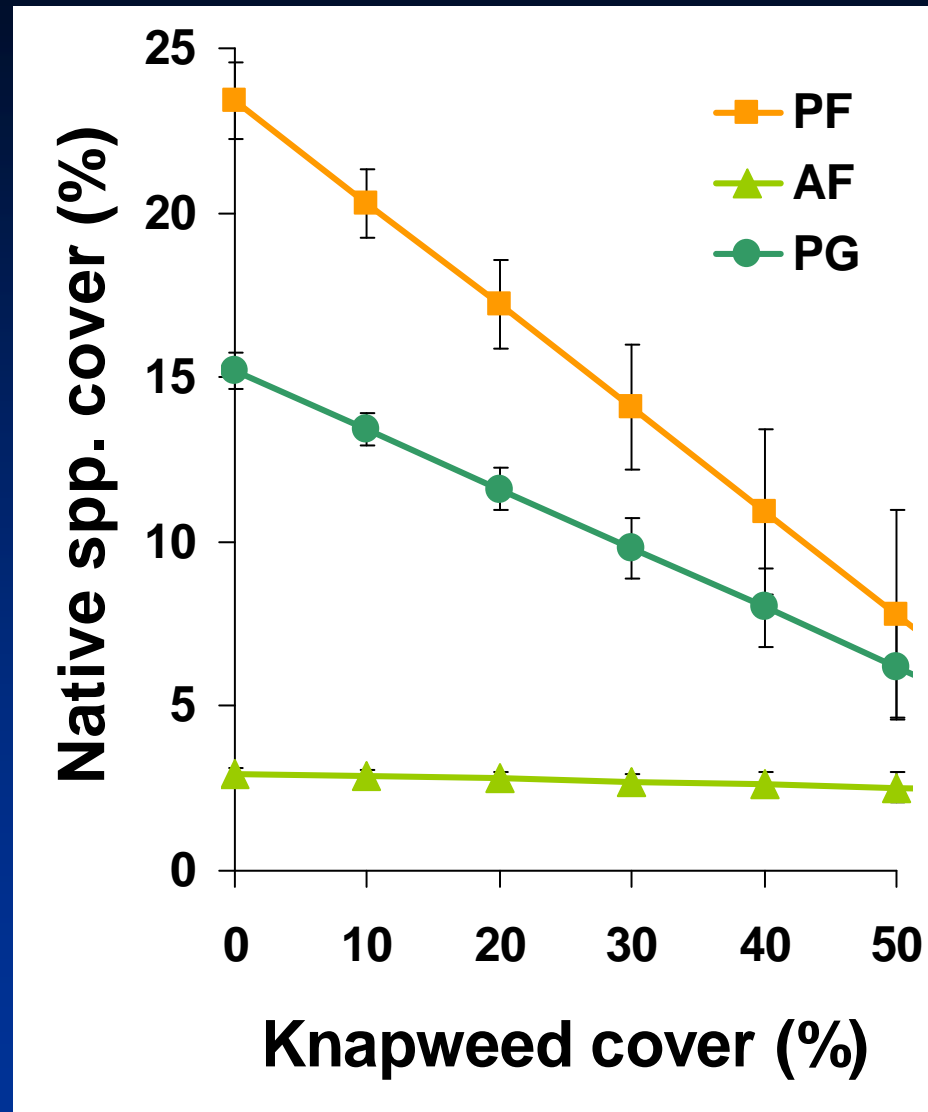


# Impacts of Knapweed Invasion on Native Plants



**differed by functional group**

# Shift in Native Plant Communities



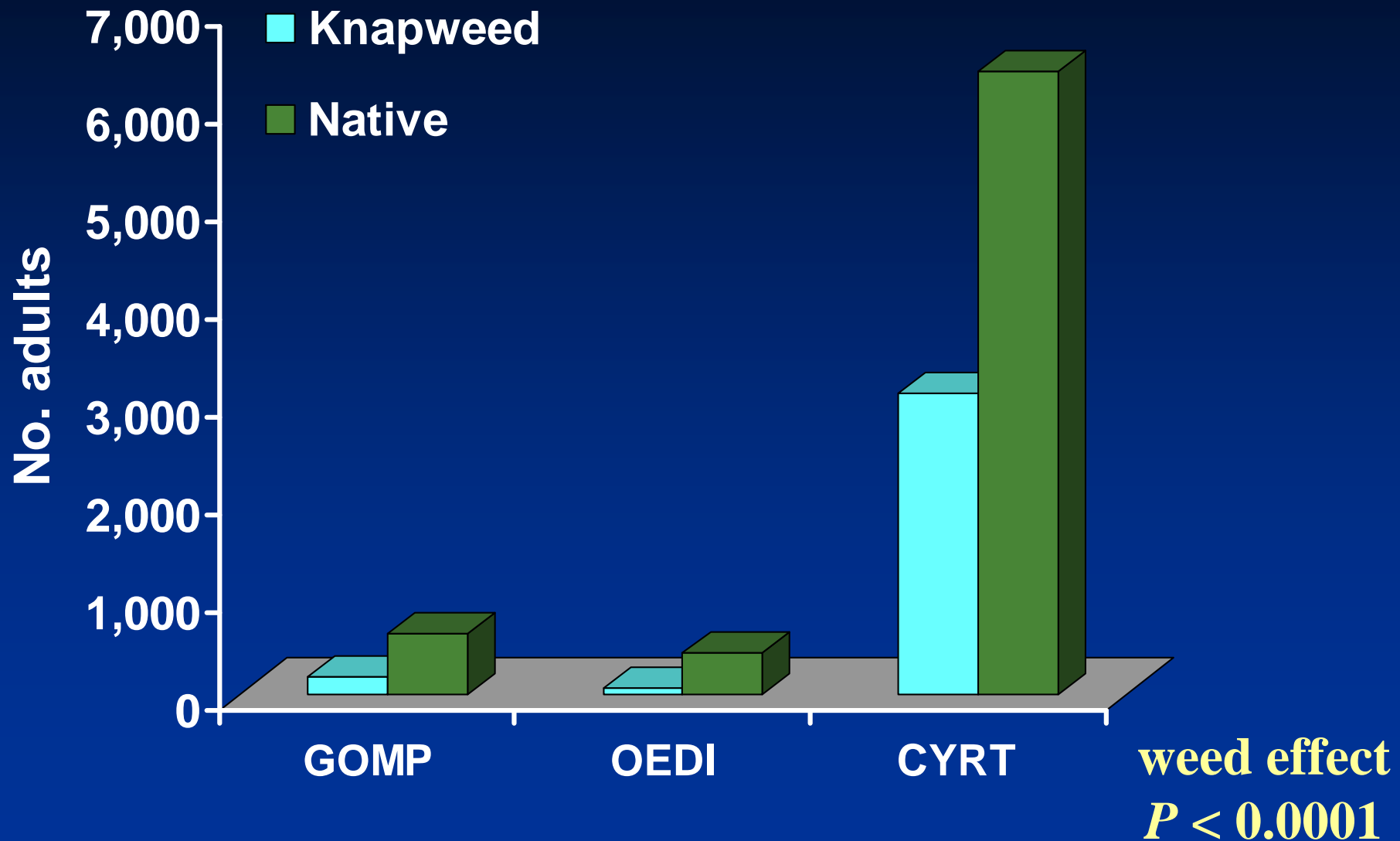


# Does Shift in Plant Communities Affect Insects?



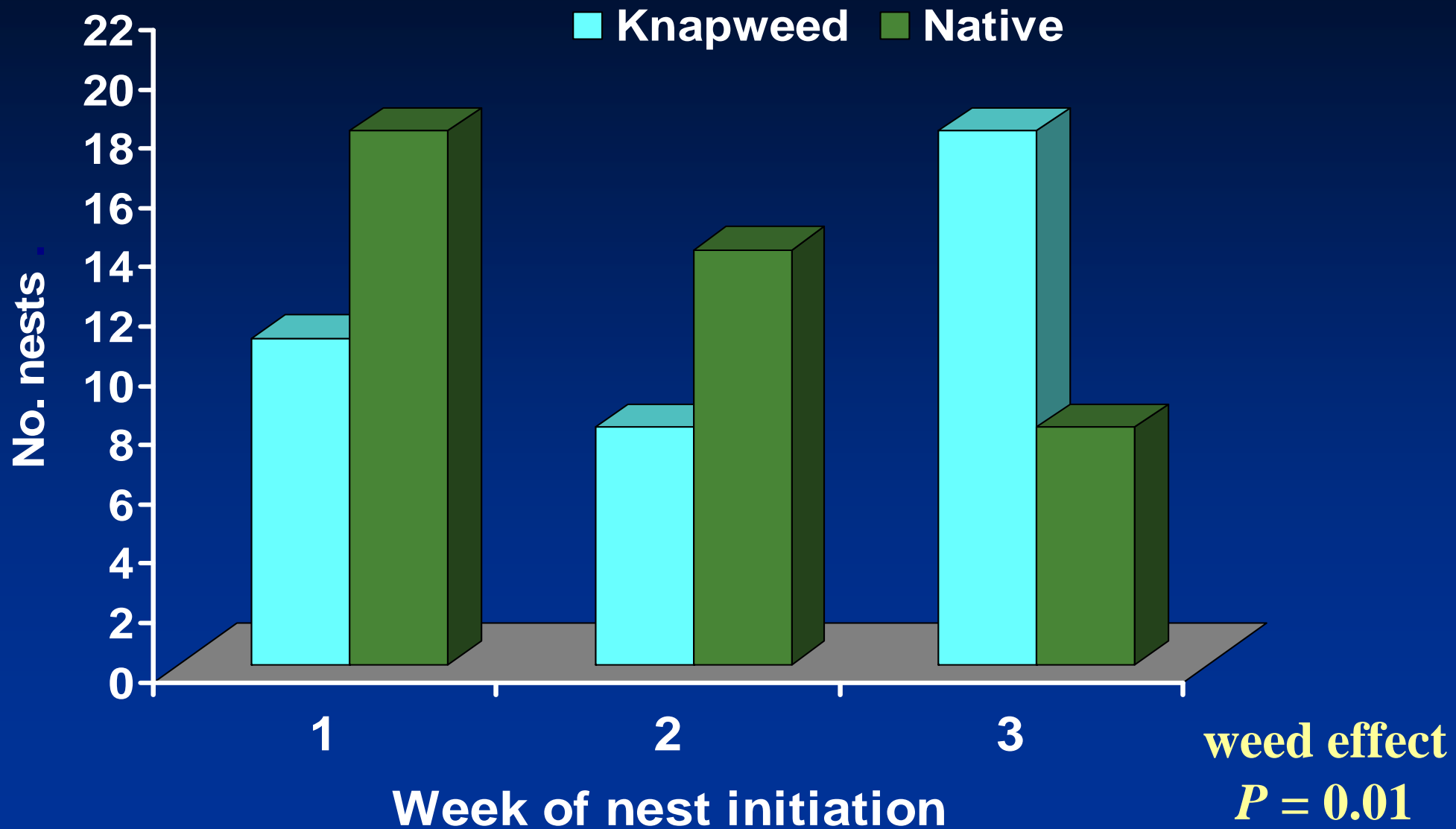
expect to see declines in prominent groups

# Fewer Grasshoppers in Knapweed vs. Native Habitat





# Delayed Breeding in Knapweed vs. Native Habitat



# Delayed Breeding Reduces Reproductive Success



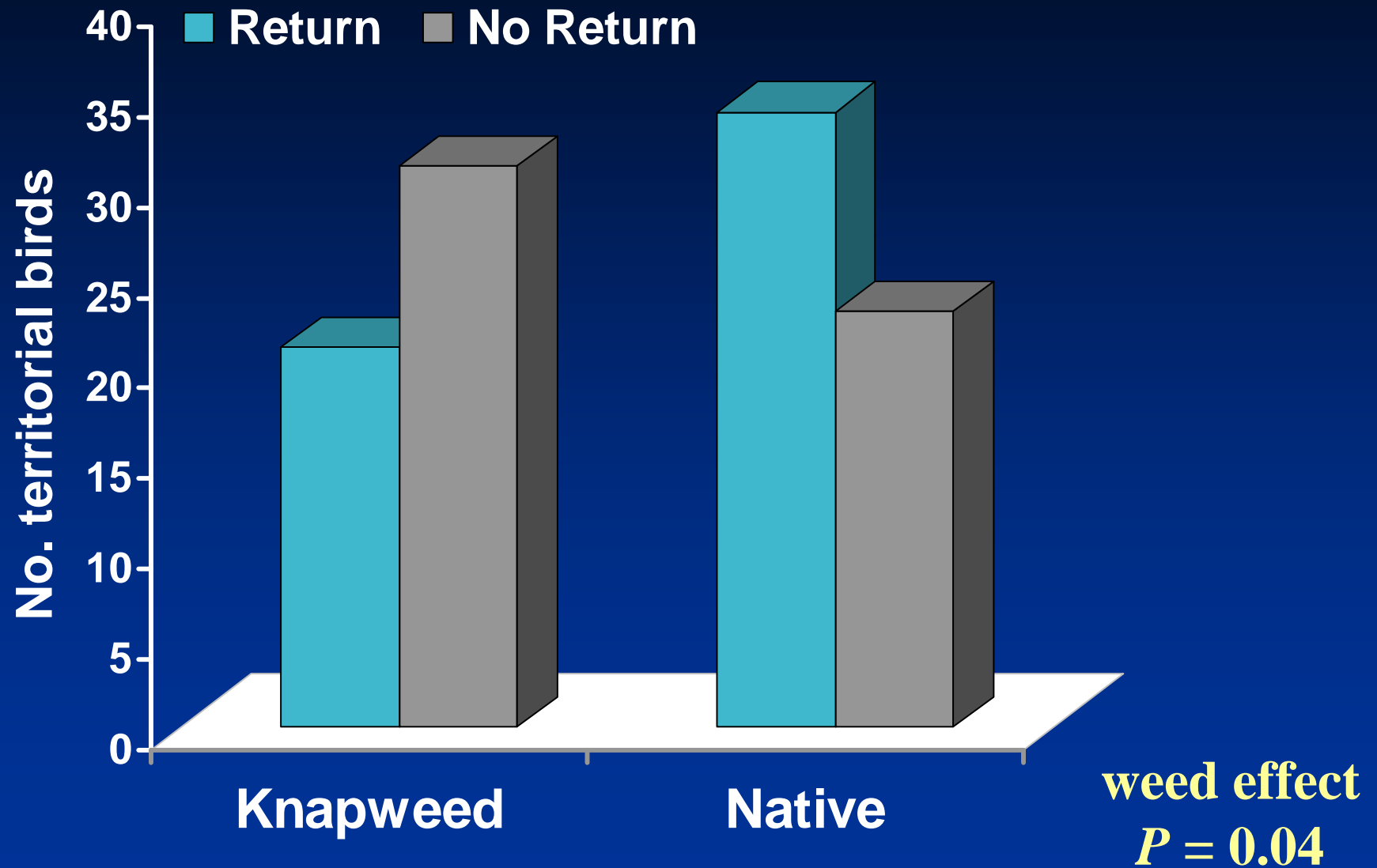
songbirds have a very limited breeding season ...  
delays further shorten it

# Reduced Reproductive Success Impacts Site Fidelity



**fewer adults return between breeding seasons**

# Reduced Site Fidelity in Knapweed vs. Native Habitat



# Reduced Site Fidelity Impacts Age Structure



prevalence of older vs. yearling birds



# Native Habitat with Low Turnover



**older**



**older**



**older**



**older**



**yearling**

# Native Habitat with Low Turnover

**YEAR 2**



**older**



**older**



**older**



**older**



**yearling**

# Native Habitat with Low Turnover

**YEAR 2**



**older**



**older**



**older**



**older**



**older**

# Native Habitat with Low Turnover

**YEAR 2**



**older**



**older**



**older**



**older**



**older**

# Native Habitat with Low Turnover

**YEAR 2**



**older**



**yearling**



**older**



**older**



**older**

# Knapweed Habitat with High Turnover



yearling



yearling



yearling



older



older

# Knapweed Habitat with High Turnover

**YEAR 2**



**yearling**



**yearling**



**yearling**



**older**



**older**

# Knapweed Habitat with High Turnover

**YEAR 2**



**older**



**yearling**



**yearling**



**older**



**older**



# Knapweed Habitat with High Turnover

**YEAR 2**



**older**



**yearling**



**yearling**



**older**



**older**

# Knapweed Habitat with High Turnover

**YEAR 2**



**older**



**older**

# Knapweed Habitat with High Turnover

**YEAR 2**



**older**



**yearling**



**yearling**



**yearling**

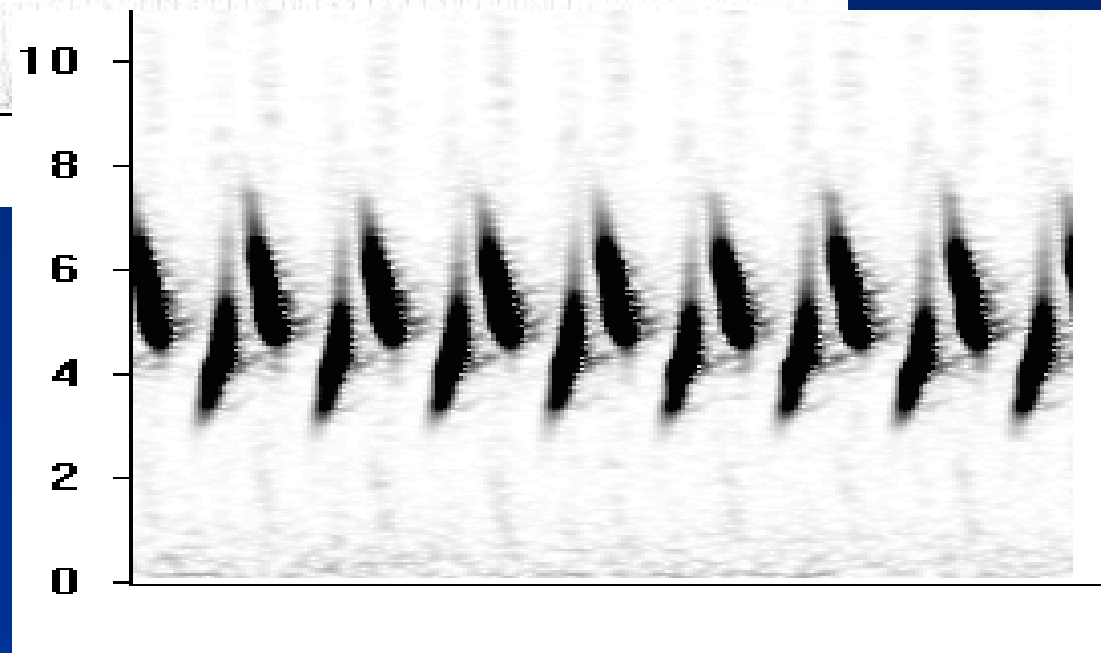
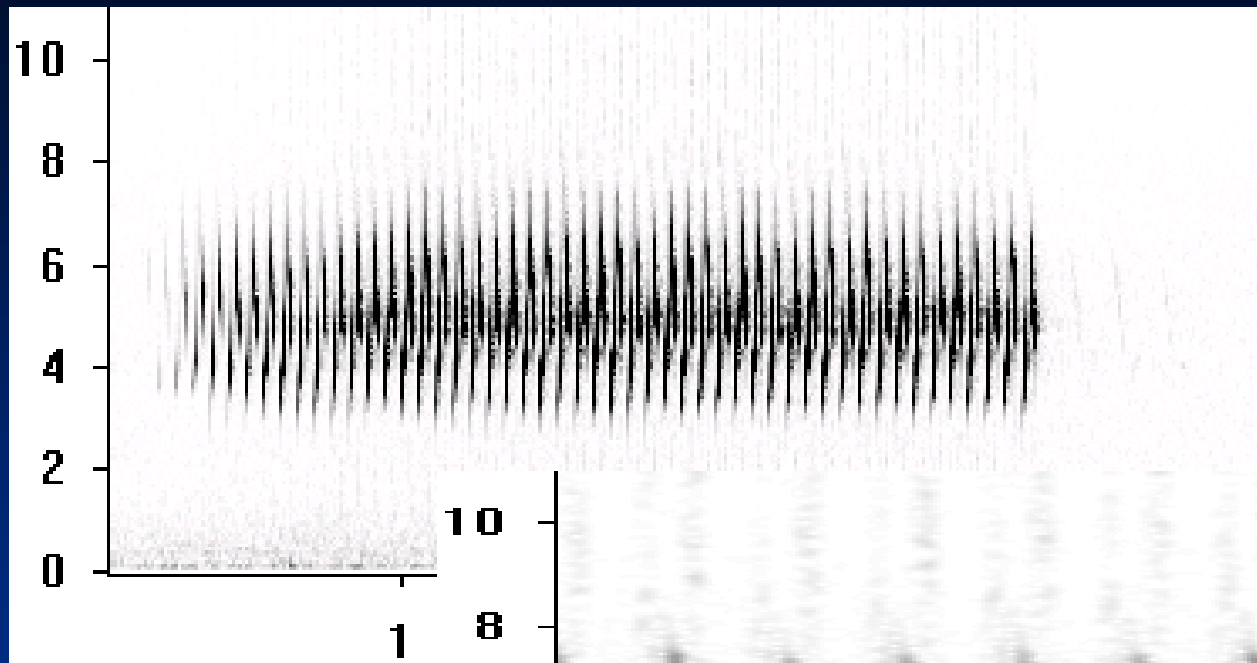


**older**

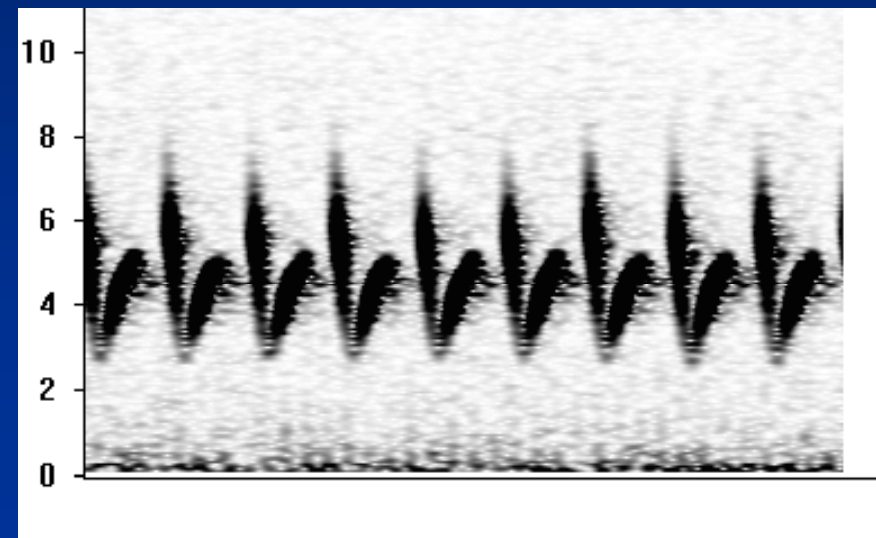
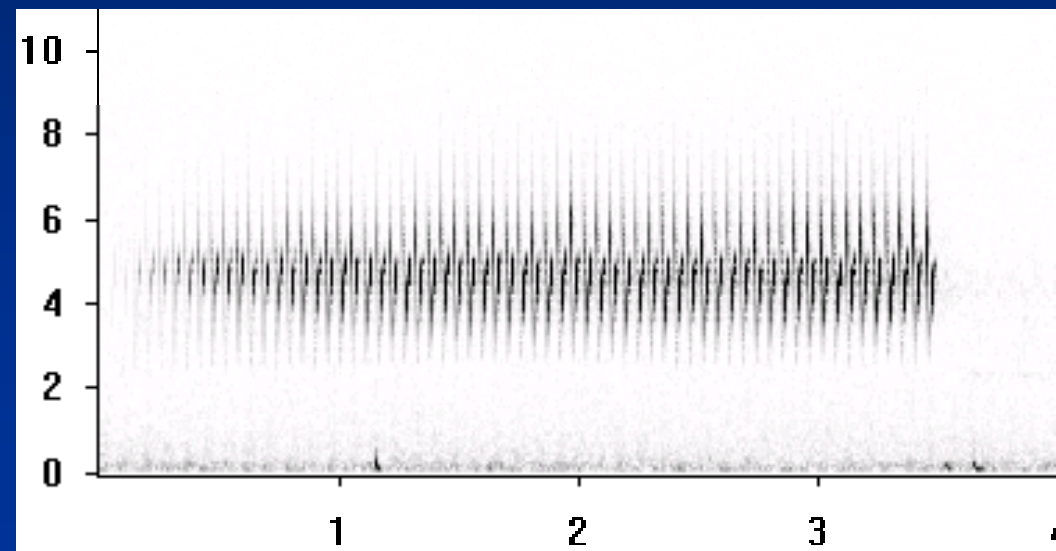
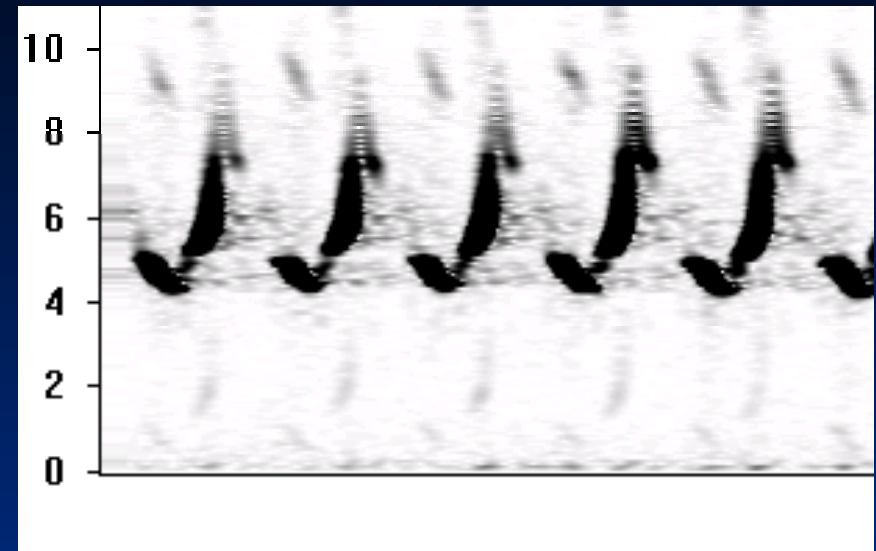
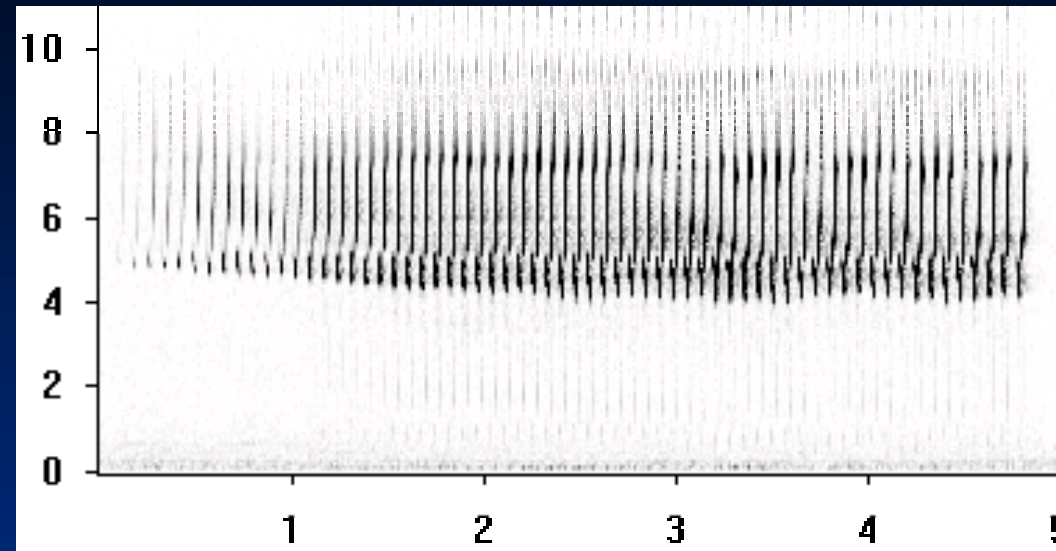
# Increased Turnover Affects Song Learning



# Chipping Sparrow Song



# Each Male has a Distinct Song Kept for Life



# Yearlings Acquire Song from Neighbors



older



yearling



older



older



older

# Native Habitat: Maintenance of Local Tradition



older



yearling



older



older



older



# Knapweed Habitat: Lack of Local Tradition



older



yearling



yearling



yearling



older

# Knapweed Habitat: Lack of Local Tradition



older



yearling



yearling

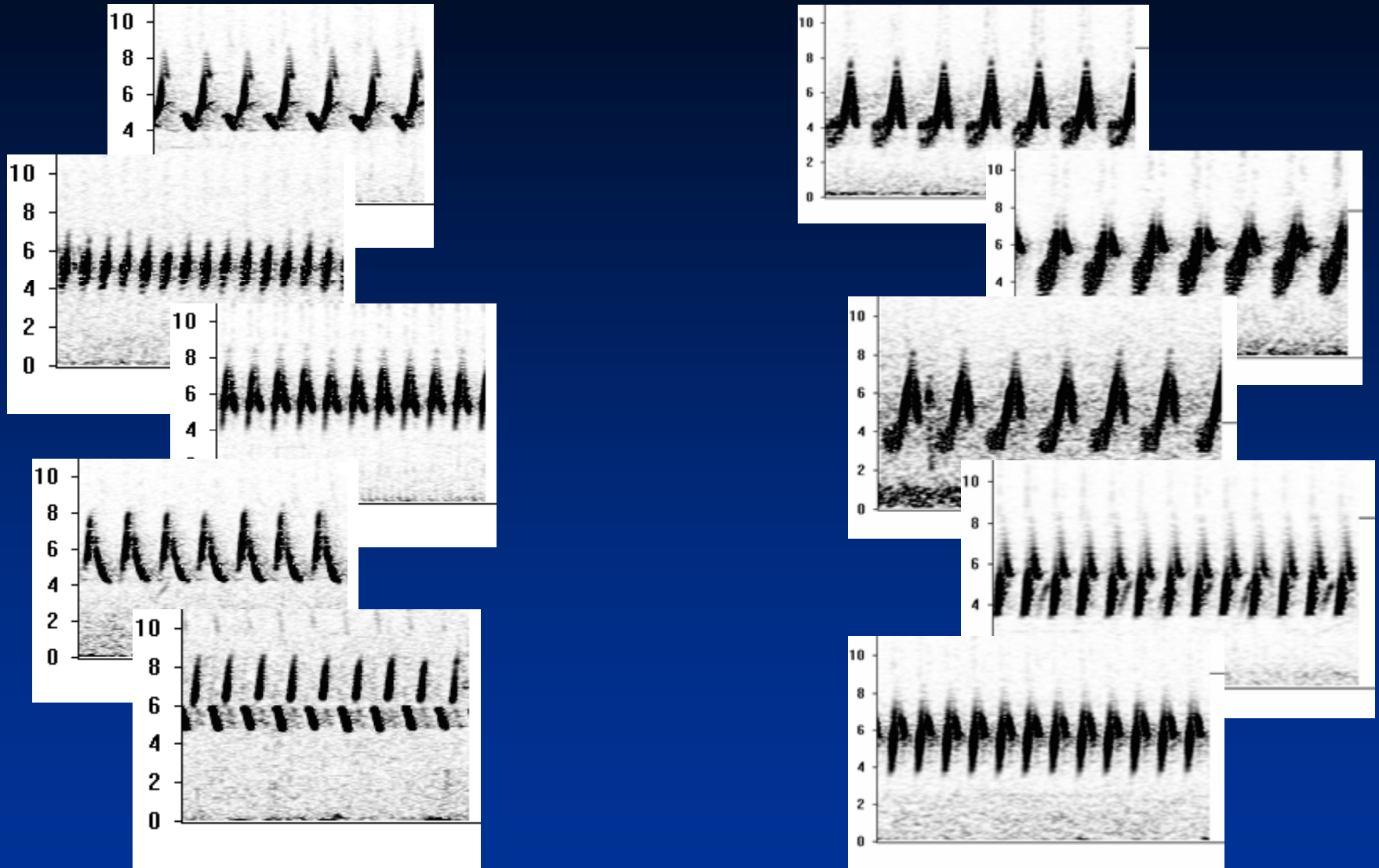


yearling



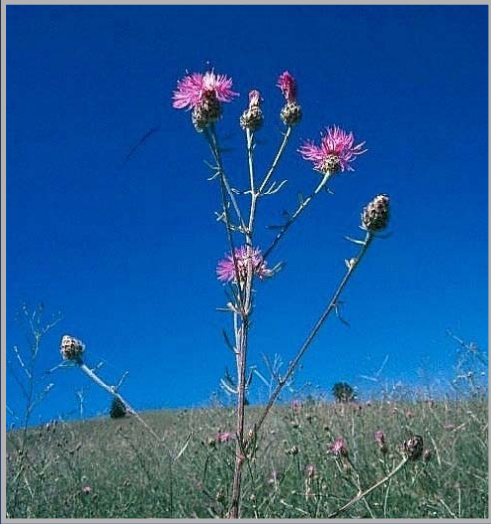
older

# Reduced Song Similarity in Knapweed vs. Native Habitat



weed effect (song similarity index):  $P = 0.008$

# Impacts of Spotted Knapweed





**pre-invasion**



**invaded**

# Use Understanding to Evaluate Management Options



pre-invasion



invaded

# Weed Control: Broadcast Spraying of Tordon



# Weed Control with Tordon: Suppression of Knapweed

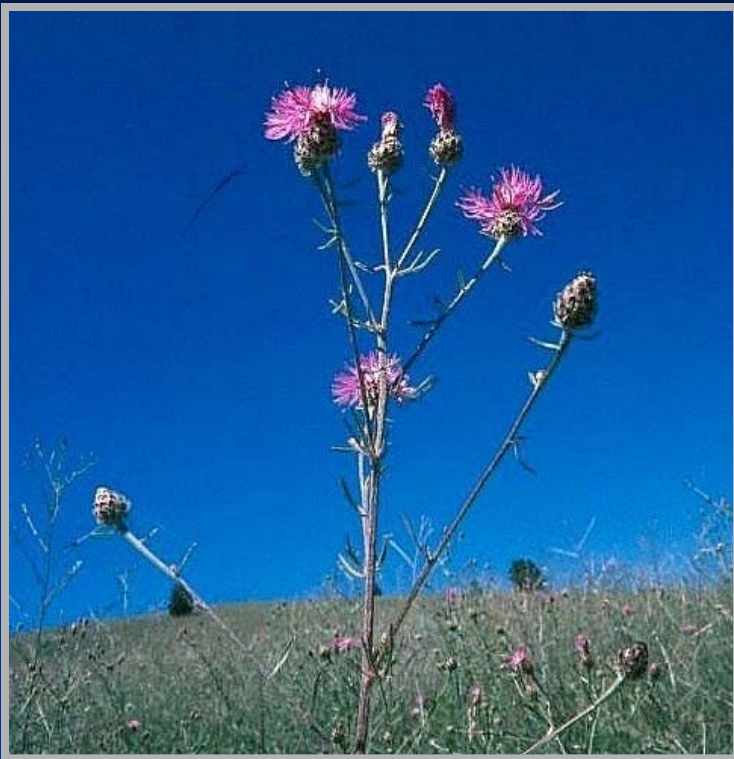




# Weed Control with Tordon: Release of Native Grasses



# Weed Control with Tordon: Release of Exotic Grasses

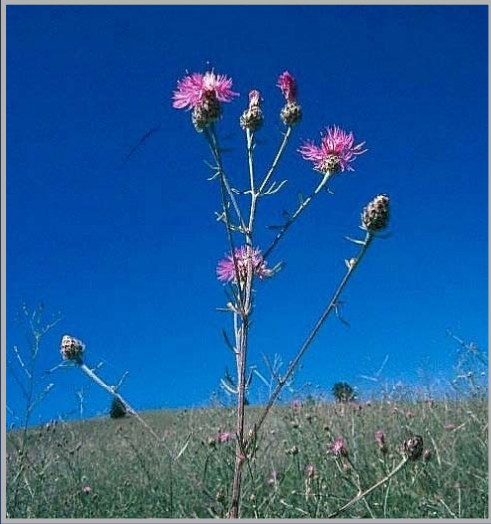


# Weed Control with Tordon: Negative Effects on Native Forbs





# Impacts of Spotted Knapweed





**Invader impacts can be complex  
and far-reaching**

**Need to define pathways of impact:  
implications & management**



**Strategies aimed at restoration  
must consider pathways of impact**

**If goal is restoration, weed suppression  
alone is unlikely to suffice**

