Butterfly Sampling Methods

Effects of grazing verses fire for prairie management

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Introduction:

Native tallgrass prairie once stretched across much of the Midwestern United States. Now, less than 2.4% of original extent of tallgrass prairie remains (Samson et al. 2004). In Minnesota, we have lost over 98% of the tallgrass prairie and what remains is highly fragmented. Historically, the prairie was maintained through wildfire and bison grazing (Middleton 2013). In its current state, land managers seek to manage the prairie in a way that mimics these historic strategies, using managed burns and, more recently, conservation grazing. The tallgrass prairie of Minnesota is home to many butterfly species which are sensitive to disturbance. Although much has been documented about the effects of fire on northern tallgrass prairie, much less is known about the effects of conservation grazing, particularly for prairie dependent butterflies in Minnesota. The butterfly sampling methods below seek to address the questions of how these different management regimes affect abundance, community composition, species richness, and diversity of butterfly species found in Minnesota's tallgrass prairie.

We will survey butterflies using a modification of the "Pollard Walk" (Pollard 1977; Pollard and Yates 1993). These methods have been widely used to answer questions of butterfly abundance, community composition, species richness, dominance and diversity (Murphy and Weiss 1988; Swengel 1996; Thomas 2005; Swengel and Swengel 2013).

Butterfly surveys will occur during the 2016 and 2017 growing seasons (May-September). Butterfly surveys will be conducted on a subset of 20 randomly-selected remnant prairie polygons out of a total of 75, all with a 10-year known management history. Ten polygons will have been predominantly grazed, 10 predominantly burned.

Butterfly presence and abundance will be assessed in specific survey locations within each polygon, using the same transects used for vegetation surveys and bee bowls. Each of the 20 sites will be surveyed three times per summer, moving from furthest south to furthest north to follow phenology. Start and end time, temperature, wind speed, and % cloud cover will be recorded and surveys will be confined, when possible, between 0930 h and 1830 h when temperatures are above 18^{o} C, sustained winds are less than 17 km/h, and cloud cover is <50%. The observer will walk the transect at a steady pace of approx. 10m/min, identifying and recording each butterfly seen within a 5-meter box to the front (2.5m on either side) (Shepherd and Debinski 2005; Davis et al. 2007; Vogel et al. 2007; Davis et al. 2008; Kadlec et al. 2012). We will take care not to sample any rare or endangered butterflies, such as *Hisperia dacotae* or *Oarisma Poweshiek*.

Transects will be delineated on maps prior to the field season and will run parallel to any elevation gradient; if none exists, a random numbers table will be used to select a compass bearing.

Field Materials:

GPS, spare batteries

Insect nets

Stopwatch (to time walk)

Watch or cell phone (for start and end time)

Wind gauge

Thermometer

Binoculars

CO_2 dispenser

Extra CO_2 cartridges

Clear centrifuge "sleep" tubes (ca. 4cm diameter)

Digital camera/phone for photographing difficult to ID individuals

Kill jars

Ethyl acetate for kill jars

Glassine envelopes

Data sheets

Butterfly identification guides/sheets

Flowering plant identification guides/sheets

Clip boards

Sharpies

Pencils

Duct tape

Flags

Flagging tape

Scissors

First aid kit

Specimen preparation materials:

Pins (size 1, 2, 3)

Pin holder

Label height setter

Glassine paper

Foam block

Butterfly spreading block

Cotton

Scissors

Forceps

Inkjet printer and acid-free cardstock for locality labels

Humidifier

Sampling Procedure:

1) Prior to visiting each field site, a random point generator will be used to create random points within each polygon using ArcMap. Transects will run through a random point, parallel to any elevation gradient, and will equal a total fixed length of 400m. We will start our transects 10 m from the edge of the polygon to minimize edge effects. The number of transects will vary depending on polygon shape and size.

2) Download GPS points for transects within each polygon onto GPS unit from computer or laptop prior to going into the field.

3) Locate the first transect within the polygon. Ends of transects will be marked with flags and numbered. Each numbered transect corresponds with a GPS location.

4) Charge kill jars with ethyl acetate to prepare to collect any difficult to identify/voucher specimens.

5) Record start time, wind speed, temperature, and percent cloud cover. Record end time when finished surveying transect.

6) Each 400m transect will be surveyed once per site visit. The observer will walk the transect at a steady pace of 10m/min. All butterflies seen 5m ahead and 2.5m on either side of the observer will be identified and recorded. The clock should be stopped to process and record individuals. Butterflies can be netted if difficult to identify on the wing and, in rare circumstances, collected to identify in the lab (see below). Butterflies netted for identification will be released after identification.

7) If a butterfly cannot be identified by netting and examining in the field, it can be collected, placed in a sleep tube, given a light pulse of CO_2 to knock it out, and then identified or photographed for later identification. Butterflies should be removed from sleep tube as soon as they have ceased moving to prevent any harm and identified or photographed in hand. Recovery takes 30 seconds to a few minutes, after which butterfly will be released.

8) If a butterfly cannot be identified by netting and examining in the field or by the CO_2 method described above, we will collect the specimen for identification in our lab at a later date. Each butterfly will be placed in its own glassine envelope with unique number (initials + polygon ID + transect number), time of capture and % open sky, and the envelope placed in a kill jar charged with ethyl acetate. We will collect at least one voucher specimen of each butterfly species encountered across all sites to assemble a voucher reference collection.

9) Vouchered butterflies will be spread, pinned, identified, and databased at the University of Minnesota Insect Collection.

10) After transect walk is complete, a time-constrained opportunistic walk will be conducted to look for other butterflies not seen along transect. Record starting and ending time. Time will vary based on polygon size, shape, habitat quality, etc.

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Effects of Grazing Verses Fire for Prairie Management Study - **2017 Butterfly Transect Datasheet**

Date:_____

Location: _____ **Transect ID: _____**

Transect length: _____ **Management: _____**

Prairie type: _____ **Observer: _____**

Avg Wind speed:_____km/h

Temperature:_____ C

Cloud Cover: _____ %

Start time:_____ h

End time:_____ h

No.	Time	Butterfly Species	#	Activ.	Dist (m)	Status	PT	Comments
1								
2								
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23								

Management: G=Grazed, B=Burned **Prairie type:** D=Dry, M=Mesic, W=Wet **Dist**: Est. distance from observer **PT** = Prairie type

Activity: N = nectaring, R = resting, I = interacting, F = flying, FL = flushing, M = mating, OV = ovipositing, O = other

Status: CR=captured and released, P=photographed, C=CO2 method, V=vouchered, GS=good sight, S=sight, PS=Poor sight

Effects of Grazing Verses Fire for Prairie Management Study - **2017 Butterfly Opportunistic Walk Datasheet**

Avg Wind speed:_____km/h
Temperature:_____ C
Cloud Cover: _____ %
Start time:_____ h
End time:_____ h

Date:_____ Observer: _____

Location: _____ Management: _____

No.	Time	Butterfly Species	#	Activ.	Dist (m)	Status	Comments
1							
2							
3							
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Management: G=Grazed, B=Burned

Activity: N = nectaring, R = resting, I = interacting, F = flying, FL = flushing, M = mating, OV = ovipositing, O = other

Status: CR=captured and released, P=photographed, C=CO2 method, V=vouchered, GS=good sight, S=sight, PS=Poor sight