POLLINATOR HABITAT MANAGEMENT
Biology Jobsheet #17

Natural Resources Conservation Service (NRCS) – Minnesota April 2015

WHAT IS POLLINATOR HABITAT MANAGEMENT?

Active management is used to develop and maintain predominantly grassland habitats established to benefit pollinator species. Consider the effects of grassland management on at risk species, including state and federally listed species.

REQUIREMENTS

Knowing what you have, what you want, and developing a plan to improve your habitat is the essence of a successful project. Management actions shall occur prior to May 15 or October 1 to protect late flowering plants.

MANAGEMENT

Pollinator habitat may be managed by one or a combination of the following methods: Mechanical disturbance or Prescribed Fire.

Recommended frequency of management for all methods:
Managing the entire pollinator patch can severely impact pollinators and leave them with limited opportunities to recolonize the site.
Manage no more than 1/3 of the pollinator habitat each year over a three year period.

Mechanical Management includes mowing or light disking.

Recommended Timing:
Mechanical disturbance shall occur in the fall (October – early November) when flowers have died back or are dormant. Disturbance at this time will also minimize disruption to nesting bumble bees.

Mowing
- Use a rotary or flail mower to evenly distribute grass clippings. Do not swath, as the windrows will smother seeding. Clippings may also be baled, removed from the field.
- Mow no shorter than 12-16 inches.
- Reduce mower speed to 8 mph or less.
- Use a flushing bar to move wildlife out of the mowing path.
- Avoid mowing at night

Light Disking/Harrowing
Light disking or harrowing (2-4" deep) of existing stands can increase the amount of open ground and encourage pollinator nesting areas and a diverse plant community of annuals and perennials.

Prescribed Burning
Pollinator habitat may also be managed through periodic burning.

Low intensity prescribed burns can allow germination of seed bearing annuals, increase plant species diversity, control unwanted woody vegetation, and open up the stand for pollinator nest sites.

Timing to promote pollinator habitat:
- Early or late in the day is preferred.
- Fall (October-Early November) burns tend to favor pollinator habitat.

It is highly recommended that burning be done according to burn plans prepared by technically qualified and adequately insured individuals. Burning will be done according to the requirements of a vendor/agency developed burn plan, or for a landowner implemented prescribed burn, in accordance with a valid "Minnesota Open Burning Permit" as issued by the Minnesota Department of Natural Resources (DNR) or their designee. Landowners are also encouraged to view the MDNR video "Prescribed Burning in Grassland" which is available at your local DNR Forestry Office.

Landowners and/or vendors are responsible for obtaining all necessary permits prior to burning and for complying with all applicable laws in carrying out the burning. Costs associated with obtaining required permits and other necessary approvals, notification of neighbors and governmental units are entirely the landowner's responsibility.

Practice Specifications Approval and Completion Certification

LANDOWNER/OPERATOR ACKNOWLEDGES:

a. They have received a copy of the specifications and understand the contents including the scope and location of the practice.
b. They have obtained all necessary permits and/or rights in advance of practice application, and will comply with all ordinances and laws pertaining to the application of this practice.
c. No changes will be made in the installation of the job without prior concurrence of the NRCS.
d. Maintenance of the installed work is necessary for proper performance during the life of the practice. The practice life is _____.

I have reviewed all specifications and agree to install as specified:

Landowner/operator name and title (type or print):		
Landowner/operator Signature:		Date:
Landowner/operator name and title (type or print):		
Landowner/operator Signature:		Date:

NRCS Review Only

DESIGN INSTALLATION AND LAYOUT APPROVAL:

Designed By:	Date: 9/23/2019	Job Approval Authority (JAA):
Approved By:	Date:	Job Approval Authority (JAA):

RECORD OF COMPLETION AND CHECK OUT CERTIFICATION:

Treated Acres:	Date Completed by Client:	Date Certified:

Certification Statement:

I certify that implementation of this conservation practice is complete, meets criteria for the stated purpose(s), and meets the NRCS conservation practice standard and specifications.

NRCS Signature:	Date:	Job Approval Authority (JAA):

NRCS Honey Bee Habitat Effort: Monitoring Protocol

Monitoring goals:

- Demonstrate to landowners when honey bees are present in fields so that steps can be taken by the landowner to protect foraging bees from insecticide and fungicide applications on adjacent land (for example, coordinate with aerial or ground rig applicators to adjust spray times in the field to not coincide with foraging honey bees).
- Provide data to the land manager on the relative abundance of honey bees visiting different plant species used in bee forage plantings to facilitate timely adaptive management decision, such as the end of the bloom period that triggers the decision to terminate the cover crop.
- Inform NRCS conservation planners of bloom time and how this relates to planting time and location for the plant species used in bee forage plantings.
- Inform NRCS conservation planners about the relative abundance of honey bees visiting different plant species used in bee forage plantings to help document value of plantings for honey bees.
- If a mix of species is planted, inform NRCS conservation planners on how plants compete with each other over time to help in adjusting seed mix ratios for future plantings, while also helping land managers understand the best species for their operation.

Overview of data to be collected during each monitoring event:

- Number of honey bees foraging on flowers in the planted area.
- Plant species in bloom in bee habitats, and planting date of each species.
- End of blooming period by planted species.
- A representative digital photo (.jpeg format) of each sampling area.

Monitoring protocol summary:

The monitoring will begin mid-July and end in October or when bee forage plantings stop blooming. During the summer of 2014, monitoring events will take place approximately every two weeks in North Dakota and South Dakota, and every four weeks in Minnesota, Wisconsin and Michigan (this corresponds to different monitoring payment scenarios offered in each state). This sample timing may change if the program is rolled out again in 2015.

For each monitoring event, land managers, their crop consultants or other representatives of the USDA program participant will collect data for one sample for every 20 acres contracted. If more than one planting type is established (e.g., a field of alfalfa and a field of buckwheat), then samples should be collected from each habitat.

Each sample consists of counting the number of honey bees visiting flowers along two 100-foot linear transects. These transects will run parallel to the edge of the habitat, and each should be marked off with a flag at the beginning and at the end. One transect will be located 10 to 25 feet from edge of the planting and the other will be located at the center of the planting or 250 feet from field edge (whichever is shorter). Transects should be located in areas of the habitat that are well-established and not where shade is impacting establishment or bee visitation. Sampling time

for each transect is 10 minutes (that is a pace of 10 feet per minute). It is important to document the flowering plant being visited by each bee counted.

Other data to be collected along each transect during each sampling effort are (a) a photo of each transect, (b) the date when the habitat was planted and the species (including variety) planted, (c) the stage (percent) of bloom of each species planted (e.g. 20% bloom/before peak, 100% bloom/peak, 50% bloom/after peak), and (d) an estimated relative percent of bloom for each species if the habitat is a mix of plants (e.g. 50% alfalfa, 40% alsike clover, 10% buckwheat). Details follow below.

Protocol[1]

Sampling times:

If you are in North Dakota or South Dakota, you should be sampling honey bee habitat sites every two weeks. If you are in Minnesota, Wisconsin, or Michigan, you should be sampling honey bee habitat every four weeks.

Conduct your sampling when weather conditions are favorable for bees to forage. It must be at least 61°F, with clear skies (partly cloudy or overcast is OK if you can still see your shadow) and wind speeds less than 8 mph. To help determine if wind speeds are appropriate, if leaves and branches on trees are in constant motion, then it is likely too windy. If you feel wind on your face and leaves are just rustling, then the wind speed is likely fine for sampling. If weather conditions are appropriate, sample anytime between 10:00 am and 4:00 pm.

Beaufort Wind Scale (to help determine wind speed)

Wind (mph)	Classification	Appearance of Wind Effects
0	Calm	Smoke rises vertically
1-3	Light air	Smoke drift indicates wind direction, still wind vanes
4-7	Light breeze	Feel the wind on your face, leaves rustle, and wind vanes begin to move
8-10	Gentle breeze	Leaves and small twigs will be in constant motion, light flags extended

Sampling locations:

[1] This honey bee monitoring protocol is based on a similar protocol developed by Kimiora Ward and Neal Williams (University of California, Davis), Emily May and Rufus Isaacs (Michigan State University), and Dan Cariveau and Rachel Winfree (Rutgers University) designed to monitor native bee abundance and diversity at restoration sites. Development of the streamlined native bee monitoring protocol was funded through a USDA NRCS Conservation Innovation Grant awarded to University of California, Davis.

You will monitor honey bees along two 100-foot transects for each sampling effort. These should be parallel to the edge of the planting, in the same location each visit, and in areas where cover crops or other plantings for bees are well-established. One transect should be 10 to 25 feet from the planting edge. The other should be 250 feet from the edge or in the center of the planting, whichever is shorter. It is important that transects are in full sun because bee activity declines in the shade. Each transect should be 100 feet long, marked with a flag at the beginning and end, and be sampled for 10 minutes.

You will need to sample one site for every 20 acres contracted in honey bee habitat. If you have less than 20 acres contracted, then you will need to sample one location. If you have 20 to 40 acres contracted, you must sample at least two locations, and so on. In choosing sites to monitor, try to sample from as many different types of cover as you have planted. For example, if you planted a field of buckwheat and a field of phacelia, please collect data from each crop type. In plantings less than 20 acres in size per crop, you may sample from the fields that are in bloom and switch from one field to the other over the course of the growing season.

Sampling process:

When you arrive at a new sample site, fill out a new datasheet. Write in the appropriate information at the top of the data sheet: site name, zip code, EQIP contract number (if available), the date and your name. Note the weather conditions to demonstrate that the monitoring was conducted during optimal conditions for bees. Also note the type of planting (e.g. cover crop, pasture/hayland, rangeland interseeded with bee forage, etc.). If your type of planting is not on the datasheet, choose 'other' and describe it. Then take a digital photo of the transect with and without the datasheet in the foreground. Make sure that the information at the top of the datasheet is clearly visible in the photo.

If sampling a cover crop planting designed for bee forage, in the data sheet table note the species and variety planted and the state of species in bloom. The state of bloom is the percentage of buds that are in flower and whether buds are still maturing or starting to die back. For example, you might have 20% of buds in flower with 80% still to open. This would be 20% bloom/before peak. If all of the buds are open with few or no dead flowers, then you are at 100% bloom/peak. If 50% of the buds are in flower and the rest have already died back, then your planting is at 50% bloom/after peak. This does not have to be exact. Please round to the nearest 10%.

Depending upon your honey bee monitoring needs, at the end of this guidebook we provide three different data sheets with space for 3, 7, or 15 plant species. For example, these can be used if monitoring a single species cover crop or pasture planting, a diverse mix of cover crop mix or wildflower species, or a very diverse mix of wildflowers, respectively.

When sampling each transect, first record the time you start. Then start the timer and begin walking along the transect. Plan your transect walk so that your shadow does not move in front of you or across where you are counting bees. As you walk slowly, focus on about three feet to one side of the line you are walking, trying to observe all the open flowers. Record each honey bee you see visiting a flower (visiting = landing on a flower for > 0.5 secs). Pause the timer if you need extra time to record an insect, and then start the timer again when you are ready to resume observations. Tally honey bees visiting each plant species in the habitat. For cover crops or cover crop mixes, it should be relatively easy to identify the plant species in bloom and count the honey bees visiting each plant. If sampling a wildflower meadow with a diversity of plants in bloom, do your best to associate honey bees with individual species, but more importantly note the total number of honey bee flower visits for all plants combined. Then add notes about what is in bloom and which species seem to be preferred in the notes section of the data sheet.

Pace yourself so you reach the end of the 100' transect in ten minutes. It is suggested that you walk a trial transect prior to your first monitoring event to calibrate your pace. If you do reach the end of the transect before the timer goes off, continue walking and counting honey bees

until the timer is finished. Do your best to walk 10 feet for each minute of sampling. If the timer goes off before you have reached the end of the transect, quickly walk to the end of the transect and take a rough count of the honey bees visiting flowers. Try not to count the same bee twice even if it visits several flowers – the goal is to count the number of bees using the site, not the rate of flower visitation. If possible, also count the other flower visitors you see along each transect. These will include native bees, flies, wasps, butterflies, and more.

When finished, look over the area around the planting and note if apiaries are obviously present or not and approximately how far they are located from the planting. The presence or absence of an apiary within a mile of the planting (whether you can see it or not) is going to have a significant effect on the number of honey bees present and is useful to know when the NRCS reviews the results of monitoring conducted by you and other landowners.

Supplies:

During your site visit you will need:

- A stopwatch, wristwatch, or timer on your phone
- 1 data sheet per sampling location (**NOTE**: At the end of this guide, we provide three different data sheets that can be used depending upon how many plants you are monitoring in your planting. We also provide an example data sheet that has been completed.)
- Monitoring protocol
- Clipboard
- Pencils or pens
- Measuring tape or other tool to lay out 100 foot transect
- Stakes and flagging tape, or other method of marking transects in the field
- Digital camera or phone with high quality camera

You may also want to have the following supplies on hand to help (not required):

- Handheld counter (e.g. http://www.amazon.com/GOGO-Counter-Handheld-Clicker-Mechanical/dp/B001KX1VW2)

Submitting your monitoring data:

Submit all datasheets and digital photos to your local NRCS field office contact. Digital photos can be brought to the field office on a flash drive, or emailed to your NRCS contact.

Recognizing honey bees

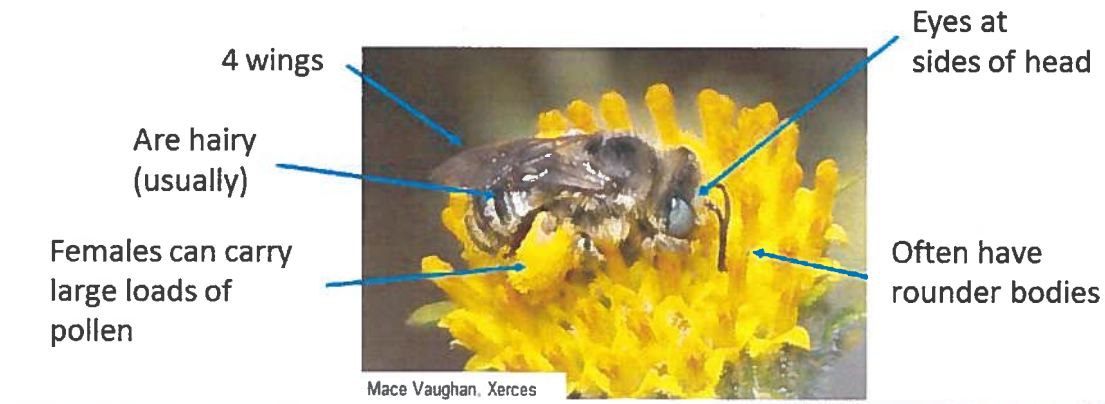
In order to assess the abundance of honey bees using a habitat restoration you will need to know how to distinguish honey bees from native bees, flies, and wasps that also look like bees and are visiting the flowers in the habitat areas. Here we provide an overview of honey bee identification, and guidance in differentiating them from the other similar flower-visiting insects.

Is it a bee?

In addition to the European honey bee, there are 4,000 species of bees native to North America, and along with that biodiversity comes great variation in appearance. One feature all bees share is their dependence on pollen for rearing young. Their adaptations for carrying pollen can make them easy to distinguish from other insects. Bees tend to be quite hairy, allowing pollen grains to stick to them, and females have special pollen carrying structures on their legs or bellies. The location of these pollen-carrying structures and the appearance of the pollen load (dry powder vs. moist packets) can be helpful in identifying various groups of bees. Bees' eyes are positioned at the sides of their heads, giving their heads a heart-shaped appearance, and their bodies tend to have a rounder shape than many wasps or flies. Although it can be hard to observe unless they are at rest, bees differ from flies in having four wings.

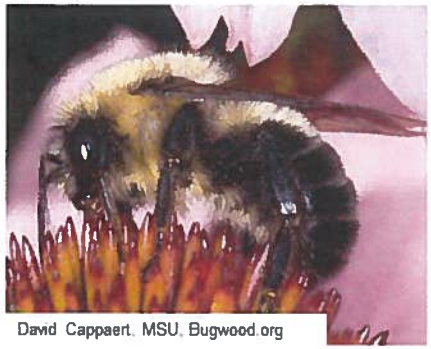
Do not count native bees when monitoring restorations.

Honey bees

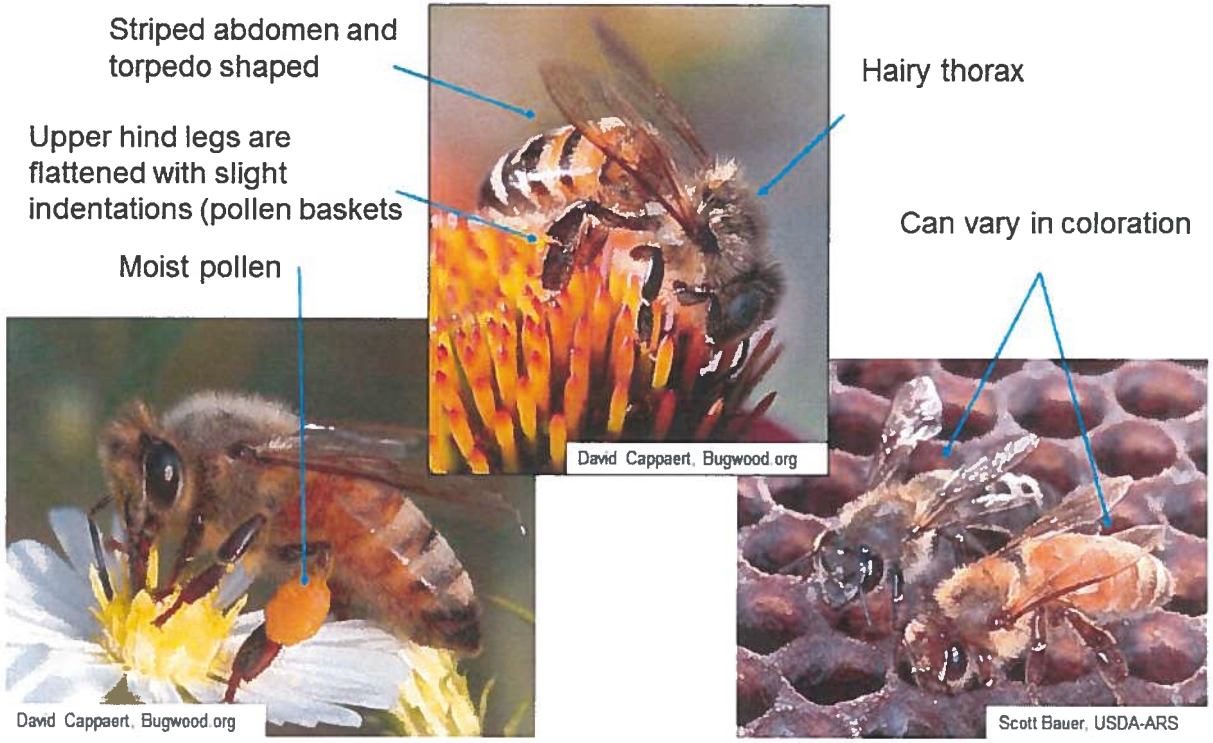



Mace Vaughan, Xerces


Mace Vaughan, Xerces


David Cappaert, MSU, Bugwood.org

For this protocol, it is important to distinguish European honey bees from wild native bees. While support of honey bees is the primary goal of this honey bee habitat effort, keep in mind that honey bees are an unreliable indicator of the restoration's ability to attract pollinators because their numbers can vary with the changing location of bee hives or apiaries. Honey bees, like wild bumble bees, carry pollen in flattened structures ringed with long hooked hairs on their upper hind legs called pollen baskets. If the pollen baskets are empty you can see the flattened wide shape of the upper hind legs. If the pollen baskets are full, you can see that the pollen is carried in moistened clumps, unlike the powdery dry pollen loads of many wild native bees. Honey bees can vary in coloration, but many are a shade of amber with a striped, "torpedo" shaped abdomen, and a thorax covered in brown or pale brown hairs.



Wasps

Wasps are close relatives of bees and share many features, including 4 wings, striping, and heart-shaped heads with the eyes on the sides. However wasps are carnivores and do not have adaptations to collect and carry pollen. They are not very hairy and have little or no pollen on their bodies. Wasps' coloration results from patterns in their exoskeleton, giving them a shiny appearance compared to bees, which usually get their stripes from colored hairs (NOTE: honey bees provide a notable exception to this, getting their abdominal orange and black stripes from colored exoskeletons). Wasps have been described as having a "tough" or "mean" look with their more slender pointed bodies compared to the more rounded shape of bees. One very common family of wasps folds their forewings lengthwise when at rest.

Do not count wasps when monitoring restorations.


Bugwood.org


Whitney Cranshaw, CSU, Bugwood.org

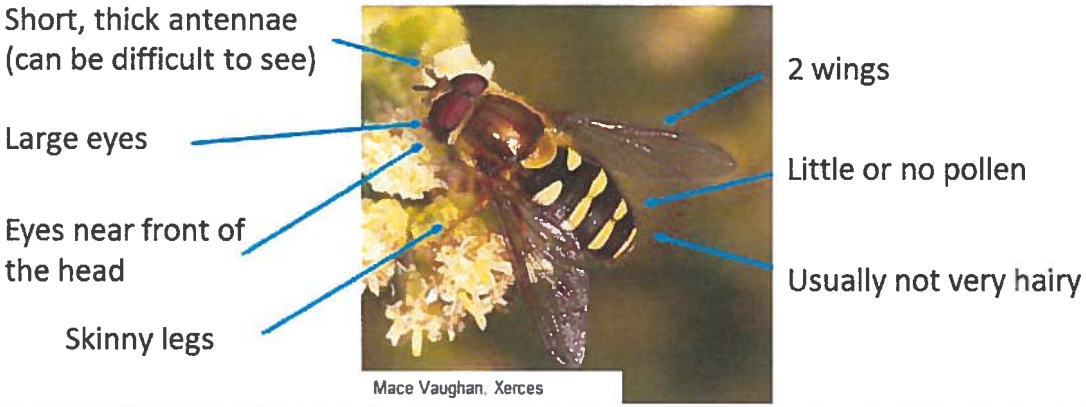

Bugwood.org

Flies

Some flies are clever bee mimics, but several features make them easy to distinguish. First, fly eyes are large and round, often making up the bulk of the head and giving the head a helmet-like appearance. Their antennae are short and thick, coming out like a V or from the middle of their face, often with a flattened lobe hanging down. Flies also have only one pair of wings.

Although they may be visiting flowers for nectar, they are not carrying pollen back to their young, so in general they are not as hairy as bees and they never have hairy pollen-carrying structures on their legs. Some flies, however, are very clever bee mimics, including mimicking fuzzy bumble bees. Look for the big eyes, stubby antennae, and lack of pollen baskets.

Do not count flies when monitoring restorations.




Joseph Berger, Bugwood org


Nancy Lee Adamson, Xerces


Bugwood org

NRCS Honey Bee Habitat Monitoring Data Sheet

Participant: _____ **EQIP Contract #:**_____

Site name: _____ **Zip code:** _____

Observer: _____ **Sampling date:** _____

Type of cover (circle): Cover Crop Pasture/Hayland Native Mix Other (describe): _____ **Date Planted:** _____

Skies (circle): Clear Partly cloudy Bright overcast **Temp:**_____°F **Wind speed (circle):** Calm (0-3mph) Light breeze (4-7mph)

Conduct observations midday (10am to 4pm), when temperatures are over 61° F, skies are clear (partly cloudy or bright overcast is OK as long as you can see your shadow), and wind speed is less than 8 mph (light breeze or less). Conduct observations along two 100 foot transects in open, well-established areas of the planting. Observe plants in each transect for ten minutes. Record the number of honey bees visiting flowers (landing on flowers) within three feet of one side of your transect line. You can note native bees, flies, wasps or other floral visitors in the notes. **Take two digital photos of each transect: one with this completed datasheet in foreground and one without.**

Sample #__	Time start	Time end	Plant species/variety	Percent bloom & Before or After Peak	# Honey bees per plant species/var.	Optional notes (e.g. # other flower visitors)
Transect 1 (10-25 feet from edge of planting)						
Transect 2 (250 feet from edge or center of planting)						

Proximity of honey bee hives or apiaries (check one)? <¼ mile___ ¼-½ mile___ ½-1 mile___ 1-2 miles___ None visible___

Photo taken of transects? YES_____ **Site notes** (e.g. for plant mixes note dominant plants in bloom and percent cover): _____

_____

_____

NRCS Honey Bee Habitat Monitoring Data Sheet

Participant: John Doe

EQIP Contract #: 74632214xxx

Site name: Paradise Farm - Bee Habitat / Sample 1 **Zip code:** 63132

Observer: Mace Vaughan **Sampling date:** July 15, 2014

Type of planting (circle): (Cover crop) Pasture/Hayland Native Mix Other (describe):_____ **Date Planted:** June 3, 2014

Skies (circle): Clear (Partly cloudy) Bright overcast **Temp:** 75°F **Wind speed (circle):** Calm (0-3mph) (Light breeze (4-7mph))

Conduct observations midday (10am to 4pm), when temperatures are over 61° F, skies are clear (partly cloudy or bright overcast is OK as long as you can see your shadow), and wind speed is low (a gentle breeze). Conduct observations along two 100 foot transects in open, well-established areas of the planting. Observe plants in each transect for ten minutes. Record the number of honey bees visiting flowers (landing on reproductive structures of flowers) within three feet of one side of your transect line. You can note native bees, flies, wasps or other floral visitors in the notes. Take two digital photos of each transect: one with this completed datasheet in foreground and one without.

Sample #1	Time start	Time end	Plant species/variety	Percent bloom & Before or After Peak	# Honey bees per plant species/var.	Optional notes (e.g. # other flower visitors)
Transect 1 (10-25 feet from edge of planting)	11:35	11:45	Buckwheat	60% (before)	85	
Transect 2 (250 feet from edge or center of planting)	11:55	12:05	Buckwheat	60% (before)	43	

Proximity of honey bee hives or apiaries (check one)? <¼ mile X ¼-½ mile___ ½-1 mile___ 1-2 miles___ None visible___

Photo taken of transects? YES X **Site notes** (e.g. for plant mixes note dominant plants in bloom and percent cover): The buckwheat established well and is approaching peak bloom. Honey bees abundant! Apiaries close by. Also noticed many bumble bees in the planting, and several bees I couldn't identify. Clover in adjacent field is just starting to bloom.

Annual Forbs and Legumes - Specifications Sheet

Landowner [redacted] **Tract Number(s)** 2985 **Field Number(s)** 1

Total Acres to be Seeded 137.3 **Prepared By** _____

Pure Live Seed Needs			Bulk Seed Needed				
(1) Species	(2) Strain or Variety	(3) PLS lbs/ac * Drill Rate	(6) Purity	(7) Germination	(8) Bulk lbs/ac needed (3)/(6x7)	(9) Acres to be seeded	(10) Total Bulk lbs needed (8)x(9)
Yellow Mustard	*Sinapis alba* or *Brassica juncea*	2.0					
Buckwheat 1/		16.0					
Cowpeas		18.0					
Annual Sunflower		0.5					
Optional additional species							
Dwarf Essex Rapeseed		1.0					
Berseem Clover		3.5					
Red Clover		4.0					

NOTE: Legume seed shall be inoculated in accordance with the directions on the innoculant container. Use the correct innoculant for each legume.

1/ Plantings containing buckwheat may not be seeded within 30 feet of an existing commodity wheat field, or in a field with a planned rotation to a commodity wheat within two years.

* %PLS = %Germination x %Purity. To obtain pounds of bulk seed needed per acre, use the following: (PLS lbs/ac) divided by (Germination x Purity). **Broadcast seeding at 1.5 times the drill rate.**

Seeding Dates: South of Interstate 94 = 5/1 – 5/15 North of Interstate 94 = 5/15 – 6/1

Seedbed Preparation Method: _____

Seeding Method: _____

Total Acres _____ X Estimated Cost per Acre _____ = Project Cost Estimate: _____

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