

Surveys of select Pocket and Open Jackpine Barrens
for Chryxus Arctic (*Oeneis chryxus*) and Tawny
Crescent (*Phyciodes batesii*) in the Northern
Chequamegon-Nicolet National Forest



Chryxus Arctic (*Oeneis chryxus*)



Tawny Crescent (*Phyciodes batesii*)

Submitted to:
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Introduction

Chryxus Arctic (*Oeneis chryxus*) is a Regional Forester Sensitive Species in the Washburn Ranger District of the Chequamegon-Nicolet National Forest (WRD-CNNF). In Wisconsin, it is State-listed as a Special Concern species, and carries a rank of S3 (rare or uncommon with 21 to 100 total occurrences). While it is considered Globally Secure, it is tracked by the Wisconsin Natural Heritage Inventory, and is listed as a Species of Greatest Conservation Need. While there are many apparent subspecies of Chryxus, the range of the species is Canadian and high montane west and the far Northern Great Lakes. Chryxus Arctic (*Oeneis chryxus*) is a species of the Brushfoot family (Nymphalidae), in the subfamily Satyrinae, and is most closely related to Satyrs. This is one of two species of this genus that occurs in Wisconsin, the other being *Oeneis jutta*, the Forest Arctic. Chryxus Arctic is a species of boreal tundra, found from western Alaska south through Washington and the Rockies (including the northern Great Lakes), east to the southern tip of Hudson Bay and through the northeast U.S. Its host plant is most generally accepted as *Danthonia spicata* (Scott 1986, Opler 1992), but may also be found with *Oryzopsis pungens*, *Phalaris arundinacea* and *Carex spectabilis* (Scott, 1986). *Oeneis chryxus* and *Oeneis jutta* are easily separated in the field as *jutta* is found in wet sedge meadows and *chryxus* flies in dry jack pine barrens. In Northern Wisconsin, Scott (1986) suggests that it flies every year, whereas in other areas of its range it may fly only in odd years.

In 2008, the Enbridge/Exel Pipeline/Powerline corridor in the Moquah Barrens Wildlife Management Area (MBWMA) was surveyed, along with many very small pocket barrens (North 2008). These surveys resulted in one individual being located along the corridor just west of FR 236. While many pockets appeared to be suitable habitat, no individuals were located.

In 2009, three power line and/or pipeline corridors were selected to be surveyed by Forest Service personnel to guide management in corridor maintenance by power companies (North 2009A). Three corridors were selected for survey; one power line/pipeline corridor (Enbridge/Exel Pipeline/Powerline) and two pipeline-only corridors. Additionally, three pocket barrens in the Northeast corner of the WRD-CNNF four polygons between FR 242 and the Enbridge/Exel Pipeline/Powerline within the MBWMA were surveyed. Several new Chryxus populations were identified in the powerline corridor, as well as in other areas in the Northern Chequamegon-Nicolet Forest, including the Sun Bowl area near Mt. Valhalla.

Tawny Crescent (*Phyciodes batesii*) is a species of the Brushfoot Family (Nymphalidae), subfamily Melitaeini, and is related to Checkerspots, Patches and Fritillaries. Here in Northern Wisconsin, *Phyciodes batesii*, *morpheus*, and *tharos* all co-occur. Tawny Crescents occur from Southern Alberta east to Southern Maine, including Northern Minnesota and Wisconsin and Northern Lower Michigan, North including all of Alberta and Saskatchewan and the Southern half of Manitoba and Ontario. This is a truly Canadian butterfly, except for the Northern Great Lakes. Its host plants are listed as all Asters (Brock, 2003) and Wavy-Leaf Aster (Opler 1992, Scott 1986). There is some question as to the validity of the two species *tharos* and *morpheus*, but many experts seem to be encountering few transitional species that cannot be separated when relevant ecological data is given. Tawny Crescent is experiencing a precipitous decline throughout its range while reasons are few and circumstantial at best (Brock and Kaufman 2003, BMNA 2011)

Tawny Crescent is a Regional Forester's Sensitive Species found on the WRD-CNNF. Its' state status in Wisconsin is a Species of Special Concern, carrying a rank of S3S4 (S3 is Rare or uncommon in Wisconsin, S4 is Apparently secure in Wisconsin with many occurrences)

which is a bit ambiguous but suggests the need for more data on the species, but Tawny Crescent is not tracked by the Natural Heritage Inventory. In 2008, the Washburn Ranger District undertook a survey to document species occurrence within the Nancy Lake Project Area and the Greater Northwest Sands Project Area. Tawny Crescents were found at eight locations during the surveys.

For 2009, the Forest Service Biologists were interested in occurrence data for the three powerline/pipeline segments that bisect the WRD (North 2009B). They were scheduled to receive maintenance by the owning companies, and so needed to be surveyed for rare or sensitive species. Additional pockets were surveyed in the Northern Chequamegon-Nicolet and in the Washburn Red Pine Project area. In these surveys, five populations were located.

This research covered 71 sites over two years, each being surveyed once for *Chryxus Arctic* and once for Tawny Crescent. They will be a continuation of sorts of surveys from the past several years, and will provide a somewhat exhaustive look at what the total distribution for these two species might be in the Northern Chequamegon-Nicolet National Forest.

Methods

Surveys began on May 5, 2010, which was 10 days earlier than the earliest previously recorded sighting for *Chryxus Arctic* in Wisconsin (Reese, 2010) The first sighting for *Chryxus* in 2010 was April 20 on the Northern Powerline/Pipeline corridor in the Moquah Barrens Wildlife Management Area, made during a non-survey reconnaissance visit. There were many individuals observed flying, even though the temperatures on that day were in the 50's and the wind was 10-20 mph from the north.

Sites were identified by biologists from the Washburn Ranger District of the Chequamegon-Nicolet National Forest, based on habitat type. Habitat type ranged from pocket barrens, where the surrounding habitat type was mixed conifer or upland hardwoods, to true barrens habitat where the polygons to be surveyed were delineated based on topography or past management regimes, rather than on a more recognizable difference in habitat characters such as vegetation. Each of the sites was to be surveyed for both Tawny Crescent and *Chryxus Arctic*, over a period of two years. Within each polygon a circular meander was performed, starting with the perimeter and concentrically winding towards the center. This allowed all of the habitat to be surveyed, while hopefully forcing any butterflies that would go unseen while flying to be pushed toward the center and seen later.

Twenty-two sites were surveyed for *Chryxus Arctic* for a total of 367 acres and twenty-six sites were surveyed for Tawny Crescent totaling 553 acres. At each site, vegetation was noted, including all nectar sources that were in flower. Additionally, in an attempt to both rank the importance of vegetation and to develop a Rapid Assessment technique, a classification system was developed. *Pinus banksiana*, *Danthonia spicata*, *Vaccinium angustifolium*, *Comptonia peregrina*, *Arctostaphylos uva-ursi* and *Prunus pumila var. susquehanae* were ranked as follows:

Abundant: Greater than 50% of the total species cover

Common: Between 5% and 50% of the total species cover

Present: Less than 5% of the total species cover

Absent: Not found within the area being described

By developing some Rapid Assessment techniques, managers could more quickly and effectively identify suitable habitat. These techniques are designed to rank the most important features of a habitat, and then allow the user to select any number of these variables to more accurately identify habitat quality. The more variables that are included in this assessment, from highest to lowest ranking, the more accurate the determination should be.

With each survey, careful attention was paid in noting subtle differences in changes in habitat; whether vegetation structure, composition, topography, area or butterfly species associations.

All naming follows the nomenclature of James A. Scott's *The Butterflies of North America*, 1986.

All species and site data was entered into a Microsoft Excel (MS Office 97) spreadsheet. Data analysis and graph preparation was done using Microsoft Excel.

Results

Over two seasons, seventy-one sites were sampled, totaling 1225 acres. Each site was sampled twice, once in an early period and once in a later period, timed to coincide with emergence of the two target species. At each site, the topography and habitat type was described, noting particular characteristic plant species and those in flower. For the Chryxus surveys, several species were classified based on abundance to look for a correlation with target species presence.

In 2010, no sites were identified for Tawny Crescent (*Phyciodes batesii*), while six sites were found to harbor Chryxus Arctic (*Oeneis chryxus*) for a total of twenty individuals. In 2011, five sites were identified for Tawny Crescent (Table 2) for a total of seven individuals, while Chryxus was found at six sites for an additional eight individuals.

In all, there were 13 species of Lepidoptera documented during surveys for Chryxus Arctic and 20 species during Tawny Crescent surveys for a total of 29 species, as four species did occur during both periods (Table 2).

Chryxus Arctic occurred at 17% (12 of 71) of the sites visited with a maximum of 6 individuals and a minimum of 1. The mean individuals per site was 2.33 per occupied site. Tawny Crescent was found at just 7% (5 of 71). The maximum individuals was 3, while the minimum was 1, with a mean of 1.4. Chryxus was found during official surveys as early as May 17th (in 2010) and as late as June 6th (in 2011), while Tawny Crescent was found as early as June 25th and as late as July 6th (both in 2011).

The maximum total species found at a site was 13 (site 6) and the minimum was 0 (site 28), with the mean being 5.38 species per site. Maximum abundance was 529 individuals (500 European Skipper) at Site 50, with minimum abundance 0 at Site 28, and a mean of 62.59 individuals per site. This measure is quite skewed as there were several readings in the hundreds of individuals for both Indian Skipper and European Skipper. These were the only two species to have abundances of greater than 30 individuals at a single site.

Somewhat surprisingly, the Canadian Tiger Swallowtail (*Papilio Canadensis*) was the most commonly encountered butterfly in the study, found at 41 sites (Table 1), while Juvenal's Skipper was next, found at 38 sites. The most abundant butterflies were the Tawny-Edged Skipper (*Polites themistocles*, 1924 individuals) and the European Skipper (*Thymelicus lineola*, 1433 individuals); see Table 1. Figure 1 is a graph of the species-area relationship at sites. It shows that only .5% ($R^2 = .055$) of the variation in species abundance at a site was explained by the size of the site. Additionally, the mean acreage of the sites at which Chryxus Arctic ($t = .165 < 1.99$, 83 d.f.) and Tawny Crescent ($t = .734 < 2.00$, 74 d.f.) were found was not different from the overall mean site size.

Sites ranged from small, isolated pocket barrens in a heavily wooded matrix to open, sprawling Pine Barrens in the MBWMA. No species of Asters (noted as the host plant for Tawny Crescent) were observed at any of the sites. The smallest site was Site 39 at 1.64 acres; the largest was Site 17 at 94.49 acres, with the mean site size being 17.25 acres.

Discussion

This survey showed the huge potential in Lepidopteran temporal variation. In 2010, *Chryxus Arctic* was found on April 20, a full 23 days earlier than ever noted in the state (wisconsinbutterflies.org, 2011). With the last individual seen on May 18th, this gave the *Chryxus* a flight period of 28 days. The spring was very warm, but when the *Chryxus* began emerging, the weather turned cold and cloudy for a couple weeks. Instead of shortening the total flight period, it seemed to lengthen it. Possibly instead of killing the later emergers, they just waited out the bad weather. In 2011, *Chryxus* was found first on May 24th, 34 days later than the year before. With the last emergent individual found on June 6th, this seemed to be a more typical two-week flight period.

In this study, site size was shown to not be a significant predictor of *Chryxus Arctic* presence. This result needs to be taken in context. First, the majority of the sites found to harbor *Chryxus Arctic* were located in open Barrens habitat. These polygons initially delineated areas of different vegetation (drawn in 2004); following prescribed burns the vegetation structure of the open barrens has since changed and appears more uniform. These polygons now represent areas of the longest-term low shrub density in the MBWMA. Much of the Moquah Barrens Wildlife Management Area is open, rolling and very hilly; not only is much of this habitat usable for breeding, but it also facilitates dispersal from one area to another. Often this dispersal to other sites can depend on habitat quality, which can change from year-to-year, as in metapopulations. Second, the sites in this research were biased in favor of sites larger than 10 acres.

Comparing the mean of 153 individuals and the median of 22 individuals clearly shows that the Tawny-Edged Skipper (1924 total individuals) and European Skipper (1433 total individuals) are driving the abundance measures at these sites. While site size was not a predictor of abundance, it is more likely that habitat quality plays a role. For example, during the Summer Tawny Crescent surveys when ALL species were more abundant, sites appeared to be much more productive when Orange Hawkweed was present in flower. A bit less apparent, in the spring, *Chryxus* seemed to prefer sites with abundant *Vaccinium angustifolium*.

With the high *Chryxus Arctic* abundances seen in 2009, it was assumed that populations would be harder to find as 2010 would have been a low year in their two-year cycle. However, the six new sites located were all in areas that had been surveyed in the past and suggest that *Chryxus* is occupying new habitats. This could be attributed to successful management by the Forest Service to promote *Chryxus* habitat. With such low abundances though, these could also be metapopulations that blink in and out with fluctuations in habitat quality or stochastic events. Either way, the new sites are very encouraging and should be viewed as strides toward establishing more breeding populations of *Chryxus Arctic*. 2011 proved to be another successful year for *Chryxus Arctic*; five new populations were added to the WRD-CNNF. The biennial population trend talked about in the literature (Scott, 1988) is difficult to see in this area. At each of the five new sites added in 2011, only one individual was seen. The predictability of *Chryxus* is oftentimes confounding. Several of the sites, upon first glance, did not seem to be suitable. At the same time, other sites that appeared to be high quality had either none or one *Chryxus*. In general, *Chryxus Arctic* in the WRD-CNNF is somewhat widely distributed, seems to be becoming more common (possibly due to successful management), but is frequently the least abundant butterfly at sites that it is found.

Many of the areas seen outside the MBWMA were heavily encroached by woody species. Some of these pockets were near to other more suitable habitat, and could either be linked or

expanded to where dispersal was possible. These particular polygons seem to be very good candidates for experimental manipulation to open and enhance the habitat to promote as Tawny and/or Chryxus habitat by both removing woody species and promoting abundance of *Danthonia spicata*. The woody species were most often Aspen (*Populus tremuloides*) or Hazelnut (*Corylus sp.*)

With just “Asters” listed as host plants in Brock and Kaufman (2003), Wavy-Leaf Aster listed in Opler and Malikul (1992) and “Asters” listed in Scott (1986), the true habitat or even life history of the Tawny Crescent is difficult to determine. Additionally, Tawny habitats that are listed in the same reference materials range from “wet meadows” to “dry, rocky ridges”. It could be supposed that Pine Barrens would occur somewhere in that range of habitat types, but that fact is not abundantly clear. In the Chicago region, Wavy-Leaf Aster is described as very weedy and is sometimes the most common fall wildflower (Swink and Wilhelm, 1994). It seems strange that such an elusive butterfly would have such a cosmopolitan host plant. So, with all this variance and so few reliable specimens collected over the past three years, its habitat preference has not become any clearer. Perhaps one needs to look elsewhere, possibly in some wet meadows, to see if it is occurring in greater abundance there. It has been discussed that in certain particular lots of museum specimens, only 2-3 individuals out of 100 were separated to Tawny Crescent (wisconsinbutterflies.com, 2011). At all of the sites found in 2011, each harbored only one individual. Temporally, they emerged several days later than Northern Crescents, and were essentially done by the time Orange Hawkweed (*Hieracium aurantiacum*) was done flowering. Whatever their distribution; whether more abundant elsewhere in their range or just in a different habitat type, they are rare in Northern Wisconsin jackpine and frost pocket habitats. Several sources have noted that there is some discussion as to whether or not *Phyciodes morpheus* and *Phyciodes tharos* are separate species. Through this research, several key ideas/characters were arrived at in distinguishing the *Phyciodes* species-complex, mainly *Phyciodes batesii* from *morpheus*. First, the presence of black-and-white antennal clubs was used as the main character; if they were black and white, then the species was assigned to *batesii* (CBIF, 2011). If this character was not readily apparent, as some (read many) individuals seemed to have an orange sheen or traces of orange on one side of the antennal club, then the next character was the wing margins of the upperside forewing. *Batesii* is said to have darker margins. In fact, they will often have a very dark margin with a small orange spot enclosed by the black. As *batesii* are generally smaller than *morpheus* (another useful character) the black margins are often apparent. The upperside forewings did also show a pale band on females, as the Northern Crescent individuals were uniformly orange. On the underside, a very good combination of characters was the very pale hindwing with very little or no dark marginal patch or veining, and the character of the black patch on the trailing edge of the forewing is larger than the patch on the leading edge. Related to this character is that the two patches, in *batesii*, will often form a continuous band on the underside forewing. This can be seen as well on the upperside of the forewing, though not as well especially as a diagnostic character.

Figure 1

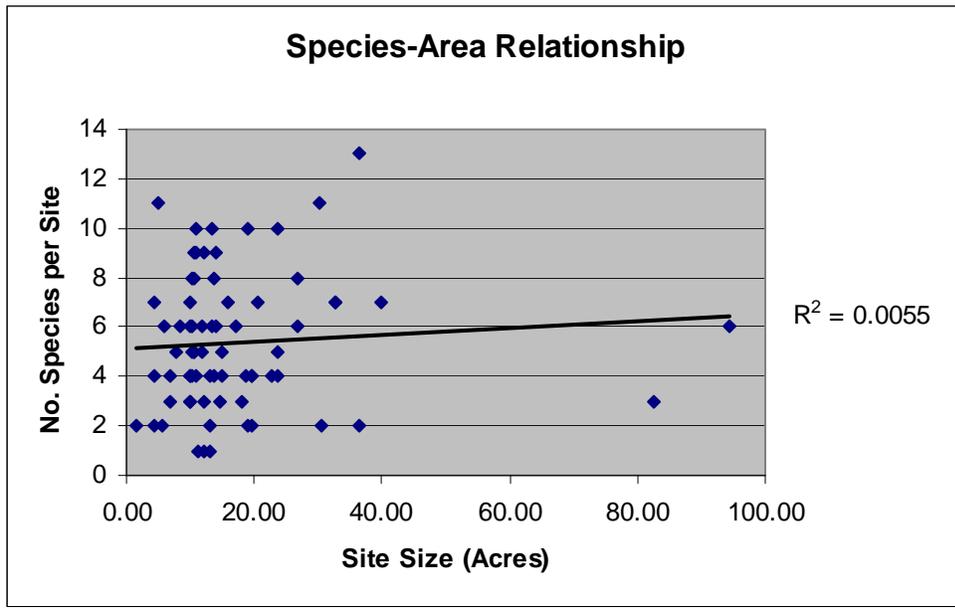


Table 1: Scientific and Common Names of Butterflies with Total Occurrence and Abundance Data

Scientific Name	Common Name	Total Site Occurrences	Total Abundances
<i>Boloria bellona</i>	Meadow Fritillary	30	60
<i>Callophrys augustinus</i>	Brown Elfin	3	11
<i>Callophrys niphon</i>	Eastern Pine Elfin	13	39
<i>Callophrys polios</i>	Hoary Elfin	10	26
<i>Celastrina ladon</i>	Spring Azure	10	22
<i>Chlosyne nycteis</i>	Silvery Checkerspot	3	3
<i>Coenonympha tullia</i>	Common Ringlet	21	108
<i>Colias interior</i>	Pink-Edged Sulphur	30	86
<i>Colias philodice</i>	Clouded Sulphur	2	2
<i>Danaus plexxipus</i>	Monarch	8	19
<i>Erynnis icelus</i>	Dreamy Duskywing	25	69
<i>Erynnis juvenalis</i>	Juvenal's Skipper	38	126
<i>Everes comyntula</i>	Eastern Tailed-Blue	4	4
<i>Hesperia sassacus</i>	Indian Skipper	17	112
<i>Limenitis artemis</i>	White Admiral	4	4
<i>Nymphalis antiopa</i>	Mourning Cloak	1	1
<i>Oeneis chryxus</i>	Chryxus Arctic	14	31
<i>Papilio canadensis</i>	Canada Swallowtail	41	137
<i>Phyciodes batesii</i>	Tawny Crescent	5	7
<i>Phyciodes morpheus</i>	Northern Crescent	31	113
<i>Phyciodes tharos</i>	Pearl Crescent	4	22
<i>Poanes hobomok</i>	Hobomok Skipper	6	18
<i>Polites peckius</i>	Peck's Skipper	7	18
<i>Polites themistocles</i>	Tawny-Edged Skipper	12	1924
<i>Polygonia sp.</i>		1	1
<i>Speyeria cybele</i>	Great Spangled Fritillary	16	33
<i>Thymelicus lineola</i>	European Skipper	16	1433
<i>Vanessa talanta</i>	Red Admiral	3	5
<i>Vanessa virginiensis</i>	American Lady	7	10

Table 2: Site Data

Site #	Site Size (Acres)	Longitude (DD)	Latitude (DD)	Rare Species Present
1	7.681174838	-91.34705422	46.47845546	
2	10.43252606	-91.34756213	46.47500314	
3	10.66895834	-91.34882093	46.47242472	
4	82.40431564	-91.25624161	46.59114629	
5	19.53552857	-91.25071993	46.58865181	
6	36.48001805	-91.26072725	46.60267803	Chryxus Arctic
7	14.71276081	-91.25670313	46.60711135	
8	4.288543759	-91.25036704	46.60968732	
9	39.7875706	-91.24899518	46.60588322	Chryxus Arctic
10	5.042990278	-91.2318707	46.60453411	Chryxus Arctic, Tawny Crescent
11	13.55053384	-91.22000046	46.60333209	
12	8.519134223	-91.20905908	46.60489037	
13	32.73518156	-91.201748	46.60723354	Chryxus Arctic
14	23.78297818	-91.21525429	46.60822478	Chryxus Arctic
15	30.44866069	-91.21258566	46.61264903	Chryxus Arctic
16	11.69602843	-91.22282057	46.61202057	
17	94.48915799	-91.22441143	46.61903888	
18	4.409718828	-91.22861411	46.63150217	
19	20.41747234	-91.23982877	46.6302244	Chryxus Arctic
20	15.84864537	-91.25517109	46.63189104	
21	5.862765964	-91.29115764	46.62881598	Chryxus Arctic
22	23.74083033	-91.28579686	46.63256346	
23	18.19628063	-91.27050329	46.62472211	Chryxus Arctic
24	11.99527817	-91.27551381	46.62316921	
25	11.15653595	-91.27324488	46.61896731	
26	13.18700863	-91.27244386	46.61115217	
27	6.698347094	-91.28144311	46.61769617	
28	12.02372797	-91.2759171	46.61599811	
29	10.3831229	-91.28185547	46.61236696	
30	13.88982404	-91.2871724	46.6201977	
31	13.223888	-91.29067755	46.62214935	
32	32.62770454	-91.29716374	46.61321684	
33	22.70083212	-91.30974978	46.61627282	
34	26.92931519	-91.29798923	46.62227833	Chryxus Arctic
35	4.45713516	-91.31982976	46.62956353	
36	6.906978953	-91.31790926	46.62262712	
37	14.0678987	-91.32241515	46.62230964	
38	5.751074161	-91.32243064	46.6276118	
39	1.636390284	-91.32188549	46.63139446	
40	13.68435327	-91.31944841	46.6337286	Chryxus Arctic
41	10.13850706	-91.32448391	46.29471586	
42	10.92511711	-91.29280299	46.25146935	
43	26.65256699	-91.2685815	46.28983199	
44	9.965681046	-91.30094421	46.30283872	
45	10.49669324	-91.31164001	46.29290558	
46	9.984373912	-91.30807478	46.29924298	
47	10.93680661	-91.32406024	46.29857984	

48	17.18073061	-91.15359666	46.57170081	
49	19.075473	-91.22671546	46.63987225	
50	19.08326807	-91.18093766	46.62794724	Tawny Crescent
51	9.984535673	-91.15761092	46.63109509	
52	10.06725704	-91.12288242	46.62029004	Tawny Crescent
53	18.61643531	-91.11552851	46.62185541	
54	30.33999495	-91.11969538	46.63978765	Tawny Crescent
55	9.944719305	-91.13427385	46.65642645	
56	9.983513589	-91.14501126	46.63931235	
57	19.57798679	-91.14808699	46.64062698	
58	15.06907128	-91.1420076	46.65546673	
59	10.4955156	-91.17326977	46.64894783	
60	14.99795591	-91.17328313	46.64487616	
61	23.70281743	-91.17044829	46.64192528	Chryxus Arctic
62	11.71193779	-91.17951119	46.65366429	
63	10.36541735	-91.18514728	46.64186958	
64	13.38934325	-91.06846775	46.69049402	Tawny Crescent
65	12.15064777	-91.08979454	46.68337725	
66	10.59261661	-91.24154332	46.68335252	
67	36.46785229	-91.21173164	46.70998786	
68	13.22622966	-91.17142464	46.74762086	
69	10.91979283	-91.10586977	46.75801841	
70	19.49940188	-91.20937441	46.63582026	
71	13.68897886	-91.0542613	46.66805273	

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Site Descriptions

Site 1 (7.68 acres)

5.8.2010 (CA), 58 F, Mostly Sunny, Wind 0-5 mph

Steep-sided narrow sinuous frost pocket- poorly maintained as there is dense *Populus* growth in the lowest section of the depression. Management would greatly benefit this area as it has high potential and is in very close proximity to Sites 2 & 3. The greatest threat to all three of these pockets is *Populus* encroachment. If managed, all three have high potential to offer excellent habitat quality and connectivity. Management here may need to be continuous, as logging of the uplands may be causing increased wind and therefore less pooling of cold air and frost in the bottoms of the depressions. This area could be an excellent candidate for spraying, as it has a very robust ground vegetation structure that would be worth trying to preserve and improve.

Flowering Species: *V. angustifolium*, *A. quinquefolia*

Lepidoptera Species: *Celastrina ladon* (1), *Vanessa virginiensis* (1), *Callophrys augustinus* (3)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp			X	
<i>Comptonia peregrina</i>			X	
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>		X		

7.7.2011 (TC), Sunny, Wind 0-5 mph, 83 F

Flowering Species: *Hieracium auriantiacum*, *Hieracium pratense*, *Campanula rotundifolia*, *Rubus* sp., *Convolvulus arvensis*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Thymelicus lineola* (300+), *Phyciodes morpheus* (8), *Chlosyne nycteis* (1), *Polites peckius* (2), *Danaus plexxipus* (1)

Site 2 (10.43 acres)

5.8.2010 (CA), 58 F, Mostly Sunny, Wind 0-5

At present, this is a well-maintained frost pocket. It is possible, however, that this site was opened as a result of logging, as an old two-track bisects the pocket running north-south. Again as at Site 1, there is *Aspen* vigorously encroaching and without management intervention the site will become completely covered with Aspen. The surrounding topography is impressively steep, sinuous and rolling.

Flowering Species: *Vaccinium angustifolium*, *C. groenlandica*, *Anemone. quinquefolia*

Lepidoptera Species: *Celastrina ladon* (2), *Vanessa virginiensis* (2), *Erynnis juvenalis* (1), *Callophrys augustinus* (4)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp		X		
Comptonia peregrina		X		
Vaccinium angustifolium			X	
Pinus banksiana			X	
Danthonia spicata		X		

7.7.2011 (TC), Sunny, Wind 0-5 mph, 83 F

Flowering Species: *Hieracium aurantiacum*, *Chrysanthemum leucanthemum*, *Campanula rotundifolia*, *Silene noctiflora*, *Lathyrus pratensis*

Lepidoptera Species: *Phyciodes morpheus* (4), *Thymelicus lineola* (200+)

Site 3 (10.67 acres)

5.8.2010 (CA), 58 F, Mostly Sunny, Wind 0-5 mph

A few small areas of *Populus* encroachment in this site, but otherwise this section of the complex is quite open. High steep hills border this depression that funnel and trap cold air and also shade it from sun. Again, a small two-track passes through the site, possibly suggesting that its existence is because of the logging operations. Fire at this site could promote new Jackpine, with seeding in. With the surrounding topography future maintenance needs could be low following initial habitat improvement measures. The *Vaccinium* and *Comptonia* here were just a bit behind other areas in flowering phenology, suggesting it may stay colder, longer, in the mornings.

Flowering Species: *Anemone quinquefolia*, *C. groenlandica*

Lepidoptera Species: *Erynnis juvenalis* (1), *Boloria bellona* (1), *Vanessa virginiensis* (1), *Callophrys augustinus* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp	X			
Comptonia peregrina	X			
Vaccinium angustifolium				X
Pinus banksiana			X	
Danthonia spicata	X			

7.7.2011 (TC), Sunny, Wind 0-5 mph, 83 F

Flowering Species: *Hieracium aurantiacum*, *Chrysanthemum leucathemum*, *Campanula rotundifolia*, *Potentilla sp.*, *Lathyrus pratensis*

Lepidoptera Species: *Thymelicus lineola* (400+)

Site 4 (82.40 acres)

Large vegetatively uniform depression/"hole". There was not much nectar source here other than scattered *Prunus pumila* var. *susquehanae* and *Vaccinium angustifolium*. This is one of the largest sites in the survey. It has moderately to steeply sloping sides, and includes several "linked" depressions. This area was burned on 5.18.2011, so the surveys for Chryxus in 2011 were not successful, but it is very likely a resident of this site. The species evaluation table for the Chryxus survey is based on the vegetation found during Tawny Surveys in 2010, which is the best available data seeing as the site was burned in 2011 before Chryxus surveys took place.

6.3.2011 (CA), Overcast, Wind 0-5 mph, 83 F

Flowering Species: None

Lepidoptera Species: *Erynnis juvenalis* (2), *Papilio canadensis* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata		X		

6.10.2010 (TC), 65 F, Overcast, Wind 0-5 mph

Flowering Species: *Hieracium aurantiacum*, *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Anaphalis margaritacea*

Lepidoptera Species: *Coenonympha tullia* (1), *Phyciodes morpheus* (1), *Erynnis icelus* (1)

Site 5 (19.54 acres)

Moderately sloping depression adjacent to open barrens. Mainly forested with 3-8 ft Jackpine from tightly spaced to scattered. Excellent habitat- doesn't seem too forested. Very similar to other sites in Douglas County where *Chryxus* is found.

6.3.2011 (CA), Overcast, Wind 0-5 mph, 83 F

Flowering Species: *Prunus pumila var. susquehanae*, *Anemone quinquefolia*, *Viola cf adunca*, *Vaccinium angustifolium*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila var. susquehanae</i>		X		
<i>Rubus sp</i>			X	
<i>Comptonia peregrina</i>		X		
<i>Vaccinium angustifolium</i>		X		
<i>Pinus banksiana</i>	X			
<i>Danthonia spicata</i>		X		

6.10.2010 (TC), 65 F, Overcast, Wind 0-5 mph

Quite wooded series of depressions and ridges. There are many areas within this stand that offer protection from the wind and elements, that make it a very good stand if not for the amount of woody growth. This could be an excellent candidate for management with chemical tree control. However, matters are complicated in that *Danthonia* abundance also needs to be enhanced, but ground vegetative structure is very good, which fire will negatively effect in the short term.

Flowering Species: *Hieracium auriantiacum*, *Vaccinium angustifolium*, *Prunus pumila var. susquehanae*, *Comptonia peregrina*

Lepidoptera Species: None

Site 6 (36.48 acres)

5.17.2010 (CA), 75 F, Sunny, Wind 5-10 mph

Large, shallow depression with Aspen slash encroaching into the bottom. Chryxus were scattered almost exclusively along the west side. This area is very good habitat, and, if managed, fire should possibly be avoided to add or maintain the complexity of the ground vegetation.

Flowering Species: *Anemone quinquefolia*

Lepidoptera Species: *Oeneis chryxus* (6), *Boloria bellona* (8), *Erynnis icelus* (4), *Erynnis juvenalis* (3), *Callophrys polios* (4), *Papilio canadensis* (2), *Vanessa atalanta* (1), *Callophrys augustinus* (5)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium			X	
Pinus banksiana			X	
Danthonia spicata		X		

6.25.2011 (TC), Sunny, Wind 5-10 mph, 81 F

Burned area (5.18.2011); seems fire increased the abundance of nectar sources in open barrens compared to last year, in particular *Hieracium*.

Flowering Species: *Hieracium aurantiacum*, *Convolvulus arvensis*, *Antennaria cf neglecta*, *Senecio obovatus*, *Krigia biflora*

Lepidoptera Species: *Papilio canadensis* (6), *Hesperia sassacus* (2), *Poanes hobomok* (4), *Erynnis juvenalis* (3), *Erynnis icelus* (1), *Speyeria cybele* (1), *Colias interior* (2), *Coenonympha tullia* (1)

Site 7 (14.71 acres)

5.17.2010 (CA), 75 F, Sunny, Wind 5-15 mph

Small, shallow depression with one small cluster of Aspen near the center of the stand, which appears to be either not spreading or spreading very slowly. Overall, there is very little *Danthonia*, as in many areas of the stand it is absent. It would seem that burning might be a viable option for management here to promote *Danthonia* abundance. There was very low Lepidoptera activity here, especially when compared to other areas.

Flowering Species: *Anemone quinquefolia*, *Prunus pumila* var. *susquehanae*

Lepidoptera Species: *Erynnis juvenalis* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium				X
Pinus banksiana			X	
Danthonia spicata			X	

6.25.2011 (TC), Sunny, Wind 0-5 mph, 81 F

Burned area (5.18.2011); seems fire increased the abundance of nectar sources in open barrens compared to last year, in particular *Hieracium*.

Flowering Species: *Hieracium aurantiacum*, *Convolvulus arvensis*, *Antennaria cf neglecta*, *Krigia biflora*

Lepidoptera Species: *Papilio canadensis* (4), *Erynnis juvenalis* (2), *Colias interior* (2)

Site 8 (4.29 acres)

5.17.2010 (CA), 80 F, Sunny, Wind 5-10 mph

Long very shallow depression, with a thin stand of scrubby *Q. ellipsoidalis* on the south edge. There exists very good vegetation structure and diversity, but there are no *Pinus banksiana*. This could be detrimental to the suitability of the stand for Chryxus. Burning could potentially be beneficial for *Danthonia* density, but would negatively affect, at least temporarily, the vegetation structure of the ground layer.

Flowering Species: *Anemone quinquefolia*

Lepidoptera Species: *Boloria bellona* (2), *Erynnis icelus* (9), *Callophrys niphon* (3)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp		X		
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana				X
Danthonia spicata			X	

6.25.2011 (TC), Sunny, Wind 5-10 mph, 81 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Convolvulus arvensis*

Lepidoptera Species: *Hesperia sassacus* (1), *Erynnis juvenalis* (2) *Colias interior* (1), *Everes comyntas* (1)

Site 9 (39.79 acres)

5.17.2010 (CA), 75 F, Sunny, Wind 5-10 mph

Shallow, sinuous depression very similar to Site 7, with a small patch of *Populus tremuloides* in the bottom of the depression containing just a few individuals that don't seem to be reproducing or sending out runners. Fire may be a valuable management option for this site. The potential for large or vigorous stands of *Populus tremuloides* seems to be low, and the area would be excellent habitat with enhanced abundances of *Danthonia*.

Flowering Species: *Anemone quinquefolia*

Lepidoptera Species: *Oeneis chryxus* (2), *Boloria bellona* (5), *Callophrys polios* (3), *Callophrys niphon* (7)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium			X	
Pinus banksiana			X	
Danthonia spicata			X	

6.25.2011 (TC), Sunny, Wind 5-10 mph, 81 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Tragopogon sp.*, *Convolvulus arvensis*

Lepidoptera Species: *Papilio canadensis* (2), *Erynnis juvenalis* (2), *Colias interior* (2)

Site 10 (5.04 acres)

5.14.2010 (CA), 58 F, Partly Cloudy, Wind 10-20 mph

This area is a small, shallow treeless depression on the boundary of the MBWMA. While not very sheltered from the wind, even on a windy, fairly cool day I found *Chryxus Arctic* flying. This pocket did not have much *Danthonia*, and could be improved with added *Danthonia* density. *Vaccinium* was not flowering as in adjacent areas, which may indicate that this area is much more shaded by the southern border of thick Jackpine.

Flowering Species: *P. susquehanae*, *A. quinquefolia*

Lepidoptera Species: *Oeneis chryxus* (2)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>		X		
<i>Danthonia spicata</i>		X		

6.25.2011 (TC), Sunny, Wind 5-10 mph, 81 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Convolvulus arvensis*, *Apocynum androsaemifolium*, *Rosa* sp., *Rubus* sp., *Tragopogon* sp.

Lepidoptera Species: *Phyciodes batesii* (1), *Phyciodes morpheus* (1), *Papilio canadensis* (5), *Hesperia sassacus* (2), *Poanes hobomok* (4), *Erynnis juvenalis* (6), *Erynnis icelus* (1), *Colias interior* (2), *Coenonympha tullia* (1), *Hesperia sassacus* (10), *Everes comyntas* (1)

Site 11 (13.55 acres)

5.14.2010 (CA), 58 F, Partly Cloudy, Wind 5-15 mph

Quite large deep depression that was once an ATV play area and has since been successfully cordoned off and is recovering slowly but progressively. *Vaccinium* is not flowering and *Prunus* had just begun flowering in this area. There is a patch of *Populus* at the center of this patch in the bottom of the depression that does not appear to be migrating up the slope, but should be monitored. This area could become excellent habitat with improvement measures that would promote the density of *Danthonia*. This area is very sheltered and has high potential to be usable *Chryxus* Arctic habitat.

Flowering Species: *P. susquehanae*, *A. quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae	X			
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana	X			
Danthonia spicata	X			

6.25.2011 (TC), Sunny, Wind 5-10 mph, 85 F

Flowering Species: *Campanula rotundifolia*, *Hieracium aurantiacum*, *Hieracium pratense*, *Convolvulus arvensis*, *Rosa sp.*, *Rubus sp.*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Phyciodes morpheus* (1), *Papilio canadensis* (6), *Hesperia sassacus* (2), *Erynnis juvenalis* (10), *Colias interior* (3), *Hesperia sassacus* (10), *Boloria bellona* (2)

Site 12 (8.52 acres)

Level to gently sloping open barrens. Excellent habitat with exceptional vegetation structure and diversity.

2011 (CA) Mostly Sunny, Wind 15-25 mph, 75 F

Flowering Species: *Viola cf adunca*, *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Arctostaphylos uva-ursi*, *Anemone quinquefolia*, *Fragaria virginiana*

Lepidoptera Species: *Erynnis juvenalis* (1), *Papilio canadensis* (1), *Vanessa sp.* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae	X			
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata		X		

7.1.2011 (TC), Sunny, Wind 5-15 mph, 80 F

Flowering Species: *Hieracium aurantiacum*, *Campanula rotundifolia*, *Rubus sp.*, *Rosa sp.*, *Krigia biflora*, *Hieracium pratense*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Colias interior* (2), *Coenonympha tullia* (3), *Phyciodes morpheus* (1)

Site 13 (32.74 acres)

Low depression with no tree cover, but excellent ground vegetation structure and composition. With no tree cover, this site was very exposed and windy. With *Danthonia* present here, there is certainly reproduction happening. The current management strategy should continue at this site, as it appears to be having a positive effect on the suitability of this site.

5.18.2010 (CA), 81 F, Sunny, Wind 5-10

Flowering Species: *Anemone quinquefolia*, *Prunus pumila* var. *susquehanae*

Lepidoptera Species: *Oeneis chryxus* (4), *Callophrys niphon* (3), *Boloria bellona* (3)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>		X		
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>			X	
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>	X			

7.5.2011 (TC), Mostly Sunny, Wind 5-10 mph, 82 F

This site was included in the burn (5.19.2011), but was very patchy. Overall, maybe 30% of the vegetation was intact.

Flowering Species: *Hieracium aurantiacum*

Lepidoptera Species: *Colias interior* (3), *Phyciodes morpheus* (2), *Papilio canadensis* (1), *Erynnis juvenalis* (1)

Site 14 (23.78 acres)

5.18.2010 (CA), 81 F, Sunny, Wind 5-10

Rolling hills and depression with heavy woody cover. This site is bordered on the east by a very dense Jackpine stand, providing quite a bit of protection from the wind and keeping the site cooler for longer in the day. The swale here does seem to hold cold air and is certainly very shaded, providing excellent cover and possibly contributing partially to the excellent ground vegetation structure and composition. Management is contributing heavily here to site quality and subsequent Chryxus Arctic presence.

Flowering Species: *Anemone quinquefolia*, *Prunus pumila var. susquehanae*, *Vaccinium angustifolium*

Species Noted: *Oeneis chryxus* (2), *Callophrys niphon* (3), *Callophrys eryphon* (2), *Erynnis juvenalis* (4)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata		X		

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 83 F

Very scarce nectar sources.

Flowering Species: *Campanula rotundifolia*, *Hieracium aurantiacum*, *Krigia biflora*

Lepidoptera Species: *Colias interior* (2)

Site 15 (30.45 acres)

5.18.2010 (CA), 81 F, Sunny, Wind 5-10

Huge, low rolling lightly wooded open barrens site. *Danthonia* is present here and so reproduction is certainly occurring here. With no Jackpine, it is strange that *Chryxus* is here, but the ground structure and composition may be making up for that deficiency. There were very few nectar sources here. The current management is successful at this site in promoting *Danthonia* and other related vegetation.

Flowering Species: *Vaccinium angustifolium*, *Anemone quinquefolia*, *Coptis groenlandica*

Lepidoptera Species: *Oeneis chryxus* (4), *Erynnis icelus* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium			X	
Pinus banksiana				X
Danthonia spicata		X		

7.5.2011 (TC), Mostly Sunny, Wind 5-10 mph, 82 F

This site was included in the burn (5.19.2011), and so was not very productive. Much of the groundcover was very low growth to begin with and was subsequently very thoroughly burned. There was mainly just grass starting to come back up.

Flowering Species: None

Lepidoptera Species: None

Site 16 (11.70 acres)

6.3.2011 (CA), Sunny, Wind 0-10 mph, 78 F

Small, shallow depression in open barrens. Burned 5.19.2011, but grasses and *Pteridium* are already coming back. Whole area is even-aged aspen slash including much of the survey area polygon.

Flowering Species: *Fragaria virginiana*

Lepidoptera Species: *Vanessa americana* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>			X	

6.5.2010 (TC), 72 F, Hazy, Wind 5-10 mph

Small shallow depression with good ground vegetative structure and composition, but being heavily encroached upon by *Populus tremuloides*. This stand needs to be re-opened to be productive for *Chryxus*. This stand may be a good candidate for chemical control, as the trees need to be removed, but the ground cover density and composition should be preserved if possible. *Hieracium aurantiacum* and *Vaccinium angustifolium* were flowering but were very sparsely distributed.

Flowering Species: *Hieracium aurantiacum*, *Vaccinium angustifolium*

Lepidoptera Species: *Erynnis juvenalis* (5), *Papilio canadensis* (3), *Vanessa americana* (2), *Coenonympha tullia* (5), *Phyciodes morpheus* (1)

Site 17 (94.49 acres)

Huge, very uniformly similar open barren stand. There are very few trees, but also very little nectar. All of the flowering species were very poorly represented, and finding any Lepidoptera flying required large amounts of walking to scare up individuals. The lack of any *Pinus banksiana* could be the detrimental factor in the habitat suitability of this stand. The vegetation table is based on data from the Tawny survey in 2010, since the site was burned before the Chryxus survey took place in 2011, and is the best available data.

7.5.2011 (CA), Mostly Sunny, Wind 5-10 mph, 82 F

This site was included in the burn (5.19.2011), and so was not very productive. Much of the groundcover was very low growth to begin with and was subsequently very thoroughly burned. There was mainly just grass starting to come back up.

Flowering Species: None

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae		X		
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata		X		

6.5.2010 (TC), 70 F, Hazy, Wind 5-10 mph

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Convolvulus arvensis*, *Vaccinium angustifolium*, *Apocynum androsaemifolium*

Lepidoptera Species: *Phyciodes morpheus* (1), *Vanessa virginiensis* (2), *Erynnis juvenalis* (4), *Coenonympha tullia* (2), *Papilio canadensis* (1), *Hesperia sassacus* (4)

Site 18 (4.41 acres)

5.26.2011 (CA), Overcast, 0-5 mph, 65 F

Large, shallow depression in open barrens. The burn (5.19.2011) was very patchy here, leaving most of the *Comptonia* still in flower and one patch of *Vaccinium* and *Arctostaphylos* in flower.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Arctostaphylos uva-ursi*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>		X		
<i>Danthonia spicata</i>			X	

7.1.2011 (TC), Sunny, Wind 5-15 mph, 80 F

Flowering Species: *Hieracium aurantiacum*, *Campanula rotundifolia*, *Krigia biflora*, *Hieracium pratense*, *Convolvulus arvensis*

Lepidoptera Species: *Danaus plexxipus* (1), *Hesperia sassacus* (1), *Erynnis juvenalis* (1)

Site 19 (20.42 acres)

5.26.2011 (CA), Overcast, Wind 5-10 mph, 65 F

Large open depression with several patches of Aspen suckers in open barrens.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Prunus pumila var. susquehanae*

Lepidoptera Species: *Erynnis icelus* (1), *Oeneis chryxus* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 80 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Campanula rotundifolia*, *Convolvulus arvensis*, *Chrysanthemum leucanthemum*, *Krigia biflora*, *Hypericum cf perforatum*

Lepidoptera Species: *Speyeria cybele* (2), *Polites themistocles* (10+), *Hesperia sassacus* (1), *Colias interior* (1), *Papilio canadensis* (2)

Site 20 (15.85 acres)

5.26.2011 (CA), Overcast, Wind 0-5 mph, 65 F

Huge, steep-sided swale in open barrens. This site is aggressively being encroached upon by *Aspen* and *Corylus*. This site is exceptional habitat and it is likely that Chryxus may have been done flying here, especially as abundances were so low.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Arctostaphylos uva-ursi*, *Fragaria virginiana*

Lepidoptera Species: *Erynnis icelus* (2), *Boloria bellona* (3), *Callophrys polios* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp			X	
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>		X		

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 81 F

Flowering Species: *Hieracium aurantiacum*, *Lathyrus pratensis*, *Campanula rotundifolia*

Lepidoptera Species: *Speyeria cybele* (4), *Polites themistocles* (10+), *Colias interior* (2), *Papilio canadensis* (3)

Site 21 (5.86 acres)

6.5.2011 (CA), Sunny, Wind 0-5 mph, 75 F

Low, shallow depression in open barrens. Surrounded by mature Aspen and mixed Aspen/Jackpine on three sides. Many clumps of *Salix* sp. within the site.

Flowering Species: *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Lithospermum*, *Viola cf adunca*

Lepidoptera Species: *Erynnis icelus* (5), *Erynnis juvenalis* (4), *Boloria bellona* (1), *Papilio canadensis* (1), *Oeneis chryxus* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp			X	
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>		X		
<i>Pinus banksiana</i>		X		
<i>Danthonia spicata</i>		X		

6.20.2010 (TC), 75 F, Mostly Sunny, Wind 5-10 mph

Nearly identical to Site22. This site is a smaller depression with many trees (4-6 ft. *Pinus banksiana*, 14-20 ft *Populus tremuloides*) and is very sheltered by large wooded ridges to the West and East. *Danthonia* is absent from this site, and as such it could be considered for management to enhance its occurrence and density.

Flowering Species: *Campanula rotundifolia*, *Hieracium aurantiacum*, *Lithospermum* sp., *Krigia biflora*

Lepidoptera Species: *Speyeria cybele* (1)

Site 22 (23.74 acres)

6.5.2011 (CA), Sunny, Wind 0-5 mph, 70 F

Large area of open rolling barrens habitat. Nearly treeless save for a handful of mature scattered Jackpine. Shows signs of 2007 prescribed burn (burned out stumps). Seems ideal mix of “indicator” plant species; this is the best example of suitable habitat in the survey. Management at this site should be mimicked at other sites where goal is to create suitable Chryxus habitat.

Flowering Species: *Vaccinium angustifolium*, *Lithospermum sp.*, *Viola cf adunca*, *Anemone quinquefolia*, *Prunus pumila var. susquehanae*

Lepidoptera Species Noted: *Boloria bellona* (3), *Erynnis juvenalis* (1), *Oeneis chryxus* (2), *Erynnis icelus* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae		X		
Rubus sp			X	
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata		X		

6.20.2010 (TC), 75 F, Mostly Sunny, Wind 5-10 mph

Large undulating area of varying vegetation and terrain containing scattered scrub oak and *Pinus banksiana*, but largely treeless.

Flowering Species: *Hieracium auriantiacum*, *Rubus sp.*, *Lonicera sp.*, *Campanula rotundifolia* (very sparsely distributed)

Lepidoptera Species: None

Site 23 (18.20 acres)

6.5.2011 (CA), Sunny, Wind 0-5 mph, 73 F

Low, shallow depression adjacent to steep Oak-covered slope in open barrens. Abundant Oak (*Q. ellipsoidalis*) and Aspen (*P. tremuloides*) saplings within and surrounding site. All small openings in the area have abundant *Danthonia*; these areas are excellent habitat but are being encroached by woody growth.

Flowering Species: *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Viola cf adunca*

Lepidoptera Species: *Oeneis chryxus* (2), *Boloria bellona* (3), *Erynnis icelus* (3)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata		X		

6.17.2010 (TC), 85 F, Mostly Sunny, Wind 5-10 mph

Shallow, sloping depression with 15-20 ft. tall scraggly Jackpine in the bottom of the swale. There are scattered 1-3 ft. tall scrub Oak trees throughout. This site is heavily dominated by *Pteridium aquilinum* at the time of survey.

Flowering Species: *Apocynum auriantiacum*, *Hieracium auriantiacum*

Lepidoptera Species: None

Site 24 (12.0 acres)

5.29.2011 (CA), Overcast, Wind 0-5 mph, 65 F

Huge, open depression in open barrens. In the vicinity there are only few scattered Oak and Jackpine, whereas there is Aspen slash in the bottom of the depression.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Prunus pumila var. susquehanae*, *Arctostaphylos uva-ursi*, *Anaphalis margaritacea*, *Fragaria virginiana*

Lepidoptera Species: *Oeneis chryxus* (1), *Boloria bellona* (1), *Erynnis juvenalis* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata			X	

6.17.2010 (TC), 85 F, Mostly Sunny, Wind 5-10 mph

Very steep-sided ravine with Jackpine and Aspen in the bottom, with scattered Oak on the north and south sides. Appears to be functioning very well as a frost pocket with mainly grasses present here. Lack of nectar sources is precluding much of any Lepidoptera activity at this site.

Flowering Species: None

Lepidoptera Species: None

Site 25 (11.16 acres)

5.29.2011 (CA), Overcast, Wind 0-5 mph, 65 F

Small, shallow depression in open barrens with aspen suckers up to 4' high in the bottom.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Prunus pumila var. susquehanae*, *Lithospermum canescens*, *Anaphalis margaritacea*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae	X			
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana				X
Danthonia spicata			X	

6.17.2010 (TC), 85 F, Mostly Sunny, Wind 5-10 mph

Small, nearly level opening with scattered 1-3 ft. *Q. ellipsoidalis*. Lack of Jackpine may be determining factor in target species presence here.

Flowering Species: None

Lepidoptera Species: *Thymelicus lineola* (1)

Site 26 (13.19 acres)

5.31.2011 (CA), Mostly Sunny, Wind 10-20 mph, 75 F

Gently sloping depression in open barrens. Scattered Oak and small, dense patch of *Corylus sp.* in the bottom of the depression. Excellent habitat as the vegetation is very evenly distributed and richness is well-represented.

Flowering Species: *Vaccinium angustifolium*, *Prunus pumila var. susquehanae*, *Arctostaphylos uva-ursi*, *Lithospermum canescens*, *Antennaria cf neglecta*, *Viola cf adunca*, *Anemone quinquefolia*

Lepidoptera Species: *Erynnis juvenalis* (1), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi	X			
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata	X			

6.17.2010 (TC), 82 F, Mostly Sunny, Wind 5-10 mph

Small, mainly treeless opening with a small shallow depression on the NW corner. Scattered scraggly and/or dead Jackpine, with scattered White Oak (1-3 ft. tall).

Flowering Species: *Daucus carota*, *Hieracium auriantiacum*, *Apocynum androsaemifolium*

Lepidoptera Species: *Coenonympha tullia* (3), *Papilio canadensis* (2)

Site 27 (6.70 acres)

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Shallowly sloping hillside in the open barrens. Very low density of *Danthonia*; dominated by other grasses. Perhaps would benefit from burning.

Flowering Species: *Antennaria cf neglecta*, *Viola cf adunca*, *Vaccinium angustifolium*

Lepidoptera Species: *Erynnis icelus* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae	X			
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata			X	

6.17.2010 (TC), 85 F, Mostly Sunny, Wind 5-10 mph

Small depression with Jackpine on the south side and NE corner; the whole pocket is very well sheltered from wind. Many scattered 2-4 ft. *Q. ellipsoidalis* within the pocket, which could be managed for *Danthonia* to improve the habitat quality here.

Flowering Species: *Hieracium auriantiacum* (moderate density), *Apocynum auriantiacum*

Lepidoptera Species: *Papilio canadensis* (1), *Phyciodes morpheus* (3)

Site 28 (12.02 acres)

5.24.2011 (CA), Overcast, Wind 0-5 mph, 65 F

Small, shallow depression in open barrens. There are a considerable number of Oak growing at this site.

Flowering Species: *Viola cf adunca*, *Prunus pumila var. susquehanae*, *Arctostaphylos uva-ursi*, *Antennaria cf neglecta*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi	X			
Prunus pumila var. susquehanae	X			
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata		X		

6.17.2010 (TC), 85 F, Sunny, Wind 5-10 mph

Small, gently sloping opening with regularly-spaced, moderately dense *Q. ellipsoidalis* 2-5 ft. tall with 9-16 ft. spacing.

Flowering Species: *Apocynum androseamifolium* (very low density)

Lepidoptera Species: None

Site 29 (10.38 acres)

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Small depression adjacent to sloping hillside in open barrens. Half of this site is dominated by Bluestem and half by *Danthonia*. The *Danthonia* half is very good habitat.

Flowering Species: *Lithospermum canescens*, *Viola cf adunca*, *Vaccinium angustifolium*, *Prunus pumila var. susquehanae*

Lepidoptera Species: *Erynnis icelus* (4), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata		X		

6.17.2010 (TC), 83 F, Mostly Sunny, Wind 5-10 mph

Large, treeless area on hillside- only scattered *Quercus alba* and *Salix* sp. Very sheltered from wind by row of mature Jackpine on the south ridge/edge of the polygon.

Flowering Species: *Campanula rotundifolia*, *Hieracium auriantiacum*, *Apocynum androsaemifolium*

Lepidoptera Species: *Coenonympha tullia* (3), *Papilio canadensis* (2)

Site 30 (13.89 acres)

6.5.2011 (CA), Sunny, Wind 0-5, 73 F

Shallow depression in open barrens, adjacent to mature Jackpine stand; many scattered 16-20 ft trees within the polygon. Very grassy with low *Danthonia* density. *Arctostaphylos* density excellent for Hoary Elfin.

Flowering Species: *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Antennaria* sp.

Lepidoptera Species: *Erynnis icelus* (3), *Erynnis juvenalis* (3), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>			X	

6.20.2010 (TC), 83 F, Sunny, Wind 0 mph

Low, grassy depression. There were a few scattered 1-2 ft. *Quercus* and 12-14 ft. *Pinus banksiana*.

Flowering Species: *Campanula rotundifolia*, *Hieracium aurantiacum*, *Apocynum androsaemifolium*, *Chrysanthemum leucanthemum* (abundant)

Lepidoptera Species: *Poanes hobomok* (2), *Thymelicus lineola* (5), *Colias interior* (2), *Papilio canadensis* (1), *Nymphalis antiopa* (1), *Speyeria cybele* (1)

Site 31 (13.22 acres)

Sloping hillside in moderately dense Oak growth barrens. Many 3-6 ft tall Oak (*Q. ellipsoidalis*) saplings. Definitely suitable but marginal habitat.

6.5.2011 (CA), Sunny, Wind 0-5 mph, 75 F

Flowering Species: *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*, *Viola cf adunca.*, *Antennaria cf neglecta*

Lepidoptera Species: *Erynnis juvenalis* (4), *Erynnis icelus* (3)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana				X
Danthonia spicata			X	

6.20.2010 (TC), 83 F, Sunny, Wind 0 mph

Moderately sloping south-facing grade dominated by *Arctostaphylos*, *Pteridium* and *Quercus ellipsoidalis* scrub.

Flowering Species: *Campanula rotundifolia*, *Rubus sp*, *Rosa sp*.

Lepidoptera Species: None

Site 32 (32.63 acres)

Large depression with high sloping hillsides in open barrens. The stand and the surrounding area are nearly treeless. Several scattered dead Jackpine in the depression bottom. This site lacks the furrowing of other sites in the barrens.

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Flowering Species: *Lithospermum*, *Viola*, *Antennaria*, *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*

Lepidoptera Species: *Papilio canadensis* (1), *Erynnis juvenalis* (4), *Erynnis icelus* (5), *Colias philodice* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>	X			
<i>Rubus</i> sp			X	
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>			X	

6.20.2010 (TC), 85 F, Sunny, Wind 0-5 mph

Long, shallow sinuous depression that is mainly treeless except scattered dead *Pinus banksiana* in the bottom of the depression.

Flowering Species: *Polygala polygama*, *Rubus* sp., *Chrysanthemum laecanthemum*, *Hieracium auriantiacum*, *Campanula rotundifolia*, *Rosa* sp.

Lepidoptera Species: *Limenitis arthemmis* (1), *Erynnis juvenalis* (1), *Speyeria cybele* (1), *Colias interior* (2)

Site 33 (22.70 acres)

Huge sloping depression with wooded area at the bottom (in the swale), with many 15-20 ft *Pinus banksiana* and *Populus tremuloides*. The surrounding slopes are nearly devoid of trees and are very grassy with pockets of *Vaccinium*, *Comptonia* and *Prunus*.

5.24.2011 (CA), Hazy Sun, Wind 5-15 mph, 62 F

It was surprising that there were no Chryxus found here, as the habitat was highly suitable. During the survey, there was an individual that was thought to be Chryxus but it was not caught. Further surveys may find Chryxus here.

Flowering Species: *Arctostaphylos uva-ursi*, *Vaccinium angustifolium*

Lepidoptera Species: *Callophrys polios* (4), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>		X		
<i>Vaccinium angustifolium</i>		X		
<i>Pinus banksiana</i>		X		
<i>Danthonia spicata</i>			X	

6.20.2010 (TC), 88 F, Sunny, Wind 0-5 mph

Flowering Species: *Senecio obovatus*, *Campanula rotundifolia*, *Hieracium aurantiacum*, *Convolvulus arvensis*

Lepidoptera Species: *Thymelicus lineola* (2), *Speyeria cybele* (1)

Site 34 (26.93 acres)

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Gently rolling opening in open barrens. One Jackpine and several Aspen in the site. The portion nearest the road is Bluestem-dominated and is poor habitat. The remainder is excellent mix of indicator (favorable) species.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Viola cf adunca*, *Lithospermum*, *Antennaria*

Lepidoptera Species: *Danaus plexxipus* (1), *Papilio canadensis* (1), *Erynnis icelus* (5), *Erynnis juvenalis* (4), *Boloria bellona* (4), *Oeneis chryxus* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>	X			
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>		X		

6.20.2010, 85 F, Sunny, Wind 0-5 mph

Shallow depression in North corner with large treeless area to the South. The level areas were dominated by *Vaccinium* and *Comptonia*. The depression itself contained a small stand of *Populus tremuloides*.

Flowering Species: *Chrysanthemum leucanthemum*, *Senecio obovatus* (abundant)

Lepidoptera Species: None

Site 35 (4.46 acres)

5.25.2011 (CA), Hazy Sun, Wind 0-10 mph, 62 F

Gently sloping hillside in the open barrens habitat. This site is becoming overgrown by *Q. ellipsoidalis*, although deer are keeping them stunted. *Danthonia* is present but only in several small clumps.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Arctostaphylos uva-ursi*, *Viola cf adunca*, *Antennaria cf. neglecta*

Lepidoptera Species: *Boloria bellona* (3)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>	X			
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 82 F

Flowering Species: *Convolvulus arvensis*, *Chrysanthemum leucanthemum*, *Senecio obovatus*

Lepidoptera Species: *Thymelicus lineola* (5), *Colias interior* (2), *Papilio canadensis* (1)

Site 36 (6.91 acres)

5.24.2011 (CA), Hazy Sun, Wind 5-15 mph, 62 F

Level opening/barrens habitat with deep, small conical depression in Southeast corner. *Danthonia* density seems like it could be improved with management. This site offers good cover from wind. The depression is heavily matted with other grass species and there is scattered *Verbascum* that is encroaching. *Pteridium* is dominant in the later season.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Arctostaphylos uva-ursi*, *Viola cf adunca*

Lepidoptera Species: *Callophrys niphon* (2), *Callophrys polios* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>	X			
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 84 F

Very little nectar; dominated by thick grasses and *Pteridium*

Flowering Species: *Campanula rotundifolia*, *Chrysanthemum leucanthemum*,

Lepidoptera Species: *Speyeria cybele* (2), *Thymelicus lineola* (5)

Site 37 (14.07 acres)

5.24.2011 (CA), Hazy Sun, Wind 5-15 mph, 62 F

Shallow depression in open barrens. *Danthonia* is present, but no Jackpine within view. This seems a good candidate for burning, or another burn interval, to increase *Danthonia* abundance, but may need management to quell the encroaching Aspen slash from the depression. There is abundant *Pteridium* later in the year.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Arctostaphylos uva-ursi*, *Viola cf adunca*, *Anemone quinquefolia*, *Antennaria cf. neglecta*

Lepidoptera Species: *Callophrys niphon* (2), *Callophrys polios* (2), *Erynnis icelus* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 84 F

Chest-Waist high *Pteridium* covers 98% of the site.

Flowering Species: *Chrysanthemum leucanthemum*, *Aster* sp. (purple)

Lepidoptera Species: *Speyeria cybele* (2), *Hesperia sassacus* (2), *Thymelicus lineola* (10+)

Site 38 (5.75 acres)

Small shallow depression in Oak/Aspen area of barrens. Adjacent Oak are somewhat spaced and *Danthonia* is abundant so it could be used as a migratory corridor. Site is dominated by *Pteridium* and this seems to prohibit development of indicator species. One small area of *Pteridium* is excellent habitat but is too small to play a role.

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Flowering Species: *Antennaria cf neglecta*, *Vaccinium angustifolium*, *Viola cf adunca*

Lepidoptera Species: *Erynnis icelus* (2), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>		X		
<i>Vaccinium angustifolium</i>		X		
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>		X		

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 83 F

Chest-Waist high *Pteridium* covers 98% of the site.

Flowering Species: *Campanula rotundifolia*

Lepidoptera Species: None

Site 39 (1.64 Acres)

6.6.2011 (CA), Sunny, Wind 0-5, 80 F

Small pothole depression in open barrens. Low density of *Danthonia* may be the most important limiting factor here, but also Oak surrounding is very dense and contiguous, limiting dispersal into the site.

Flowering Species: *Vaccinium angustifolium*, *Antennaria cf neglecta*

Lepidoptera Species: *Erynnis icelus* (5), *Colias philodice* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi		X		
Prunus pumila var. susquehanae				
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 83 F

Very grassy and very little nectar; only several individuals of each.

Flowering Species: *Campanula rotundifolia*, *Aster sp.(purple)*

Lepidoptera Species: None

Site 40 (13.68 acres)

5.24.2011 (CA), Hazy Sun, Wind 0-10 mph, 65 F

Large open barrens area bordered to the North and South by mixed conifer and hardwood. This site did not appear to be likely habitat as there is low density of *Danthonia* and no Jackpine. Management could improve the quality by reducing grassy buildup and promote *Danthonia* abundance. There is woody encroachment by *Salix* sp. and *Prunus serotina*. Chryxus presence here is hard to explain and is possibly an example of the low-end of habitat quality where other factors (chance dispersal, proximity to other sources) may explain the pattern.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Arctostaphylos uva-ursi*, *Viola cf adunca*, *Antennaria cf. neglecta*

Lepidoptera Species: *Erynnis juvenalis* (4), *Boloria bellona* (2), *Oeneis chryxus* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae		X		
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata			X	

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 82 F

Flowering Species: *Hieracium aurantiacum*, *Campanula rotundifolia*, *Apocynum androsaemifolium*

Lepidoptera Species: *Speyeria cybele* (10+), *Polites themistocles* (50+), *Thymelicus lineola* (10), *Colias interior* (3), *Phyciodes morpheus* (1)

Site 41 (10.14 acres)

5.4.2010, 73 F, Mostly Cloudy, Wind 5-10 mph

Extensive open meadow dominated by Bluegrass and clover, with several small patches of Blueberry (*V. angustifolium*). This appears to be an old field that is being allowed to succeed back to normal vegetation, which from the perimeter of this patch would be Blueberry (*V. angustifolium*), Blackberry (*Rubus sp.*), and Bracken Fern (*P. aquilinum*). As this is not a frost pocket, woody species may also encroach and fill this in a short time. This area is poor habitat, with the lack of any real topography to sustain it as an opening without any mechanical maintenance, and also its lack of Jackpine.

Flowering Species: *Vaccinium angustifolium*, *Anemone quinquefolia*, *Coptis groenlandica*

Lepidoptera Species: *Celastrina ladon* (1), *Vanessa virginiensis* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp			X	
Comptonia peregrina				X
Vaccinium angustifolium			X	
Pinus banksiana				X
Danthonia spicata			X	

6.18.2010 (TC), 85 F, Sunny, Wind 10-20 mph

Does not seem to be a true remnant pocket barren. Appears to have been maintained mechanically as a farm field. This field contains mainly very weedy vegetation. This is an area that should not be prioritized as a conservation concern, and more likely removed from the classification as a pocket barren, as its vegetation is not characteristic of barrens ecosystems.

Flowering Species: *Chrysanthemum leucanthemum*, *Hieracium aurantiacum*, *Melilotus sp.*, *Ranunculus sp.*, *Hieracium pratense*, *Rubus sp.*, *Apocynum androsaemifolium*

Lepidoptera Species: *Coenomympha tullia* (30), *Thymelicus lineola* (100+), *Hesperia sassacus* (30+), *Danaus plexxipus* (5), *Phyciodes morpheus* (15), *Boloria bellona* (1)

Site 42 (10.93 acres)

5.4.2010, 65 F, Sunny, Wind 0-5 mph

This area initially appears to be a frost pocket topographically, and still could be, but there is evidence of the area being cleared at one time as a settlement. There are fairly steep slopes on the east and west sides that could potentially funnel and trap cold air. There is one small area where *Populus tremuloides* is encroaching, and another in the section to the north where *Rubus sp.* is becoming thick. This area is marginal habitat, as management could produce a productive area with burning

Flowering Species: *Vaccinium angustifolium*, *Fragaria virginiana*, *Anemone quinquefolia*, *Taraxicum officinale*

Lepidoptera Species: *Celastrina ladon* (6), *Boloria bellona* (1), *Erynnis icelus* (1), *Vanessa virginiensis* (1), *Callophrys niphon* (4)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp	X			
Comptonia peregrina			X	
Vaccinium angustifolium			X	
Pinus banksiana			X	
Danthonia spicata				X

6.18.2010 (TC), 82 F, Mostly Sunny, Wind 10-20 mph

This stand was a small pocket with a moderate hillslope. There is a small amount of *Populus tremuloides* in the bottom of the pocket, which is limiting its potential as Chryxus or Tawny habitat. The site is very sheltered, so with proper management it could become excellent habitat.

Asters: Absent

Flowering Species: *Rubus sp.*, *Hieracium aurantiacum*, *Verbascum thapsus* (present but not flowering)

Lepidoptera Species: *Coenonympha tullia* (2), *Danaus plexxipus* (6), *Hesperia sassucus* (4), *Polites peckius* (3), *Speyeria cybele* (1)

Site 43 (26.65 acres)

5.4.2010, 80 F, Mostly Cloudy, Wind 5-10 mph

This pocket barren was a very sinuous, steep-sided frost pocket. As the season progresses, it will probably become very overgrown with Pteridium and Rubus. All of the main indicator species were present except *Pinus banksiana*, which may be detrimental to the productivity of this pocket. Additionally, *Corylus cornuta* has become weedy and is encroaching into the interior of the site. It is likely, however, that this area effectively holds very cold dense air that helps to maintain it as an opening. With climate change, this may be just the type of habitat that will become grown-in as the frequency and severity of seasonal frost decreases. The surrounding areas are also very steep but heavily wooded and have been heavily logged. Despite heavy nectaring activity at *Vaccinium* by Hymenoptera, there was very little Lepidopteran activity.

Flowering Species: *Rubus sp.*, *Hepatica sp.*, *Coptis groenlandica*, *Anemone quinquefolia*

Lepidoptera Species: *Celastrina ladon* (6), *Erynnis icelus* (1), *Callophrys niphon* (3)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus sp</i>			X	
<i>Comptonia peregrina</i>			X	
<i>Vaccinium angustifolium</i>			X	
<i>Pinus banksiana</i>				X
<i>Danthonia spicata</i>		X		

7.7.2011 (TC), Sunny, Wind 0-5 mph, 83 F

Flowering Species: *Hieracium aurantiacum*, *Chrysanthemum leucanthemum*, *Lathyrus pratensis*

Lepidoptera Species: *Speyeria cybele* (1), *Thymelicus lineola* (400+), *Phyciodes morpheus* (4)

Site 44 (9.97 acres)

5.6.2010, 55 F, Partly Cloudy, Wind 0

This is a small, heavily wooded (for an “opening”) frost pocket with very steep sides. The North slope is being heavily encroached upon by *Populus tremuloides*. Otherwise, the pocket seems to be maintained fairly well with cold air and frost activity. Although small, this pocket is good habitat, but probably is not usable for Chryxus, as it is small and far-removed from other suitable habitat.

Flowering Species: *V. angustifolium*, *C. groenlandica*, *A. quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata	X			

6.31.2011 (TC), Sunny, Wind 0-5 mph, 91 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Convolvulus arvensis*, *Ranunculus septentrionalis*, *Rubus sp.*, *Hypericum cf perforatum*, *Lathyrus pratensis*

Lepidoptera Species: *Erynnis icelus* (1), *Thymelicus linleola* (300+), *Boloria bellona* (1), *Phyciodes morpheus* (3), *Coenonympha tullia* (10), *Polites themistocles* (1)

Site 45 (10.50 acres)

5.6.2010, 60 F, Partly Sunny, Wind 0-5 mph

Very good habitat- small cluster of 8-10 semi-mature Jackpine in the center of a true frost pocket. Site funnels and holds cold air very effectively. There are no *Corylus* or *Populus* encroaching, and seems to be a true “remnant” pocket. This site should continue to be visited for Lepidoptera surveys.

Flowering Species: *Polygala paucifolia*, *Anemone quinquefolia*, *Vaccinium angustifolium*, *Coptis groenlandica*

Lepidoptera Species: *Erynnis juvenalis* (1), *Boloria bellona* (1), *Celastrina ladon* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata	X			

6.31.2011 (TC), Mix of Sun/Clouds, Wind 0-5 mph, 91 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Hieracium pratense*, *Convolvulus arvensis*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Thymelicus linleola* (500+), *Boloria bellona* (1), *Phyciodes morpheus* (5), *Papilio canadensis* (4), *Coenonympha tullia* (1), *Speyeria cybele* (1)

Site 46 (9.98 acres)

5.6.2010, 60 F, Partly Cloudy, Wind 0

This is a large open pocket, with evidence of being an old settlement, and is very good habitat. Many large trees have colonized this pocket since it was abandoned (*P. tremuloides*, *P. banksiana*, *P. resinosa*). There are many areas that were excavated and several old foundations in the site. This area is excellent habitat, with much of the opening remaining open with no management. This area is bounded to the North by private property and there is a deer stand directly above the boundary line, apparently giving line of sight to the opening itself. Even with the vigorous nectaring by Hymenoptera on anything flowering within the site, there was very little Lepidoptera activity, surprisingly.

Flowering Species: *Viola cf adunca*, *Vaccinium. angustifolium*, *Coptis groenlandica*, *Anemone quinquefolia*

Lepidoptera Species: *Boloria bellona* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp			X	
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>	X			

6.31.2011 (TC), Mix of Sun/Clouds, Wind 0-5 mph, 91 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Convolvulus arvensis*, *Chrysanthemum leucanthemum*, *Chrysanthemum leucanthemum*, *Hypericum cf perforatum*

Lepidoptera Species: *Thymelicus linleola* (400+), *Boloria bellona* (1), *Phyciodes morpheus* (5), *Papilio canadensis* (4), *Coenonympha tullia* (10+), *Erynnis icelus* (3), *Polites peckius* (1)

Site 47 (10.94 acres)

5.6.2010 (CA), 55 F, Partly Cloudy, Wind 0-5 mph

Large sinuous open area- good habitat. This area would be a good candidate for management, as the nearby road increases access. It is becoming heavily encroached upon by *Rubus*, but little *Populus* and so may respond well to burning and possibly reseed with *Danthonia* to increase initial density. All patches of *V. angustifolium* were being vigorously visited by nectaring Hymenoptera, but there was little Lepidopteran activity.

Flowering Species: *Anemone quinquefolia*, *Polygala paucifolia*, *Viola cf adunca*, *Vaccinium angustifolium*, *Taraxicum officianale*, *Prunus virginiana*

Lepidoptera Species: *Vanessa virginiensis* (1), *Boloria bellona* (1)

6.18.2010 (TC), 85 F, Sunny, Wind 10-20 mph

Pocket barren with large, deep pothole in SW corner. Abundant *Pteridium aquilinum* and *Hieracium*, with *Aster* sp.(vegetative) common in the SE corner.

Flowering Species: *Rubus* sp., *Apocynum auriantiacum*, *Hieracium pratense*, *Chrysanthemum leucanthemum*, *Lathyrus* sp., *Melilotus* sp.

Lepidoptera Species: *Papilio canadensis* (3), *Hesperia sassacus* (30), *Thymelicus lineola* (100+), *Coenonympha tullia* (30+), *Danaus plexxipus* (3), *Phyciodes tharos* (1), *Phyciodes morpheus* (4)

Site 48 (17.18 acres)

5.10.2010 (CA), Mostly Sunny, Wind 0-5 mph, 62 F

This site is a large pocket with heavy manipulation, both as a former settlement and more recently an excavation area. Currently people are using this area for target practice and motorized recreation. For the most part, this does not seem to be effecting its' habitat quality, as it is still very good habitat. The east side is more wooded with Oak and a *Vaccinium* and *Pteridium* understory that may be better suited for Elfin habitat. With Aspen surrounding this site, it must be holding cold air fairly well to not be being encroached upon by the Aspen. This site could be an excellent candidate for habitat improvement in some form, as it is already highly manipulated and it is close to the road with a two-track access already bisecting the opening running east-west.

Flowering Species: *V. angustifolium*, *A. quinquefolia*

Lepidoptera Species: *Erynnis juvenalis* (3), *Vanessa virginiensis* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp		X		
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata		X		

7.5.2011 (TC), Mostly Sunny, Wind 5-10 mph, 82 F

Hieracium was abundant and was the focal nectar source for all of the species found at the site.

Flowering Species: *Hieracium aurantiacum*

Lepidoptera Species: *Phyciodes morpheus* (5), *Papilio canadensis* (2), *Colias interior* (3), *Everes comyntas* (1)

Site 49 (19.08 acres)

5.26.2011 (CA), Overcast, Wind 5-15 mph, 62 F

Large depression with steep barren hillsides and heavily grass-dominated bottom. Aspen/Red Pine/Jack Pine forest surround the site. The Aspen is mature and does not appear to be sending out runners into the site.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Fragaria virginiana*

Lepidoptera Species: *Erynnis juvenalis* (1), *Boloria bellona* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata		X		

7.8.2011 (TC), Mostly Sunny, Wind 0-5 mph, 83 F

Chest-Waist high Pteridium covers 98% of the site.

Flowering Species: *Campanula rotundifolia* (3 individuals)

Lepidoptera Species: None

Site 50 (19.08 acres)

5.10.2010 (CA), 58 F, Mostly Sunny, Wind 0-5 mph

Very steep, wooded sinuous “pocket” leading to a steep-sided more open bowl depression that had been managed at some point as evidenced by deep furrowing. Clustered small pockets of Aspen are surrounding the bowl but there is no apparent encroachment. This is very good habitat but may not be close enough to other source populations to continue monitoring or managing.

Surrounding Tree Species: *P. tremuloides*, *P. banksiana*

Flowering Species: *Arctostaphylos uva-ursi*, *Taraxicum officianale*, *Anemone quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi	X			
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium		X		
Pinus banksiana	X			
Danthonia spicata				X

7.6.2011 (TC), Sunny, Wind 0-5 mph, 84 F

Flowering Species: *Hieracium auriantiacum*, *Campanula rotundifolia*, *Krigia biflora*, *Rubus sp.*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Erynnis juvenalis* (3), *Thymelicus lineola* (500+), *Colias interior* (8), *Papilio canadensis* (1), *Coenonympha tullia* (3), *Phyciodes morpheus* (10), ***Phyciodes batesii*** (1), *Polites peckius* (1), *Chlosyne nycteis* (1), *Hesperia sassacus* (1), *Everes comyntas* (1)

Site 51 (9.98 acres)

5.26.2011 (CA), Sunny, Wind 5-15 mph, 60 F

Medium-sized pocket in mainly Aspen-Oak habitat. Many small- browsed *Prunus serotina* scattered through most of the site. There are several mature Jackpine, but there seems to be little regeneration. This site is highly dominated by *Pteridium* later in the growing season. Aspen at this site is not encroaching.

Flowering Species: *Prunus pumila var. susquehanae*, *Vaccinium angustifolium*, *Viola cf adunca*

Lepidoptera Species: *None*

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp			X	
Comptonia peregrina			X	
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata			X	

7.6.2011 (TC), Sunny, Wind 0-5 mph, 81 F

Hieracium is 80-90% done flowering.

Flowering Species: *Hieracium auriantiacum*, *Campanula rotundifolia*, *Rubus sp.*

Lepidoptera Species: *Thymelicus lineola* (50+), *Papilio canadensis* (1), *Phyciodes morpheus* (4)

Site 52 (10.07 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 60 F

Small opening in hardwood forest dominated by Aspen and Oak. The aspen is slowly encroaching from the margins, and with *Prunus serotina* and *Pteridium* completely dominate the site later in the growing season.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Prunus pumila* var. *susquehanae*, *Lithospermum canescens*, *Arctostaphylos uva-ursi*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana				X
Danthonia spicata			X	

6.29.2011, Sunny, Wind 5-10 mph, 78 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pretense*, *Convolvulus arvensis*, *Rubus* sp.

Lepidoptera Species: *Phyciodes batesii* (1), *Phyciodes morpheus* (4), *Papilio canadensis* (5), *Erynnis juvenalis* (2), *Coenonympha tullia* (1), *Chlosyne nycteis* (1)

Site 53 (18.62 acres)

Shallow open depression in a hardwood forest with Oak, Aspen and Paper Birch; much more mesic than other sites. This site is being encroached by Aspen. There is a good density of Danthonia, but no Jackpine and therefore does not seem worth maintaining. The site was very non-uniform in habitat quality. The southwest depression was more suitable, with the NW half mainly forested and the groundcover was dominated by Rubus.

5.20.2011 (CA), Hazy Sun, Wind 0-5 mph, 82 F

Flowering Species: *Prunus pumila var. susquehanae*, *Arctostaphylos uva-ursi*, *Vaccinium angustifolium*, *Anemone quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp		X		
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana				X
Danthonia spicata		X		

6.29.2011 (TC), Sunny, Wind 5-10 mph, 78 F

Completely *Pteridium*-dominated. The groundcover was difficult to see without parting the ferns.

Flowering Species: *Hieracium aurantiacum*, *Convolvulus arvensis*, *Rubus sp.*

Lepidoptera Species: *Phyciodes morpheus* (4), *Erynnis icelus* (1) *Papilio canadensis* (4), *Hesperia sassacus* (2)

Site 54 (30.34 acres)

5.26.2011 (CA), Sunny, Wind 5-15 mph, 60 F

Large, steep-sided kettle in Jackpine/Redpine forest. Approximately 25% of the site is covered by *Pteridium* later in the growing season. This is excellent habitat with a very good diversity of barrens species.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Prunus pumila* var. *susquehanae*, *Fragaria virginiana*, *Arctostaphylos uva-ursi*

Lepidoptera Species: *Callophrys niphon* (3), *Erynnis juvenalis* (1), *Celastrina ladon* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>	X			
<i>Danthonia spicata</i>		X		

6.30.2011 (TC), Mix of Sun /Clouds, Wind 5-10 mph, 84 F

Completely *Pteridium*-dominated. The groundcover was difficult to see without parting the ferns.

Flowering Species: *Hieracium auriantiacum* (abundant), *Convolvulus arvensis*, *Rubus* sp, *Campanula rotundifolia*, *Hieracium pratensis*

Lepidoptera Species: *Phyciodes morpheus* (8), *Papilio canadensis* (6), *Hesperia sassacus* (3), *Polites peckius* (2), *Thymelicus lineola* (30), *Colias interior* (6), *Bolotria bellona* (1), *Erynnis juvenalis* (2), *Phyciodes batesii* (3)

Site 55 (9.94 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 62 F

Medium-sized kettle surrounded by moderate slopes. Mostly coniferous Redpine/Jackpine forest surrounding this site with one small patch of Aspen. The site was is very grassy, and seems to be a good candidate for management.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Fragaria virginiana*

Lepidoptera Species: *Callophrys niphon* (5), *Erynnis juvenalis* (2), *Celastrina ladon* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana		X		
Danthonia spicata			X	

6.28.2011 (TC), Mostly Sunny, Wind 5-10 mph, 78 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Rubus sp.*

Lepidoptera Species: *Phyciodes morpheus* (5), *Erynnis icelus* (3) *Papilio canadensis* (12), *Polites peckius* (8), *Erynnis juvenalis* (4)

Site 56 (9.98 acres)

5.26.2011 (CA), Sunny, Wind 5-15 mph, 60 F

Small, shallow wooded depression surrounded by Aspen. There are many large mature Jackpine in the depression and on the Northeast corner. Much of this site is forested with either Jackpine or Aspen and is poor quality.

Flowering Species: *Prunus pumila* var. *susquehanae*, *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Fragaria virginiana*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata			X	

6.30.2011 (TC), Mix of Sun/Clouds, Wind 5-10 mph, 87 F

Very little nectar at this site at this time.

Flowering Species: *Hieracium auriantiacum*, *Campanula rotundifolia*

Lepidoptera Species: *Boloria bellona* (1), *Phyciodes morpheus* (1), *Colias interior* (1)

Site 57 (19.58 acres)

5.26.2011 (CA), Sunny, Wind 5-15 mph, 60 F

Small depression in mixed conifer *Jackpine/Red Pine/Acer saccharum* habitat. The Jackpine are large, mature trees.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata			X	

6.30.2011 (TC), Mix of Sun/Clouds, Wind 5-10 mph, 87 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*

Lepidoptera Species: *Boloria bellona* (1), *Papilio canadensis* (5), *Thymelicus lineola* (5), *Coenonympha tullia* (2), *Colias interior* (5)

Site 58 (15.07 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 62 F

Long, narrow, sinuous pocket within a Red Pine plantation. The site contains scattered Jack Pine and later in the year is dominated largely by *Pteridium*. There is a large heath-dominated poor fen on the North end of this site. It was surveyed for rare peatland butterflies and none were found in either survey period.

Flowering Species: *Vaccinium angustifolium*, *Anemone quinquefolia*,

Lepidoptera Species: *Polygonia* sp.

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata			X	

6.28.2011, Mostly Sunny, Wind 5-10 mph, 75 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Convolvulus arvensis*, *Rubus* sp.

Lepidoptera Species: *Phyciodes morpheus* (1), *Papilio canadensis* (8), *Erynnis juvenalis* (4), *Coenonympha tullia* (1)

Site 59 (10.50 acres)

5.25.2011 (CA), Sunny, Wind 0-10, 60 F

Long shallow depression with shallow pothole at the North end. The site is moderately to heavily forested not discernable as a pocket or opening within a fully coniferous matrix. *Pteridium* is heavily dominant later in the year.

Flowering Species: *Viola cf adunca*, *Anemone quinquefolia*, *Vaccinium angustifolium*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium			X	
Pinus banksiana		X		
Danthonia spicata			X	

7.6.2011 (TC), Sunny, Wind 0-5 mph, 80 F

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*, *Campanula rotundifolia*, *Krigia biflora*, *Convolvulus arvensis*

Lepidoptera Species: *Erynnis juvenalis* (10), *Thymelicus lineola* (10), *Speyeria cybele* (1), *Colias interior* (1), *Papilio canadensis* (1)

Site 60 (15.00 Acres)

5.25.2011 (CA), Mostly Sunny, Wind 5-10 mph, 58 F

Series of depressions in a more savannah-like portion of open barrens. The site was moderately treed with pure conifers surrounding, and an excellent burn candidate.

Flowering Species: *Vaccinium angustifolium*, *Anemone quinquefolia*, *Viola cf adunca*, *Arctostaphylos uva-ursi*

Lepidoptera Species: *Celastrina ladon* (1), *Erynnis juvenalis* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata		X		

7.6.2011 (TC), Sunny, Wind 0-5 mph, 80 F

Flowering Species: *Hieracium aurantiacum* (very sparse)

Lepidoptera Species: *Erynnis juvenalis* (5), *Colias interior* (1)

Site 61 (23.70 acres)

5.24.2011 (CA), Sunny, Wind 0-5, 61 F

Long, moderately deep, sinuous draw. Mainly Jackpine/Red Pine with on e small pocket of Aspen on the Southwest hillside. This site ranges from open on the South to moderately forested with small openings on the North. It nearly blends into Site 60 and if burned and harvested could create a large area of contiguous very good habitat.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Arctostaphylos uva-ursi*

Lepidoptera Species: *Oeneis chryxus* (1), *Callophrys niphon* (1), *Callophrys polios* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae			X	
Rubus sp			X	
Comptonia peregrina	X			
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata			X	

7.6.2011 (TC), Sunny, Wind 0-5 mph, 80 F

Flowering Species: *Hieracium auriantiacum*, *Hieracium pratense*, *Campanula rotundifolia*, *Krigia biflora*, *Convolvulus arvensis*, *Rubus sp.*

Lepidoptera Species: *Erynnis juvenalis* (10), *Colias interior* (2), *Papilio canadensis* (1), *Phyciodes morpheus* (1), *Coenonympha tullia* (1), *Speyeria cybele* (2), *Polites peckius* (1)

Site 62 (11.71 acres)

5.25.2011 (CA), Sunny, Wind 0-10, 60 F

Shallow, sinuous depression heavily forested with Aspen on the South end of the site. Lightly forested with Jackpine in the remainder of the site and a mixed hardwood forest surrounding. The site is dominated by *Pteridium* later in the year. This site does not appear to warrant management, as it is too small and is too heavily encroached by woody species.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Lithospermum canescens*

Lepidoptera Species: *Erynnis juvenalis* (4)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae			X	
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium			X	
Pinus banksiana			X	
Danthonia spicata			X	

7.6.2011 (TC), Sunny, Wind 5-10 mph, 80 F

Very sparse nectar sources; heavily *Pteridium*-dominated.

Flowering Species: *Hieracium aurantiacum* (sparse)

Lepidoptera Species: *Papilio canadensis* (3), *Hesperia sassacus* (1), *Speyeria cybele* (2), *Phyciodes morpheus* (1)

Site 63 (10.37 acres)

5.25.2011(CA), Mostly Sunny, Wind 5-10 mph, 58 F

Mostly flat opening in a mixed conifer *Q. ellipsoidalis*/ *P. resinosa*/ *P. banksiana* forest. *Quercus* is common within the site while litter may be precluding *Danthonia* and other herbaceous growth preferred by barrens species. Potentially an excellent candidate for burning. Only approximately 50% of the *Vaccinium* was flowering at the time of visit.

Flowering Species: *Viola cf adunca*, *Anemone quinquefolia*, *Vaccinium angustifolium*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>				X
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>			X	

6.24.2011(TC), Sunny, Wind 5-10 mph, 72 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Hieracium pratense*, *Chrysanthemum leucanthemum*

Lepidoptera Species: *Hesperia sassacus* (4), *Erynnis juvenalis* (8), *Poanes hobomok* (3), *Colias interior* (5), *Papilio canadensis* (10)

Site 64 (13.39 acres)

5.20.2011 (CA), Sunny, Wind 0-5 mph, 80 F

Very large, shallow depression surrounded by a mix of Red Pine/Jackpine with many scattered mature Jackpine within the site. This site is at least 50% dominated by *Pteridium* later in the season. There are at least two other openings very near this one that could be added to the overall acreage of this site, and could add to suitability if managed as such.

Flowering Species: *Anemone quinquefolia*, *Viola cf. adunca*, *Vaccinium angustifolium*, *Antennaria cf neglecta*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium	X			
Pinus banksiana		X		
Danthonia spicata	X			

6.28.2011, Mostly Sunny, Wind 5-10 mph, 70 F

Flowering Species: *Hieracium aurantiacum* (abundant), *Hieracium pratense*, *Campanula rotundifolia*

Lepidoptera Species: *Phyciodes batesii* (1), *Phyciodes morpheus* (4), *Phyciodes tharos* (1), *Papilio canadensis* (10), *Hesperia sassacus* (2), *Poanes hobomok* (4), *Erynnis juvenalis* (1), *Colias interior* (15), *Coenonympha tullia* (1), *Boloria bellona* (1)

Site 65 (12.15 acres)

5.20.2011 (CA), Hazy Sun, Wind 5-10 mph, 80 F

Two shallow, adjacent depressions surrounded by planted Red Pine and scattered Jackpine. There was no *Pteridium* here; seems fire would not improve this as it is excellent habitat and is not being encroached by woody or invasive species.

Flowering Species: *Arctostaphylos uva-ursi*, *Anemone quinquefolia*, *Viola cf adunca*, *Vaccinium angustifolium*

Lepidoptera Species: *Callophrys niphon* (1), *Celastrina ladon* (1), *Callophrys polios* (2), *Erynnis juvenalis* (1)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>	X			
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>		X		

6.25.2011 (TC), Mostly Sunny, Wind 5-10 mph, 75 F

Flowering Species: *Hieracium auriantiacum* (abundant), *Convolvulus arvensis*, *Campanula rotundifolia*

Lepidoptera Species: *Phyciodes morpheus* (3), *Papilio canadensis* (5), *Erynnis juvenalis* (2), *Erynnis icelus* (2), *Colias interior* (3), *Boloria bellona* (1)

Site 66 (10.59 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 60 F

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina			X	
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata			X	

6.19.2010 (TC), 74 F, Mix of Sun and Clouds, Wind 5-15 mph

Narrow North-South running ravine. *Pteridium aquilinum* was not as dense at this site. Area with the least amount of *Pteridium* (south half) was the most active for Lepidoptera. *Pinus banksiana* were all mature, healthy trees.

Flowering Species: *Hieracium aurantiacum*, *Rubus sp.*, *Convolvulus arvensis*.

Lepidoptera Species: *Coenonympha tullia* (1), *Papilio canadensis* (1), *Danaus plexxipus* (1), *Polites peckius* (1), *Thymelicus lineola* (5), *Phyciodes morpheus* (5) *Limnitis arthemmis* (1), *Poanes hobomok* (1), *Colias interior* (1)

Site 67 (36.47 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 60 F

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*

Lepidoptera Species: None

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina	X			
Vaccinium angustifolium			X	
Pinus banksiana		X		
Danthonia spicata			X	

6.19.2010 (TC), 70 F, Cloudy, Wind 10-15 mph

Steep, south-facing hillside that is heavily manipulated at the base and has been degraded by ATV's. There is a large clear area that is bare sand. There was no Aster present at this site. The site is in a mixed Apsen/Oak/Red Pine dominated barrens. Mainly *Comptonia* is dominant, but the site is very grassy (likely a *Poa* sp) and would likely be improved with some combination of management actions.

Flowering Species: *Hieracium aurantiacum*, *Hieracium pratense*

Lepidoptera Species: *Limenitis arthemis* (1), *Papilio canadensis* (1)

Site 68 (13.23 acres)

5.26.2011 (CA), Sunny, Wind 5-10 mph, 60 F

Small opening in hardwood forest dominated by Aspen and Oak. The aspen is slowly encroaching from the margins, while *Prunus serotina* and *Pteridium* completely dominate the site later in the growing season.

Flowering Species: *Vaccinium angustifolium*, *Viola cf adunca*, *Anemone quinquefolia*, *Polygala paucifolia*

Lepidoptera Species: *Erynnis juvenalis* (2)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi				X
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium		X		
Pinus banksiana			X	
Danthonia spicata	X			

6.19.2010 (TC), 75 F, Mix of Sun and Clouds, Wind 5-10 mph

Small opening- not a true frost packet or pocket barrens, but rather a heavily wooded series of very small openings with no contiguous habitat. The ground layer, although early in the season, was dominated by *Pteridium aquilinum*. This area should not be considered for management, and not classified as a pocket or opening. There was no Aster present at this site.

Flowering Species: None

Lepidoptera Species: None

Site 69 (10.92 acres)

5.26.2011 (CA), Hazy Sun, Wind 5-10 mph, 60 F

Flowering Species: *Vaccinium angustifolium*, *Anemone quinquefolia*, *Prunus serotina*, *Arctostaphylos uva-ursi*

Lepidoptera Species: *Callophrys niphon* (2)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>			X	
<i>Prunus pumila</i> var. <i>susquehanae</i>				X
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>	X			
<i>Vaccinium angustifolium</i>	X			
<i>Pinus banksiana</i>			X	
<i>Danthonia spicata</i>			X	

6.19.2010 (TC), 75 F, Periods of Sun and Clouds, Wind 5-10 mph

Long, Narrow sinuous ravine with steep north and south slopes. The ridgetops are *Populus grandidentata*, where the ravine bottoms are composed of *Pinus resinosa* and *Pinus banksiana*; all mature trees. This was excellent habitat; a perfect example of a remnant pocket barren with well-functioning frost pocket topography and vegetation. The surrounding slopes are steep to funnel and hold cold air and the ridges all heavily wooded to prevent wind penetration. The sparse *Hieracium* is overtopped by *Pteridium aquilinum*, which covers all of the opening.

Flowering: *Hieracium aurantiacum*, *Fragaria virginiana*, *Convolvulus arvensis*.

Lepidoptera Species: *Papilio canadensis* (2), *Danaus plexxipus* (1), *Limnitis arthemis* (1)

Site 70 (19.50 acres)

Large, open grassy depression with very few trees. This pocket is an excellent example of a true frost pocket by the topography, although the ground vegetation is very low and not diverse. Management for *Danthonia* could be considered, as this is a large patch and as such action would greatly improve its potential for both target species. No *Aster* was present at this site. Overall, there was very little nectar at this site, making it unlikely to harbor Tawny Crescent. This is a very high quality, productive site, and an excellent example of a still high-functioning frost pocket/pocket barren.

5.20.2011 (CA), Sunny, Wind 0-5 mph, 80 F

Flowering Species: *Arctostaphylos uva-ursi*, *Vaccinium angustifolium*, *Prunus pumila* var. *susquehanae*

Lepidoptera Species: *Callophrys polios* (6), *Boloria bellona* (3)

	Abundant	Common	Present	Absent
<i>Arctostaphylos uva-ursi</i>		X		
<i>Prunus pumila</i> var. <i>susquehanae</i>			X	
<i>Rubus</i> sp				X
<i>Comptonia peregrina</i>		X		
<i>Vaccinium angustifolium</i>		X		
<i>Pinus banksiana</i>		X		
<i>Danthonia spicata</i>		X		

6.19.2010 (TC), 73 F, Cloudy, Wind 5-10 mph

Flowering Species: *Hieracium aurantiacum*, *Campanula rotundifolia*, *Senecio obovatus* (all species sparsely represented)

Lepidoptera Species: *Colias interior* (1), *Phyciodes morpheus* (1)

Site 71 (13.69 acres)

5.20.2011 (CA), Hazy Sun, Wind 0-5 mph, 80 F

Sinuuous, non-depressed opening in hardwood with scattered mature Jackpine; later becomes dominated by *Pteridium*. Seems fire may improve habitat quality, with some other ground-modifying technique.

Flowering Species: *Anemone quinquefolia*, *Vaccinium angustifolium*, *Arctostaphylos uva-ursi*

Lepidoptera Species: *Celastrina ladon* (1)

	Abundant	Common	Present	Absent
Arctostaphylos uva-ursi			X	
Prunus pumila var. susquehanae				X
Rubus sp				X
Comptonia peregrina		X		
Vaccinium angustifolium	X			
Pinus banksiana			X	
Danthonia spicata		X		

6.28.2011 (TC), Mostly Sunny, Wind 5-10 mph, 74 F

Flowering Species: *Hieracium auriantiacum*, *Hieracium pratense*, *Convolvulus arvensis*, *Campanula rotundifolia*

Lepidoptera Species: *Papilio canadensis* (5), *Erynnis juvenalis* (4), *Colias interior* (2)

