

MOTHS OF THE MALHEUR NATIONAL WILDLIFE REFUGE:

Results from 10 sites sampled 5-8 August 2013



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SUMMARY

Macro-moths were sampled from the OO Ranch and Sodhouse/Headquarters areas of Malheur National Wildlife Refuge 5-8 August, 2013 as part of an ongoing faunal inventory of Lepidoptera. Blacklight traps were used to sample moths at 10 locations throughout the refuge over single night periods. A total of 57 species were identified and included 38 new species for the refuge. Lacking federal funding, moth inventory work was provided pro bono in the interest of maintaining momentum in documenting this ecologically important insect group.

INTRODUCTION

National wildlife refuges protect important habitats for many plant and animal species. Refuge inventories have frequently included plants, birds and mammals, but insects - arguably the most abundant and species-rich group in any terrestrial habitat - have largely been ignored. A large number of superficially similar moth species combined with few able moth taxonomists have likely contributed to their being overlooked. Yet moths (and other insects) can be easily and inexpensively sampled and can be identified by regional experts when they exist. Once identified, many moth species can be tied to plants that serve as hosts for their caterpillars. This established relationship places both moth and hostplant into a more meaningful ecological context.

Moths along with butterflies belong to the insect Order Lepidoptera. The larvae (caterpillars) are consumers of enormous quantities of plant biomass and help to recycle plant nutrients back into the soil. Most adult moths feed on nocturnally available flower nectar and in doing so pollinate many flowering plant species. As egg, larva, pupa or adult, moths are an abundant and essential food resource for many species of birds (especially when nesting), bats, rodents, reptiles, amphibians and other insects. Moths are, therefore, an essential component of a healthy and highly functioning ecosystem.

Sampling that includes the physical collection of voucher specimens is a necessary part of any meaningful insect inventory. Vouchers added to regional collections serve as indisputable evidence of a study's findings and contribute to a greater knowledge about phenotypic variability. When moth information (species, date, location, etc.) is data-based and combined with existing data-sets it can lead to a more resolute understanding of each species' range, distribution, flight period and relative abundance, as well as responses to environmental variability over time such as those brought about by global climate change.

Each refuge has a unique species assemblage where each species serves one or more ecological roles. Moths are a particularly rich invertebrate group that remains largely unknown for most important wildlife areas including our national wildlife refuges. This study provides an important step towards documenting these less conspicuous yet vitally important life forms.

METHODS

Ten trap sites were selected to maximize sampling of refuge moth diversity and included several new sites in the OO Ranch and Headquarters/Sodhouse areas. As before (September 2012), a variety of plant communities and habitat types were sampled across a broad portion of the refuge. Both wetland and upland sites were included and spanned from the headquarters area in the northeast to the OO Ranch area west. The Buena Vista Overlook was also sampled. (Figures 1-3, Tables 1 and 2, Photos 1-4).

For each site sampled a 12 volt battery-powered light trap unit was run continuously over one full night (from dusk until dawn) with a 22 watt circular UV-blacklight bulb as a visual attractant. Moths hitting clear acrylic vanes mounted above the trap fell down through a funnel and into a collection bucket charged with a fumigant ("No Pest Strip") which quickly killed them.

Sample dates were chosen to coincide with the new moon, a time when interference from ambient moon light is minimal and the effectiveness of light traps is greatest. Warm, calm nights with cloud cover are preferable to cold or windy nights, although spring and fall flying species are well adapted to cold or otherwise adverse conditions.

Samples from traps were collected early the following morning, placed and sealed in sealable plastic bags and labeled with location and date using a permanent marker pen. Samples were then transferred to a freezer until all refuge sampling was finished for the sample period. After transfer to the lab in Corvallis (and kept cool in transit), samples were placed again in a freezer until they could be processed.

Processing entailed thawing moths on a large white sheet of paper and sorting/counting to species. Identifications of most moths were determined immediately. Less familiar moths were identified using the Oregon State Arthropod Collection (OSAC, Dept. of Zoology, Oregon State University, Corvallis) and web-based resources such as the PNW Moths (pnwmoths.biol.wvu.edu) and Moth Photographers Group (mothphotographersgroup.msstate.edu) web-sites. The most difficult identifications required assistance from other moth experts.

One or more voucher specimens for each new moth species sampled were retained, mounted and labeled, to be accessioned into OSAC.

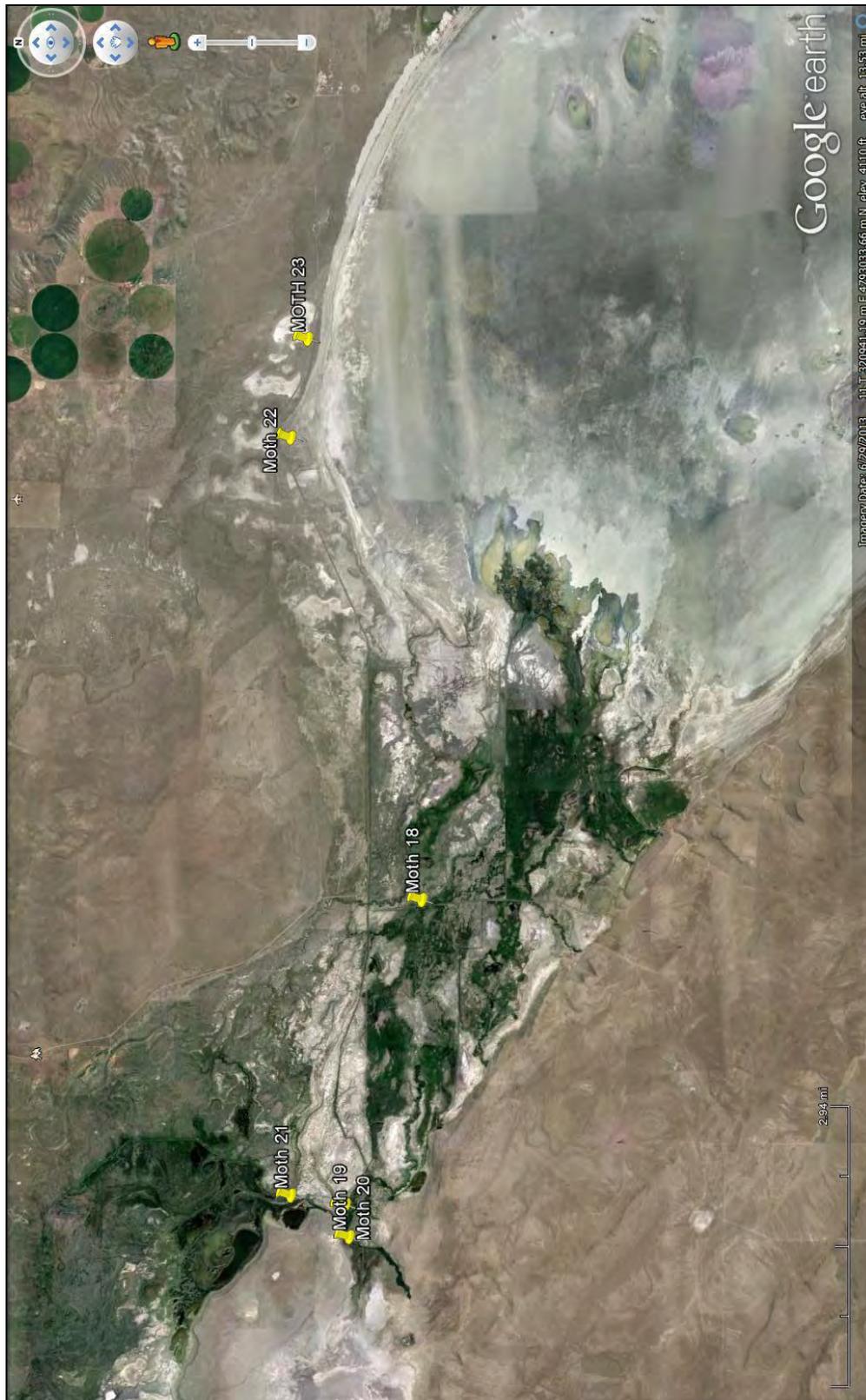


Figure 1 - Map of OO Ranch moth trap locations.



Figure 2 - Map of Sodhouse area moth trap locations.

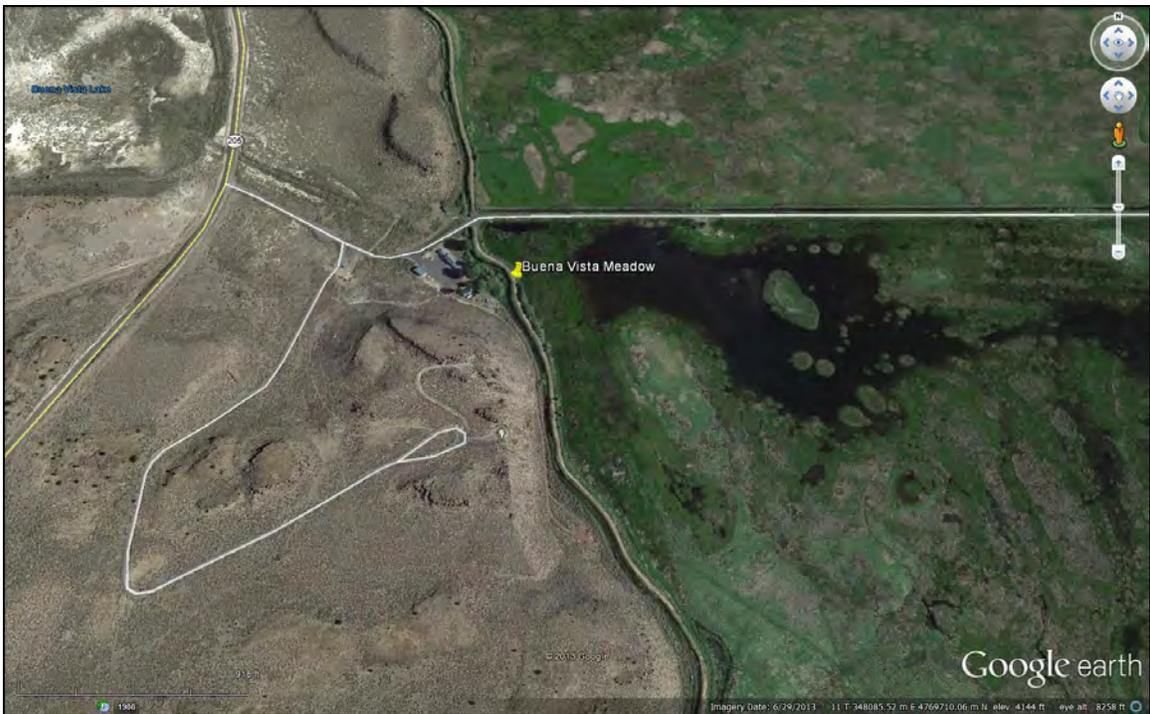


Figure 3 – Map of Buena Vista Meadow trap location.

Table 1. Moth site GIS attributes I.

NO.	NAME	UNIT	DATE	HAB_VEG
6	Headquarters	Sodhouse	8/6/2013	Overlook (high spot) with dry sage and "cheat" grass.
8	Blitzen at Northeast Wright	Sodhouse	8/6/2013	Riparian edge with lots of willow, v tall "bunchgrass", etc.
10	Malheur Lake/Boat Launch Rd.	Sodhouse	8/6/2013	Reeds, cattails, weeds, near canal.
12	Buena Vista Meadow	Buena Vista	8/8/2013	Mowed grass road, heavy willow "wall" plus pond, canal edges, large cottonwoods nearby.
18	South Harney Rd.	OO Ranch	8/5/2013	Field with grasses, weeds, "Senecio" near taller cattails, reeds, etc.
19	Big Stick Rd.	OO Ranch	8/5/2013	Alkali shrubs, riparian herbs.
20	Big Stick/OO junction	OO Ranch	8/6/2013	Opening within willows; goldenrod, herbs.
21	SE Derrick Lake canal	OO Ranch	8/5/2013	Upland shrubs & forbs next to canal vegetation.
22	North Harney Lake West	OO Ranch	8/5/2013	Fairly sparse grasses and "alkali shrubs".
23	North Harney Lake East	OO Ranch	8/6/2013	Dense shrubs on alkali soils.

Table 2. Moth site GIS attributes II.

NO.	NAME	UNIT	GPS	EAST	NORTH	ACCU RACY
6	Headquarters	Sodhouse	11T 0350548 / 4791532 +/-14 feet	350548	4791532	14
8	Blitzen at Northeast Wright	Sodhouse	11T 0349250 / 4788410 +/-14 feet	349250	4788410	14
10	Malheur Lake/Boat Launch Rd.	Sodhouse	11T 0350843 / 4793307 +/-17 feet	350843	4793307	17
12	Buena Vista Meadow	Buena Vista	11T 0348068 / 4769644 +/-17 feet	348068	4769644	17
18	South Harney Rd.	OO Ranch	11T 0317617 / 4795278 +/-7 feet	317545	4793224	7
19	Big Stick Rd.	OO Ranch	11T 0311884 / 4794595 +/-7 feet	311884	4794595	7
20	Big Stick/OO junction	OO Ranch	11T 0312425 / 4794648 +/-14 feet	312425	4794648	14
21	SE Derrick Lake canal	OO Ranch	11T 0312688 / 4795356 +/-17 feet	312688	4795356	17
22	North Harney Lake West	OO Ranch	11T 0325296 / 4795278 +/-17 feet	325296	4795278	17
23	North Harney Lake East	OO Ranch	11T 0327114 / 4794910 +/-20 feet	327114	4794910	20



Photo 1. Sparse vegetation in alkali habitat north side of Harney Lake (Site 22).



Photo 2. Lush willow dominated habitat west of Harney Lake (Site 20).



Photo 3. Combining diverse wet and dry habitats in the OO Ranch area (Site 21).



Photo 4. Dry opening within a wet area of heavy cattails, rushes and reeds (Site 18).

RESULTS & DISCUSSION

Approximately 1,500 individual moths and 57 moth species were sampled from all sites combined (Tables 4, 5) during this August 2013 effort. Individual samples ranged in size from 81 to 233 moths and included from 8 to 29 species each. Moth samples were on average substantially smaller and less diverse than those taken in September of 2012. Nonetheless, fully 67% (38 species, Table 3) of the sampled moth fauna was new to the refuge and brings the total number of documented refuge moth species to 143.

Differences in moth sample abundance and species richness can vary due to site, season and year. Ambient moonlight, temperature and humidity can also impact moth activity and the relative effectiveness of moth light-traps. To account for these factors and to help gauge overall moth activity, three sites sampled in 2012 (Buena Vista Meadow, Headquarters, Blitzen at Northeast Wright) were also sampled in 2013.

Additional sampling of refuge habitats over time will undoubtedly reveal many additional moth species for the Malheur NWR. May, June and July sampling has not yet occurred and is a time when a unique moth assemblage fauna is in flight. Additional late summer-fall sampling will also continue to add species since many rare moths are active at that time.

Table 3. New moths for the Malheur NWR.

CRAMBIDAE	Loxostege ceralalis Loxostege lepidalis	NOCTUIDAE	Euxoa bocha Hadenella pergentilis Helotropha reniformis
EREBIDAE	Notarctia arizonensis		Hydraecia perobliqua Hypocoena rufostrigata
GEOMETRIDAE	Chlorochlamys triangularis Digrammia curvata Digrammia nubiculata Digrammia subminiata Synchlora bistriaria		Lacinipolia strigicollis Mythimna oxygala Papaipema insulidens Ponometia elegantula Protogygia postera Proxenus mindara
LASIOCAMPIDAE	Malacosoma disstria		Schinia acutilinea Schinia unimacula Schinia walsinghamsi
NOCTUIDAE	Abagrotis erratica Abagrotis glenni Afortella cylindrica Anarta decepta Apamea niveivenosa obscuroides Autographa californica Capsula subflava Caradrina meralis Euxoa atristrigata		Scotogramma fervida Simyra insularis Spodoptera praefica Trichordestra liquida Xylomoia indirecta
		NOTODONTIDAE	Furcula scolopendrina

Table 3. Macro-moth species abundance by trap site.

Family	Taxon	Moth Trap Site Number										Total Abundance
		Sodhouse			B Vista	OO Ranch						
		6	8	10	12	18	19	20	21	22	23	1492
Crambidae	<i>Loxostege cereralis</i>	1										1
	<i>Loxostege lepidalis</i>	8					7		3	32	35	85
Erebidae	<i>Grammia nevadensis</i>										1	1
	<i>Notarctia arizonensis</i>			1			7					8
Geometridae	<i>Chlorochlamys triangularis</i>	1										1
	<i>Digrammia curvata</i>	3	4		8		1	1			7	24
	<i>Digrammia nubiculata</i>	6	1							6		13
	<i>Digrammia subminiata</i>		12		12		4	11				39
	<i>Perizoma custodiata</i>									6	9	15
	<i>Prochoerodes amplicineraria</i>	2					1					3
	<i>Synchlora bistrifaria</i>		1		1		1					3
Lasiocampidae	<i>Malacosoma distria</i>	1										1
Noctuidae	<i>Abagrotis erratica</i>		1									1
	<i>Abagrotis glenni</i>									1		1
	<i>Abagrotis nanalis</i>	1										1
	<i>Abagrotis vittifrons</i>		3				1					4
	<i>Afotella cylindrica</i>	3	3		5		10	4	13	8	44	90
	<i>Anarta decepta</i>						19					19
	<i>Apamea devastator</i>	16	66	17	25	16	2	28	10	5	3	188
	<i>Apamea niveivenosa obscuroides</i>	2	1	4	5	70	3	4	12			101
	<i>Autographa californica</i>	1	1									2
	<i>Capsula subflava</i>			4		2		1	1			8
	<i>Caradrina meralis</i>	1										1
	<i>Caradrina montana</i>		6					1			1	8
	<i>Euxoa atristrigata</i>	2										2
	<i>Euxoa bocha</i>		1									1
	<i>Euxoa declarata</i>		1									1
	<i>Euxoa laetificans</i>						2		18			20
	<i>Euxoa plagigera</i>	6										6
	<i>Euxoa tristicula</i>		1	1		1	1					4
	<i>Feltia jaculifera</i>		6			1						7
	<i>Hadenella pergentilis</i>	1					2	1	2	6	20	32
	<i>Helotropha reniformis</i>			1								1
	<i>Hydraecia perobliqua</i>							9				9

(Table 4 continued next page)

Family	Taxon	Moth Trap Site Number										Total Abundance
		Sodhouse			B Vista	OO Ranch						
		6	8	10	12	18	19	20	21	22	23	
	<i>Hypocoena rufostrigata</i>			5			1					6
	<i>Lacinipolia strigicollis</i>	3			4		1	1				9
	<i>Leucania farcta</i>		44			9	4	11	8			76
	<i>Melanchra picta</i>			1				1				2
	<i>Mythimna oxygala</i>	8	3	8	4	5	2	20	4			54
	<i>Oligia violacea</i>	18	1		4		13	17	2			55
	<i>Papaipema insulidens</i>							1				1
	<i>Ponometia elegantula</i>	1					1					2
	<i>Protopgygia postera</i>	15	29	1	4	2	15	77	24	34	46	247
	<i>Proxenus mindara</i>	46	3	27	4	1	4	12	3		5	105
	<i>Pseudanarta crocea</i>	1										1
	<i>Rhizagrotis modesta</i>	11	7		6		40	22	32	3	13	134
	<i>Schinia acutilinea</i>	11										11
	<i>Schinia unimacula</i>	6										6
	<i>Schinia walsinghamsi</i>	20							10		2	32
	<i>Scotogramma fervida</i>					2	2	3	2		9	18
	<i>Simyra insularis</i>	1		8	2		1					12
	<i>Spodoptera praefica</i>	1									1	2
	<i>Trichordestra liquida</i>				1							1
	<i>Xylomoia indirecta</i>		2	2	4	1						9
Notodontidae	<i>Furcula scolopendrina</i>				1			2				3
Sphingidae	<i>Hyles lineata</i>		1									1
	<i>Smerinthus ophthalmica</i>				1							1
Unidentifiable	No discernable wing pattern	1		1	1							3
Total Moths -->											1492	

Table 3. Moth abundance and richness by trap site

Site #	Site Name	Site Unit	Moth Abundance	Moth Richness
6	Headquarters	Sodhouse	198	29
8	Blitzen at NE Wright	Sodhouse	198	23
10	Boat Ramp Road	Sodhouse	81	13
12	Buena Vista Meadow	Buena Vista	92	17
18	South Harney Road	OO Ranch	110	11
19	Big Stick Road	OO Ranch	120	23
20	Big Stick/OO Junction	OO Ranch	233	22
21	SE Derrick Lake canal	OO Ranch	144	15
22	North Harney Lake West	OO Ranch	100	8
23	North Harney Lake East	OO Ranch	197	15

CONCLUSIONS

A total of 143 moth species have now been documented for the Malheur National Wildlife Refuge. While this number may seem sizeable, it likely represents barely one-third of the true number of macro-moth species present there.

August samples in 2013 were both smaller and less diverse than expected - perhaps due in part to sub-normal precipitation - but contributed many new species to this inventory effort. Expanding moth collection localities into the OO Ranch area helped to incorporate additional plant communities and likely resulted in additional moth species. It also provided better breadth of coverage for the refuge as a whole.

Resampling of certain sites helps to establish a moth abundance/richness baseline for a given sample period and is very helpful in placing newly sampled locations into a larger refuge context. Sites at the refuge headquarters overlook (Site 6), Blitzen River (Site 8) and Buena Vista Meadow (Site 12) were resampled and should be included as is possible in all future sampling for this purpose.

Finally, from a wildlife conservation standpoint it is useful to know something about rare species and their distribution across a given landscape of interest. Typically, the number of rare moth species documented increases with the number of samples taken. Oftentimes, rare moths are extremely localized and are tightly bound to the vicinity of their larval hostplants. Locating and sampling rare or unusual habitats and plant species can thus help to increase the odds of detecting rare moths.

Continued sampling of diverse plant communities across the refuge will eventually produce an impressive picture of the distribution and abundance of this complex insect assemblage.

