Surveys for Odonates at Low and Mid-Elevation Wetlands
Colville National Forest
Northeast Washington
Summer 2012
ISSSP Project

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SUMMARY
This is the first of a two-year project to document odonates that occupy low and mid-elevation wetlands on the Colville National Forest within the northeastern Washington counties of Ferry, Stevens, and Pend Oreille. We surveyed eight wetlands in five discrete areas. We visited each site three times, (early, middle and late summer) during warm, sunny weather and periods of the day when odonates were typically active. We also kept track of incidental captures in the three counties. We captured 45 species overall and, at every site, photographed the first specimen of each species captured. We retained vouchers of the two county record captures and sent those to Dennis Paulson (Professor Emeritus, University of Puget Sound). For all species, we measured the length of the first five males and five females captured at each site and added these to our database of local body lengths.

INTRODUCTION
In northeastern Washington (NEWA), surveys for invertebrates, even the charismatic lepidoptera and odonata, were ad hoc in nature until 2009. Though Cannings (2002) and Paulson (1999) listed species that probably occurred in NEWA, no systematic surveys had been conducted to document NEWA odonate distribution.

Beginning in 2005, the Colville National Forest (CNF) coordinated limited surveys for odonates at various sites on public land in NEWA. Most sites were located at low or middle elevations. The CNF also maintained records of miscellaneous odonate sightings. Beginning in 2009, the CNF implemented a systematic survey program to document the distribution of odonates over time and space at elevations greater than 3,500 feet (Loggers & Moore, 2009; Loggers & Moore, 2010; Loggers & Moore, 2011). Those surveys and sightings resulted in the documentation of 21 county records (first captures in a specific county) and records that have expanded the known flight seasons of several species (Paulson, D., personal communication).

This survey program was begun in part due to the "Update of the Regional Forester's Sensitive Species Lists and Transmittal of Strategic Species List" (USDA Forest Service 2008, updated 2012), which list five odonates as "sensitive" and one as "strategic":

Sensitive species	Strategic species
Aeshna subarctica (Subarctic darner)	Leucorrhinia borealis (Boreal whiteface)
Aeshna sitchensis (Zigzag darner)	
Coenagrion interrogatum (Subarctic bluet)	
Somatochlora franklini (Delicate emerald)	
Somatochlora whitehousei (Whitehouse's emerald)	

All of the above species are considered boreal obligates, their distribution being either holarctic (*Aeshna subarctica*) or restricted to North America (the others). This boreal environment dips into Washington in two locations: the NE part of the state (the area covered by the CNF) and the central part of the state (the Okanogan Highlands).

This year, we expanded the surveys in an attempt to complete distribution maps of odonate species that occur in NE Washington by concentrating on mid- and lower-elevation sites. We will complete the survey of mid- and lower-elevation sites in 2013.

METHODS

We used the National Wetlands Database GIS and the CNF digital elevation GIS coverages to identify eight wetland complexes, larger than five acres and at elevations less than 4,000 feet, that were accessible and had not been previously surveyed (Table 1).

Table 1. ***Wetlands chosen for survey in 2012***

	WGS 84, UTM Zone 11N						
Location	**Lat (N)**	**Long (W)**	**T**	**R**	**Sec**	**County**	**Elev. (ft)**
Ferry Lake	48° 31.329	-118° 48.805	35	32	21	Ferry	3,349
Long Lake	48° 29.828	-118° 48.765	35	32	28	Ferry	3,246
Sheep Mountain Wetland	48° 32.424	-118° 48.491	35	32	9	Ferry	3,284
Empire Lake	48° 48.470	-118° 42.823	38	32	12	Ferry	3,626
Ward Lake	48° 47.216	-118° 43.839	38	32	14	Ferry	3,641
Little Twin Lakes	48° 34.209	-117° 38.654	35	41	04	Stevens	3,737
Stuart Meadows	48° 41.324	-117° 31.169	37	42	20&21	Pend Oreille	3,585
Haliday Fen	48° 55.338	-117° 17.632	40	44	31	Pend Oreille	2,963

Since odonate seasonal flight periods vary by species, our general sampling protocol includes surveys at three times during the general flight season, to increase the likelihood of encountering all potential species: (1) early summer - between mid-June and mid-July; (2) middle summer - between mid-July and mid-August; and (3) late summer/early autumn - between mid-August and the end of September. Table 2 shows the sampling dates for each location for 2012.

Table 2. ***Survey dates by location***

Location	**Dates surveyed in 2012**		
Ferry Lake	NS	7-August	24-September
Long Lake	25-June	7-August	24-September
Sheep Mountain Wetland	NS	7-August	24-September
Empire Lake	11-June	8-August	13-September
Ward Lake	11-June	8-August	13-September
Little Twin Lakes	20-June	27-July	25-September
Stuart Meadow	20-June	26-July	14-September
Haliday Fen	24-June	1-August	16-September

Two to five people surveyed each wetland area and surveys were performed on warm, sunny days to maximize the chances of encountering flying odonates. We recorded time, temperature, and a general description of the weather at the beginning and end of each survey. Surveyors walked the entire wetland and associated dry, open uplands, if present. We identified each odonate caught, or placed it in a live container for identification later that day. If identification was uncertain, we vouchered the specimen and sent it to D. Paulson for verification. The first time we captured a species at a site during a survey, we photographed it to establish a photographic

database. We vouchered any specimens identified as county records. We also measured overall length (head to tip of the cerci) of the first five males and five females of each species at each site, for inclusion in the CNF database of local body lengths. To avoid duplicate measurements, we marked measured animals by removing a small section of the hindwing. All records are stored in a spreadsheet maintained by the CNF and will be entered into NRIS by spring 2013. County records have been uploaded to Odonata Central (http://www.odonatacentral.org/).

RESULTS AND DISCUSSION

Across all sites and survey periods we encountered 45 species of odonates (Table 3). This compares to 32 species in 2009, 26 in 2010 and 31 in 2011 (Loggers & Moore, 2009; Loggers & Moore, 2010; Loggers & Moore, 2011). This substantial increase in the number of species encountered relative to the higher elevation surveys of the last three years is consistent with observations across most insect taxa. Even within this year, the lowest elevation site (Haliday Fen) had the largest number of encounters for any sample period (Table 4). Consistent with previous year's data, the middle summer sampling period had the highest number of odonate species present (Table 4), representing some overlap between earlier and later sampling sessions.

Table 4. Number of species captured, by location and capture session.

Survey Period	Ferry Lake	Long Lake	Sheep Mtn	Empire Lake	Ward Lake	Twin Lakes	Stuart Meadow	Haliday Fen	Total
Early Summer	NS	7	NS	6	4	5	6	9	37
Middle Summer	8	10	7	12	17	16	16	22	108
Late Summer	5	12	6	12	11	12	13	12	83

Nine of the 45 species were present in at least seven of the sample sites, while 24 of the 45 species were encountered at no more than two sites (Table 3). The genera *Aeshna* and *Sympetrum* were the two most speciose. Although previously captured in NEWA, the encounters of *Ophiogomphus occidentus, Argia vivida, S. franklini, Ischnura cervula,* and *I. perparva* were a first for the CNF project. In 2012, we captured two Stevens county records, *Macromia magnifica,* and *A. subartica*. Since ISSSP began funding these systematic surveys in 2009, we have recorded 12 county records, leading to a total of 21 county records since the CNF began documenting odonate distributions in NEWA in 2005. We vouchered all county records and sent the specimens to D. Paulson.

Of the 45 species we observed, only three (*Enallagma annexum, S. semicircularis* and *S. walshii*) were encountered during all three survey periods, while 18 were encountered only during a single survey period (Table 3). After four years of sampling, these data are now providing a fairly robust picture of the temporal distributions of the adult phase of the life cycle for NEWA odonates.

These surveys have also extended the known distribution of two of the "strategic" odonate species identified by the Forest Service. *A. subarctica* has now been documented at seven different locations on the CNF, and *S. franklini* has now been documented at two locales on the CNF in Pend Oreille County.

Over the next several decades, climate change is predicted to profoundly affect species that use wetlands across the globe, particularly temperature sensitive ectothermic species such as insects. In NEWA, where climate change is expected to cause warmer, drier, summers, many insect species may be forced to shift attitudinally and/or elevationally to find suitable habitats. This project documents an indicator taxon's spatial and temporal

distribution within the CNF. These data provide a baseline against which future distribution data can be compared.

The systematic survey of low and mid-elevation wetlands across the CNF was performed using ISSSP funds in 2012 and will be continued through 2013.

LITERATURE CITED

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Table 3. ***Results of odonate surveys, by survey period and wetland, on the CNF, Summer 2012***

Survey periods: 1 = early summer; 2 = middle summer; 3 = late summer.

Species	Ferry Lake*	Long Lake	Sheep Mtn Wetland*	Empire Lake	Ward Lake	Little Twin Lakes	Stuart Meadows	Haliday Fen	Incidental
Aeshna canadensis	2	2-3	2-3		2	2-3	2-3	2	
A. constricta					3			2	
A. eremita	2	2-3		2-3	2-3	2-3			
A. interrupta	3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	
A. juncea				3			2-3	2-3	
A. palmata	2-3	2-3	2	2-3	2-3	3	2-3	2-3	
A. sitchensis							2-3	2-3	
A. subarctica						3**		3	
A. tuberculifera						3	3		
A. umbrosa	3	3				3	3	3	
Amphiagrion abbreviatum								1-2	
Anax junius		3							
Argia vivida								2	
Coenagrion resolutum		1				1	1-2	1	
Cordulia shurtleffii				1		2	1	1	
Enallagma annexum	2	1-2		1-2	1-2	2	2-3	2	
Epitheca spinigera				1	1				
Ischnura cervula				2		1			
I. perparva				3					
Ladona julia						2			2 Swan Lake
Lestes congener	3	3	3	3	2-3	3	3	3	
L. disjunctus	2	2-3		2	2	2	2	2	
L. dryas			2	2	2	2	2	2	
L. unguiculatus			3						
Leucorrhinia glacialis						2			
L. hudsonica		1-2		1-2	1-2	1	1-2	1-2	
Leucorrhinia intacta					2				
Leucorrhinia proxima	2	1-2			2	2	2	1	
Libellula forensis	2					2			
Libellula quadrimaculata	2	1-2		1-2	1-2	1-2	1-2	1-2	
Macromia magnifica								2	1** LPO Refuge
Nehalennia irene		1				2	1	1-2	
Ophiogomphus occidentis								2	
Rhionaeschna californica		1		1					
Somatochlora franklini								2-3	
S. semicircularis			2	2		1	1-3	1-2	
S. walshii								1-3	
Sympetrum corruptum				3					
S. costiferum		3			3	3		3	
S. danae		3	2-3	2-3	2-3	2-3	2-3	2-3	
S. internum				3	2-3				
S. madidum					2				
S. obtrusum	3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	
S. pallipes		3		3	3	2-3	2-3	2	
S. semicinctum				3	2-3				

* Only surveyed during periods 2 and 3

** County Records