

SURVEYS TO DETERMINE THE STATUS AND DISTRIBUTION OF THREE COLUMBIA RIVER GORGE ENDEMIC CADDISFLY AND STONEFLY SPECIES: *FARULA CONSTRICTA*, *NEOTHREMMMA ANDERSONI*, AND *NANONEMOURA WAHKEENA*

FINAL REPORT FROM THE XERCES SOCIETY AND AQUATIC BIOLOGY ASSOCIATES, INC. TO THE INTERAGENCY SPECIAL STATUS/SENSITIVE SPECIES PROGRAM (ISSSSP) AND THE COLUMBIA RIVER GORGE NATIONAL SCENIC AREA (CRGNSA)

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Multnomah Falls, Columbia River Gorge National Scenic Area, Oregon. Photo by Candace Fallon (Xerces Society).

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ABSTRACT

The Columbia Gorge caddisfly (*Neothremma andersoni*), the Wahkeena Falls flightless stonefly (*Nanonemoura wahkeena*), and the farulan caddisfly (*Farula constricta*), are all rare endemic aquatic invertebrates thought to be restricted to the Columbia River Gorge in Oregon. To better understand their distribution throughout the Columbia River Gorge National Scenic Area (CRGNSA), as well as the potential impacts of recreation on their populations, biologists from the Xerces Society and Aquatic Biology Associates, Inc. comprehensively surveyed over 70 aquatic habitat sites throughout the Scenic Area from April through October 2015. This survey effort resulted in documenting new locations for five species of Forest Service Sensitive or Strategic caddisflies: *Farula constricta* (OR-SEN), *Neothremma andersoni* (OR-SEN), *Neophylax smithi* (WA-STR, previously known only from Washington State and a single site in Oregon), *Rhyacophila viquaea* (WA-STR), and *Namamyia plutonis* (OR-STR). The endemic caddisfly *Neothremma prolata*, which was previously known from only its type locality at Cabin Creek Falls (NatureServe 2015), was also discovered at a second site on Wonder Creek. This species may be the rarest and most vulnerable caddisfly species in the CRGNSA. In addition, a single female of what may be *Rhyacophila unipunctata* (OR-STR) was collected from the Wahkeena Creek springhead. Two other caddisfly taxa, *Neothremma* near *andersoni* and *Ochrotrichia* near *buccata/hadria*, were also discovered and may represent new species, as both are similar yet distinct from the currently described species. Follow-up surveys are needed to collect more adults for species identification and publishing descriptions. Finally, we confirmed the presence of the Wahkeena flightless stonefly, *Nanonemoura wahkeena* (OR-SEN), at its type locality at Wahkeena Spring. During our survey efforts we also documented the presence of the OR-STR/WA-SEN pristine springsnail (*Pristinicola hemphilli*), which was observed from at least 20 sites.

We achieved all major goals of this project:

- Conduct a sensitive caddisfly and stonefly identification and survey methods training workshop for Forest Service and Bureau of Land Management biologists (occurred on May 20, 2015)
- Consult with CRGNSA biologists to identify priority survey sites near the known collection localities of three Columbia River Gorge endemic species in Oregon: *Farula constricta*, *Neothremma andersoni*, and *Nanonemoura wahkeena*
- Survey suitable habitat on the CRGNSA
- Record all data including documenting where surveys were conducted
- Write a complete report that includes detailed maps of areas surveyed for these three species

We recommend that increased survey efforts continue in the Columbia River Gorge NSA and adjacent Mt. Hood National Forest. Further documentation of these species' ranges and habitats is especially critical for advancing understanding of their status and needs and taking the appropriate conservation measures. Of the sites surveyed in 2015, the Eagle Creek, Mist Creek, Mossy Falls, Oneonta Creek, and Wahkeena Creek basins all hosted one or more of our target species and may be especially important for protecting sensitive aquatic invertebrates. The population of *Neothremma prolata* at Lancaster Falls on Wonder Creek is particularly vulnerable and would greatly benefit from protection. Given the difficulty identifying many immature caddisfly and stonefly species, many of our collections would benefit from genetic analysis. In particular, CO1 DNA barcoding could be used on immature specimens to make accurate species identifications. Based on the results of our surveys, we recommend the following:

- Apply CO1 DNA barcoding to current and future larval collections to assess the diversity and distribution of *Neothremma* species in the Columbia River Gorge and adjacent areas;

- Revisit all sites with *Neothremma* or *Farula* collections that have potential to be *N. andersoni*, *N. prolata*, *N. near andersoni*, or *F. constricta* and collect adults for positive species identification;
- Revisit the Wahkeena Creek springhead to confirm the single female collection of *Rhyacophila* probably *unipunctata* (OR-STR);
- Revisit sites with *Soliperla* collections to collect adult males for positive species identification;
- Conduct a thorough evaluation of the Mist Falls headwater spring, which may support *Neothremma andersoni*, *Setvena wahkeena*, *Nanonemoura wahkeena*, and other rare or sensitive invertebrates;
- Continue identifying *Farula* populations in the Gorge and adjacent Mt. Hood National Forest and conduct CO1 DNA analyses to determine the potential existence of a species complex;
- Investigate the unnamed tributary to Multnomah Creek (Multnomah Creek Site 7), which may have potential for harboring *Neothremma andersoni* and *Nanonemoura wahkeena* in its headwaters;
- Collect more specimens of the two potential new species (*Neothremma near andersoni* and *Ochrotrichia near buccata/hadria*) for genetic and morphological evaluation.

INTRODUCTION

The Columbia River Gorge National Scenic Area (CRGNSA) straddles two states and an 85 mile stretch of the Columbia River, encompassing 292,500 acres and spanning six counties in Oregon and Washington. Elevations throughout the Scenic Area range from sea level to nearly 1,525 meters (5,000 feet). This dramatic range in elevation, combined with the geologic and climatic factors that gave rise to the Gorge, has resulted in an incredibly unique area with a high diversity of habitats and species, including a number of endemic plants and invertebrates. Despite the relative protection afforded by the rugged landscapes within the Gorge, increasing recreation pressures and habitat alterations, particularly along the Historic Columbia River Highway corridor, may render populations of these endemic species vulnerable.

Our study had three main objectives: to document the distribution of three rare endemic caddisfly and stonefly species in the Columbia River Gorge National Scenic Area; to characterize the aquatic habitats these species are most likely to be found in; and to determine if human activities (such as recreation, road building, etc.) may be impacting their habitat. In searching for these species, we also collected and took note of other stoneflies and caddisflies that occurred in the same areas. These collections will help us assess stream health, species distributions, and habitat associations, and may be used for future genetic research on speciation.

FARULA CONSTRICTA

Farula constricta (OR-SEN) is a small, dark brown caddisfly reaching lengths of 5 mm (Wiggins & Wisseman 1992). Larvae of this species make extremely slender, smooth cases out of tiny sand grains; they can be mistaken for conifer needles (Wiggins 1996, Figure 2). Adults have been found at lower elevations in the Gorge in April and May, and the flight season may extend from March through June (Wisseman 2015; see Appendix II). The preferred habitat for *F. constricta* caddisflies is small, cool perennial streams at waterfalls and talus slopes below waterfalls. This is the most widely distributed of the three target species and had been found in several different basins, ranging from Mist Falls near Wahkeena Creek in the west to Eagle Creek in the east (Figure 1). It has a global status of G1, a national status of N1, and a state status of S1 in Oregon (NatureServe 2015, ORBIC 2013).

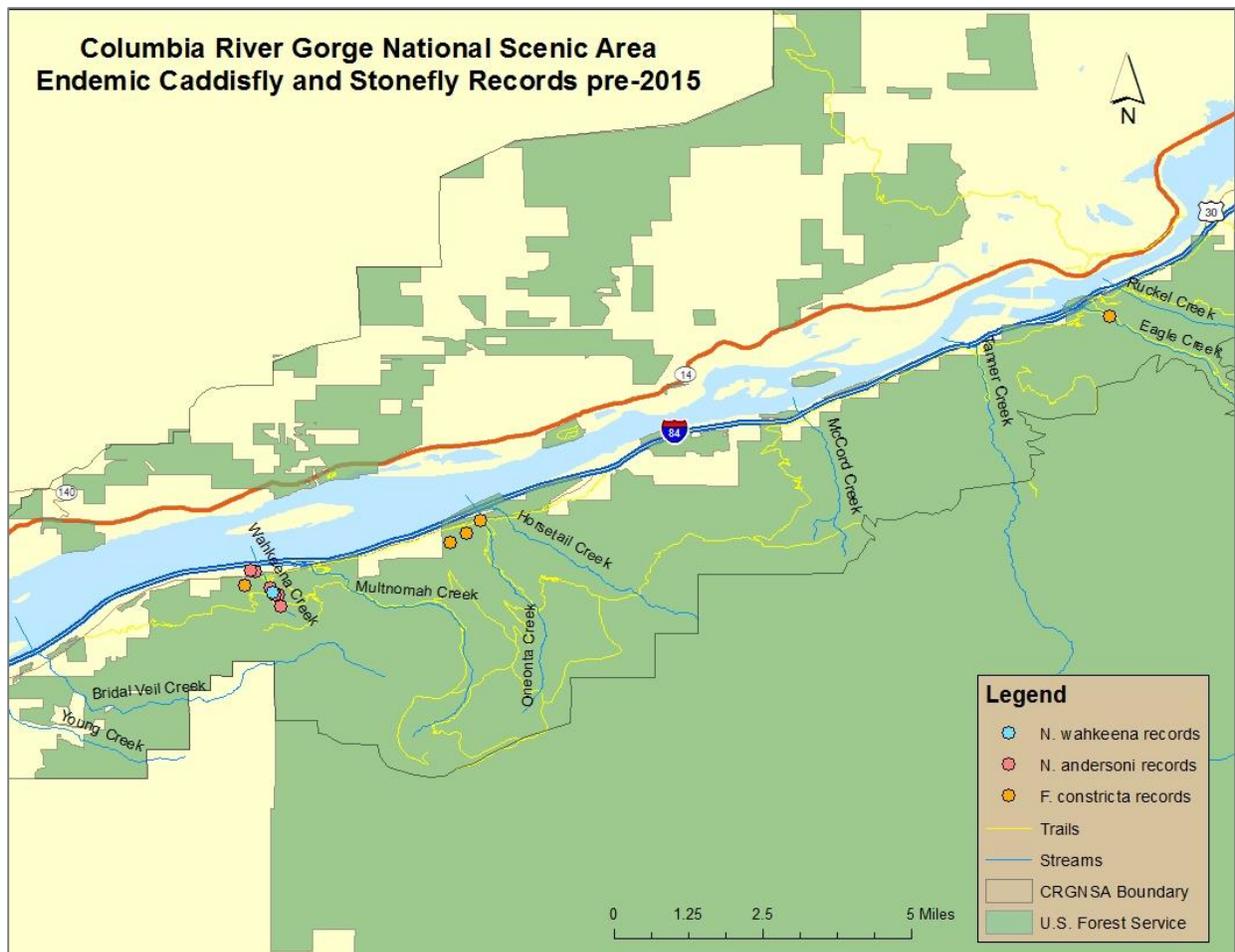


Figure 1: Map of known records of *Farula constricta*, *Neothremma andersoni*, and *Nanonemoura wahkeena* in Oregon prior to the 2015 surveys described in this report.

NEOTHREMMA ANDERSONI

Adults of the caddisfly *Neothremma andersoni* (OR-SEN) are medium brown with forewings 5-6 mm long (Wiggins 1975). Larvae lack abdominal gills and occur in cold, rapid streams, constructing smooth slender, cylindrical cases of sand grains (Anderson 1976), similar to those of *Farula* (see Figure 2). Larvae are associated with rubble, cobble, and wood substrates, whereas adults can be found on streamside vegetation and on rocks or logs adjacent to or protruding from the stream (Jordan 2011). This species is only known from the Wahkeena Creek stream system in the Columbia River Gorge, OR (Anderson 1976, see Figure 1), even after 2015 surveys. It has a global status of G1, national status of N1, and a state status of S1 in Oregon (NatureServe 2015, ORBIC 2013). This species has a relatively long flight period and has been collected from late May to mid-August (Appendix II).

NANONEMOURA WAHKEENA

The Wahkeena Falls flightless stonefly, *Nanonemoura wahkeena* (OR-SEN), is known only from its namesake Wahkeena Creek in the Columbia River Gorge (Baumann & Fiala 2001, Wisseman 2015; see Figure 1). Specimens can be found in a large seepage area along the trail to the upper spring as well as in the spring head itself (Baumann & Fiala 2001, Wisseman 2015). Numerous attempts to find this species in nearby watersheds have been

unsuccessful (Baumann & Fiala 2001; Baumann 2011, pers. comm.; Wisseman 2015). This species has a global status of G2, national status of N2, and a state status of S2 in Oregon (NatureServe 2015, ORBIC 2013 [note that the species is listed as *Zapada wahkeena* by ORBIC]). Adults look like small grasshopper nymphs with very small wings, dark brown bodies, and yellow legs, which are more than twice the length of the abdomen (Baumann & Fiala 2001). Mature larvae and adults are approximately 5 mm in length (Wisseman 2015). Adults are easily distinguished from all other Nemourinae by these long legs, long maxillary palpi, and micropterous wings (Baumann & Fiala 2001; see Figure 2). They can be very active and difficult to capture (Wisseman 2015). Adult collection records for the flightless stonefly range from March through May (Appendix II).

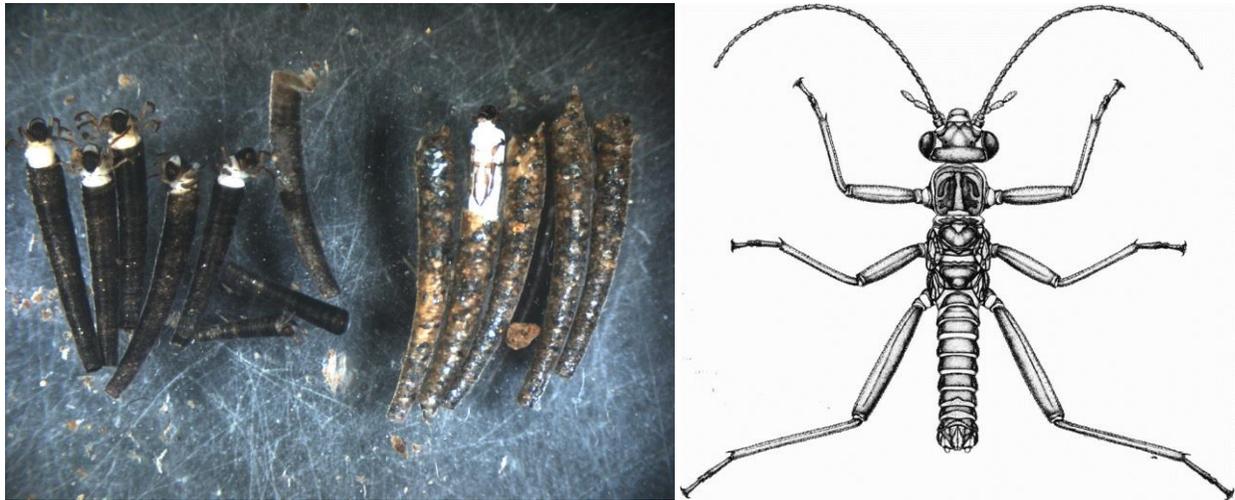


Figure 2: Left photo: comparison of *Farula* larvae (left) and *Neothremma* larvae (right). Photo by Robert Wisseman (Aquatic Biology Associates). Right figure: *Nanonemoura wahkeena* male adult, habitus. Figure from Baumann & Fiala (2001).

METHODS

SITE SELECTION

All historical collection sites for the three target species were revisited as part of this project. Additional sites were selected that provided habitat required by the three sensitive species, provided broad coverage of all relatively accessible major drainages in the CRGNSA, and experienced some level of recreational or other human impact. Sites were selected with the assistance of Brett Carré (CRGNSA Wildlife and Fisheries Programs Manager) and included the following:

- | | |
|----------------------|---------------------|
| 1. Bridal Veil Creek | 10. McCord Creek |
| 2. Cabin Creek | 11. Multnomah Creek |
| 3. Dry Creek | 12. Oneonta Creek |
| 4. Eagle Creek | 13. Ruckel Creek |
| 5. Gorton Creek | 14. Tanner Creek |
| 6. Grays Creek | 15. Wahkeena Creek |
| 7. Herman Creek | 16. Warren Creek |
| 8. Horsetail Creek | 17. Wonder Creek |
| 9. Lindsey Creek | 18. Young Creek |

SURVEY PERIOD

Surveys took place over a five month period (April – August 2015) with approximately three survey days a month. In addition, surveyors revisited several sites along Multnomah Creek one day in October 2015. In total, surveyors spent 16 days (35 person days) in the field searching for these species. At least two people were present for each survey. Since all three of these species live in adjacent habitats in the same drainage system and have overlapping survey periods, they were surveyed for simultaneously, maximizing survey efforts. The long survey period also maximized our chances of collecting adults or mature pupae of each of the target species. Immature stages often cannot be identified to species, and adult activity periods tend to be short and difficult to predict. The longer survey window was likely a major contributor to the success of this project.

SAMPLING METHODOLOGY

All sites were surveyed by biologists from the Xerces Society and/or Aquatic Biology Associates, Inc. At each site, we took photographs and recorded water temperature, substrate type(s), water source, water depth, stream width, canopy cover, streamside vegetation, and degree of human impact. Site coordinates were recorded using a Garmin Rino 120 GPS unit (NAD83), a Garmin etrex Summit GPS unit (NAD83), or the iNaturalist application with a smart phone (WGS84). Data were written on rite-in-the-rain data sheets in the field (Appendix I) and entered into NRIS data sheets upon return to the office.

Two to three survey methods were employed at each site: hand picking the substrate, sweep netting for adults, and kick-netting the benthos. Immature specimens were collected with forceps and placed in plastic screw-cap vials containing 95% ethanol as a preservative. We followed the general sampling protocol outlined by Wisseman (2015). Adults were collected from sweep nets or with forceps and preserved the same way. The number of stream miles, springs, and seeps that were covered varied widely each survey day depending on accessibility of each site; however, on average we visited five sites per day. In some cases, these sites were all part of the same stream system. Sites that had a high diversity of caddisflies and stoneflies were visited more than once. Specimens collected during the study were identified by Robert Wisseman and are currently in his possession or that of Dave Ruiter or Richard Baumann. A reference collection will be created and deposited at CRGNSA headquarters sometime in 2016.

RESULTS

Our surveys resulted in documentation of several previously unknown populations of the caddisflies *Farula constricta* (OR-SEN) and *Neothremma andersoni* (OR-SEN). The Wahkeena flightless stonefly, *Nanonemoura wahkeena* (OR-SEN), was found only at the headwater spring of its namesake Wahkeena Creek, despite efforts to relocate it at multiple sites along the creek. The type locale for this species is described as “tiny spring seeps along Wahkeena Creek in the Wahkeena Falls area” (Baumann & Fiala 2001). In addition, we collected specimens of five other Forest Service sensitive or strategic species, as well as *Neothremma prolata* that we propose be added to the sensitive species list (Table 1). Several possible new caddisfly species were also encountered. Additional adult specimens need to be collected before descriptions can be published. See Figure 3 for a map of special status species collections.

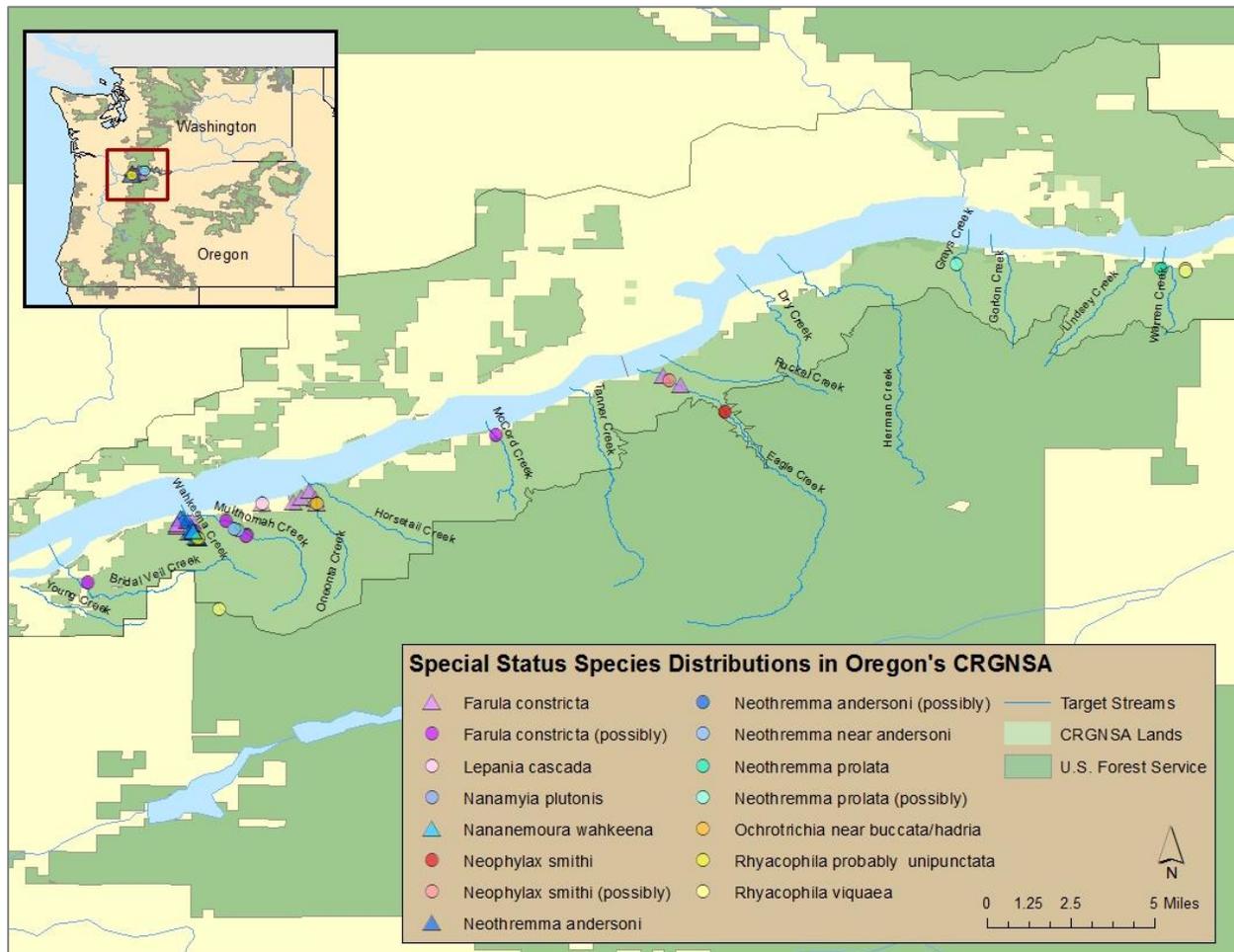


Figure 3: Collection sites for special status caddisfly and stonefly species in Oregon's CRGNSA.

In total, we conducted 90 site visits and sampled 72 sites throughout the CRGNSA in Oregon between April and October 2015 (several sites were visited more than once). We collected and identified 94 species of caddisflies as well the Wahkeena flightless stonefly. All other stonefly adults were sent to Dr. Richard Baumann (Emeritus Curator, Brigham Young University), who is working on a publication of the stoneflies of the Columbia River Gorge. For a full species list, a list of all sites surveyed, and descriptions of survey sites, see the Appendices.

Table 1: Special status caddisfly and stonefly species recorded from the Columbia River Gorge National Scenic Area, Oregon. An asterisk (*) indicates a target species.

Order: Family	Species	ISSSP Status	Notes	# Collection Sites
Plecoptera: Nemouridae	<i>Nanonemoura wahkeena</i> *	OR-SEN		1 confirmed
Trichoptera: Goeridae	<i>Lepania cascada</i>	STR		3 confirmed
Trichoptera: Hydroptilidae	<i>Ochrotrichia near buccata/hadria</i>	None	Potential new species	1 confirmed
Trichoptera: Odontoceridae	<i>Namamyia plutonis</i>	OR-STR		2 confirmed

Order: Family	Species	ISSSSP Status	Notes	# Collection Sites
Trichoptera: Rhyacophilidae	<i>Rhyacophila</i> probably <i>unipunctata</i>	OR-STR		1 confirmed
Trichoptera: Rhyacophilidae	<i>Rhyacophila viquaea</i>	WA-STR		4 confirmed
Trichoptera: Uenoidae	<i>Farula constricta</i> *	OR-SEN		6 confirmed; 6 potential
Trichoptera: Uenoidae	<i>Neophylax smithi</i>	WA-STR		1 confirmed; 1 potential
Trichoptera: Uenoidae	<i>Neothremma andersoni</i> *	OR-SEN		4 confirmed; 1 potential
Trichoptera: Uenoidae	<i>Neothremma prolata</i>	None	Proposed – extremely rare	1 confirmed, 2 potential
Trichoptera: Uenoidae	<i>Neothremma</i> near <i>andersoni</i>	None	Potential new species	2 confirmed

DISCUSSION

SPECIES DISTRIBUTIONS

Successive and massive volcanic basalt flows formed the base geology of the Columbia River Gorge during the Miocene, 5.3-23 million years ago. The Columbia River gradually cut through these basalt flows and shaped the land form of steep slopes and sheer cliffs we see today in the Columbia River Gorge (Allen 1984). Precipitation, mainly as rain, is a result of the wet maritime climate in the western side of the gorge, which feeds many torrential stream systems on the north facing Oregon side of the gorge. Most of the larger stream systems arise from a dendritic network of tributaries extending higher into the Cascade Mountains. However, many smaller streams, and even larger ones such as Multnomah and Wahkeena Creeks, have truncated headwater networks, arising from cold springs at elevations less than 500 meters. Thus, there is often no network of perennial headwater tributaries that allow easy “communication” between adjacent basins for dispersal of invertebrates.

Many streams on the Oregon side of the gorge are isolated, cold, spring-fed systems perched in recessed pockets in the gorge wall at relatively low elevations. Communication between these watersheds is hampered by the lack of a headwater tributary network, dense forest vegetation, strong winds, and the fact that many of these tributaries empty directly into the Columbia River, a large river habitat unsuitable for small stream adapted species. Habitat similar to these cold low elevation gorge spring streams is currently found only at much higher elevations in the adjacent Oregon Cascade Mountains. Effective communication through adult dispersal between these elevation bands is undoubtedly low.

Though glaciers extended down the Hood River Valley to the east and the Sandy River to the west during the Pleistocene, the perched stream valleys along the Oregon side of the gorge were apparently ice-free (Allen 1984). Thus, it is likely that many of these perched spring-fed stream systems have provided a relatively stable habitat since the end of the Miocene. Spring-fed systems tend to maintain a more constant flow and temperature regime. The aquatic habitat of these gorge streams is much older by far than found on nearby Cascade volcanic peaks. Time, stable habitat, and isolating mechanisms exhibited in this region of the gorge have produced a number of endemic aquatic invertebrate species. The full spectrum of endemic species is yet to be discovered and documented.

The preferred aquatic habitat common to most of the species listed in Table 1 is high gradient, cold, spring-fed, perennial stream systems, a habitat this region of the Columbia River gorge has in great diversity and density. As discussed in more detail below, stream channels traversing steep talus slopes that have formed below small perennial waterfalls appear to support the greatest concentration of endemic and sensitive species.

FARULA CONSTRICTA

Farula is a genus of caddisflies restricted to the maritime montane region of western North America from Washington to California (Wiggins 1996). There are currently 12 described species, with many more species yet to be discovered. Populations are typically associated with high gradient, cool-cold, perennial springs and spring streams in montane regions. Cold spring system habitat is patchily distributed in mountain ranges where the genus occurs. This habitat isolation combined with the low dispersal capabilities of adults has led to species restricted to small geographic areas (Wisseman unpublished).

Farula constricta (OR-SEN) was originally found at the base of Mist Falls and at the unnamed tributary 0.9 miles west of Oneonta Gorge in 1989 (Wiggins & Wisseman 1992). After our 2015 surveys, the species was found to be more widespread in the Columbia River Gorge (Figure 4). Additional sites where adults or mature pupae were found include Eagle, Mist, and Oneonta Creeks, as well as Mossy Falls. Larvae or old pupal cases *Farula* probably *constricta* were collected at Bridal Veil, McCord, and Multnomah Creeks. We recommend that these sites be revisited in future years in May to search for pupae or adults.

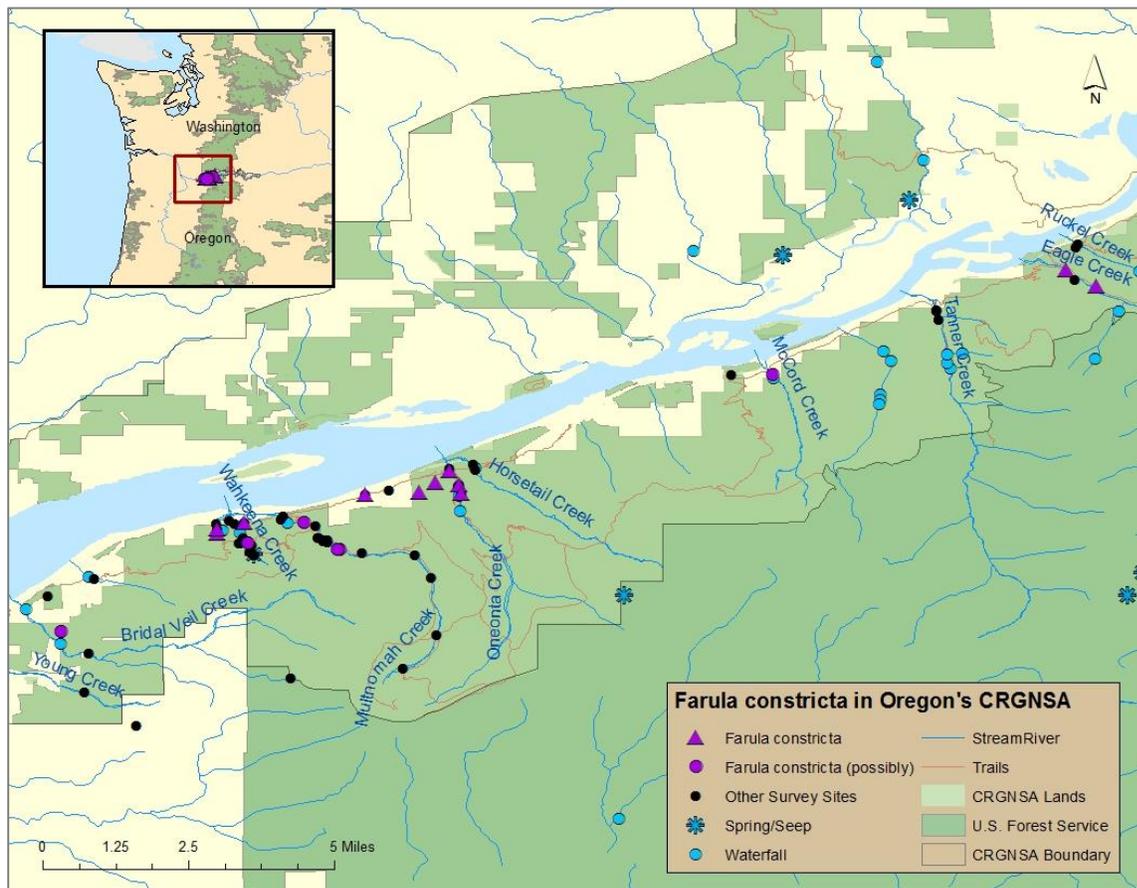


Figure 4: Collection sites of *Farula constricta* (OR-SEN) in the CRGNSA, Oregon.

The preferred habitat for this species is small, cool perennial streams at waterfalls and particularly in talus slopes that form below many smaller waterfalls. They do not occur at larger waterfalls with high winter discharge, such as Multnomah, Wahkeena and Horsetail Falls, in part because stronger flows found at these falls form plunge pools at their base instead of the critical talus slope habitat. *Farula* larvae prefer rock or wood surfaces wetted by splashing from falls or in thin streams of water running over rock or wood surfaces in the talus slope (madicolous habitat; see Figure 5). Larvae also occur on vertical rock surfaces at the base of falls, where they are found on the wetted margins, not in the full force of torrential flow. Pupae are most often found in aggregations in madicolous habitat at the base of falls or beneath rocks in the talus slope zone. Adults are found in or on herbaceous and shrub vegetation near the stream, are day active, and do not appear to be strong fliers that can readily disperse between watersheds.

Populations can be highly localized to the base of the waterfall and the talus slope immediately below. This habitat type appears to be relatively common in the Columbia River Gorge, and this species may be more common than previously thought, perhaps even extending up to Mount Hood. *Farula* near *constricta* has been collected at two sites on Lolo Pass near Mt. Hood. While there are significant differences in the male and female genitalia, it is not known if the differences are enough to constitute a new species. It would be useful to continue identifying populations and conduct CO1 DNA analysis to determine if this may be a species complex.

Adult males or mature male pupae are currently required for positive species identification, and these life stages are only present in a short and unpredictable seasonal window at any given site. Larvae are present in streams throughout the year, and we now have larval collections from many sites in the gorge survey area. Species identification using CO1 DNA barcoding on larval collections is recommended to expand our knowledge of the number of *Farula* species in the Columbia River Gorge and adjacent areas, their distribution, habitat association, how common they are, and if populations or species may be vulnerable to human activity.



Figure 5: *Farula constricta* larvae on a rock face in madicolous habitat. Photo by Robert Wisseman (Aquatic Biology Associates).

NEOTHREMMMA ANDERSONI

This species, originally collected in 1964 and 1974 (Wiggins 1975), has only been documented from the Wahkeena Creek watershed (Wisseman 1990 & Wisseman unpublished). In 2015, larvae and adults were collected from the Wahkeena Creek springhead all the way downstream to the railway bridge near the mouth (Figure 6). It has also been collected in the East Fork of Wahkeena Creek and from a small tributary entering 100 m below the main Wahkeena Creek springhead.

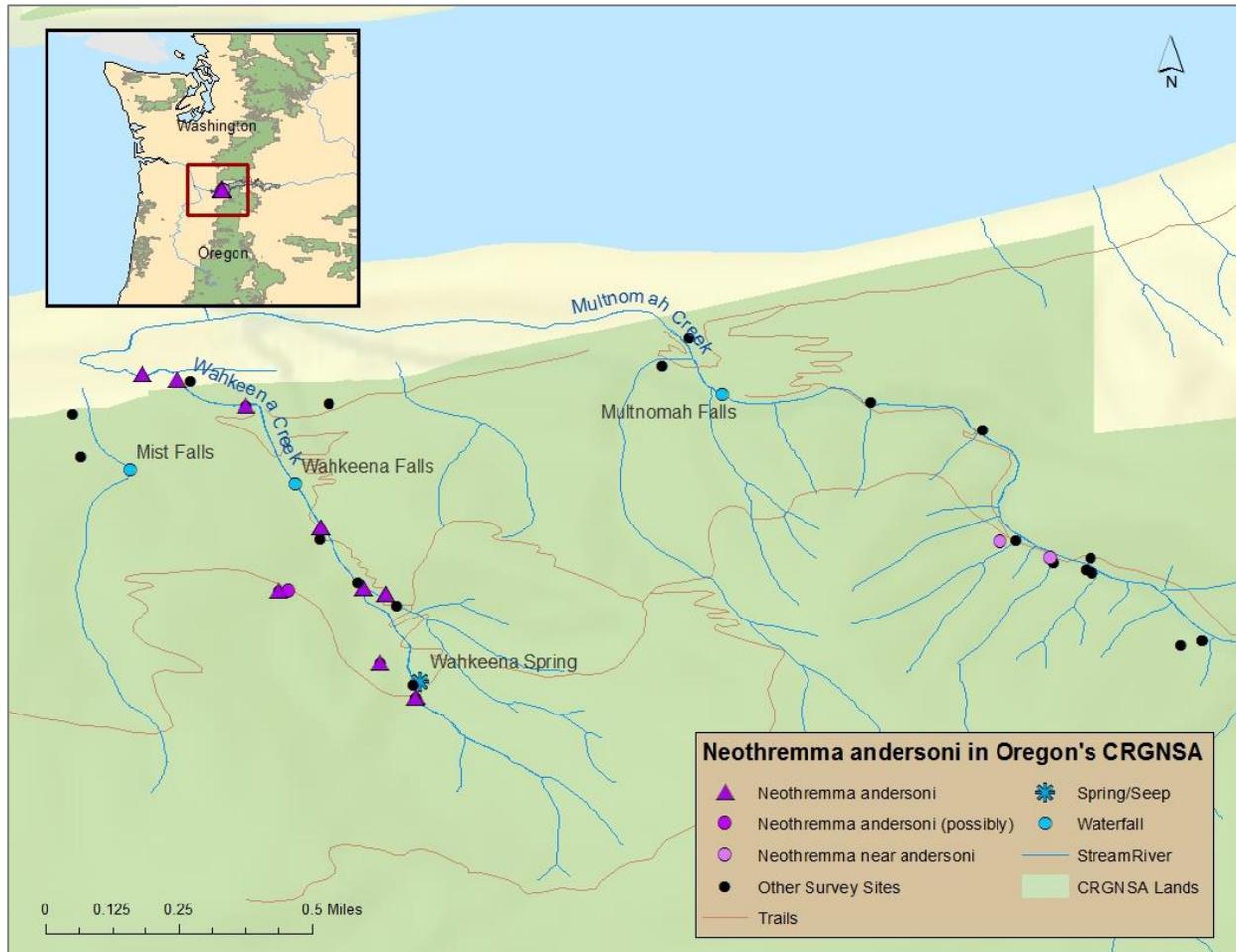


Figure 6: Collection sites of *Neothremma andersoni* (OR-SEN) in the CRGNSA, Oregon.

Populations of this species are secure in the Wahkeena Creek basin, but it would be interesting to determine if populations also exist in the Mist Falls and Multnomah Creek basins. By proximity and similarity in habitat (cold, high gradient, spring fed streams), we have identified two to three possible sites outside of the Wahkeena Creek watershed where the species may be found: the springhead of Mist Falls less than one half mile from the Wahkeena springhead and two spring-fed tributaries to Multnomah Creek that enter from the west and whose headwaters are 1-2 miles from the Wahkeena basin. *Neothremma* larvae and one adult female (probably *N. andersoni*) have been collected from the Mist Falls springhead. Adult male collections or DNA analysis are needed to confirm this record.

Larvae of *Neothremma* were also collected at Elowah Falls, Grays Creek, Horsetail Creek, Oneonta Creek, and Multnomah Creek. Most of these probably represent the common Cascade Mountain Range species, *Neothremma didactyla*. Larval specimens from Grays and Oneonta Creeks collected in 2015 are potentially *Neothremma prolata*, another gorge endemic. A possible new species of *Neothremma near andersoni* was found at 2 small stream sites crossing the Multnomah Creek trail above Multnomah Falls. As with *Farula*, adult males or mature male pupa are currently required for positive species identification of *Neothremma*. Applying CO1 DNA barcoding to current and future larval collections to assess the diversity and distribution of *Neothremma* species in the Columbia River Gorge and adjacent areas is recommended.

Neothremma populations can be found in a more diverse array of spring and stream habitats than *Farula*, from very small perennial channels to larger streams up to 6 meters wide. Cool-cold year-round water temperatures are required to support populations. *Neothremma andersoni* (OR-SEN) larvae are found from the Wahkeena Creek spring-head all the way downstream past the Old Gorge Highway, an elevation drop of about 400 meters. They are also found in small, first order side tributaries crossing the Wahkeena Creek trail that are barely flowing in late summer. *Neothremma prolata* seems to prefer talus slope habitat below waterfalls at Cabin and Wonder Creeks that are larger in size than *Farula constricta* (OR-SEN) prefers. *Neothremma near andersoni* was found in very small, perennial streams crossing the trail above Multnomah Falls. In this case trail building may have enhanced the rock face and plunge pool habitat the species may prefer. *Neothremma didactyla*, the common Cascades species, is generally found at higher elevations in the Cascades in cold streams, but appears to extend downslope to lower elevations in the cool-cold streams of the north facing Oregon side of the gorge. They appear to be found only in streams that have an extensive headwater network extending up into higher elevations.

NANONEMOURA WAHKEENA

This unusual stonefly species (Figure 4) is only known from the Wahkeena Creek watershed (Baumann & Fiala 2001; see Figure 7). Since it was originally collected in 1945 by Stan Jewett, stonefly researchers have made repeated expeditions to the area to recollect the species and attempt to find populations in adjacent watersheds with no success (Baumann, personal communication). We collected adults at the Wahkeena Creek springhead side seep (one of the original type localities), but apparently missed the main emergence period for this species. We recommend additional surveys in nearby habitats earlier in the spring. By proximity and similarity in habitat (cold, high gradient, spring fed streams), we have identified two to three possible sites outside of the Wahkeena Creek watershed where the species may be found: the springhead of Mist Falls less than one half mile from the Wahkeena springhead and two spring fed tributaries to Multnomah Creek that enter from the west and whose headwaters are 1-2 miles from the Wahkeena basin.

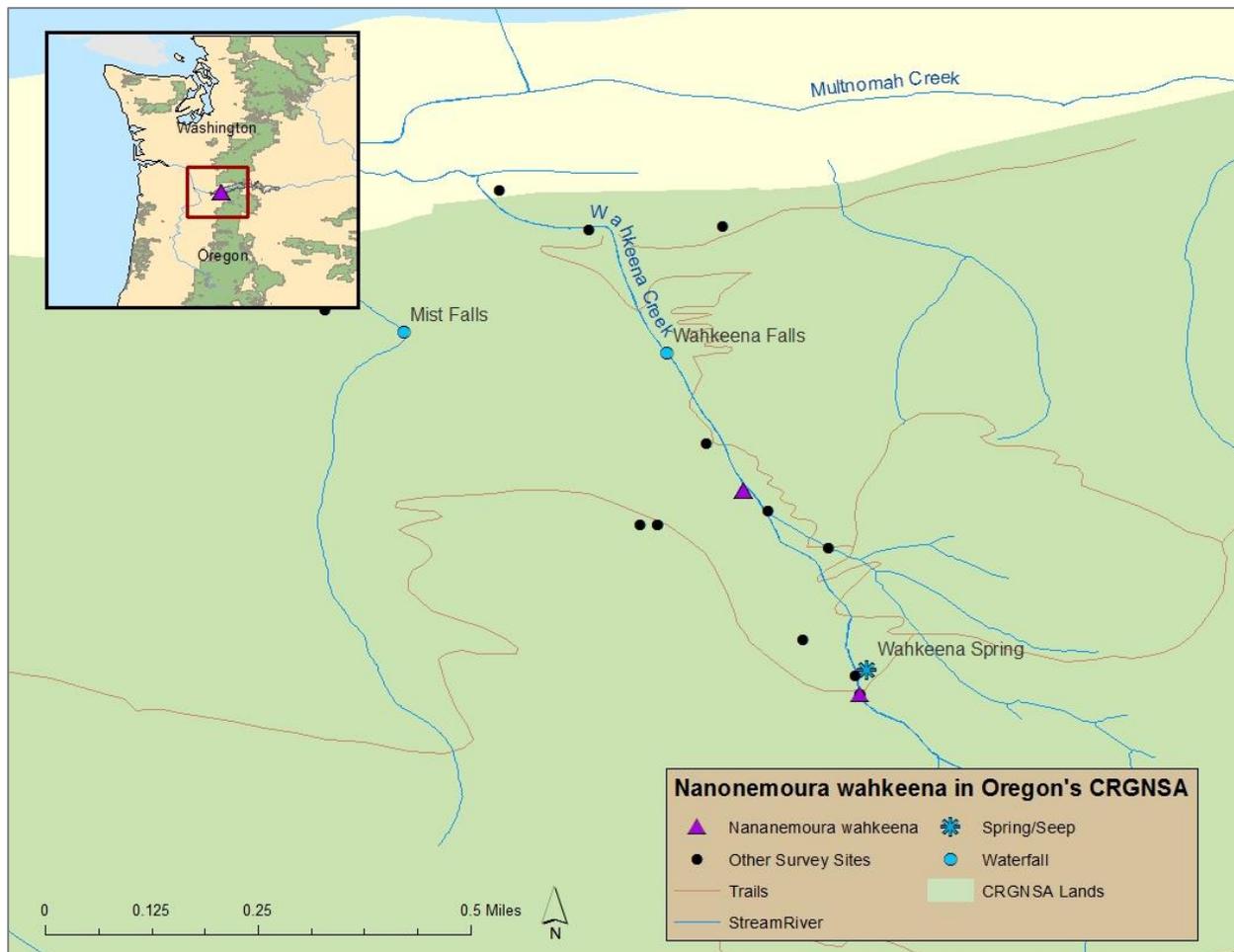


Figure 7: Collection sites of *Nananemoura wahkeena* (OR-SEN) in the CRGNSA, Oregon.

OTHER SPECIES OF INTEREST

Several other Forest Service sensitive and strategic species were encountered during the 2015 surveys. *Soliperla fenderi* from the Mt. Rainier area is currently listed as WA-STR. There is a remote possibility it occurs in the Gorge. We collected *Soliperla* larvae at 10 or more sites in the Gorge in 2015; however these cannot be identified as there is no larval key to species. Adults collected have been sent to Dr. Richard Baumann at Brigham Young University. The pristine springsnail (*Pristinicola hemphilli*) was found throughout the Gorge in at least 20 survey sites. *Oligophlebodes* larvae were collected at Wahkeena Creek during a previous survey effort (Wiseman 1990) and are potentially *Oligophlebodes mostbento*, a strategic caddisfly species known from the Oregon Cascades. *Lepania cascada* (STR) was found in an unnamed creek approximately 0.9 miles west of the Oneonta Creek crossing with the Old Highway, as well as in Wahkeena Creek. This species has not previously been documented on the CRGNSA. *Namamyia plutonis* (OR-STR) was found in Cabin Creek. *Neophylax smithi* (WA-STR) was found in Eagle Creek. This species was previously known only from the Washington Cascades and a May 2003 collection at the fish hatchery at Herman Creek (Ruiter 2015, pers. comm.). It may be occasional to common in the larger creeks at lower elevations in the Gorge. Another caddisfly species, *Rhyacophila viquaea*, was found in Bridal Veil, Cabin, and Mist Creeks. In addition, a single female of what may be *Rhyacophila unipunctata* (OR-STR) was found at the Wahkeena Creek springhead. Species confirmation requires collection of male adults or CO1 DNA analysis.

Two potentially new species were discovered during our surveys. *Ochrotrichia* near *buccata/hadria* was found in the Oneonta Creek basin and *Neothremma* near *andersoni* was found in the Multnomah Creek basin. Additional adults of both species are needed to confirm identifications and publish descriptions. If these are indeed new species they may warrant addition to the sensitive species list.

We recommend that ORBIC ranks *Neothremma prolata*, and if the ranking justifies it, that this species then be added to the USFS sensitive species list. This species was previously known from only the type locality at Cabin Creek. We revisited the type locale at the base of Cabin Creek Falls and could not find the population. Surface flow of the outlet stream of the falls plunge pool where the species was previously found had disappeared in this drought year. Populations were not found at sites higher on Cabin Creek either. At Lancaster Falls on Wonder Creek, about a half mile west of the Cabin Creek, we found a significant population at the falls and in the talus slope below the falls. It may be that Wonder Creek supports the main population of this species, and Cabin Creek intermittently supports a satellite population. The Lancaster Falls site on Wonder Creek is heavily impacted from human activity, both with a trail crossing and a clear-cut power line corridor immediately below the falls. Larvae of *Neothremma* were also collected from Grays Creek at the Gorge Trail crossing and at a weeping wall along Oneonta Creek, and are potentially *N. prolata*. Pupae, adults, or DNA analysis are needed to confirm species identification; we recommend revisiting both sites to see if pupae or adults are present. Of the endemic and sensitive caddisfly species in the Columbia River Gorge, *N. prolata* may be one of the rarest and most vulnerable.

FUTURE SURVEY EFFORTS

We recommend that increased survey efforts continue in the Columbia River Gorge NSA and adjacent Mt. Hood National Forest. Further documentation of these species' ranges and habitats is especially critical for advancing understanding of their status and needs and taking the appropriate conservation measures. Based on the results of our surveys, we recommend the following:

1. Revisit all sites with *Neothremma* or *Farula* collections that have potential to be *N. andersoni*, *N. prolata*, *N. near andersoni*, or *F. constricta*. These sites include:
 - a. Bridal Veil Creek unnamed tributary at FS road crossing: *Farula* larvae present.
 - b. Elowah Falls water tank overflow: *Neothremma* larvae present; possibly *N. didactyla*.
 - c. Grays Creek at the Gorge Trail crossing: *Neothremma* larvae present; may be *N. prolata*.
 - d. Horsetail Creek at Ponytail Falls: *Neothremma* larvae present, although probably *N. didactyla*.
 - e. McCord Creek at Elowah Falls: *Farula* pupal cases present; probably *F. constricta*.
 - f. Multnomah Creek tributary and weeping wall: *Farula* larvae common on cliff face; likely *F. constricta*.
 - g. Multnomah Creek tributaries that support *N. near andersoni*.
 - h. Oneonta Creek weeping wall: *Neothremma* prepupae and pupae present; possibly *N. prolata*.
 - i. Wahkeena Creek middle: *F. constricta* adult female; need males or DNA for positive ID.
2. Revisit the Wahkeena Creek springhead to search for *Rhyacophila unipunctata* (OR-STR). A single female was found during 2015 surveys, and species confirmation requires collection of male adults or CO1 DNA analysis.
3. Revisit sites with *Soliperla* collections during the appropriate adult flight period and collect specimens to determine if these species represent the OR-SEN species *S. fenderi*.
4. Conduct a thorough evaluation of the Mist Falls headwater spring. This site may support *Neothremma andersoni*, *Setvena wahkeena*, *Nanonemoura wahkeena*, and other sensitive invertebrates. *Neothremma*

larvae and a single female adult were collected from this site that could be *N. andersoni*. Adult males, mature pupae, or DNA analysis are needed to confirm identification.

- Investigate Multnomah Creek Site 7. This tributary is probably spring-fed and has no noticeable human impacts. There is no trail access. This tributary may have potential for harboring *Neothremma andersoni* and *Nanonemoura wahkeena* in its headwaters. It is one of the closest tributaries in the Multnomah Creek basin with similar habitat characteristics to Wahkeena Creek.

April through June may be the best time to search for adults of these and other special status species in the lower Columbia River Gorge area, based on 2015 collection results (see Table 2). However, 2015 was also a record hot and dry year in the Gorge, and this may have influenced species emergence.

Table 2: Adult and larval/pupal collection periods for special status species. Adult collections are shown in black. Collections of larvae or pupae are displayed in dark gray.

Species	ISSSP Status	Apr	May	Jun	Jul	Aug
<i>Nanonemoura wahkeena</i>	OR-SEN		■			
<i>Lepania cascada</i>	STR	■	■	■		
<i>Ochrotrichia near buccata/hadria</i>	None (potential new sp.)			■		
<i>Namamyia plutonis</i>	OR-STR			■		
<i>Rhyacophila probably unipunctata</i>	OR-STR		■	■		
<i>Rhyacophila viquaea</i>	WA-STR		■	■		
<i>Farula constricta</i>	OR-SEN	■	■	■		
<i>Neophylax smithi</i>	WA-STR		■			
<i>Neothremma andersoni</i>	OR-SEN	■	■			
<i>Neothremma prolata</i>	None (proposed)		■	■		
<i>Neothremma near andersoni</i>	None (potential new sp.)				■	■

SPECIES IDENTIFICATION

Given the difficulty identifying many immature caddisfly and stonefly species, these taxa would benefit from genetic analysis. In particular, CO1 DNA barcoding could be used on immature specimens to make accurate species identifications. All material collected for this project was preserved in 95% ethyl alcohol (ETOH) for use in future genetic work. Several of the unidentified *Farula* specimens (including *F. constricta* from the type locale at Mist Falls and three other possible *F. constricta* larvae) have already been sent out for CO1 barcoding.

THREATS AND MANAGEMENT NEEDS

Populations of our two target caddisflies were found at multiple sites during our survey efforts and may be relatively secure in the CRGNSA. *Farula constricta* (OR-SEN) is found at numerous sites in areas with low human impact, and *Neothremma andersoni* (OR-SEN) is abundant in the Wahkeena Creek basin. The stonefly *Nanonemoura wahkeena* (OR-SEN) may be the most restricted and thus vulnerable of the three target species, with just a few individuals observed at Wahkeena Spring. At this site in particular, managers could consider closing off trail access to the spring, which is currently located just above the springhead. A second trail already exists directly downstream of the springhead that could serve as the primary trail.

Managers could strive to protect all new and known sites from practices that would adversely affect any aspect of these species' life cycles. Riparian habitat protection, including maintenance of water quality, substrate conditions, and canopy cover, would likely benefit and help maintain these species. The primary threats to our target species are habitat alteration (including sedimentation from road and trail building and logging), recreation use (trampling, sedimentation), and climate change. Spring and seep habitats where these animals are found would benefit from monitoring and protection, as these habitats are particularly vulnerable to natural disturbances.

Observation of many individuals of *N. andersoni* (OR-SEN) suggest an apparently healthy population in the Wahkeena Creek basin; however, longer term monitoring is needed to confirm this. Impacts from current human activities and past construction are negligible. One potential threat to the *N. andersoni* population is warming of stream water from climate change; however, this is a spring-fed system that appears to be well buffered against rapid changes in temperature. Another threat is wildfire; yet again, the stream is more buffered since temperatures are cooler and humidity higher within the Wahkeena Creek canyon.

Of the sites surveyed in 2015, Mist Falls, Mossy Falls, Oneonta Creek and adjacent seeps and tributaries, Wahkeena Creek, and Wonder Creek all hosted one or more of our target species and may be especially important for protecting sensitive aquatic invertebrates. Mist Falls and Mossy Falls both have healthy populations of *Farula constricta* (OR-SEN). Mist Falls appears to receive little human visitation, whereas Mossy Falls is immediately accessible from the trail and there is evidence of human habitat disruption; however, this site has been maintaining itself since it was first discovered in 1989. *F. constricta* is also present in the Oneonta Creek basin and in abundance at an unnamed tributary between Oneonta and Multnomah Creeks. Wahkeena Creek, its springhead, and associated tributaries are important strongholds for *Neothremma andersoni* (OR-SEN) and *Nanonemoura wahkeena* (OR-SEN).

The population of *Neothremma prolata* at Lancaster Falls on Wonder Creek is particularly vulnerable and would benefit from protection. Mt. Defiance Trail #413 crosses the creek just below the falls in sensitive habitat; however, the power line corridor overhead is by far the biggest impact to this habitat. Surveying for possible additional and stable populations of *Farula prolata* higher in the Cabin, Wonder and adjacent watersheds is needed before impacts to the species as a whole presented by trail and power line corridor crossings at Wonder Creek can be assessed.

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APPENDIX I: DATA SHEET TEMPLATE

2015 CRGNSA Sensitive Caddisfly and Stonefly Surveys

Observers: _____
Possible sensitive species observed? No Yes _____
Date: _____ **Site Number:** _____ **Number of vials:** _____
Waterbody & location: _____
State: _____ **County:** _____ **Land ownership:** _____
Visit length (hours): _____ **Weather:** _____
Methods: Hand pick Sweep net adults Uv light Kick net benthos Other
Latitude: _____ **Longitude:** _____ **Elevation (m):** _____
Water temperature at sampling: _____
Probable thermal regime: Cold year-round Summer cool Summer warm
Photos (record time): _____
Waterbody type: seep spring waterfall seasonal channel small perennial stream
 mid-size stream large stream other _____
Channel width (m): _____ **Depth range (cm):** _____
Riparian vegetation: _____ **Shading:** Full sun Partial shade Full shade
Gradient: Low Medium High Torrential
Habitats (rank): Riffle Glide Cascade Falls Pool Pockets Madicolous
 Talus slopes Waterfall Other _____
Moss coverage: None Low Medium High
Human disturbance near site and in watershed: _____

Optional information=====

Basin & sub-basins: _____
Distance to source (km): _____ **Distance to mouth (km):** _____
Watershed vegetation: _____
Watershed aspect: N NW NE W S SW SE E
Watershed geology: Sedimentary Serpentine Volcanic Basalt Mix
Slope steepness: Low Medium High **Stream valley:** Narrow Medium Broad
Primarily spring fed?: Yes No **Primarily snow-melt or glacial fed?:** Yes No
Does surface flow appear to be seasonal or perennial?
Hydrograph flashiness: Low Moderate High
Channel roughness & microhabitat complexity: Low Medium High
Mineral substrates (rank): Bedrock Boulder Cobble Gravel Sand Silt
Rocks: Little eroded-angular Partially eroded Eroded-rounded
Substrate stability: Low Medium High **Scouring of surfaces:** Low Medium High
Embedding: Low Medium High **Crevice & pore space:** Low Medium High
Diatom development: Low Medium High **Filamentous algae:** Low Medium High
Scuz coverage: Low Medium High
Macrophytes: None Low Medium High **Liverwort:** None Low Medium High
Conifer detritus: None Low Medium High **Deciduous detritus:** None Low Medium High
Probable dissolved oxygen saturation: Low Medium High
Probable trophic status: Ultra-oligotrophic Oligotrophic Mesotrophic Eutrophic
Turbidity: None Low Medium High **Plant leachates:** None Low Medium High
Chemical considerations (e.g. iron precipitates, alkalinity, etc.): None _____

Notes and taxa observations on back:

APPENDIX II: PRIOR SPECIES RECORDS

Species	Location	County	State	UTM_E (NAD83)	UTM_N (NAD83)	Zone	Loc_Acc	Land_Owner	BLM_NF	Elev (m)	Date
<i>Farula constricta</i>	Small unnamed stream 0.9 miles west of Oneonta Creek	Multnomah	OR	5048164	571577	10	GPS1-3	USFS	CRGNSA/MTH	122	March-April 1989
<i>Farula constricta</i>	Mist Falls near Wahkeena Creek	Multnomah	OR	5046968	567672	10	GPS1-3	USFS	CRGNSA/MTH	213	April 1989
<i>Farula constricta</i>	stream between Multnomah Falls and Oneonta Falls	Multnomah	OR	5048419	571872	10	MAN6	USFS	CRGNSA/MTH		13-May-2003
<i>Farula constricta</i>	Eagle Creek, Eagle Creek Trail	Hood River	OR	5054456	584029	10	MAN6	USFS	CRGNSA/MTH		14-May-2003
<i>Farula constricta</i>	Oneonta Creek, Oneonta Gorge	Multnomah	OR	5048774	572142	10	MAN6	USFS	CRGNSA/MTH		15-May-2003
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				5-Apr-1945
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				16-Apr-1955
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				26-Apr-1955
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				4-May-1982
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				29-Feb-1984

Species	Location	County	State	UTM_E (NAD83)	UTM_N (NAD83)	Zone	Loc_Acc	Land_Owner	BLM_NF	Elev (m)	Date
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				29-Mar-1984
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				17-Apr-1984
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				6-Apr-1985
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				9-Apr-1988
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				8-May-1988
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				23-Mar-1992
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				23-Mar-2001
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				28-Mar-2001
<i>Nanonemoura wahkeena</i>	Wahkeena Creek near Wahkeena Falls, Columbia River Gorge	Multnomah	OR	5046770	568217	10	MAN6				May 2003
<i>Neothremma andersoni</i>	Wahkeena Creek, 30 miles east of Portland, near the parking lot for Wahkeena Creek Falls	Multnomah	OR	5047356	567785	10	MAN4				25-Jul-1964

Species	Location	County	State	UTM_E (NAD83)	UTM_N (NAD83)	Zone	Loc_Acc	Land_Owner	BLM_NF	Elev (m)	Date
<i>Neothremma andersoni</i>	Wahkeena Creek, 30 miles east of Portland, near the parking lot for Wahkeena Creek Falls	Multnomah	OR	5047356	567785	10	MAN4				11-Jun-1974
<i>Neothremma andersoni</i>	Wahkeena Creek, 30 miles east of Portland, near the parking lot for Wahkeena Creek Falls	Multnomah	OR	5047356	567785	10	MAN4				22-Jul-1974
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 2": Mainstem, Old Gorge Highway Bridge to base of main falls, 300 m long segment	Multnomah	OR	5047340	567859	10	MAN3			61-152	17-Mar-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 1": Mainstem, near mouth: railroad bridge to Old Gorge Highway, adjacent to Benson State Park, 200-300 m long segment	Multnomah	OR	5047356	567785	10	MAN3			55-61	7-Apr-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 2": Mainstem, Old Gorge Highway Bridge to base of main falls, 300 m long segment	Multnomah	OR	5047340	567859	10	MAN3			61-152	3-May-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Canyon "segment 4"	Multnomah	OR	5046896	568169	10	MAN3			213-457	17-May-1989

Species	Location	County	State	UTM_E (NAD83)	UTM_N (NAD83)	Zone	Loc_Acc	Land_Owner	BLM_NF	Elev (m)	Date
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 5": East Fork Tributary: Mouth of East Fork & 200 m upstream to Fairy Falls of the East Fork	Multnomah	OR	5046714	568261	10	MAN3			305-335	17-May-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Canyon "segment 4"	Multnomah	OR	5046896	568169	10	MAN3			213-457	31-May-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Canyon "segment 4"	Multnomah	OR	5046896	568169	10	MAN3			213-457	21-Jun-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 5": East Fork Tributary: Mouth of East Fork & 200 m upstream to Fairy Falls of the East Fork	Multnomah	OR	5046714	568261	10	MAN3			305-335	21-Jun-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Springhead "segment 9"	Multnomah	OR	5046388	568375	10	MAN3			472	21-Jun-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Canyon "segment 4"	Multnomah	OR	5046896	568169	10	MAN3			213-457	5-Jul-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 5-6": East Fork Tributary: Mouth of East Fork & 200 m upstream to Fairy Falls of the East Fork	Multnomah	OR	5046698	568308	10	MAN3			305-335	5-Jul-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Springhead "segment 9"	Multnomah	OR	5046388	568375	10	MAN3			472	5-Jul-1989
<i>Neothremma andersoni</i>	Seep above East Fork	Multnomah	OR	5046714	568261	10	MAN4				5-Jul-1989

Species	Location	County	State	UTM_E (NAD83)	UTM_N (NAD83)	Zone	Loc_Acc	Land_Owner	BLM_NF	Elev (m)	Date
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 1": Mainstem, near mouth: railroad bridge to Old Gorge Highway, adjacent to Benson State Park, 200-300 m long segment	Multnomah	OR	5047356	567785	10	MAN3			55-61	19-Jul-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 6": Fairy Falls of the East Fork	Multnomah	OR	5046698	568308	10	MAN3			335	19-Jul-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Springhead "segment 9"	Multnomah	OR	5046388	568375	10	MAN3			472	19-Jul-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 6": Fairy Falls of the East Fork	Multnomah	OR	5046698	568308	10	MAN3			335	2-Aug-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Canyon "segment 4"	Multnomah	OR	5046896	568169	10	MAN3			213-457	16-Aug-1989
<i>Neothremma andersoni</i>	Wahkeena Creek "segment 6": Fairy Falls of the East Fork	Multnomah	OR	5046698	568308	10	MAN3			335	16-Aug-1989
<i>Neothremma andersoni</i>	Wahkeena Creek Springhead "segment 9"	Multnomah	OR	5046388	568375	10	MAN3			472	16-Aug-1989
<i>Neothremma andersoni</i>	Wahkeena Creek springhead	Multnomah	OR	5046388	568375	10	MAN3				7-May-2005

APPENDIX III: LIST OF SPECIES COLLECTED BY BASIN

Species of interest, including Forest Service sensitive and strategic species, are highlighted. Note that this list includes prior species records for the Gorge. “Unnamed Creek” refers to a creek located approximately 0.9 miles west of the Oneonta Cr. and Old Highway crossing. Mossy Falls is the small falls on the return trail between Wahkeena and Multnomah Creeks just above the Old Gorge Highway. A “Proposed” status means that we recommend the species be considered for the ISSSSP Sensitive and Strategic Species list. Sites listed as “possibly” refer to possible species occurrences based on larvae and case structure. See Appendix IV for site coordinates and Appendix V for site descriptions and accompanying species’ list for special status species.

Order: Family	Species	ISSSSP Status	Basin(s)
Plecoptera: Nemouridae	<i>Nanonemoura wahkeena</i> (Baumann & Fiala 2001)	OR-SEN	Wahkeena Cr.
Trichoptera: Apataniidae	<i>Apatania Kolenati</i> 1848	None	Lindsey Cr., Tanner Cr.
Trichoptera: Apataniidae	<i>Apatania sorex</i> (Ross 1941)	None	Dry Cr.
Trichoptera: Brachycentridae	<i>Eobranchycentrus gelidae</i> Wiggins 1965	None	Mist Cr., Wahkeena Cr.
Trichoptera: Brachycentridae	<i>Micrasema</i> McLachlan 1876	None	Bridal Veil Cr., Cabin Cr., Coopey Cr., Dry Cr., Eagle Cr., Gorton Cr., Herman Cr., Horsetail Cr., McCord Cr., Mist Cr., Mossy Falls, Multnomah Cr., Oneonta Cr., Ruckel Cr., Tanner Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.
Trichoptera: Brachycentridae	<i>Micrasema bactro</i> Ross 1938	None	Eagle Cr., Mist Cr., Unnamed Cr., Wahkeena Cr.
Trichoptera: Calamoceratidae	<i>Heteroplectron californicum</i> McLachlan 1871	None	Cabin Cr., Gorton Cr., Lindsey Cr., Multnomah Cr., Tanner Cr., Young Cr.
Trichoptera: Glossosomatidae	<i>Agapetus</i> Curtis 1834	None	Lindsey Cr.
Trichoptera: Glossosomatidae	<i>Agapetus taho</i>	None	Eagle Cr.
Trichoptera: Glossosomatidae	<i>Anagapetus</i> Ross 1938	None	Bridal Veil Cr., Dry Cr., Eagle Cr., Gorton Cr., Grays Cr., Herman Cr., Lindsey Cr., Multnomah Cr., Ruckel Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.
Trichoptera: Glossosomatidae	<i>Anagapetus bernea</i> Ross 1947	None	Cabin Cr., Dry Cr., Gorton Cr., Herman Cr., Mist Cr., Multnomah Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Glossosomatidae	<i>Glossosoma</i> Curtis 1834	None	Bridal Veil Cr., Cabin Cr., Dry Cr., Eagle Cr., Gorton Cr., Grays Cr., Lindsey Cr., Multnomah Cr., Ruckel Cr., Sorenson Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Glossosomatidae	<i>Glossosoma penitum</i> Banks 1914	None	Coopey Cr., Eagle Cr., Horsetail Cr., Lindsey Cr., Tanner Cr., Viento Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Goeridae	<i>Goeracea genota</i> (Ross 1941)	None	Eagle Cr., Herman Cr., McCord Cr., Mist Cr., Multnomah Cr., Oneonta Cr., Wahkeena Cr., Young Cr.
Trichoptera: Goeridae	<i>Lepania cascada</i> Ross 1941	STR	Unnamed Cr., Wahkeena Cr.
Trichoptera: Hydroptilidae	<i>Ochrotrichia</i> Mosely 1934	None	Oneonta Cr., Wahkeena Cr.
Trichoptera: Hydroptilidae	<i>Ochrotrichia</i> near <i>buccata/hadria</i> Denning & Blickle 1972	None (potential new sp.)	Oneonta Cr. Mist Creek
Trichoptera: Hydroptilidae	<i>Palaeagapetus nearcticus</i> Banks 1936	None	Harphan Cr., Multnomah Cr., Wahkeena Cr., Young Cr.
Trichoptera: Hydropsychidae	<i>Arctopsyche grandis</i> (Banks 1900)	None	Herman Cr., Wahkeena Cr.
Trichoptera: Hydropsychidae	<i>Hydropsyche</i> Pictet 1834	None	Cabin Cr., Dry Cr., Eagle Cr., Gorton Cr., Herman Cr., Horsetail Cr., Lindsey Cr., Mist Cr., Multnomah Cr., Oneonta Cr., Tanner Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.
Trichoptera: Hydropsychidae	<i>Hydropsyche andersoni</i> Denning 1983	None	Oneonta Cr., Unnamed Cr.
Trichoptera: Hydropsychidae	<i>Hydropsyche oslari</i> Banks 1905	None	Lindsey Cr.
Trichoptera: Hydropsychidae	<i>Parapsyche almota</i> Ross 1938	None	Bridal Veil Cr., Cabin Cr., Coopey Cr., Eagle Cr., Grays Cr., Lindsey Cr., Tanner Cr., Young Cr.
Trichoptera: Hydropsychidae	<i>Parapsyche elsis</i> Milne 1936	None	Bridal Veil Cr., Dry Cr., Herman Cr., Horsetail Cr., Multnomah Cr., Oneonta Cr., Sorenson Cr., Unnamed Cr., Wahkeena Cr., Wonder Cr., Young Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Lepidostomatidae	<i>Lepidostoma cascadense</i> Milne 1936	None	Bridal Veil Cr., Herman Cr., Multnomah Cr., Oneonta Cr., Wahkeena Cr., Warren Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma hoodi</i> Ross 1948	None	Bridal Veil Cr., Cabin Cr., Coopey Cr., Dry Cr., Herman Cr., Horsetail Cr., McCord Cr., Multnomah Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma roafi</i> (Milne 1936)	None	Multnomah Cr., Wahkeena Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma unicolor</i> (Banks 1911)	None	Cabin Cr., Dry Cr., Eagle Cr., Gorton Cr., Herman Cr., Horsetail Cr., Lindsey Cr., Multnomah Cr., Oneonta Cr., Tanner Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma</i> (<i>Neodinarthrum</i>) Weaver 1988	None	Eagle Cr., Herman Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma</i> -panel case larvae Wiggins 1996	None	Herman Cr., Horsetail Cr., Lindsey Cr., Multnomah Cr., Oneonta Cr., Sorenson Cr., Wahkeena Cr., Young Cr.
Trichoptera: Lepidostomatidae	<i>Lepidostoma</i> -spiral case larvae Wiggins 1996	None	Mist Cr., Multnomah Cr., Sorenson Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Allocosmoecus partitus</i> Banks 1943	None	Cabin Cr., Coopey Cr., Dry Cr., Eagle Cr., Herman Cr., Lindsey Cr., Multnomah Cr., Sorenson Cr., Tanner Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Chyranda centralis</i> (Banks 1900)	None	Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Cryptochia pilosa</i> (Banks 1907)	None	Coopey Cr., Mist Cr., Multnomah Cr., Unnamed Cr., Wahkeena Cr., Young Cr.
Trichoptera: Limnephilidae	<i>Dicosmoecus atripes</i> (Hagen 1875)	None	Multnomah Cr.
Trichoptera: Limnephilidae	<i>Dicosmoecus gilvipes</i> (Hagen 1875)	None	Herman Cr., Multnomah Cr., Oneonta Cr., Tanner Cr.
Trichoptera: Limnephilidae	<i>Ecclisomyia</i> Banks 1907	None	Eagle Cr., Lindsey Cr., Multnomah Cr., Ruckel Cr., Tanner Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Limnephilidae	<i>Ecclisomyia conspersa</i> Banks 1907	None	Gorton Cr., Herman Cr., Horsetail Cr., Moffett Cr., Oneonta Cr., Ruckel Cr., Viento Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Ecclisomyia simulata</i> Banks 1920	None	Wahkeena Cr., Young Cr.
Trichoptera: Limnephilidae	<i>Eocosmoecus frontalis</i> (Banks 1943)	None	Mist Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Hydatophylax Hesperus</i> (Banks 1914)	None	Oneonta Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Limnephilus nogus</i> Ross 1944	None	Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Onocosmoecus unicolor</i> (Banks 1897)	None	Oneonta Cr.
Trichoptera: Limnephilidae	<i>Philocasca rivularis</i> Wiggins 1968	None	Bridal Veil Cr., McCord Cr., Mist Cr., Multnomah Cr., Oneonta Cr., Unnamed Cr., Wahkeena Cr., Young Cr.
Trichoptera: Limnephilidae	<i>Pseudostenophylax edwardsi</i> (Banks 1920)	None	Harphan Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Psychoglypha</i> Ross 1944	None	Bridal Veil Cr., Eagle Cr., Herman Cr., Multnomah Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Limnephilidae	<i>Psychoglypha avigo</i> (Ross 1941)	None	Harphan Cr., Wahkeena Cr.
Trichoptera: Limnephilidae	<i>Psychoglypha bella</i> (Banks 1903)	None	Gorton Cr., Lindsey Cr., Oneonta Cr., Tanner Cr.
Trichoptera: Limnephilidae	<i>Psychoglypha subborealis</i> (Banks 1924)	None	Lindsey Cr., Multnomah Cr.
Trichoptera: Odontoceridae	<i>Namamyia plutonis</i> Banks 1905	OR-STR	Cabin Cr.
Trichoptera: Odontoceridae	<i>Parthina linea</i> Denning 1954	None	Cabin Cr., Eagle Cr., Oneonta Cr., Unnamed Cr., Wahkeena Cr.
Trichoptera: Philopotamidae	<i>Dolophilodes</i> Ulmer 1909	None	Lindsey Cr., Mist Cr., Multnomah Cr., Sorenson Cr., Tanner Cr., Wahkeena Cr.
Trichoptera: Philopotamidae	<i>Dolophilodes aequalis</i> (Banks 1924)	None	Wahkeena Cr.
Trichoptera: Philopotamidae	<i>Dolophilodes dorcus</i> (Ross 1938)	None	Bridal Veil Cr., Cabin Cr., Dry Cr., Eagle Cr., Herman Cr., Mist Cr., Multnomah Cr., Oneonta Cr., Ruckel Cr., Sorenson Cr., Starvation Cr., Tanner Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Philopotamidae	<i>Dolophilodes novusamericanus</i> (Ling 1938)	None	Eagle Cr., Mist Cr., Oneonta Cr., Starvation Cr., Unnamed Cr., Wahkeena Cr.
Trichoptera: Philopotamidae	<i>Dolophilodes pallidipes</i> Banks 1936	None	Eagle Cr., Mist Cr., Multnomah Cr., Unnamed Cr., Wahkeena Cr., Young Cr.
Trichoptera: Philopotamidae	<i>Sisko sisko</i> (Ross 1949)	None	Wahkeena Cr.
Trichoptera: Philopotamidae	<i>Wormaldia</i> McLachlan 1865	None	Bridal Veil Cr., Cabin Cr., Multnomah Cr., Wahkeena Cr., Young Cr.
Trichoptera: Philopotamidae	<i>Wormaldia anilla</i> (Ross 1941)	None	Bridal Veil Cr., Eagle Cr., Mist Cr., Multnomah Cr., Wahkeena Cr., Young Cr.
Trichoptera: Philopotamidae	<i>Wormaldia occidea</i> (Ross 1938)	None	Bridal Veil Cr., Harphan Cr., Mist Cr., Mossy Falls, Multnomah Cr., Oneonta Cr., Wahkeena Cr., Young Cr.
Trichoptera: Polycentropodidae	<i>Polycentropus</i> Curtis 1835	None	Cabin Cr., Eagle Cr., Multnomah Cr., Oneonta Cr., Ruckel Cr., Wahkeena Cr.
Trichoptera: Polycentropodidae	<i>Polycentropus variegatus</i> Banks 1900	None	Oneonta Cr.
Trichoptera: Psychomyiidae	<i>Psychomyia lumina</i> (Ross 1938)	None	Eagle Cr.
Trichoptera: Psychomyiidae	<i>Tinodes cascadius</i> Denning 1956	None	Cabin Cr., Oneonta Cr., Unnamed Cr.
Trichoptera: Rhyacophilidae	<i>Himalopsyche phryganea</i> (Ross 1941)	None	Bridal Veil Cr., Cabin Cr., Herman Cr., Horsetail Cr., Lindsey Cr., Multnomah Cr., Oneonta Cr., Starvation Cr., Wahkeena Cr., Warren Cr., Wonder Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila angelita</i> Banks 1911	None	Eagle Cr., Multnomah Cr., Oneonta Cr., Unnamed Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila angelita</i> group sensu Schmid 1970	None	Bridal Veil Cr., Cabin Cr., Eagle Cr., Gorton Cr., Horsetail Cr., Oneonta Cr., Ruckel Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila arnaldi</i> Denning 1948	None	Lindsey Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila betteni</i> group sensu Schmid 1970	None	Bridal Veil Cr., Dry Cr., Eagle Cr., Horsetail Cr., Lindsey Cr., McCord Cr., Mist Cr., Multnomah Cr., Tanner Cr., Wahkeena Cr., Young Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Rhyacophilidae	<i>Rhyacophila betteni</i> group B sensu Giersch & Wisseman 2012	None	Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila brunnea</i> group sensu Schmid 1970	None	Bridal Veil Cr., Cabin Cr., Herman Cr., Horsetail Cr., Lindsey Cr., Multnomah Cr., Oneonta Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila ecosa</i> Ross 1941	None	Cabin Cr., Mist Cr., Mossy Falls, Multnomah Cr., Oneonta Cr., Starvation Cr., Unnamed Cr., Warren Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila fender</i> Ross 1948	None	Bridal Veil Cr., Multnomah Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila grandis</i> Banks 1911	None	Bridal Veil Cr., Dry Cr., Grays Cr., Harphan Cr., Mist Cr., Mossy Falls, Multnomah Creek, Ruckel Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila hyalinata</i> Banks 1905	None	Cabin Cr., Dry Cr., Mist Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila hyalinata</i> group sensu Schmid 1970	None	Coopey Cr., Gorton Cr., Horsetail Cr., Oneonta Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila iranda</i> Ross 1938	None	Mist Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila jewetti</i> Denning 1954	None	Multnomah Cr., Oneonta Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila narvae</i> Navas 1926	None	Bridal Veil Cr., Cabin Cr., Dry Cr., Gorton Cr., Herman Cr., Mist Cr., Multnomah Cr., Viento Cr., Wahkeena Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila nevadensis</i> group sensu Schmid 1970	None	Multnomah Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila norcuta</i> Ross 1938	None	Mist Cr., Multnomah Cr., Oneonta Cr., Unnamed Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila oreta</i> Ross 1941	None	Bridal Veil Cr., Cabin Cr., Eagle Cr., Herman Cr., Horsetail Cr., McCord Cr., Mist Cr., Mossy Falls, Multnomah Cr., Oneonta Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr.

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Rhyacophilidae	<i>Rhyacophila perda</i> Ross 1938	None	Cabin Cr., Eagle Cr., Mist Cr., Multnomah Cr., Wahkeena Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila perplana</i> Roos & Spencer 1952	None	Eagle Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila rotunda</i> group sensu Schmid 1970	None	Bridal Veil Cr., Cabin Cr., Eagle Cr., Grays Cr., Multnomah Cr., Oneonta Cr., Unnamed Cr., Wahkeena Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila</i> probably <i>unipunctata</i> Schmid 1970	OR-STR	Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vaccua</i> Milne 1936	None	Cabin Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila</i> near <i>vaccua</i> Wisseman unpublished	None	Multnomah Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vaefes</i> Milne 1936	None	Eagle Cr., Multnomah Cr., Oneonta Cr., Young Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila valuma</i> Milne 1936	None	Dry Cr., Herman Cr., Wahkeena Cr., Warren Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vao-brunnea</i> Milne 1936	None	Coopey Cr., Dry Cr., Eagle Cr., Gorton Cr., Herman Cr., Moffett Cr., Multnomah Cr., Oneonta Cr., Ruckel Cr., Viento Cr., Wahkeena Cr., Warren Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vedra</i> Milne 1936	None	Eagle Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila Verrula</i> Milne 1936	None	Herman Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila viquaea</i> Milne 1936	WA-STR	Bridal Veil Cr., Cabin Cr., Mist Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila visor</i> Milne 1936	None	Cabin Cr., Mist Cr., Multnomah Cr., Oneonta Cr., Wahkeena Cr., Wonder Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vocala</i> Milne 1936	None	Eagle Cr., Wahkeena Cr.
Trichoptera: Rhyacophilidae	<i>Rhyacophila vofixa</i> group sensu Schmid 1970	None	Multnomah Cr.
Trichoptera: Uenoidae	<i>Farula</i> (not <i>constricta</i>) Milne 1936	None	Mist Cr., Wahkeena Cr.
Trichoptera: Uenoidae	<i>Farula constricta</i> Wiggins & Wisseman 1992	OR-SEN	Bridal Veil Cr. (possibly), Eagle Cr., McCord Cr. (possibly), Mist Cr., Mossy Falls, Multnomah Cr. (possibly), Oneonta Cr., Unnamed Cr., Wahkeena Cr. (possibly)

Order: Family	Species	ISSSP Status	Basin(s)
Trichoptera: Uenoidae	<i>Neophylax occidentis</i> Banks 1924	None	Wahkeena Cr.
Trichoptera: Uenoidae	<i>Neophylax rickeri</i> Milne 1935	None	Eagle Cr., Gorton Cr., Herman Cr., Horsetail Cr., Lindsey Cr., Ruckel Cr., Tanner Cr.
Trichoptera: Uenoidae	<i>Neophylax smithi</i> Vineyard & Wiggins 1987	WA-STR	Eagle Cr.
Trichoptera: Uenoidae	<i>Neophylax splendens</i> Denning 1948	None	Bridal Veil Cr., Cabin Cr., Coopey Cr., Dry Cr., Eagle Cr., Gorton Cr., Grays Cr., Herman Cr., Horsetail Cr., Lindsey Cr., McCord Cr., Mist Cr., Mossy Falls, Multnomah Cr., Oneonta Cr., Ruckel Cr., Sorenson Cr., Tanner Cr., Unnamed Cr., Wahkeena Cr., Warren Cr., Wonder Cr., Young Cr.
Trichoptera: Uenoidae	<i>Neothremma</i> Dodds & Hisaw 1925	None	Grays Cr., Horsetail Cr., McCord Cr., Mist Cr., Multnomah Cr., Oneonta Cr.
Trichoptera: Uenoidae	<i>Neothremma andersoni</i> Wiggins 1975	OR-SEN	Mist Cr. (possibly), Wahkeena Cr.
Trichoptera: Uenoidae	<i>Neothremma didactyla</i> Ross 1949	None	Eagle Cr., Herman Cr., Multnomah Cr., Sorenson Cr., Young Cr.
Trichoptera: Uenoidae	<i>Neothremma prolata</i> Wiggins & Wisseman 1992	None (proposed)	Grays Cr. (possibly), Oneonta Cr. (possibly), Wonder Cr.
Trichoptera: Uenoidae	<i>Neothremma</i> new species Wisseman unpublished	None (potential new species)	Multnomah Cr.
Trichoptera: Uenoidae	<i>Oligophlebodes minutus</i> (Banks 1897)	None	Eagle Cr.
Trichoptera: Uenoidae	<i>Oligophlebodes</i> Ulmer 1905	Possibly <i>Oligophlebodes mostbento</i> (OR-STR)	Wahkeena Cr. As larvae In 1989.

APPENDIX IV: LIST OF ALL SITES SURVEYED IN 2015

Below we list all sites surveyed in 2015. Sites are in alphabetical order by basin name and then site number. Photos and site descriptions are available in Appendix V. Species of interest are listed using the first two letters of the genus and species names (e.g., *Farula constricta* is FACO). Species with a ‘?’ need additional collections for ID confirmation.

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
Bridal Veil Creek	1	1 st order trib	CRGNSA	6/25/2015	45.557569	-122.174925	65	No
	2	2 nd order trib	CRGNSA	6/25/2015	45.548684	-122.171630	302	FACO?
	3	Bridge crossing	CRGNSA	6/25/2015	45.543189	-122.164821	425	No
	4	2 nd order trib	MTH NF	6/25/2015	45.537055	-122.114560	841	RHVI
Cabin Creek	1	Starvation Ridge Trail	CRGNSA	5/1/2015, 6/24/2015	45.684918	-121.695427	163	NAPL, RHVI
	2	U/s Starvation ridge trail	CRGNSA	5/1/2015	45.684134	-121.695341	180	NAPL, RHVI
	3	Lower Falls	State	6/24/2015	45.687234	-121.696511	61	No
Coopey Creek	1	Angel’s Rest trail	State	7/22/2015	45.561702	-122.163281	114	No
Dry Creek	1	Falls	CRGNSA	5/8/2015	45.657686	-121.867120	256	No
	2	Trail at footbridge	CRGNSA	5/8/2015	45.660292	-121.869055	210	No
Eagle Creek	1	Diversion dam area	CRGNSA	5/15/2015	45.636279	-121.919619	76	NESM?
	2	d/s Punchbowl Falls, weeping wall	CRGNSA	5/15/2015	45.622868	-121.895248	243	NESM?

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
	3	Sorenson Creek	CRGNSA	5/15/2015	45.625502	-121.894710	243	No
	4	Trailside seep	CRGNSA	5/15/2015	45.634465	-121.914202	181	FACO
	5	Falls trib (east)	MTH NF	8/26/2015	45.592463	-121.865878	305	No
	6	Tish Cr. at trail	CRGNSA	8/26/2015	45.621927	-121.893680	244	No
Gorton Creek	1	Trail crossing	CRGNSA	5/1/2015	45.686470	-121.771482	67	No
Grays Creek	1	Trail crossing	CRGNSA	7/15/2015	45.687107	-121.794661	188	NEPR?
Herman Creek	1	Trail crossing	CRGNSA	5/8/2015	45.679080	-121.836025	155	No
	2	Lower trib @PCT	CRGNSA	5/8/2015	45.669184	-121.845722	250	No
Horsetail Creek	1	D/s Horsetail Falls	CRGNSA	4/21/2015	45.590380	-122.069050	10	No
	2	Ponytail Falls	CRGNSA	6/10/2015	45.588994	-122.068585	115	No
Lindsey Creek	1	U/s I-84 crossing	Private	7/15/2015	45.687589	-121.714506	61	No
	2	First falls	CRGNSA	7/15/2015	45.686749	-121.715877	61	No
McCord Creek	1	Elowah Falls	State	7/22/2015	45.612596	-121.994741	65	FACO?
	2	Water tank overflow	CRGNSA	7/22/2015	45.612452	-122.005028	57	No
Mist Creek	1	Falls to hwy	CRGNSA	4/20/2015, 5/20/2015	45.574210	-122.132870	20-115	FACO

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
	2	Headwater spring	CRGNSA	5/21/2015, 6/5/2015	45.570556	-122.127222	336	RHVI, NEAN?
Mossy Falls	1	Falls and talus slope	CRGNSA	4/20/2015, 5/20/2015, 7/21/2015	45.575647	-122.126111	40	FACO
Multnomah Creek	1	west trib d/s falls	CRGNSA	4/21/2015	45.576660	-122.117070	65	No
	2	d/s falls	CRGNSA	4/21/2015	45.577444	-122.116336	15	No
	3	upper	CRGNSA	7/21/2015	45.539531	-122.086665	979	No
	4	upper	CRGNSA	7/21/2015	45.547764	-122.078405	852	No
	5	upper	CRGNSA	7/21/2015	45.562190	-122.079545	640	No
	6	EF @ mouth	CRGNSA	7/21/2015	45.567708	-122.083765	506	No
	7	upper spring trib	CRGNSA	7/21/2015	45.568226	-122.096677	442	No
	8	middle spring tribs	CRGNSA	7/21/2015, 8/25/2015, 10/3/3015	45.569192	-122.102383	438	FACO?
	9	1 st order trib from east	CRGNSA	7/21/2015	45.571924	-122.107442	371	No
	10	middle spring trib	CRGNSA	8/25/2015	45.569068	-122.102987	427	FACO?
	11	1st ord trib @ trail	CRGNSA	8/25/2015, 10/3/2015	45.571024	-122.105380	365	No

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
	12	1st ord trib @ trail	CRGNSA	8/25/2015, 10/3/2015	45.571133	-122.105550	367	No
	13	1st ord trib @ trail	CRGNSA	8/25/2015, 10/3/2015	45.571439	-122.106536	371	NEAR nov. sp.?
	14	1st ord trib @ trail	CRGNSA	8/25/2015	45.571886	-122.107898	366	NEAR nov. sp.?
	15	seep & weeping wall	CRGNSA	8/25/2015	45.575702	-122.111401	212	FACO?
	16	middle creek, above falls	CRGNSA	10/3/2015	45.574924	-122.108343	260	No
Oneonta Creek	1	u/s hwy	CRGNSA	4/21/2015	45.589210	-122.075060	15	No
	2	seep near trail	CRGNSA	6/10/2015	45.585291	-122.072732	182	FACO
	3	middle falls @trail	CRGNSA	6/10/2015	45.584817	-122.072835	193	No
	4	middle mainstem	CRGNSA	6/10/2015	45.584324	-122.072533	182	No
	5	weeping wall	CRGNSA	6/10/2015	45.583056	-122.072222	261	FACO, NEPR?, OCBU?
Ruckel Creek	1	u/s bike trail	CRGNSA	5/15/2015	45.644135	-121.919437	60	No
	2	d/s bike trail	CRGNSA	5/15/2015	45.644974	-121.918859	60	No
Tanner Creek	1	d/s diversion dam	CRGNSA	7/15/2015	45.628759	-121.953951	67	No

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
	2	u/s diversion dam	CRGNSA	7/15/2015	45.628496	-121.953994	63	No
	3	waterfall trib	CRGNSA	7/15/2015	45.626284	-121.953481	68	No
Unnamed Creek	1	u/s highway	State	4/21/2015, 6/24/2015, 7/21/2015	45.582810	-122.096000	45-61	FACO, LECA
	1	falls to railroad	CRGNSA	4/20/2015, 4/21/2015, 5/20/2015	45.575590	-122.128390	20-30	NEAN
	2	spring area, tribs & seeps	CRGNSA	4/21/2015, 5/21/2015, 6/5/2015	45.567660	-122.123770	380-470	NEAN, NAWA, LECA, RHUN?
Wahkeena Creek	3	EF trailside seep	CRGNSA	4/21/2015	45.568580	-122.124738	430	NEAN, LECA
	4	middle above falls	CRGNSA	4/21/2015	45.570780	-122.125322	367	FACO?
	5	tributary near springhead	CRGNSA	5/21/2015	45.570556	-122.127500	380	NEAN
	6	middle, seep	CRGNSA	5/21/2015	45.571944	-122.126389	286	No
	7	Fairy Falls & EF	CRGNSA	6/5/2015	45.570150	-122.124300	358	No
Warren Creek	1	trail crossing	CRGNSA	5/1/2015, 6/24/2015	45.684414	-121.701714	120	No
	2	Hole in the Wall Falls	Private	6/24/2015	45.686213	-121.702010	61	No

Water Body	Site #	Description	Land Owner	Date(s)	Latitude	Longitude	Elev. (m)	Species of Interest
Wonder Creek	1	d/s Lancaster Falls	CRGNSA	5/1/2015, 6/24/2015	45.684897	-121.706161	91	NEPR
Young Creek	1	impoundment	CRGNSA	6/5/2015	45.547218	-122.191372	113	No
	2	Shepperd's Dell	State	6/5/2015	45.547875	-122.197558	61	No
	3	Brower Rd crossing	CRGNSA	6/25/2015	45.533582	-122.165923	486	No
	4	headwaters	Private	6/25/2015	45.525296	-122.152970	576	No
	5	tribs @ old hwy	Private	7/22/2015	45.541154	-122.207947	61	No
	6	trib @ old hwy	Private	7/22/2015	45.540907	-122.208823	61	No

APPENDIX V: DESCRIPTION OF SITES VISITED

Below is a list of all sites surveyed in 2015, with photos and notes on habitat, survey dates, and special status species encountered. Sites are organized alphabetically by basin name and then site number. Appendix IV includes coordinates for all sites.

BRIDAL VEIL CREEK

Site 1: Bridal Veil Creek unnamed tributary along Palmer Creek Road, 65 m elevation, June 25, 2015; small perennial stream with moderate gradient; may be warm in the summer, probably not suitable habitat for sensitive species.

No sensitive species encountered.



Figure 8: Unnamed tributary to Bridal Veil Creek along Palmer Creek Rd. Photo by Candace Fallon (Xerces Society).

Site 2: Bridal Veil Creek unnamed tributary at FS road crossing, 302 m elevation; June 25, 2015; perennial stream with excellent habitat for sensitive species; cascades, falls and talus habitat; fauna present indicates the stream remains cool-cold over the summer. Worth checking further upstream for a spring source. Logged in the past with FS road crossing.

Farula larvae and old pupal cases present. These may be *Farula constricta* (OR-SEN). Adults, mature pupae or DNA analysis needed to confirm species. Revisit this site earlier in the spring.

Rhyacophila fenderi adult



Figure 9: Unnamed tributary to Bridal Veil Creek at FS road crossing. Photo by Candace Fallon (Xerces Society).

Site 3: Bridal Veil Creek at NE Brower Rd bridge crossing, June 25, 2015. Large perennial stream not suitable for sensitive species.

No sensitive species encountered



Figure 10: Bridal Veil Creek at bridge crossing. Photo by Candace Fallon (Xerces Society).

Site 4: Bridal Veil Creek tributary @ FS road 15 crossing, 708 m elevation, June 25, 2015; this is a small, perennial cool stream that has potential habitat for sensitive species; second growth forest.

Rhyacophila viquaea (WA-STR) adults



Figure 11: Unnamed tributary to Bridal Veil Creek at FS Rd 15 crossing. Photo by Candace Fallon (Xerces Society).

CABIN CREEK

Sites 1 & 2: Cabin Creek @ Starvation Ridge Trail crossing to 50 m upstream, 163 m elevation. This is a cool, high gradient, small-mid-size stream that is potential habitat for *Farula* or *Neothremma* and other sensitive species. It is the stream with the type locale of *Neothremma prolata*. Minimal disturbance of habitat from trail crossing.

May 1, 2015

Neothremma prolata not encountered.

Namamyia plutonis (OR-STR), 3 larvae

Rhyacophila viquaea (WA-STR), 1 male adult

Pristinicola hemphilli (OR-STR/WA-SEN) present

June 24, 2015

Farula or *Neothremma* not found.

Rhyacophila viquaea (WA-STR) male and female adult

Namamyia plutonis (OR-STR) old pupal case.

Site 3: Cabin Creek Falls @ base, June 24, 2015. This is the type locality for *Neothremma prolata*. The stream below the plunge pool was almost entirely subsurface on June 24. No *Neothremma prolata* found. This may be a satellite population of *N. prolata* that does poorly in drought years.



Figure 12: Cabin Creek at Starvation Ridge trail crossing (left) and Cabin Creek Falls (right). Photos by Emilie Blevins & Candace Fallon (Xerces Society).

COOPEY CREEK

Coopey Creek above falls @ Angels Rest Trail crossing; July 22, 2015; fauna present indicates this stream warms considerably in the summer; some human impact from trampling; mid-size warmer stream probably not suitable habitat for sensitive species.

No sensitive species encountered



Figure 13: Coopey Creek. Photo by Candace Fallon (Xerces Society).

DRY CREEK

Site 1: Dry Creek Falls and downstream to trail bridge, May 8, 2015; has stream diversion structure immediately below falls, a foot bridge and trail up to falls. By the other cool-water fauna present and the habitat type this site below the falls may support sensitive species.

Soliperla present



Figure 14: Dry Creek Falls. Photo by Candace Fallon (Xerces Society).

Site 2: Dry Creek @ log bridge on Pacific Crest Trail, May 8, 2015; some erosion from human foot traffic near bridge. By the other cool-water fauna present and the habitat type this site may support sensitive species.

Pristinicola hemphilli (OR-STR/WA-SEN) present



Figure 15: Dry Creek. Photo by Candace Fallon (Xerces Society).

EAGLE CREEK

Site 1: Eagle Creek at and above diversion dam, May 15, 2015; this is a large, low gradient stream at this point, that appears to warm up considerably in the summer, and thus is not suitable habitat for sensitive species.

Possibly *Neophylax smithi* (WA-STR), 1 immature pupa



Figure 16: Eagle Creek diversion dam. Photo by Candace Fallon (Xerces Society).

Site 2: Eagle Creek below Punchbowl Falls, May 15, 2015; this is a large, lower gradient stream that warms considerably in the summer and is not suitable habitat for most of the sensitive species.

Neophylax smithi (WA-STR), 1 male and 1 female pupae, confirmed I.D.



Figure 17: Eagle Creek weeping wall. Photo by Candace Fallon (Xerces Society).

Site 3: Sorenson Creek @ Eagle Creek Trail crossing, May 15, 2015; this is a mid-size stream with moderate gradient. The fauna present indicates it remains cool through the summer. The habitat at the trail crossing is probably not supportive of most of the sensitive species. More suitable habitat may occur upstream.

No sensitive caddisflies encountered.

Neothremma didactyla (common Cascades species) present.



Figure 18: Sorenson Creek. Photo by Candace Fallon (Xerces Society).

Site 4: Eagle Creek side seep along trail to Punchbowl Falls, May 15, 2015. Tiny seep with very little water flow along Eagle Creek trail. Site may dry up in some years.

Farula constricta (OR-SEN), 1 dead pupa



Figure 19: Eagle Creek side seep. Photo by Candace Fallon (Xerces Society).

Site 5: Falls tributary (east), August 26, 2015. Tributary to Eagle Creek, about 100 meters upstream of Trail 440 crossing. Undercut falls amphitheater with talus slope at base, then large pool. Seems like ideal habitat for *Farula* or *Neothremma*, but at height of summer this amphitheater may be too warm.

Pristinicola hemphilli (OR-STR/WA-SEN) present.



Figure 20: Tributary creek and falls to Eagle Creek. Photos by Candace Fallon (Xerces Society).

Site 6: Tish Creek at trail, August 26, 2015. Another west-facing tributary to Eagle Creek that may be too warm in the summer for *Farula* or *Neothremma*.

No sensitive species encountered

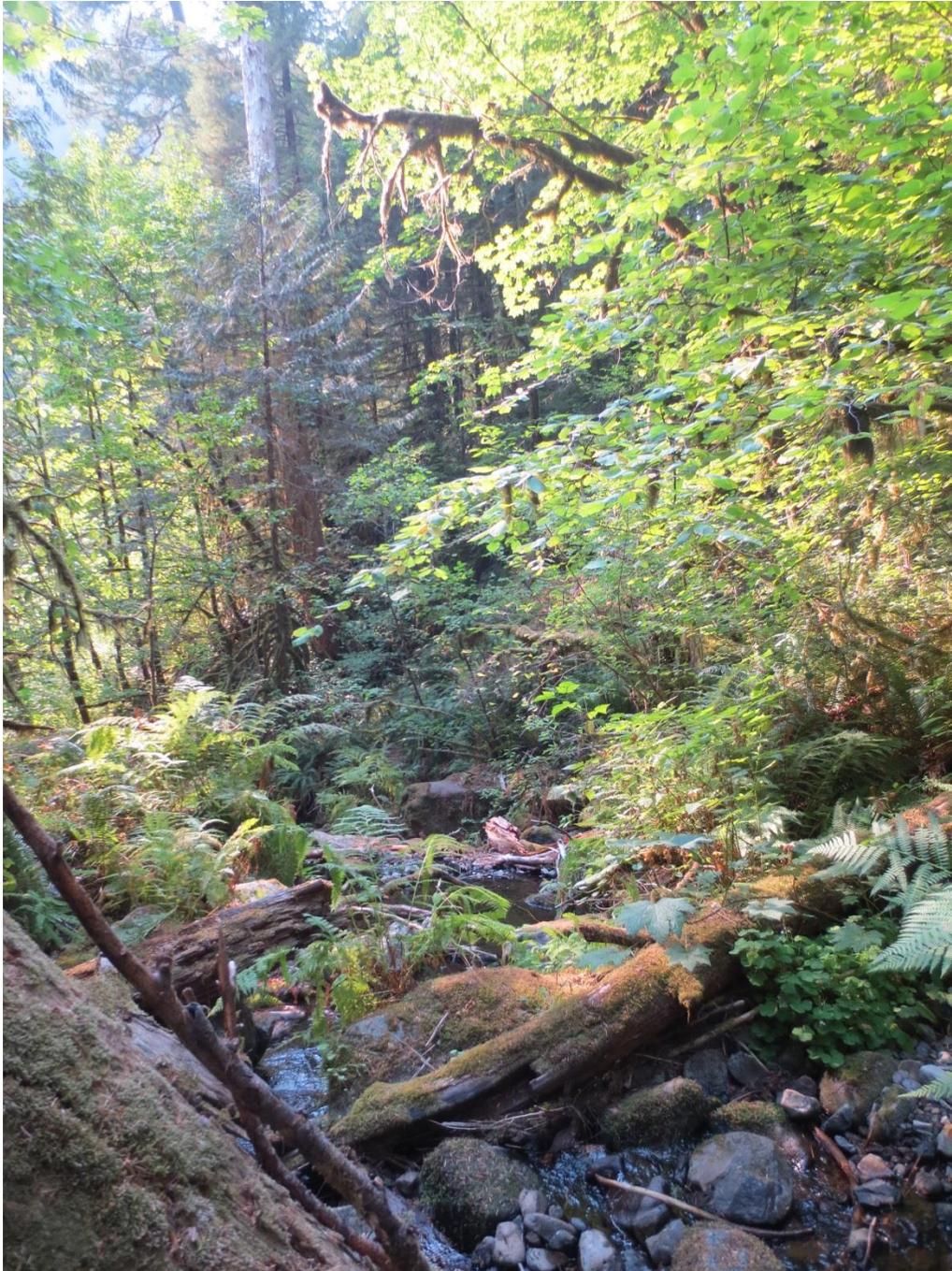


Figure 21: Tish Creek. Photo by Candace Fallon (Xerces Society).

GORTON CREEK

Gorton Creek @ Trail 400 crossing, May 1, 2015, considerable human disturbance from trail bridge and some trampling, water too warm and gradient too low to be suitable habitat for sensitive species.

No sensitive species encountered



Figure 22: Gorton Creek. Photo by Candace Fallon (Xerces Society).

GRAYS CREEK

Grays Creek @ gorge trail crossing; July 15, 2015; small stream that may become intermittent in late summer; fauna present indicates it may remain cool in the summer; trail crosses through creek with minimal human impact; potential habitat for sensitive species.

Neothremma larvae present. This stream is not far from Cabin and Wonder Creeks, so these could be *Neothremma prolata*. Need adults, mature pupae or DNA analysis to identify species.



Figure 23: Grays Creek. Photo by Candace Fallon (Xerces Society).

HERMAN CREEK

Site 1: Herman Creek @ trail crossing, May 8, 2015; stream is probably too large, too warm in the summer; and too low gradient to support sensitive species.

No sensitive species encountered



Figure 24: Herman Creek. Photo by Candace Fallon (Xerces Society).

Site 2: Unnamed tributary west of Herman Creek on Pacific Crest Trail, May 8, 2015; by the cold water fauna present and small, high gradient habitat, this site may support sensitive species. The Pacific Crest Trail runs through the stream. Known colloquially as Pacific Crest Falls.

Soliperla present

Neothremma didactyla (common Cascade species) present.



Figure 25: Unnamed tributary west of Herman Creek. Photo by Candace Fallon (Xerces Society).

HORSETAIL CREEK

Site 1: Horsetail Falls, just u/s of Historic Hwy, April 21, 2015. Large falls and stream flowing into slough along the Columbia River. Area receives high visitation load – located along Historic Highway with pedestrian access to stream.

No sensitive species encountered.



Figure 26: Splash pool below Horsetail Falls. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 2: Horsetail Creek @ Ponytail Falls, June 10, 2015; large stream with moderate gradient below falls and falls; fauna present indicates the stream is cool in the summer. This habitat is unlikely to support sensitive species.

Neothremma larvae present, probably *Neothremma didactyla* (common Cascades species), needs to be verified with adults or mature pupae.

Pristinicola hemphilli (OR-STR/WA-SEN) present

Hydrobiidae (another genus) present



Figure 27: Horsetail Creek and Ponytail Falls. Photo by Candace Fallon (Xerces Society).

LINDSEY CREEK

Site 1: Lindsey Creek above I-84 crossing; July 15, 2015; fauna present indicates the stream is warm in the summer; mid-size perennial stream with moderate gradient. Unlikely habitat for sensitive species.

No sensitive species encountered



Figure 28: Lindsey Creek at highway crossing. Photo by Candace Fallon (Xerces Society).

Site 2: Lindsey Creek @ first falls above I-84, July 15, 2015; fauna present indicates the stream is borderline warm in the summer; possible habitat for sensitive species.

No sensitive species encountered



Figure 29: Lindsey Creek at falls. Photo by Candace Fallon (Xerces Society).

MCCORD CREEK

Site 1: McCord Creek @ Elowah Falls, July 22, 2015; in falls amphitheater there is a side falls and weeps/seeps on the west side with an extensive talus slope habitat where water is mostly subsurface; human impact very low; suitable habitat for sensitive species.

Farula probably *constricta*, 2 old pupal cases. Population here probably pupated and emerged earlier in the spring. Revisit in May.



Figure 30: McCord Creek at Elowah Falls. Photo by Candace Fallon (Xerces Society).

Site 2: Elowah Falls trailhead water tank overflow; July 22, 2015; there is an old wooden water tank near the trailhead that is fed by a pipe coming from a spring or well higher on the hill; the overflow of the water tank creates a splash zone on cobbles and a short 10 m section of surface flow before disappearing underground; human created habitat; suitable for sensitive species.

Neothremma larvae present, possibly *N. didactyla* (common Cascades species), but needs verification with adults or mature pupae.

Pristinicola hemphilli (OR-STR/WA-SEN) present



Figure 31: Elowah Falls water tank. Photo by Candace Fallon (Xerces Society).

MIST CREEK

Site 1: Mist Falls, base of falls d/s 100 m; little human activity in area. Unimproved trail starts at the Historic Highway and travels up to the base of the falls. Some erosion along trail and light trampling at base of falls. Probably very few visitors. Moderate flow at falls with large areas of cliff face damp or flowing with streams of water.

April 20, 2015

Soliperla (stonefly) common

Farula constricta (OR-SEN), many larvae, pupae and adults, very healthy population, abundance tapers off rapidly downstream towards highway.

May 20, 2015

Farula constricta (OR-SEN) 1 pupa and larvae common.



Figure 32: Base of Mist Falls (left) and looking downstream from Mist Falls (right). Photos by Robert Wisseman (Aquatic Biology Associates).

Site 2: Mist Falls headwater spring: spring emerges about 20 m north and downhill of the Angels Rest Trail. Fantastic, cold water habitat for many sensitive species. No evidence that humans ever visit the site. This site needs a thorough evaluation as it may support *Neothremma andersoni* (OR-SEN), *Setvena wahkeena*, *Nanonemoura wahkeena*, and other sensitive invertebrates.

May 21, 2015

Rhyacophila viquaea (WA-STR) adult

Setvena larvae present

Farula larvae present, probably not *F. constricta*

Neothremma larvae present. Could be *Neothremma andersoni* (OR-SEN). Need adults or mature pupae.

Pristinicola hemphilli (OR-STR/WA-SEN) present

Eobrachycentrus gelidae old pupal cases

June 5, 2015

Adult sweeping. *Neothremma* probably *andersoni* 1 female. High probability this is *N. andersoni*, but females of *N. andersoni* and *N. prolata* are very close. Males or DNA analysis needed to confirm identification.



Figure 33: Mist Falls headwater spring. Photo by Robert Wisseman (Aquatic Biology Associates).

MOSSY FALLS

Mossy Falls, on return trail from Multnomah to Wahkeena Falls.

April 20, 2015

Farula constricta (OR-SEN), many adults and egg masses, a few pupae; habitat is immediately accessible from the trail and there is evidence of human habitat disruption, but this population has been maintaining itself since first discovered in 1989.

May 20, 2015

Farula constricta (OR-SEN), larvae occasional

Pristinicola hemphilli (OR-STR/WA-SEN) present

July 21, 2015

Did not collect but noticed that there was still substantial flow and drips down onto the talus area at the base where *Farula constricta* (OR-SEN) is present.



Figure 34: Mossy Falls. Photo by Robert Wisseman (Aquatic Biology Associates).

MULTNOMAH CREEK

Site 1: Multnomah Creek, 1st order tributary entering from west near lower falls viewing area above trail crossing, April 21, 2015. There is potential habitat here (large stream), but no sensitive caddis seen. Access to stream by human traffic is well protected by fences and bridge.

Pristinicola hemphilli (OR-STR/WA-SEN) present

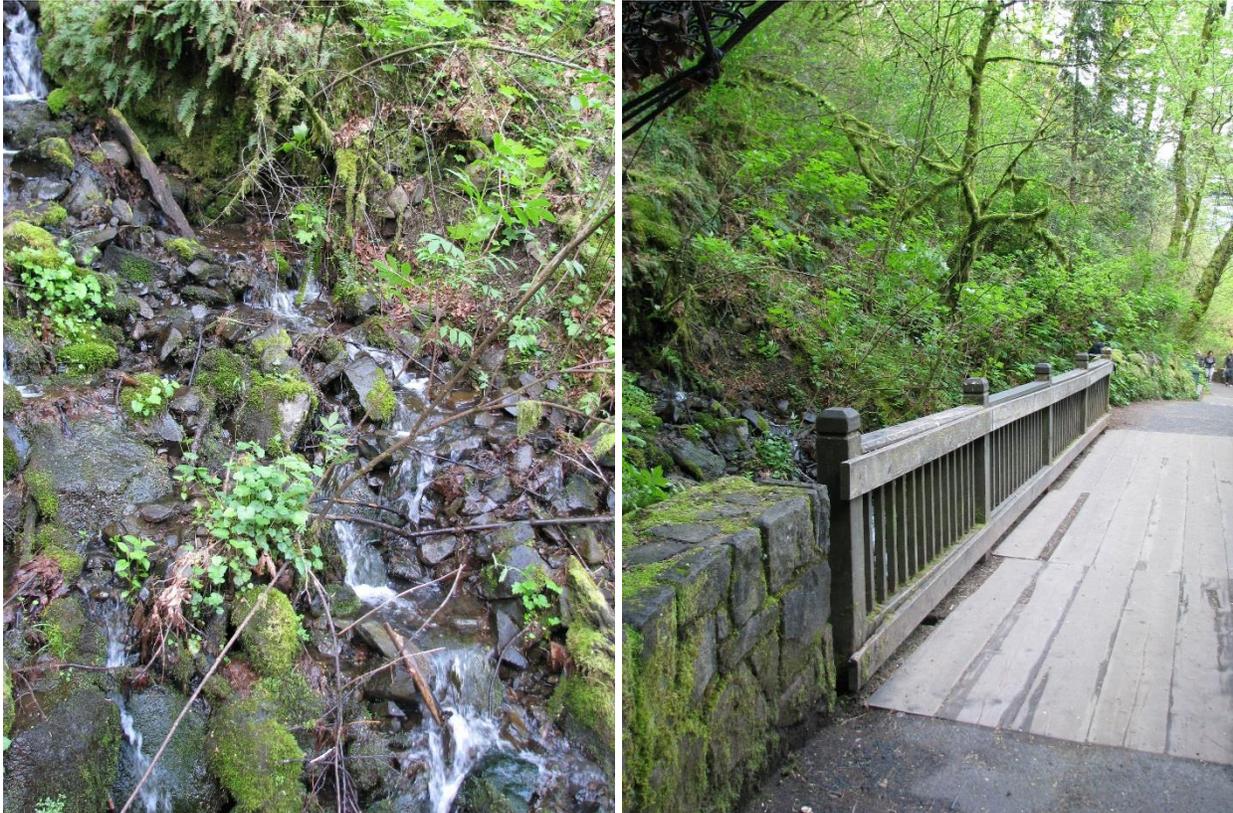


Figure 35: 1st order tributary to Multnomah Creek and trail crossing. Photos by Robert Wisseman (Aquatic Biology Associates).

Site 2: Multnomah Creek lower, April 21, 2015, 100 m downstream falls. This is unsuitable habitat. The fauna present indicates this is a warmer stream, unlikely to support species like *Neothremma wahkeena*.

No sensitive species encountered



Figure 36: Multnomah Creek lower. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 3: Multnomah Creek upper @ Trail 444 crossing, 850 m elevation, July 21, 2015; creek is a seasonal channel at this point with intermittent surface water on July 21; low human impact; probably not suitable habitat for most sensitive species.

Soliperla present



Figure 37: Upper Multnomah Creek at Trail 444 crossing. Photo by Candace Fallon (Xerces Society).

Site 4: Multnomah Creek upper @ Trail 444 & 446 junction & crossing; 830 m elevation, July 21, 2015; channel is low gradient with intermittent surface water; human impact low; not suitable habitat for many sensitive species.

Pristinicola hemphilli (OR-STR/WA-SEN) present

Palaeagapetus nearcticus adults present



Figure 38: Upper Multnomah Creek at junction of Trails 444 and 446. Photo by Candace Fallon (Xerces Society).

Site 5: Multnomah Creek @ Trail 441 crossing, 634 m elevation; July 21, 2015; summer cool, flashy system; low human impact from trails; mid-size stream now with perennial surface flow. Probably not suitable habitat for sensitive species.

Soliperla present

Neothremma didactyla (common Cascades species) pupae present



Figure 39: Multnomah Creek at Trail 441 crossing. Photo by Candace Fallon (Xerces Society).

Site 6: Multnomah Creek, East Fork @ mouth; 516 m elevation; July 21, 2015; only a little surface water on July 21 near mouth, intermittent above; flashy system that may warm in the summer; human impact very low; not potential habitat for sensitive species.

Neothremma didactyla (common Cascade species) larvae present



Figure 40: East Fork Multnomah Creek, at mouth. Photo by Candace Fallon (Xerces Society).

Site 7: Multnomah Creek tributary @ 510 m elevation, July 21, 2015; first perennial tributary entering from west when descending Multnomah Creek; cold water, with strong perennial flow; probably spring-fed; cascades & bedrock near mouth; no human impacts; may be suitable habitat for sensitive species.

Neothremma didactyla (common Cascades species) present

Pristinicola hemphilli (OR-STR/WA-SEN) present

Soliperla present

This tributary and a similar spring-fed tributary entering from the west just downstream may have potential for harboring *Neothremma andersoni* (OR-SEN) and *Nanonemoura wahkeena* in their headwaters. These are the closest tributaries in the Multnomah Creek basin with similar habitat characteristics to Wahkeena Creek. There is no trail access.



Figure 41: Tributary to Multnomah Creek. Photo by Candace Fallon (Xerces Society).

Site 8: Multnomah Creek tributary @ 500 m elevation; second perennial tributary entering from west when descending Multnomah Creek; cold water, with strong perennial flow; probably spring-fed; waterfall at mouth drops directly into the Multnomah Creek main-stem; no human impacts; suitable habitat for sensitive species.

July 21, 2015

Farula larvae common on cliff face. These are probably *Farula constricta* (OR-SEN), but need adults or mature pupae to confirm. Revisited this site in August and October but no pupae or adults were present. We recommend that this site be revisited earlier in the year.

Soliperla present

Setvena present (possibly *Setvena wahkeena*)

Pristinicola hemphilli (OR-STR/WA-SEN) present

August 25, 2015

Many *Farula* 5th instar larvae. Early and mid-instar larvae visible on cliff rock surface.

October 3, 2015

Many *Farula* 5th instar larvae

Neothremma present

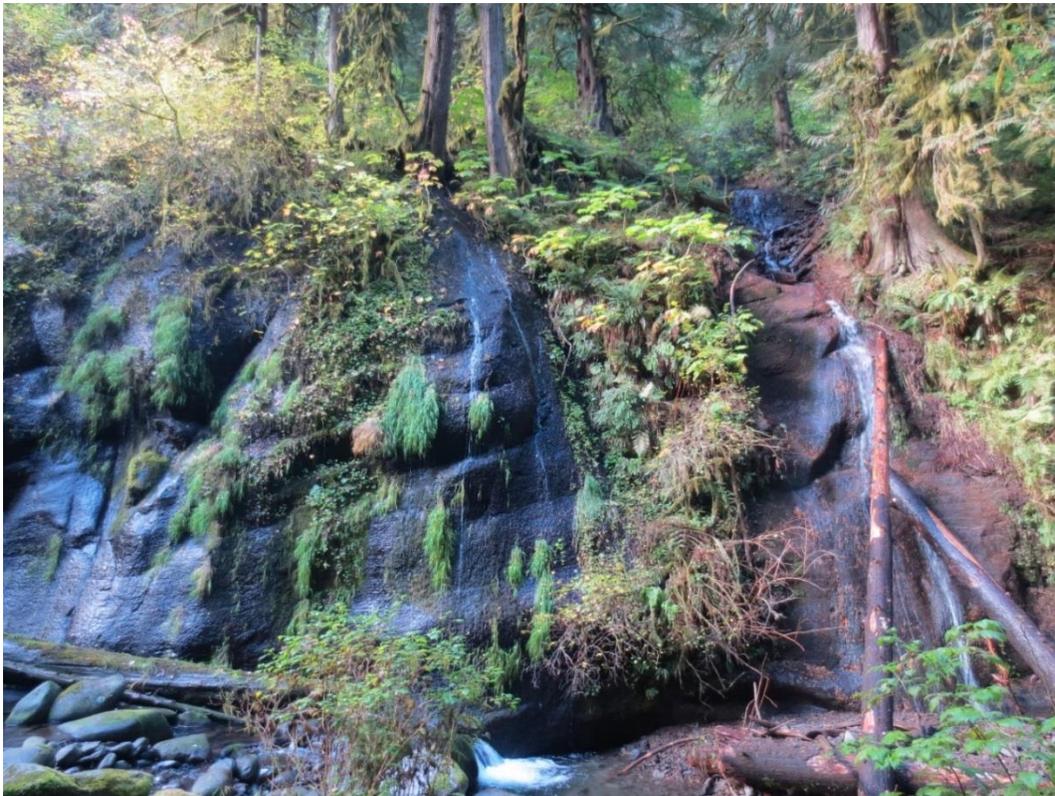


Figure 42: Multnomah Creek tributary weeping wall. Photo by Candace Fallon (Xerces Society).

Site 9: Multnomah Creek tributary @ 515 m elevation from east, July 21, 2015; 1st order tributary with small falls and talus slope above trail; intermittent channel below trail; limited human impact; suitable habitat for sensitive species.

Pristinicola hemphilli (OR-STR/WA-SEN) abundant

Setvena (possibly *S. wahkeena*) larvae present

Neothremma probably *didactyla* (common Cascades species) larvae and immature pupae; adults or mature pupae needed for species identification.



Figure 43: Tributary to Multnomah Creek. Photo by Candace Fallon (Xerces Society).

Site 10: Tributary to Multnomah Creek adjacent to Site 8; August 25, 2015. 1st to 2nd order perennial tributary and falls right next to weeping wall of Site 8.

Farula late instar larvae present – probably *F. constricta*.

Setvena larva present

Soliperla larvae present



Figure 44: Tributary to Multnomah Creek (uphill from Site 8). Photo by Candace Fallon (Xerces Society).

Site 11: Tributary 1st order middle Multnomah ~100 m downhill of bridge. West slope tributary at Trail 441 crossing. Summer cool stream in full shade.

August 25, 2015

Setvena larvae present

Neothremma late instar larvae present

October 3, 2015

No sensitive species encountered



Figure 45: Tributary to middle Multnomah Creek. Photo by Candace Fallon (Xerces Society).

Site 12: 1st order tributary to middle Multnomah Creek ~150 m downhill bridge. 50 m from Site 11.

August 25, 2015

Setvena larva present

Neothremma old pupal cases present

October 3, 2015

No sensitive species encountered



Figure 46: Tributary to middle Multnomah Creek. Photo by Candace Fallon (Xerces Society).

Site 13: 1st order tributary to middle Multnomah from west.

August 25, 2015

Pristinicola hemphilli (OR-STR/WA-SEN) present

A single male *Neothremma* near *andersoni* present – potentially new species.

October 3, 2015

No sensitive species encountered



Figure 47: Tributary to middle Multnomah Creek from west. Photo by Candace Fallon (Xerces Society).

Site 14: 1st order tributary to middle Multnomah Creek ~150 m downhill bridge. 50 m from Site 11, August 25, 2015.

Pristinicola hemphilli (OR-STR/WA-SEN) present

Neothremma near *andersoni* mid-instar larvae and two male pupae.



Figure 48: Tributary to middle Multnomah Creek. Photo by Candace Fallon (Xerces Society).

Site 15: Seep and weeping wall, August 25, 2015, along trail. West slope tributary. Trail construction likely created the weeping wall. Mid-instar *Farula* occasional on cliff face in madicolous habitat.

Farula larvae present – probably *constricta*.



Figure 49: Trailside seep. Photo by Candace Fallon (Xerces Society).

Site 16: Middle Multnomah Creek, above falls, 260 meters; October 3, 2015. Large midstem creek, not suitable for sensitive species.

No sensitive species encountered



Figure 50: Middle Multnomah Creek. Photo by Candace Fallon (Xerces Society).

ONEONTA CREEK

Site 1: Oneonta Creek lower, April 21, 2015, from Old Highway upstream about 100 meters. The stream is too large to support most of the small stream and seep sensitive caddis, and too warm to support *Neothremma andersoni* (OR-SEN).

No sensitive species encountered



Figure 51: Lower Oneonta Creek. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 2: Oneonta Creek tributary seep, June 10, 2015; adjacent to trail and receives erosion from trail.

Farula constricta (OR-SEN) 1 dead pupa and old pupal cases



Figure 52: Trailside seep near Oneonta Creek. Photo by Candace Fallon (Xerces Society).

Site 3: Oneonta Creek @ trail crossing above Middle Falls, June 10, 2015; large stream with moderate gradient is unlikely habitat for sensitive species. Limited human impact from trampling.

No sensitive species encountered

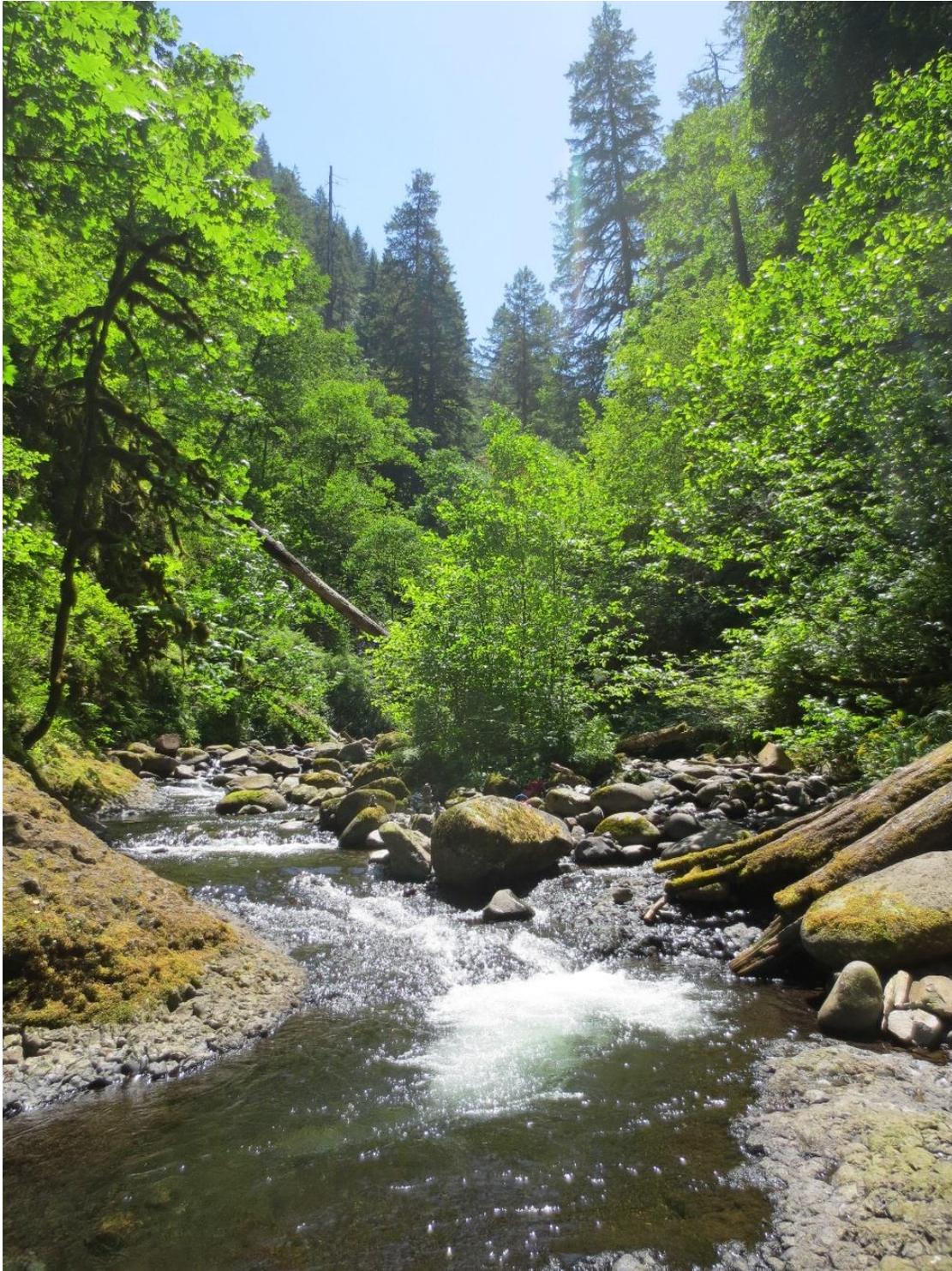


Figure 53: Oneonta Creek. Photo by Candace Fallon (Xerces Society).

Site 4: Oneonta Creek main-stem at 261 m elevation, June 10, 2015; limited human impact from trampling. Larger warmer stream that is not suitable habitat for sensitive species.

No sensitive species encountered.



Figure 54: Oneonta Creek. Photo by Candace Fallon (Xerces Society).

Site 5: Oneonta Creek weeping wall beside small waterfall 182 m elevation, June 10, 2015; no trail near site; limited human impact.

Farula constricta (OR-SEN) adults, pupae and larvae

Neothremma species prepupae and immature pupae. Need adults or mature pupae to identify species. Possibly *Neothremma prolata*.

Ochrotrichia near *buccata/hadria* pupa and larvae



Figure 55: Oneonta Creek weeping wall. Photo by Candace Fallon (Xerces Society).

RUCKEL CREEK

Sites 1 & 2: Ruckel Creek above and below gorge bike trail, May 15, 2015; the fauna present at this mid-size stream site indicates it may get too warm in the summer to support sensitive species, plus the gradient is too low. More suitable habitat may occur further upstream away from all human disturbance.

No sensitive species encountered.



Figure 56: Ruckel Creek. Photo by Candace Fallon (Xerces Society).

TANNER CREEK

Sites 1 & 2: Tanner Creek d/s and u/s of diversion dam, July 15, 2015, human impact is high at these sites; fauna present indicates the stream warms up in the summer; mid-large size stream with moderate gradient; unlikely habitat for sensitive species.

No sensitive species encountered



Figure 57: Tanner Creek diversion dam. Photo by Candace Fallon (Xerces Society).

Site 3: Tanner Creek tributary (Munra Falls), 1st tributary on Wahclellah Trail; foot bridge crossing at mouth; fauna present indicates this stream warms up in the summer; exposed to a lot of solar radiation; very warm on July 15; waterfall habitat has potential the potential for supporting sensitive species, but may get too warm in the summer.

No sensitive species encountered

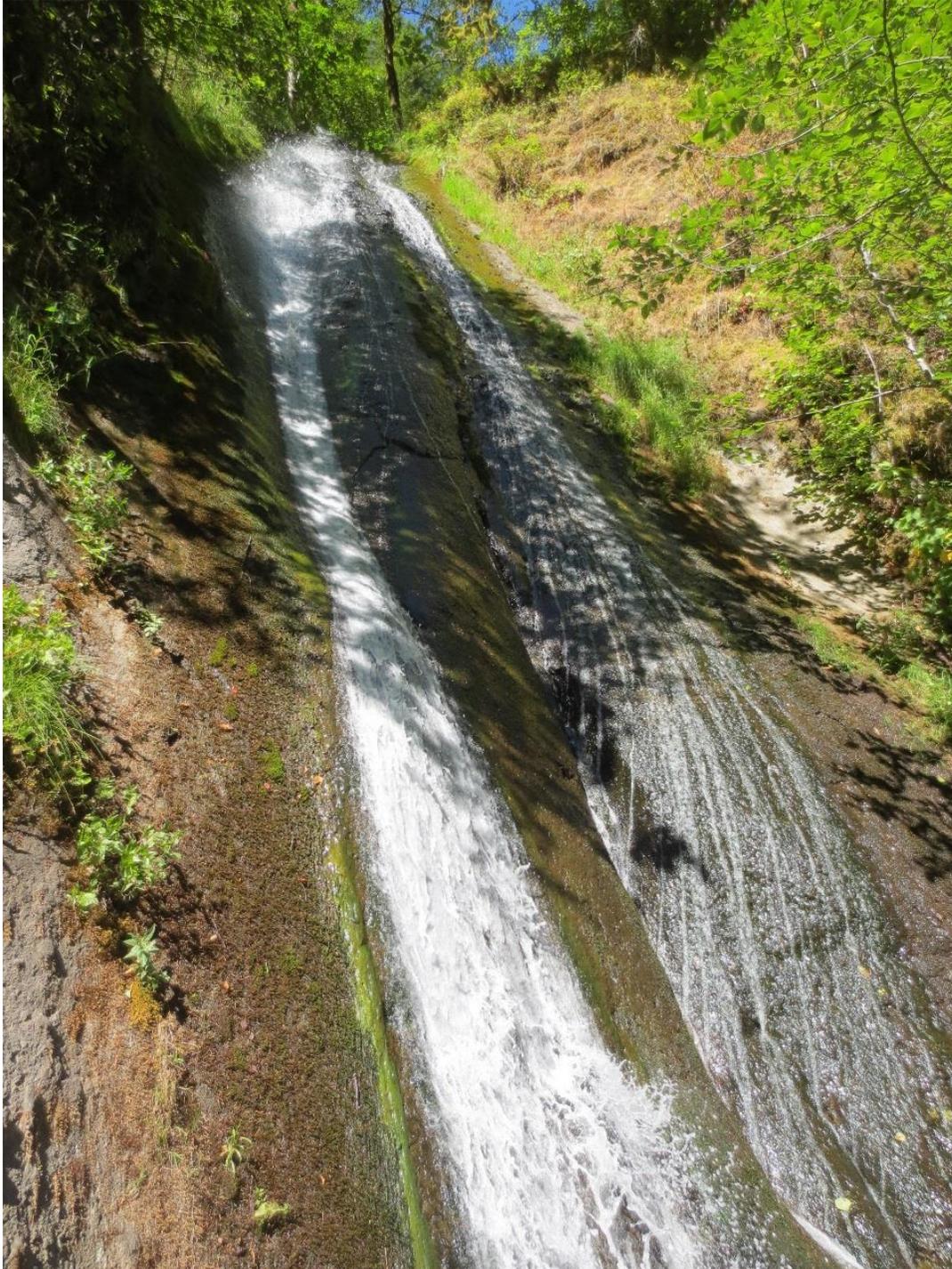


Figure 58: Munra Falls. Photo by Candace Fallon (Xerces Society).

UNNAMED CREEK

Unnamed tributary between Oneonta and Multnomah Creek above Old Gorge Highway, April 21, 2015. This is one of the original collecting sites for *Farula constricta* (OR-SEN). Little evidence of human disturbance.

Farula constricta (OR-SEN), adults, prepupae, and old pupae cases occasional above highway.

Unnamed tributary between Oneonta and Multnomah Creek above Old Gorge Highway, June 24, 2015; hiked upstream to base of a falls at about 61 m elevation. Small, perennial falls and talus slope below falls is ideal habitat for *Farula constricta* (OR-SEN). This is the center of the population. No evidence of recent human visitation.

Farula constricta (OR-SEN) larvae, old pupal cases and egg masses common

Lepania cascada (STR) adults

Unnamed tributary between Oneonta and Multnomah Creek, July 21, 2015; just above highway there is no surface water flowing, probably all subterranean now from above highway to near the falls.

No collections.



Figure 59: Unnamed tributary and falls between Oneonta and Multnomah Creeks. Photo on left by Robert Wisseman (Aquatic Biology Associates); one on right by Candace Fallon (Xerces Society).

WAHKEENA CREEK

Site 1: Wahkeena Creek lower, from railroad bridge to Old Highway Bridge

April 20, 2015

Neothremma andersoni (OR-SEN), larvae, prepupae and immature pupae occasional in lower creek between railroad bridge and Old Highway bridge.

April 21, 2015

Neothremma andersoni (OR-SEN) larvae, prepupae, pupae occasional down to near railroad bridge; more common near Old Highway where human access to stream is more difficult

Soliperla (stonefly) present

Pristinicola hemphilli (OR-STR/WA-SEN) present

May 20, 2015

Neothremma andersoni (OR-SEN) larvae occasional from Old Highway downstream to railroad bridge.



Figure 60: Wahkeena Creek downstream from Historic Highway. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 2: Wahkeena Creek springhead and associated seeps and tributaries.

April 21, 2015: There is human traffic around the spring, but vegetation precludes most people from trampling sensitive areas.

Neothremma andersoni (OR-SEN), larvae common

Palaeagapetus nearcticus larvae present

May 21, 2015: Springhead and seep entering from west; well protected by thorny vegetation from human traffic.

Nanonemoura wahkeena (OR-SEN), 2 males, 1 female. Underside of salmonberry leaves. This side seep may be the center of the population in the spring-head area. May 21 was probably at the end of the adult emergence season.

Hydrobiidae snail unknown present

Neothremma andersoni (OR-SEN), 6 larvae, 1 pupa

Setvena probably *wahkeena* larvae present

Lepania cascada (STR) larvae

Farula larvae present that are not *F. constricta*

Rhyacophila probably *unipunctata* (OR-STR), 1 female

Eobrachycentrus gelidae, 1 old pupal case

June 5, 2015: Springhead

No *Nanonemoura wahkeena* seen

Rhyacophila fenderi

Lepania cascada (STR) larvae



Figure 61: Wahkeena Creek springhead. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 3: EF Wahkeena Creek trailside seep, April 21, 2015; the trail goes right through this seep

Neothremma andersoni (OR-SEN) larvae common

Lepania cascada (STR) adults

Site 4: Wahkeena Creek middle, April 21, 2015, top of falls to first trail bridge; human impact to stream is minimal

Farula constricta (OR-SEN), adult female, 95% sure, need males or DNA for 100%

Site 5: Wahkeena Creek tributary entering about 100 m below spring-head from west, May 21, 2015; potential habitat for sensitive species

Neothremma andersoni (OR-SEN), 1 larvae

Pristinicola hemphilli (OR-STR/WA-SEN) present

Acneus (beetle larvae) present

Possibly *Lyrogyrus* (hydrobiid snail) present



Figure 62: Wahkeena Creek tributary near springhead. Photo by Robert Wisseman (Aquatic Biology Associates).

Site 6: Wahkeena Creek middle, seep along trail, just before first footbridge on west side, May 21, 2015, potential *Nanonemoura* habitat

No sensitive species encountered, may dry up later in the summer

Site 7: EF Wahkeena Creek @ Fairy Falls, adult sweep June 5, 2015, trail goes through stream near base of falls; after multiple collections at this site since 1989, no sensitive species have been encountered.

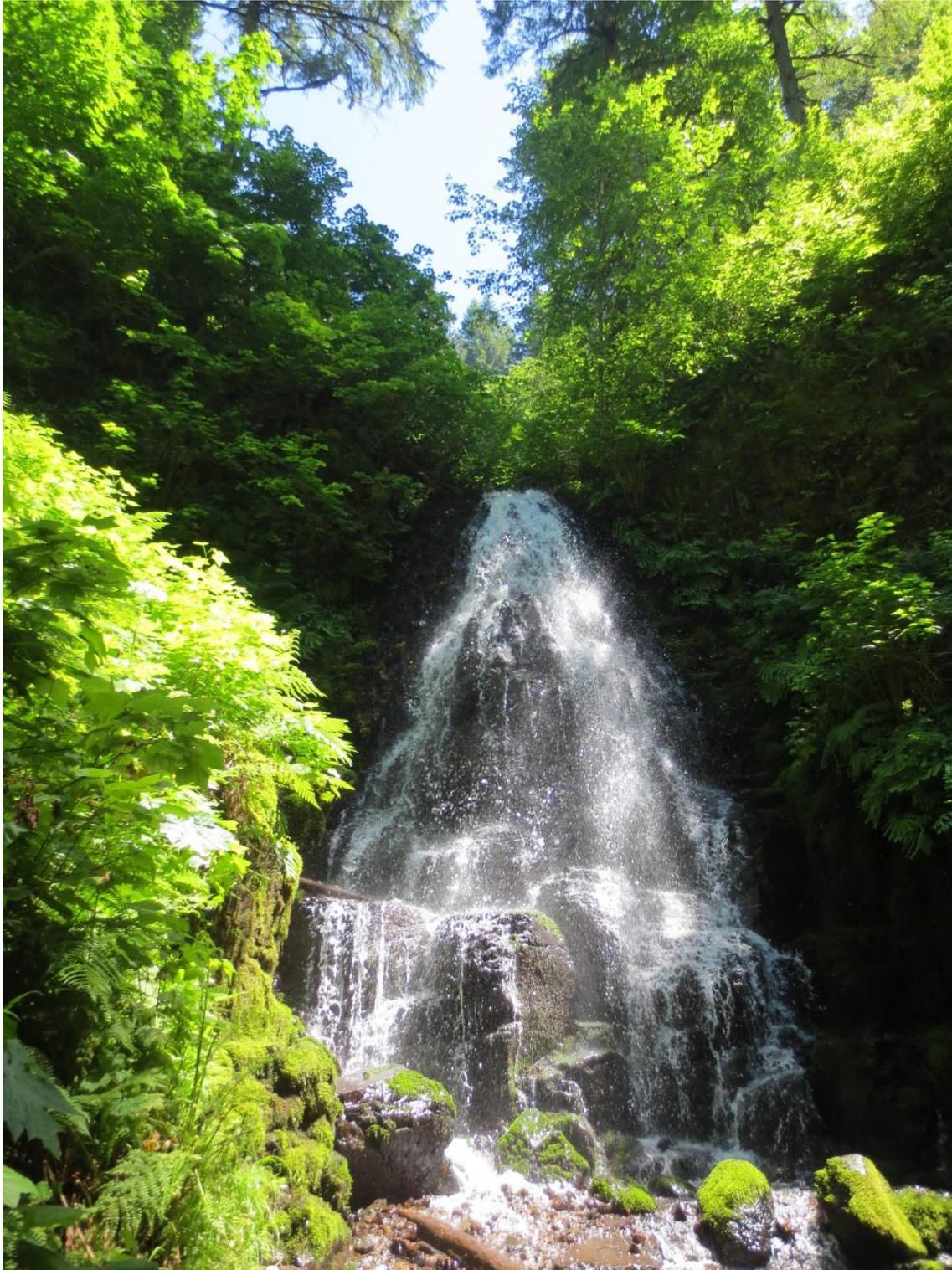


Figure 63: East Fork Wahkeena Creek at Fairy Falls. Photo by Candace Fallon (Xerces Society).

WARREN CREEK

Site 1: Warren Creek @ Starvation Ridge Trail crossing; human impact minimal at trail crossing, some erosion. This is a medium size stream with cool water habitat that may support sensitive species.

May 1, 2015

No sensitive species encountered

June 24, 2015

Soliperla present



Figure 64: Warren Creek at Starvation Ridge Trail. Photo by Emilie Blevins (Xerces Society).

Site 2: Warren Creek @ Hole in the Wall Falls, June 24, 2015. No suitable habitat seen for sensitive species. Adult sweep only.

WONDER CREEK

Wonder Creek @ Lancaster Falls; trail crosses the creek just below the falls in sensitive habitat; however, the power line corridor is by far the biggest impact to habitat.

May 1, 2015

Neothremma prolata larvae, prepupae, and pupae common

Pristinicola hemphilli (OR-STR/WA-SEN) present

June 24, 2015

Neothremma prolata pupae and larvae common

Pristinicola hemphilli (OR-STR/WA-SEN) present



Figure 65: Wonder Creek at Lancaster Falls. Photo by Candace Fallon (Xerces Society).

YOUNG CREEK

Site 1: Young Creek @ impoundment by Bridal Veil Lake, June 5, 2015; road crossing, culvert and impoundment, so human impact is high. The fauna present indicate that this stream is warm in the summer, and the stream gradient is low. Not suitable habitat for sensitive species.

No sensitive species encountered



Figure 66: Young Creek. Photo by Candace Fallon (Xerces Society).

Site 2: Young Creek @ Shepperd's Dell, June 5, 2015; there is a trail to the falls that is gated at the end. The high gradient, small stream habitat may support sensitive species, though the fauna present indicates the stream warms considerably in the summer, which may preclude them.

Neothremma didactyla (common Cascades species) present



Figure 67: Young Creek at Shepperd's Dell. Photo by Candace Fallon (Xerces Society).

Site 3: Young Creek @ NE Brower Road crossing, June 25, 2015; headwaters on private land have been logged repeatedly. Mid-size stream with moderate gradient. Fauna present indicates this stream is cool-cold over the summer and may be spring-fed. May be potential habitat for sensitive species higher up.

Palaeagapetus nearcticus larvae present



Figure 68: Young Creek at Brower Rd. crossing. Photo by Candace Fallon (Xerces Society).

Site 4: Young Creek headwaters above private logging road crossing, 576 m elevation, June 25, 2015; small perennial stream with potential for supporting sensitive species; logged repeatedly. Fauna present indicates it remains cool in the summer.

Pristinicola hemphilli (OR-STR/WA-SEN) common



Figure 69: Young Creek headwaters. Photo by Candace Fallon (Xerces Society).

Sites 5 & 6: Young Creek tributaries @ Old Gorge Highway crossing, 44401 address, 60 m elevation, July 22, 2015; private land with development above; two high gradient 1st order perennial streams with talus and short falls; second growth forest; sedimentation a problem; National Forest land higher up in drainage; fauna present indicates the streams remain cool over the summer.

Pristinicola hemphilli (OR-STR/WA-SEN) present

Setvena present

Soliperla present



Figure 70: Young Creek tributaries. Photos by Candace Fallon (Xerces Society).