THE AQUATIC INSECT COMMUNITIES OF HOLBROOK CREEK AND COCHETOPA CREEK IN COLORADO

Mark Allen Wallace, B.S.

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APPROVED:

James H. Kennedy, Major Professor
Kenneth Dickson, Committee Member
William T. Waller, Committee Member
Earl G. Zimmerman, Chair of the Department of Biological Sciences
Sandra L. Terrell, Interim Dean of the Robert B. Toulouse School of Graduate Studies

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The first objective for this problem in lieu of thesis project was to gather, identify to the lowest practical taxonomic level and organize all available aquatic insects collected from high altitude Colorado aquatic systems during the summers of 1994, 1996, 1998, and 2002 for the University of North Texas Environmental Science Field Course (BIOL 5650). The curated collection will be housed in the Elm Fork Natural History Museum, located at the University of North Texas. The second objective was to provide a summary and discussion of the occurrence and distribution of the aquatic insects collected from Mt. Blanca in 1994, 1996, and 1998 and to create a taxa list of aquatic insects collected from Cochetopa Creek during the summer of 2002.

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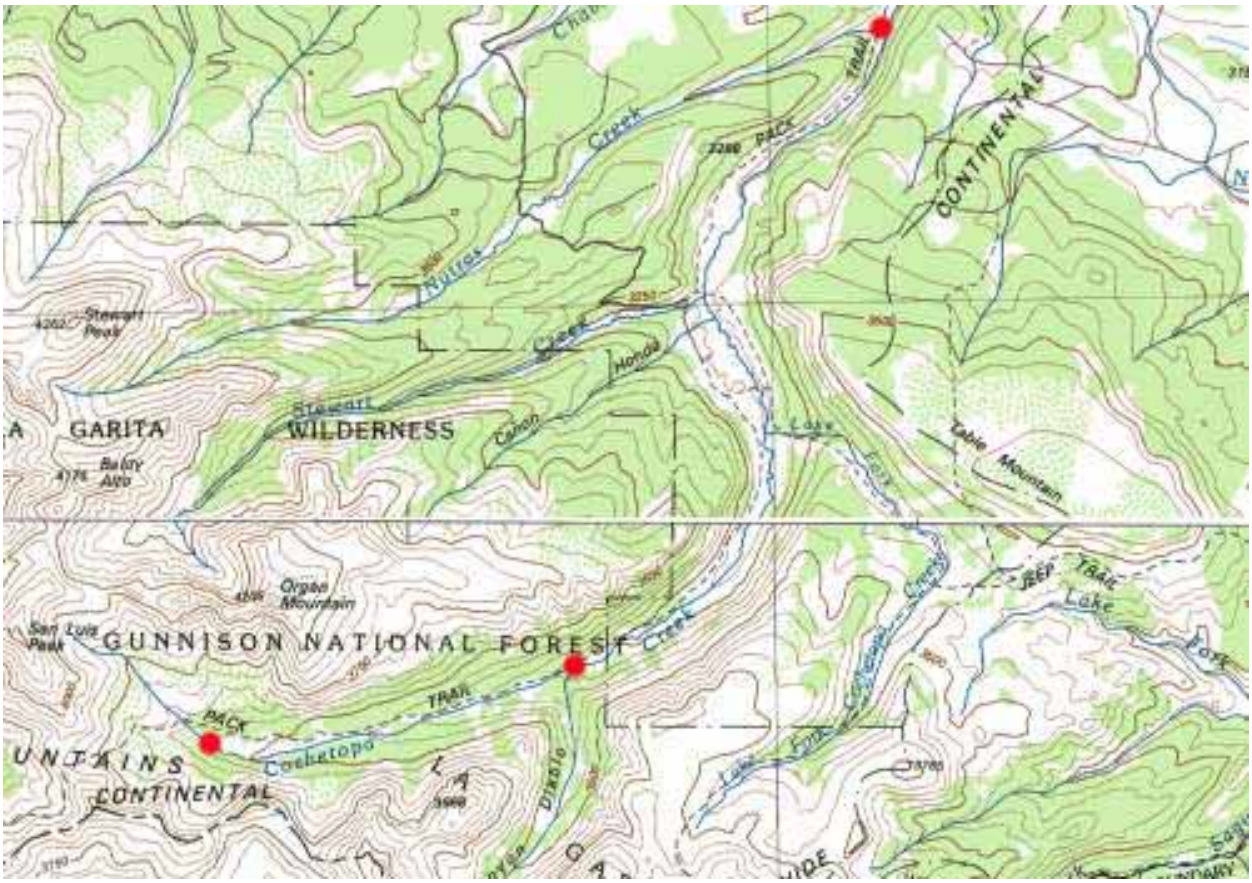
INTRODUCTION

The Department of Biological Sciences' environmental science program of the University of North Texas teaches an Environmental Science Field Course (BIOL 5650), Alpine Ecology. This course is held every two years in the summer. An activity associated with this course is a field experience held in the Rocky Mountains in Colorado. During the summers of 1994, 1996, 1998, and 2000 the course was held on Mt. Blanca (Appendix A). The field trips departed from Denton Texas the first Saturday after the 4th of July. The classes arrives in Cuchara, Colorado on Saturday evening and typically engages in activities that help the course participants acclimate to higher elevations on Sunday. Ascent of Mt. Blanca occurs on Monday. Various field activities designed to target the objectives of the course are scheduled through out the week until Saturday when the class descends the mountain. One of the field activities usually involves the study and collection of macroinvertebrates. An exception occurred in 2000, when there were no aquatic insects collected.

In 2002, the Alpine Ecology course went to the Cochetopa Valley in Gunnison National Forest. The Gunnison Forest is located on the western slope of the Colorado River and west of the Continental Divide (Figure 1).

There were two objectives for this problem in lieu of thesis project. The first was to gather, identify to the lowest practical taxonomic level and organize all available aquatic insects collected during the Alpine Ecology course. The second objective was to write this paper to provide a summary and discussion of the occurrence and distribution of the aquatic insects from Mt. Blanca and create a taxa list of aquatic insects collected from Cochetopa Creek during the summer of 2002.

Figure 1. Map of Cochetopa Creek with Collection Sites.



Site Description: Holbrook Creek Drainage Basin

Approximately 35 km northeast of Alamosa, Colorado in the Sangre de Cristo mountain range sits Mt. Blanca (4,372m) (Appendix A). On the west slope of Mt. Blanca is the Holbrook Creek drainage basin, one of four systems that radially drain Mt. Blanca. The total area of the drainage basin is approximately 817 hectares (2,020 acres), or 8.18 km^2 (3.16 $miles^2$) (Maxey 1994). Within the drainage basin are four cirque lakes, Crater Lake, Blue Lake #1, Blue Lake #2, and Lake Como, that were created by the movement and freezing and thawing of a glacier. The four lakes are all linked by Holbrook Creek. The continuous flow of water that feeds Holbrook Creek comes from the melting and runoff of several permanent snow packs.

The majority of Holbrook Creek is rhithral. Rhithral is defined as the creek extending downstream from the headwaters to the location where summer temperatures are equal to but

less than 20C. Other rhithral characteristics include high oxygen concentrations, high current velocities, and coarse substrate (Ward, 2002). Rhithral biotypes are characterized by soft water, an extended period of snowmelt runoff, streams with maximum temperatures between 5 and 10C, a diverse collection of macroinvertebrates that include four insect orders (Plecoptera, Ephemeroptera, Trichoptera, Diptera), and headwaters which occur as outlet streams from cirque lakes (Ward, 1994).

The collection area (Figure 2) consists of the four cirque lakes and Holbrook Creek. The headwaters for Holbrook creek emerge from Crater Lake (3784m). From Crater Lake, Holbrook Creek flows 117m and drops 27m into Blue Lake #1 (3846m). The creek continues from Blue Lake #1 for approximately 235m to a waterfall (top of the waterfall is 3,780m). Holbrook Creek then plummets approximately 80m over a distance of 80m.

Figure 2. Map of Crater Lake, Blue Lake #1, Blue Lake #2, Lake Como, and Holbrook Creek with Collection Sites.

From the bottom of the falls (3,730m), Holbrook Creek travels another 118m to Blue Lake #2 (3,700m). The total difference in elevation between Blue Lake #1 and Blue Lake #2 is 146m. From Blue Lake #2 the creek continues until it reaches Lake Como (3601m). The distance from Blue Lake #2 to Lake Como is 1.2km, and the elevation drops 122m to a height of 3,578m. Holbrook Creek then continues 4.3 km until it reaches an alluvial fan (2,804m), at which point it goes underground. The total travel distance of Holbrook Creek from Crater Lake to the alluvial

fan is approximately 6 km. See Appendix A for a complete map of the Holbrook Creek drainage basin with tree line and watershed.

The maximum depths of the lakes are 15m for Crater Lake, 3.5m for Blue Lake #1, 3m for Lake Como, and 1.5m for Blue Lake #2. All the lakes are clear to the bottom except Crater Lake. Crater Lake has a Secchi depth of 4.5 m. The substrate of the lakes and creek is rock rubble interspersed with small stones and areas of fine sediment. Over the three collection years, the maximum surface temperature recorded for each lake was 5.5C for Crater Lake, 10C for Blue Lake #1, 13C for Blue Lake #2, and 14C for Lake Como. Alpine Ecology student papers indicate that the pH of the Lakes stayed between 6.2 and 7.3 (Table 1). Lake Como pH values are reported to range between 6.69-7.3. Blue Lake #1 was more acidic with values between 6.26 and 6.44.

Table 1. Surface pH of Each Lake by Year.

Lake/Year	1994	1996	1998
Lake Como	7.02	7.30	6.69
Blue Lake #2	6.79	6.29	6.62
Blue Lake #1	6.26	6.36	6.44
Crater Lake	6.63	6.93	6.55

Flora and Fauna

The headwaters of Holbrook Creek is 157m above the tree line (3,627m). The higher elevations are dominated by a meadow community. The vegetation in the meadow is made up of mostly grasses, such as bromegrass, wildrye, and wheatgrass. For a full grass species list, see Appendix 2. Once the timberline is reached, the area becomes dominated by Douglas fir (*Pseudotsuga menziesii*) and Englemann spruce (*Picea englemannii*). A little farther down, the diversity of trees and grasses increases. Blue spruce is seen close to water and Bristlecone pine are found along the south facing slopes. For a complete list of trees, and there altitudinal range see Appendix 3. Millet Woodrush (*Luzula parviflora*) is the primary grass species found beneath the trees. The primary forbs for the area are Mountain bluebell (*Mertensia ciliate*), heartleaf

arnica (*Arnica cordifolia*) and skunkleaf Plemonium (*Polemonium pulcherrimum*). See Appendix D for a list of forbs present. (Windhager, 1996).

Throughout the Alpine Ecology students' papers, there is only rare mention of the types of fish found in Holbrook Creek or the four lakes. In 1996, a cutthroat trout (*Oncorhynchus clarki* Richardson 1836)(formerly *Salmo clarki*) and a brook trout (*Salvelinus fontinalis* Mitchill 1814) were caught in Blue Lake #2 and in Lake Como respectively. In addition, there is a mention of cutthroat trout also inhabiting Crater Lake and an unidentified fish turning up periodically in Blue Lake #1. Since Crater Lake and Blue Lake #1 are connected and not separated by the waterfall, it can be assumed that the fish is also a cutthroat trout.

MATERIALS AND METHODS

Collection Sites: Mt. Blanca

Each year of the Mt. Blanca trips, the collection sites were recorded. To make the process of site location more easily transferable from year to year, each collection site was assigned a number from one to eleven based upon the 1996 collection data (Figure 2). Site 1 is where the Jeep tail first crosses Holbrook Creek (elevation 3255m). Site 2 (3,572m) is approximately 100 meters downstream of Lake Como. Site 3 is Lake Como (3,581m). Site 3.5 (3,581m) is where Holbrook Creek enters Lake Como on the southeast side. Site 4 (3596m) is 150m upstream of Lake Como. Approximately 600m upstream of Lake Como, site 5 (3,658m) is an alpine wetland between Lake Como and Blue Lake #2. Site 6 (3,679m) is where the jeep trail crosses Holbrook Creek between Lake Como and Blue Lake #2. Site 7 (3,700m) is Blue Lake #2. Collection site 7.5 (3,712m) is between Blue Lake #2 and the waterfall. Site 8 is the whole waterfall from top (3,780m) to bottom (3,730). Site 9 (3,825m) is a collection of rock pools between the waterfall and Blue Lake #1. Site 10 (3,846m) is Blue Lake #1, and site 11 (3,874m) is Crater Lake.

Occasional discrepancies were noted when elevations reported for some sites in student reports were compared to USGS topographical maps. When there was a discrepancy between the elevations of the recorded sites and the elevation on the topographical map, the topographical map elevation was used. Based upon the closeness of contour lines, I determined that the top of the waterfall has an elevation of 3780m and the bottom an elevation of 3,730m.

In 1996, each sample collected was given a catalog number. The catalog numbers ranged from 1 to 56. In creating the species inventory, the 1996 system was retained with some modifications. The 1994 and 1998 samples were not assigned catalog numbers when collected. However, as each sample was inventoried, it was assigned a catalog number,

determined by the order of processing. To designate the year collected, the samples were labeled 94-X, 96-X, or 98-X, where X represents the catalog number.

Collection Sites: Cochetopa Creek

There were three collection sites along Cochetopa Creek. The first site was at an elevation of 3,574m. The second was at an elevation of 3,269m which is close to the confluence of Diablo Canyon. As a comparison, some samples were also collected from Diablo Canyon. The third location was at an elevation of 3,048m, next to the Eddiesville trailhead.

Collection Methods: Mt. Blanca

The methods of collection for the four years included aerial net, dip net, drift net, emergence trap, hand picking, kick net, Malaise trap, and sweep net. There are no two years in which the aquatic insects were collected in the exactly the same way. There were two methods of collection that stayed constant throughout the four trips: hand picking and kick netting (Table 1). The majority of insects collected were by either hand picking or kick netting. Each year, insects were collected on the four lakes and at several locations along Holbrook Creek (Figure 2).

Table 2. Methods of Insect Collection.

Collection technique/Year	1994	1996	1998	2002
Aerial Net		X	X	
Dip Net			X	
Drift Net	X			
Emergence Trap	X	X	X	
Hank Pick	X	X	X	X
Kick Net	X	X	X	X
Malaise Trap		X		
Sweep Net	X	X		

The 1994 trip to Mt. Blanca occurred from July 11 to July 16. During this trip, aquatic insects were collected by kick net, sweep net, and hand picking on July 13 and 14 (Table 1). On Blue Lake #2, an emergence trap was set out and left overnight. On July 14, drift nets were set

out about 68m apart. The lowest net was set out about 14m upstream of Lake Como. The nets were set out twice, once during the day and once at night to check for insect drift along Holbrook Creek. The daytime net was set out from 1500 to 1530 hours. The nighttime drift net was set out approximately 30 minutes after dark for 45 minutes.

The 1996 trip to Mt. Blanca took place from approximately July 9 to July 11. During this trip, the aquatic insects were collected by kick net, sweep net, aerial net, hand picking, emergence traps, and Malaise traps (Table 1). The Malaise traps were set out in three locations along Holbrook Creek. One trap was set out approximately 250 meters upstream of Lake Como, just below the tree line. Another was set up 100 meters upstream of Lake Como (site 4). The final trap was set up 100 meters downstream of Lake Como (site 2). The emergence traps were placed 100 meters downstream of Lake Como and at the first point that Holbrook Creek crosses the Jeep trail (site 1). During the trip, all insects collected were preserved in Kahles. When the samples were brought back to the lab, the Khales was changed out with 70% ethanol.

The 1998 trip to Mt. Blanca took place from July 11 to July 19. The aquatic insects were collected by one minute kick net, dip net, hand picking and aerial net (Table 1).

Collection Methods: Cochetopa

The 2002 to Cochetopa took place from July 6 to July 14. The aquatic insects were collected by using a D-framed net or by hand picking from rock substrate. Each riffle area was sampled in three equidistant sites. The samples were collected from the downstream to the upstream position within the riffle. Each sample was placed into a pan and sectioned into four equal quadrants. One quadrant was then chosen and placed into a second pan and the organisms removed. Once the organisms were removed, the original sample was looked at for any large or unsampled organisms not previously accounted for. The specimens were preserved in 70% ethanol.

Altitudinal Distribution

For the three collection years, the location and year collected of each aquatic nymph was recorded. Each individual collection, as well as all three collection years as a whole, was looked at for distributional patterns.

Taxonomic Identification

The Plecoptera and most of the Trichoptera were identified to the species level, the Ephemeroptera were identified to the genus level, and the Diptera where identified to the family level. The majority of the aquatic insect identifications were done from the immature aquatic stages which prevented the identification to the species level. The specimens were confirmed by the taxonomic specialists listed in the Acknowledgments. The following is a list of the literature that was used for identifications: Baumann et al. 1977, Edmunds and Allen 1964, Merritt and Cummins 1996, Schmid 1998, Stewart and Stark 1988, Szczytko and Stewart 1979, Wiggins 1996, Zloty and Pritchard 1997.

RESULTS

The three collection trips to Mt. Blanca produced 33 taxa (Table 2). Of the 33 taxa, 16 are exclusively lotic, 5 are exclusively lentic, and 11 are found in both types of habitats. For the complete list for every insect collected with their collection sites and dates collected, see Appendix 5. For the Cochetopa trip, there were 25 taxa collected and identified. For the complete list of Cochetopa insects, see Table 3.

Table 3. Mt. Blanca Insect Taxa List.

Ephemeroptera
- Ephemerellidae
  - *Ephemerella*
- Heptageniidae
  - *Cinygmula*
  - *Epeorus (Iron)*
- Ameletidae
  - *Ameletus*
- Baetidae
  - *Acerpenna*
  - *Baetis*
  - *Cloeodes*

Plecoptera
- Capniidae
  - *Mesocapnia**
- Nemouridae
  - *Zapada oregonesis* group
  - *Zapada haysi* (Ricker)
- Perlidae
  - *Hesperoperla pacifica* (Banks)
- Chloroperlidae
  - *Alloperla pilosa* Needham & Claassen
  - *Sweltsa lamba* (Needham & Claassen)
- Perlodidae
  - *Kogotus modestus* (Banks)
  - *Megarcys signata* (Hagen)
  - *Isoperla sobria* (Hagen)

Hemiptera
- Corixidae
  - *Corisella*
- Notonectidae
  - *Notonecta*

Coleoptera
- Dytiscidae
  - *Agabus*
- Carabidae

Diptera

- Tipulidae
- Culicidae
  - *Ochlerotatus canadensis* (Theobald)
- Simulidae
  - *Prosimulium*
- Chironomidae
- Ephydridae
- Syrphidae

Trichoptera
- Rhyacophilidae
  - *Rhyacophila brunnea* Banks
  - *Rhyacophila hyalinata* Banks
- Limnephilidae
  - *Asynarchus*
  - *Dicosmoecus atripes* (Hagen)
  - *Hesperophylax occidentalis* (Banks)

* Female nymph assigned to *Mesocapnia*. Females can not be differentiated with certainty.

Table 4. Cochetopa Insect Taxa List.

Ephemeroptera
- Leptophlebiidae
- Potamanthidae
- Ephemerellidae
  - *Drunella*
  - *Ephemerella dobbsi*
  - *Serratella*
- Heptageniidae
  - *Cinygmula*
  - *Epeorus*
  - *Rhithrogena*
- Ameletus
  - *Ameletus*
- Baetidae
  - *Baetis*
  - *Baetis bicaudatus* Dobbs

Plecoptera
- Chloroperlidae
  - *Sweltsa*
- Perlodidae
  - *Kogotus modestus* (Banks)
  - *Megarcys signata* (Hagen)
  - *Pictetiella expansa* (Banks)
  - *Zapada oregonensis* (Claassen)

Coleoptera
- Elmidae

Diptera
- Simulidae
  - *Twinnia*
- Chironomidae

Trichoptera

Hydropsychidae
    Arctopsyche
Rhyacophilidae
    Rhyacophilidae
Limnephilidae
    Dicosmoecus
    Psychoglypha
Glossosomatidae
    Glossosoma
Brachycentridae
    Brachycentrus

DISCUSSION

There were several samples that had location labels with only partial information. For some samples, it was an easy matter to discern the location, but for others a location had to be assigned by a best guess. Catalog 94-3 had a location label of Holbrook Creek above tree line. This sample was simply designated as Holbrook Creek, a lotic system. Catalog 96-56 and 94-8 had only the county and state as the location of collection. Catalog 96-56 was an *Asynarchus* nymph. Since *Asynarchus* can be found in both lentic and lotic habitats, the real location can not be determined. Catalog 94-8 was an adult *Asynarchus*, so that site also can not be determined. Catalog 96-12, 96-15, 96-17, and 96-45 were collected from a rock pool. The only other description of rock pools comes from location 9, so these samples are assumed to be from location 9 as well.

Individual specimens that were collected at multiple collection sites representing both lotic and lentic environments were noted on the species inventory. No nymphs were collected from sites 1, 4, 6, and 10.

It should be noted that some collection years have better documentation than others. For example, of the Mt. Blanca trips, the 1996 trip by far was the most encompassing and the best documented trip for aquatic insects.

Ephemeroptera information

The Heptageniidae family is the most commonly collected Ephemeroptera. There were two Heptageniidae genera, *Cinygmula* and *Epeorus (Iron)* identified from the samples. *Cinygmula* occurred throughout the Holbrook Creek (sites 2, 3.5, 7, 8, and 9). *Epeorus (Iron)* was the most collected Ephemeroptera. *Epeorus* was also found throughout Holbrook Creek (sites 2, 3.5, 7, 8, and 9). Like most Heptageniidae, *Cinygmula* and *Epeorus* dwell in lotic habitats where they are collectors-gatherers (Merrit and Cummins, 1996).

Ephemerella was the only Ephemerellidae collected on Mt. Blanca. They were collected from two lakes, Como Lake and Blue Lake #2 (sites 3.5 and 7). The genus *Ephemerella* inhabits lotic habitats and depending on the species are either collectors-gatherers or scrapers.

Ameletidae nymphs were recorded from Blue Lake #2 and the waterfall (sites 7 and 8). The family Ameletidae has only one genus, *Ameletus. Ameletus* nymphs could not be identified to species because they were missing caudal filaments, a key characteristic (Zloty and Prichard, 1997). Because of the fragile nature of the structures, loss of the caudal filaments probably occurred during the process of collecting them. They are scrapers or collectors-gatherers (Merritt and Cummins, 1996).

There are three representatives of the Baetidae family: *Acerpenna*, *Baetis*, and *Cloeodes*. Of the Baetidae, *Acerpenna* was collected most often. *Acerpenna* were found in lotic habitats and are classified as collector-gatherers. This genus was found upstream of Lake Como at sites 3.5, 7, 7.5, 8, and 9. *Baetis* only occurred in two samples. These samples were collected from two locations along Holbrook Creek (sites 2 and 8). The genus is reported to be found in both lentic and lotic habitats and are collector-gatherers (Merritt and Cummins, 1996). In this study, *Baetis* was only collected from lotic habitats. There was only a single *Cloeodes* collected. It was collected from a lentic site, Blue Lake #2 (site 7). According to Merritt and Cummins (1996), *Cloeodes* inhabit both lotic and lentic communities and are collector-gatherers.

Plecoptera information

The Capniidae nymphs were collected from Lake Como where Holbrook Creek drains into it (site 3.5). The Capniidae nymphs could not be identified to a genus level. The three specimen collected were female, and it is not possible to distinguish females of *Mesocapnia* from *Utacapnia* and *Capnia*. The female Capniiade collected from Mt. Blanca are most similar to *Mesocapnia*, but this can not be confirmed without an adult male specimen. The *Mesocapnia* lifecycle is uncertain but would suggest a univoltine cycle (Stewart and Stark, 1988). Generally, Capniiade are sprawlers and clingers that feed upon coarse particulate organic matter (shredders-detritivores) (Merritt and Cummins, 1996).

Zapada haysi (Ricker) is the only Nemouridae representative in the collection. Like the Capniidae, there were very few individuals collected. Also, like the Capniidae, Z. haysi were collected from where Holbrook Creek runs into Lake Como (Site 3.5). Out of all the samples, only four adults and one nymph were collected. According to Baumann et al. (1977) *Z. haysi* is an uncommon find. The nymphs are small 5-8mm and characteristic in that they have four unbranched cervical gills. *Zapada haysi* is reported as univoltine but could be semivoltine. Previous studies describing Z. haysi life cycles used a collection device with a large mesh size. Based on their field observations of nymphal distributions Stewart and Stark (1998) suggest that the large mesh may have failed to retain small nymphs resulting in a misinterpretation of the life cycle (Stewart and Stark, 1998). The nymphs collected were found in both lotic and lentic systems. *Z. haysi* nymphs are shredders-detritivores (Merritt and Cummins, 1996).

The only Perlidae nymph, *Hesperoperla pacifica*, was collected in Holbrook Creek downstream of Lake Como (site 2). *Hesperoperla pacifica* (Banks), is much larger than *Z. haysi* (18-30mm in length) (Stewart and Stark, 1988). According to Baumann et al. (1977), *H. Pacifica* is the most widely distributed stonefly species in the rocky Mountains. *Hesperoperla Pacifica* has a semivoltine cycle that is reported to last two to three years (Stewart and Stark,

1988). They are voracious predators that feed mainly upon Chironomidae when they are small and Ephemeroptera and Trichoptera larvae when they are larger. Stewart and Stark (1988) reported that *H. pacifica* are collected up to an elevation of 3500m. In Holbrook Creek, it was found 100m downstream from Lake Como at an elevation of 3547 meters. *Hesperoperla pacifica* can be found in both lotic and lentic habitats. They are clingers and predators that swallow their prey whole, or in parts (engulfers) (Merritt and Cummins, 1996).

A single male adult *Alloperla pilosa* Needham & Claassen was collected in July 1998 along Holbrook Creek 150 meters above Lake Como (site 4). Alloperla pilosa is only recorded on from Colorado (Stark, 1998), and only in high altitude streams (personal communication J.S. Sandberg, UNT Doctoral Student-June 2003). Because the *Alloperla* genus is poorly known, there is virtually no specific published information of nymphal development (Stewart and Stark, 1988). This species has been collected only in the Colorado Rockies (southern Rockies). It occurs in small creeks at high elevations where the adults emerge in June and July (Baumann et al., 1977). Alloperla in general are clingers found in lotic habitats, where they can be predators, scrapers, or collector-gatherers. There were no nymphs collected.

Sweltsa lamba (Needham & Claassen) was the most abundant of all Plecoptera for the three different years of collecting at Mt. Blanca. The nymphs were collected from Holbrook Creek as it enters Lake Como (site 3.5) and at the waterfall (site 8). Because a key characteristic, black hairs on the thoracic sternum, had become bleached out after storage in ethanol for several years, the nymphs of *Sweltsa* are assumed to be *lamba* since the only adults of the genus *Sweltsa* are *S. lamba*. *Sweltsa lamba* are predators (engulfers) of Chironomidae and Simulidae and are found in lotic habitats (Merritt and Cummins, 1996). *Sweltsa lamba* were collected at sites 3.5 and 8.

Kogotus modestus (Banks) nymphs were collected at two locations along Holbrook Creek, downstream of Lake Como (site 2) and from a sample that combined collections made at

Blue Lake #2, the waterfall, and rock pools below Blue Lake #2 (sites 7, 8, and 9). *Kogotus modestus* are univoltine in Colorado. The nymphs feed primarily on Chironomidae during the night and mayflies (*Baetis*) during the day(Allan, 1982).

The nymphs of *Megarcys signata* (Hagen) were found where Holbrook Creek enters Lake Como (site 3.5), at Holbrook Creek between the waterfalls and Blue Lake #2 (site 7.5) and near the waterfall (site 8). *Megarcys signata* prefer swift, aerated stony streams at high elevation (Stewart and Stark, 1988). *Megarcys signata* has been reported as having a univoltine cycle but has recently been seen to exhibit a semivoltine cycle, at least at high elevations. The semivoltine cycle is characterized with an extended egg stage that lasts for nearly a year, from the time of oviposition (in June-August) until the following summer, when the temperature of the stream begins to warm (Taylor et al., 1999). In a stream equivalent to Holbrook Creek, the adults emerge during the months of July to August (Taylor et al., 1998). The nymphs are omnivorous and feed mainly upon diatoms, Chironomidae, and mayflies (Allan, 1982). It should be noted that *Megarcys* and *Kogotus* are often found together above 3,300m (VanWieren et al., 2001)

Several *Isoperla sobria* (Ricker) adults were collected between the waterfall and blue Lake #2 (site 7.5). *Isoperla sobria* is a rare find in Colorado (personal communication J.S. Sandberg, UNT Doctoral Student-June 2003). Very little published information could be found on *Isoperla sobria.* The information that could be found was generic for the genus. *Isoperla* seem to have a univoltine cycle. Nymphs can be found in large cold lakes, where they are clingers and sprawlers (Stewart and Stark, 1988). They are either predators that feed upon Ephemeroptera and other Plecoptera, or they are facultative collector-gatherers (Merritt and Cummins,1996).

Trichoptera Information

Rhyacophilidae larvae were collected from downstream of Lake Como (site 2), where Holbrook Creek enters Lake Como (site 3.5), and along Holbrook Creek 7, 8, and 9. There are two genera in the family Rhyacophilidae. Of the two, *Rhyacophila* was collected. Rhyacophila represent the largest genus in the Trichoptera with more than 100 species in North America. *Rhyacophila* larvae are free living predators and are widespread throughout the United States (Merritt and Cummins, 1996). Two species, *Rhyacophila brunnea* and *Rhyacophila hyalinata*, were collected from Holbrook Creek. *Rhyacophila brunnea* was collected in Holbrook Creek downstream from Lake Como and from Lake Como (sites 2 and 3 respectfully). *Rhyacophila hyalinata* was collected from where Holbrook Creek enters Lake Como (site 3.5) and from a sample that combined collections made from Blue Lake #2, the waterfall, and rock pools below Blue Lake #1 (sites 7, 8, and 9). Since *Rhyacophila* is found in lotic systems, it is assumed that *R. hyalinata* from the combined samples came from the waterfall (site 8).

The rest of the Trichoptera genera all belong to the family Limnephilidae. The first genus, *Asynarchus*, was found in a an alpine wetland between Lake Como and Blue Lake #2 (site 5), in a rock pool between the waterfall and Blue Lake #1 (site 9), and in Crater Lake (site 11). *Asynarchus* is easy to misclassify as *Limnephilus* and *Philarctus* (Wiggins, 1996). A key characteristic is the presence of chloride epithelia located both on the dorsal and ventral sides of the nymph. The larvae measure up to 23mm and they make a case that can be up 28mm in length (Wiggins, 1996). The case can be made of either rock or plant material arranged lengthwise. *Asynarchus* is found in the North and the Rocky Mountains, where they can be found in lentic habitats including temporary ponds (Merritt and Cummins,1996).

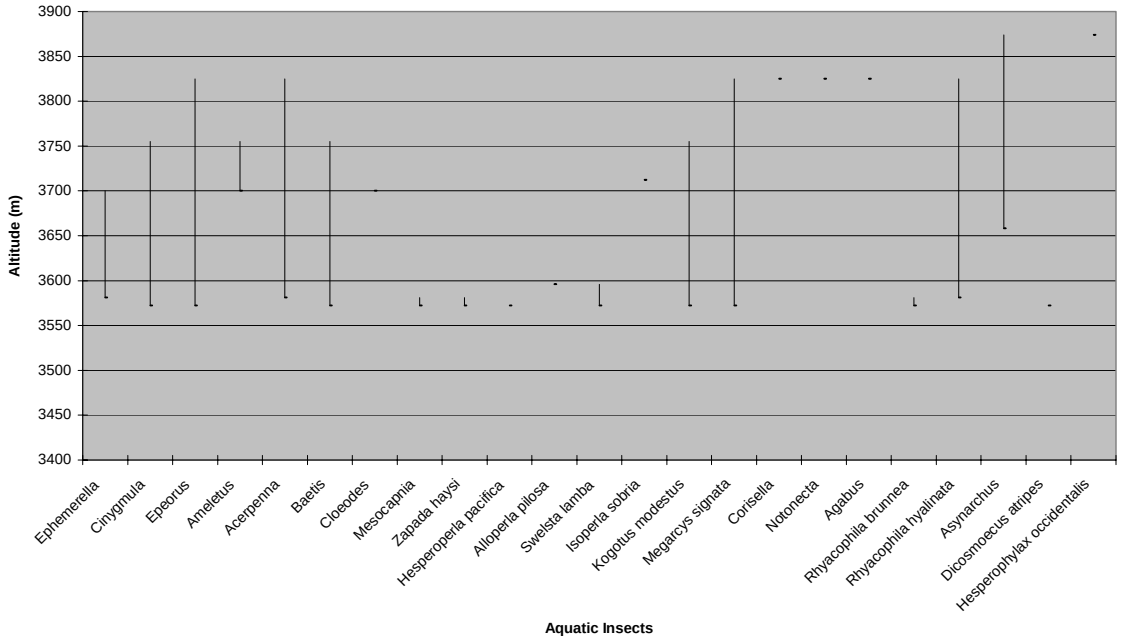
Hesperophylax occidentalis were found along Holbrook Creek below Lake Como, at the waterfall, and in Crater Lake (sites 2, 8, and 11 respectfully). The larvae of *H. occidentalis* measure up to 33mm in length (Wiggins, 1996). A key characteristic is that the gills of the

dorsal and ventral side of the abdomen have four or more branches. The case they make consists entirely of rock fragments and measures up to 40mm in length (Wiggins, 1996). All species are univoltine. They over winter as 4th or 5th instars. *Hesperophylax occidentalis* are shredders that are found in lotic systems. They are widespread in the United States (Merritt and Cummins, 1996). It is unusual that one would be found at site 11 (Crater Lake) since they like lotic systems.

Altitudinal Distribution

The effect of altitudinal distribution is largely due to the effects of temperature and food supply (Knight and Gaufin, 1966). As the creek flows downstream, the water warms and the composition of flora and fauna changes. When the locations of the collected nymphs of all three collection years are looked at, several distributional patterns develop. *Ameletus* was found only above 3,700m, that is, upstream of Blue Lake #2 (site 7). *Acerpenna* was collected from sites that were at an elevation of 3,581m and above, upstream of Lake Como (sites 3.5, 7, 8, and 9). Capniidae and *Hesperoperla pacifica* were found at an elevation of 3,581m and below, downstream of Lake Como and in Lake Como (sites 2 and 3). *Zapada haysi* was found at the entrance of Lake Como and below (sites 2, 3, and 3.5). Of the genus *Rhyacophila*, the two species, *Rhyacophila brunnea* and *Rhyacophila hyalinata*, are nicely separated by altitude. *Rhyacophila brunnea* was only found at and below an elevation of 3,581m (sites 2 and 3). *Rhyacophila hyalinata* were found at an elevation of 3,581m and above, where Holbrook Creek enters Lake Como (Site 3.5), and at the waterfall (site 8). The rest of the taxa were found at sites occurring at a variety of elevations or were not collected often enough, two times or less, to reasonably make conclusions about altitudinal distribution. Table 5 shows the distribution along Holbrook Creek of all the aquatic insects identified to the genus level.

Table 5. Aquatic Insect Distribution along Holbrook Creek.



When the locations of each collection year were looked at individually there were a few differences. In 1994, there were insects collected from only three sites (sites 7.5, 8, and 11). Site 7.5 and 8 are both lotic with a difference of only 18m in elevation. Site 11, Crater Lake, is one of six lotic collection sites. Because of this, a distribution pattern can not be discerned. In 1996, *S. lamba* (site 3.5), *K. modestus* (site 2), and *M. signata* (site 3.5) were all found in the entrance of Lake Como and below (sites 2 and 3.5). Only one insect was found to inhibit the upper reaches exclusively. *Asynarchus* was found only upstream of the alpine wetland (sites 5 and 9). In 1998, two Heptageniidae, *Cinygmula* and *Epeorus* (Iron) were found in the low reaches, in Lake Como and below (sites 2 and 3.5). *Hesperoperla pacifica* was also found only below Lake Como (site 2). *Megarcys signata* was the only insect distributed exclusively in the higher elevations (site 8).

Recommendations for Future Trips

The Alpine Ecology trip encompasses such a wide variety of disciplines and is so limited on time that it is difficult to take all of the samples required in a quantitative manner. To make the insect aspect of the course more quantitative, there are three things I would recommend.

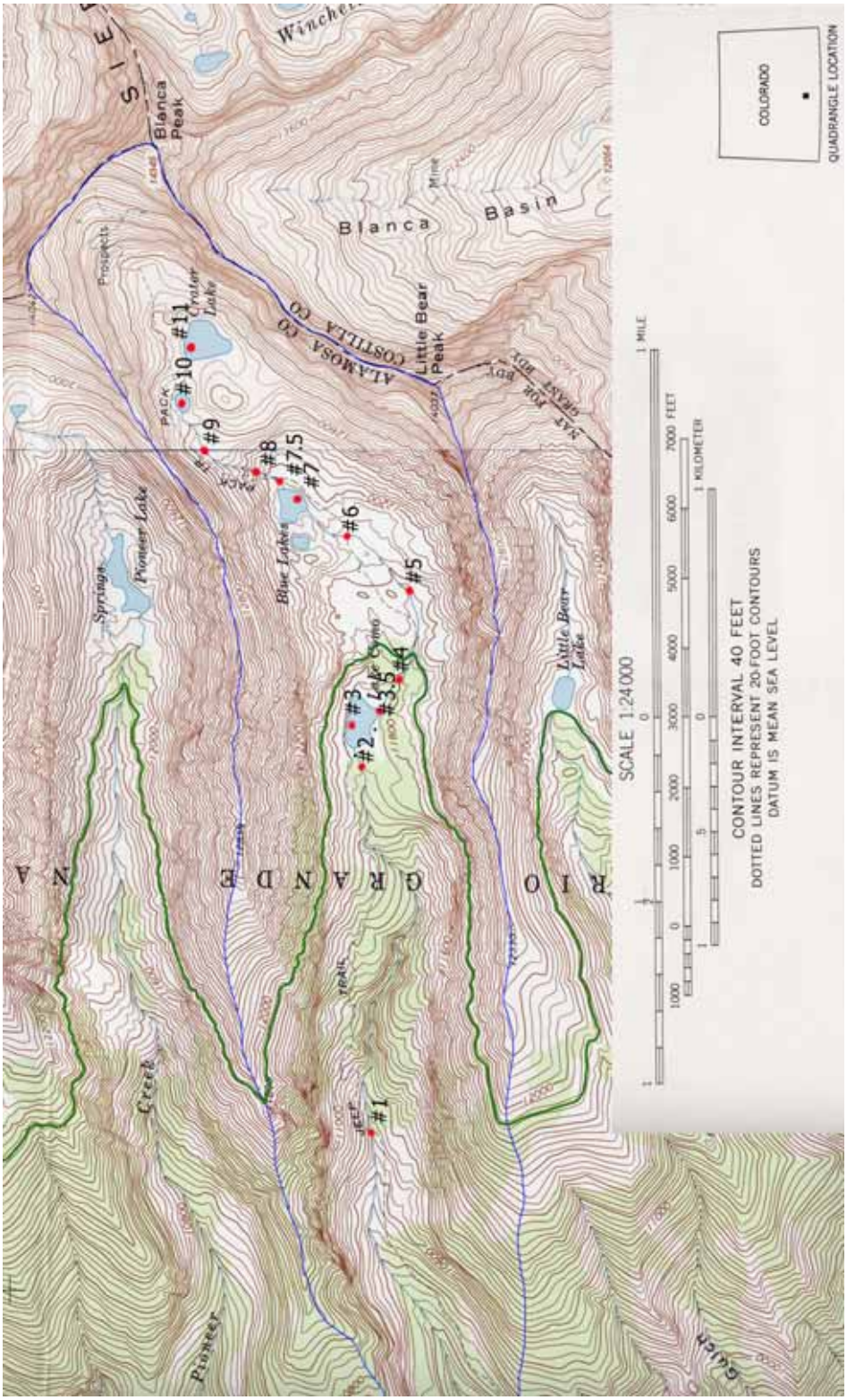
1. Collect more adult insects to confirm the species of each insect. Possibly rear the immature insects on site or back in the lab.
2. Reduce the number of sites, but collect more at each site.
3. To get a better sense of altitudinal distribution, establish collection sites lower on Holbrook creek.

Since all equipment that is used for the course has to be carried in on a hike that is several hours in length, the fewer items brought, the better. I would recommend though that at the minimum, D-framed aquatic nets, aerial nets, beating sheets, and black lights, along with the preserving equipment needed, be brought along on all future trips. The D-framed aquatic kick net will allow for semi-quantitative sampling to be performed (for example, a one-minute kicknet covering approximately one square meter). Finally, one last factor that would help with the Alpine Ecology project as a whole is to identify aquatic vegetation present in the drainage system.

APPENDIX A

MAP OF THE HOLBROOK CREEK DRAINAGE BASIN WITH COLLECTION SITES, WATERSHED, AND APPROXIMATE TREE LINE

Appendix A. Map of the Holbrook Creek Drainage Basin with Collection Sites, Watershed (blue line) and Approximate Tree Line (green line).



APPENDIX B

GRASSES AND SEDGES SPECIES LIST

Appendix B. Grasses and Sedges Species List (used with permission Windhager, 1996).

Common Name	Genus	Species
Wheatgrass	*Agropyron*	*sp.*
Fringed Brome	*Bromus*	*ciliate*
Smooth Brome	*Bromus*	*inermis*
Bluejoint Reedgrass	*Calamagrostis*	*Canadensis*
Cliff Sedge	*Carex*	*scopulorum*
Silvertop Sedge	*Carex*	*foenea*
Tufted Hairgrass	*Deschampsia*	*cespitosa*
Blue Wildrye	*Elymus*	*glaucus*
Millet Woodrush	*Luzula*	*parviflora*

APPENDIX C

TREES OF HOLBROOK CANYON AND THEIR ELEVATIONAL RANGE

Appendix C. Trees of Holbrook Canyon and their Elevational Range (used with permission Windhager, 1996).

Common Name	Genus	Species	Elevational Range in m
White Fir	*Abies*	*concolor*	3261 - 3566
Subalpine Fir	*Abies*	*lasiocarpa*	3505 – 3566
Corkbark fir	*Abies*	*lasiocarpa arizonica*	Rare – 3566
Rocky Mtn. Juniper	*Juniperus*	*scopulorum*	2408 – 2743
Engleman Spruce	*Picea*	*englemannii*	3566 – 3627
Blue Spruce	*Picea*	*pungens*	3170 – 3413
Bristlecone Pine	*Pinus*	*aristata*	2987 – 3566
Pinyon Pine	*Pinus*	*edulis*	2423 – 2895
Limber Pine	*Pinus*	*flexilis*	2895 – 3261
Ponderosa Pine	*Pinus*	*ponderosa*	2865 – 2987
Quaking Aspen	*Populus*	*tremuloides*	2895 – 3261
Douglas Fir	*Pseudotsuga*	*mensiesii*	3261 - 3566

APPENDIX D

FORB SPECIES LIST

Appendix D. Forb Species List (used with permission Windhager, 1996).

Common Name	Genus	Species
Yarrow	*Achillea*	*millefolium*
Orange Agoseris	*Agoseris*	*aurantiaca*
Pale Agoseris	*Agoseris*	*glauca*
Pearly Everllasting	*Anaphalis*	*margaritacea*
Mountain Pussytoes	*Antennaria*	*parvifolia*
Death Camas	*Anticlea*	*elegans*
Colorado Columbine	*Aquilegia*	*caerulea*
Heartleaf Arnica	*Arnica*	*cardifolia*
Marsh Marigold	*Caltha*	*leptosepala*
Parry Bellflower	*Campanula*	*parryi*
Bluebell	*Campanula*	*rotundifolia*
Shepard's Purse	*Capsella*	*bursa*
Heartleaf Bittercress	*Cardamine*	*cordifolia*
Whiteweed	*Cardaria*	*draba*
Sulfur Paintbrush	*Castilleja*	*sulphurea*
Starry Cerastium	*Cerastium*	*arvense*
Fireweed	*Chamerion*	*angustifolium*
Thistle	*Cirsium*	*spp.*
Rose Crown	*Clementisia*	*rhodantha*
Shooting Star	*Dodecatheon*	*pulchellum*
Bigflower Cinquefoil	*Drymocallis*	*fissa*
Oregon Fleabane	*Erigeron*	*speciosus*
Daisy	*Erigeron*	*spp.*
Wood Strawberry	*Fragaria*	*vesca*
Virginia Strawberry	*Fragaria*	*virginiana*
Northern Bedstraw	Galium	*boreale*
Cowparsnip	*Heracleum*	*sphondylium*
Stemless Hymenoxys	*Hymenoxys*	*acaulis*
Porter Ligusticum	*Ligusticum*	*porteri*
Mountain Bluebells	*Mertensia*	*ciliate*
Parry Goldenweed	*Orechrysum*	*parryi*
Fendler Cowbane	*Oxypolis*	*fendleri*
Elephanthead	*Pedicularis*	*groenlandia*
Sidebells Penstemon	*Penstemon*	*secundiflorus*
Whipple Penstemon	*Penstemon*	*whippleanus*
Cushion Plox	*Plox*	*pulvinata*
Blue Gentian	*Pneumonanthe*	*calycosa*
Skunkleaf Polemonium	*Polemonium*	*pulcherrium*
Western Bistort	*Polygonum*	*bistortoides*
Northwest Cinquefoil	*Potentilla*	*gracilis*
Horse Cinquefoil	*Potentilla*	*tippiana*
Parry Primrose	*Primula*	*parryi*
Mountain Parsley	*Pseudocympoterus*	*mantanus*
King's Crown	*Rhodiola*	*integrifoia*
Spotted Saxifrage	*Saxifraga*	*bronchialis*

Brook Saxifrage	*Saxifraga*	*odontoloma*
Diamondleaf Saxifrage	*Saxifraga*	*rhomboidea*
Nodding Groundsel	*Senecio*	*bigelovii*
Fendler Groundsel	*Sencio*	*fendleri*
Butterweed Groundsel	*Sencio*	*serra*
Moss Pink	*Silene*	*acaulis*
Star Gentian	*Swertia*	*perennis*
Dandelion	*Tataxacum*	*officinale*
Wild Candytuft	*Thlaspi*	*montanum*
Clover	*Trifolium*	*spp.*
Shrubby Cinquefoil	*Pentaphylloides*	*floribunda*
Colorado Currant	*Ribes*	*coloradense*
Rose	*Rosa*	*spp.*
Red Raspberry	*Rubus*	*idaeus*
Willow	*Salix*	*spp.*
Sage	*Salvia*	*spp.*
Red Osier Dogwood	*Swida*	*sericea*
Blueberry	*Vaccinium*	*spp.*

APPENDIX E

LIST OF INSECTS WITH CATALOG NUMBER, SITE NUMBER, AND LIFE STAGE

Appendix E. List of Insects with Catalog Number, Site Number, and Life Stage.

Catalog #	Site #	Orders	Families	*Genus*	*species*	Life Stage
96-8	7	Ephemeroptera	Ephemerellidae	*Ephemerella*		Larva
98-7	3.5	Ephemeroptera	Ephemerellidae			Larva
98-6	8	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
96-6	8	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
96-8	7	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
96-22	3.5	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
96-34	7, 8, 9	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
94-1	8	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
94-3	Holbrook Creek	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
98-1	2	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
98-7	3.5	Ephemeroptera	Heptageniidae	*Cinygmula*		Larva
96-6	8	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
96-8	7	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
96-22	3.5	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
96-29	7	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
96-34	7, 8, 9	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
94-1	8	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
94-2	9	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
94-3	Holbrook Creek	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
98-1	2	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
98-7	3.5	Ephemeroptera	Heptageniidae	*Epeorus (Iron)*		Larva
94-7	7.5	Ephemeroptera	Heptageniidae			Larva
96-29	7	Ephemeroptera	Ameletidae	*Ameletus*		Larva
94-4	8	Ephemeroptera	Ameletidae	*Ameletus*		Larva
96-6	8	Ephemeroptera	Baetidae	*Acerpenna*		Larva
96-22	3.5	Ephemeroptera	Baetidae	*Acerpenna*		Larva
96-29	7	Ephemeroptera	Baetidae	*Acerpenna*		Larva
96-34	7, 8, 9	Ephemeroptera	Baetidae	*Acerpenna*		Larva
94-2	9	Ephemeroptera	Baetidae	*Acerpenna*		Larva
94-3	Holbrook Creek	Ephemeroptera	Baetidae	*Acerpenna*		Larva
94-4	8	Ephemeroptera	Baetidae	*Acerpenna*		Larva
94-6	8	Ephemeroptera	Baetidae	*Acerpenna*		Larva
98-1	2	Ephemeroptera	Baetidae	*Baetis*		Larva
98-6	8	Ephemeroptera	Baetidae	*Baetis*		Larva
96-8	7	Ephemeroptera	Baetidae	*Cloeodes*		Larva
96-24	2	Ephemeroptera				
96-33	3	Ephemeroptera				
96-16	2	Plecoptera	Capniidae	*Mesocapnia**		Adult
96-19	3	Plecoptera	Capniidae	*Mesocapnia**		Adult
96-32	2	Plecoptera	Capniidae	*Mesocapnia**		Adult
96-27	3	Plecoptera	Nemouridae	*Zapada*	*haysi* (Ricker)	Adult
94-3	Holbrook Creek	Plecoptera	Nemouridae	*Zapada*	*haysi* (Ricker)**	Adult
98-1	2	Plecoptera	Nemouridae	*Zapada*	*haysi* (Ricker)	Adult
98-7	3.5	Plecoptera	Nemouridae	*Zapada*	*oregonensis* group	Larva
98-7	3.5	Plecoptera	Nemouridae	*Zapada*	*haysi* (Ricker)	Adult
98-1	2	Plecoptera	Perlidae	*Hesperoperla*	*pacifica* (Banks)**	Larva

96-40	4	Plecoptera	Chloroperlidae	*Alloperla*	*pilosa***	Adult
96-2	2	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba***	Adult
96-3	3	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
96-16	2	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
96-19	3	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
96-22	3.5	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Larva
96-22	3.5	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult & Larva
96-32	2	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
96-39	2, 4	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
94-4	8	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Larva
98-1	2	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
98-2	2	Plecoptera	Chloroperlidae	*Sweltsa*	*lamba*	Adult
96-2	2	Plecoptera	Perlodidae	*Kogotus*	*modestus* **	Larva
96-34	7, 8, 9	Plecoptera	Perlodidae	*Kogotus*	*modestus*	Larva
96-2	2	Plecoptera	Perlodidae	*Megarcys*	*signata* **	Adult
96-16	2	Plecoptera	Perlodidae	*Megarcys*	*signata*	Adult
96-22	3.5	Plecoptera	Perlodidae	*Megarcys*	*signata* **	Larva
94-2	9	Plecoptera	Perlodidae	*Megarcys*	*signata*	Larva
94-6	8	Plecoptera	Perlodidae	*Megarcys*	*signata*	Larva
98-6	8	Plecoptera	Perlodidae	*Megarcys*	*signata*	Larva
94-7	7.5	Plecoptera	Perlodidae	*Isoperla*	*sobria* **	
96-12	9	Plecoptera (Exuvia)				
96-33	3	Plecoptera				
96-35	11	Hemiptera	Corixidae	*Corisella*		Adult
96-45	9	Hemiptera	Corixidae	*Corisella*		Adult
96-15	9	Hemiptera	Notonectidae	*Notonecta*		Adult
96-1	3	Hemiptera				
96-2	2	Hemiptera				
96-13	10	Hemiptera				
96-21	3	Hemiptera				
96-22	3.5	Hemiptera				
96-25	8	Hemiptera				
96-37	11	Hemiptera				
96-39	2, 4	Hemiptera				
96-40	4	Hemiptera				
96-42	7	Hemiptera				
96-1	3.5	Hymenoptera				
96-3	3	Hymenoptera				
96-13	10	Hymenoptera				
96-15	9	Hymenoptera				
96-25	8	Hymenoptera				
96-27	3	Hymenoptera				
96-29	7	Hymenoptera				
96-32	2	Hymenoptera				
96-39	2, 4	Hymenoptera				
96-40	4	Hymenoptera				
96-42	7	Hymenoptera				
96-55	0	Hymenoptera	Formicidae			
96-12	9	Coleoptera	Dytiscidae	*Agabus*		adult
96-14	9	Coleoptera	Dytiscidae	*Agabus*		Larva
94-9		Coleoptera	Dytiscidae	*Agabus*		Adult
94-9		Coleoptera	Dytiscidae	*Agabus*		Larva
96-1	3.5	Coleoptera				
96-2	2	Coleoptera				
96-8	7	Coleoptera				
96-15	9	Coleoptera				
96-16	2	Coleoptera				
96-22	3.5	Coleoptera				

96-26	3	Coleoptera				
96-35	11	Coleoptera				
96-40	4	Coleoptera				
96-43	7	Coleoptera				
96-45	9	Coleoptera				
94-3	Holbrook Creek	Coleoptera	Carabidae			Adult
96-2	2	Diptera	Tipulidae			Adult
96-16	2	Diptera	Tipulidae			
96-21	3	Diptera	Tipulidae			
96-29	7	Diptera	Tipulidae			
96-32	2	Diptera	Tipulidae			Adult
96-39	2,4	Diptera	Tipulidae			Adult
96-43	7	Diptera	Tipulidae			Adult
98-5	4	Diptera	Culicidae	*Ochlerotatus*	*canadensis*	Larva
96-1	3.5	Diptera	Culicidae			Adult
96-21	3	Diptera	Culicidae			
96-32	2	Diptera	Culicidae			Adult
96-45	9	Diptera	Culicidae			Adult
96-6	8	Diptera	Simulidae	*Piezosimalium?*		Pupae & Larva
96-2	2	Diptera	Simulidae			Adult
96-16	2	Diptera	Simulidae			
96-22	3.5	Diptera	Simulidae			Pupae & Larva
96-25	8	Diptera	Simulidae			Adult
96-34	7, 8, 9	Diptera	Simulidae			
94-4	8	Diptera	Simulidae			Larva
94-6	8	Diptera	Simulidae			Larva
96-1	3.5	Diptera	Chironomidae			Adult
96-2	2	Diptera	Chironomidae			Adult
96-3	3	Diptera	Chironomidae			
96-6	8	Diptera	Chironomidae			Pupae & Larva
96-8	7	Diptera	Chironomidae			
96-14	9	Diptera	Chironomidae			Larva
96-16	2	Diptera	Chironomidae			
96-17	9	Diptera	Chironomidae			
96-19	3	Diptera	Chironomidae			Adult
96-20	7	Diptera	Chironomidae			
96-21	3	Diptera	Chironomidae			
96-22	3.5	Diptera	Chironomidae			Larva
96-24	2	Diptera	Chironomidae			Adult
96-25	8	Diptera	Chironomidae			Adult
96-27	3	Diptera	Chironomidae			Adult
96-29	7	Diptera	Chironomidae			
96-30	7	Diptera	Chironomidae			Adult
96-32	2	Diptera	Chironomidae			Adult
96-34	7, 8, 9	Diptera	Chironomidae			
96-35	11	Diptera	Chironomidae			Adult
96-39	2, 4	Diptera	Chironomidae			Adult
96-41	2	Diptera	Chironomidae			Adult
96-42	2	Diptera	Chironomidae			Adult
96-43	7	Diptera	Chironomidae			Adult
96-45	9	Diptera	Chironomidae			Larva
94-6	8	Diptera	Chironomidae			Larva
96-21	3	Diptera	Ephydridae			
96-25	8	Diptera	Ephydridae			Adult
96-32	2	Diptera	Ephydridae			Adult

96-32	2	Diptera	Muscidae			Adult
96-35	11	Diptera	Ephydridae			Adult
96-39	2,4	Diptera	Ephydridae			Adult
96-42	2	Diptera	Syrphidae			Adult
96-42	7	Diptera	Ephydridae			Adult
96-43	7	Diptera	Ephydridae			Adult
	3	Diptera	Ephydridae			Adult
96-5	10,11	Diptera				
96-37	11	Diptera				
96-40	4	Diptera				
98-3	8.5	Diptera				
96-2	2	Trichoptera	Rhyacophilidae	*Rhyacophila*	*brunnea*	Adult
96-22	3.5	Trichoptera	Rhyacophilidae	*Rhyacophila*	*hyalinata*	Larva
96-26	3	Trichoptera	Rhyacophilidae	*Rhyacophila*	*brunnea*	Adult
96-32	2	Trichoptera	Rhyacophilidae	*Rhyacophila*		Adult
96-34	7, 8, 9	Trichoptera	Rhyacophilidae	*Rhyacophila*	*hyalinata*	Larva
96-39	2, 4	Trichoptera	Rhyacophilidae	*Rhyacophila*		Adult
94-4	8	Trichoptera	Rhyacophilidae	*Rhyacophila*		Larva
98-1	2	Trichoptera	Rhyacophilidae	*Rhyacophila*		Larva
98-6	8	Trichoptera	Rhyacophilidae	*Rhyacophila*		Larva
98-7	3.5	Trichoptera	Rhyacophilidae	*Rhyacophila*		Larva
96-15	9	Trichoptera	Limnephilidae	*Asynarchus*		Larva
96-36	5	Trichoptera	Limnephilidae	*Asynarchus*		Larva
96-45	9	Trichoptera	Limnephilidae	*Asynarchus*		Larva
96-56	?	Trichoptera	Limnephilidae	*Asynarchus*		Larva
94-5	11	Trichoptera	Limnephilidae	*Asynarchus*		Larva
98-8	5	Trichoptera	Limnephilidae	*Asynarchus*		Larva
98-1	2	Trichoptera	Limnephilidae	*Dicosmoecus*	*atripes*	Larva
98-10	11	Trichoptera	Limnephilidae	*Hesperophylax*		Larva
98-12	11	Trichoptera	Limnephilidae	*Hesperophylax*	*occidentalis*	Adult
98-9	8	Trichoptera	Limnephilidae	*Hesperophylax*		Larva
96-5	10,11	Trichoptera	Limnephilidae	*Limnephilus ?*		Adult
96-33	3	Trichoptera	Limnephilidae	*Limnephilus ?*		Adult
96-35	11	Trichoptera	Limnephilidae	*Hesperophylax*	*occidentalis*	Adult
96-37	11	Trichoptera	Limnephilidae	*Hesperophylax*	*occidentalis*	Adult
94-8	?	Trichoptera	Limnephilidae	*Limnephilus ?*		Adult
98-3	8.5	Trichoptera	Limnephilidae	*Limnephilus ?*		Adult
98-4	11	Trichoptera	Limnephilidae	*Limnephilus ?*		Adult
96-13	10	Trichoptera	Empty cases			
96-14	9	Trichoptera	Empty cases			
96-21	3	Trichoptera				
96-27	3	Trichoptera				
96-20	7	Oligochaeta				
96-26	3	Oligochaeta				
96-40	4	Homoptera				
96-42	7	Homoptera				
96-43	7	Homoptera				
96-55	0	Isoptera				
96-55	0	Lepidoptera				

*Looks like Mesocapnia. Females are not satisfactorily separable from Mesocapnia.
**Verified specimen.

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