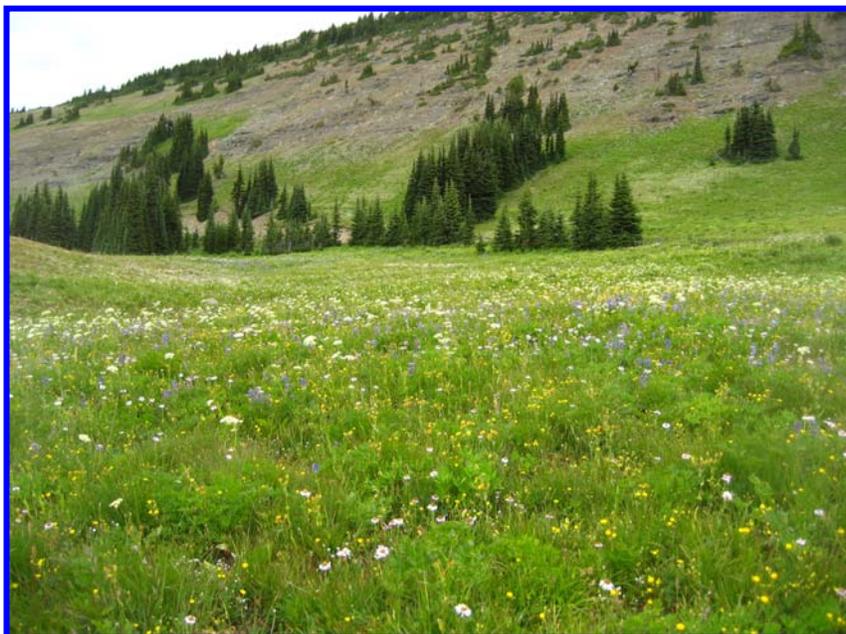


2009 ISSSSP Final Report on *Carex heteroneura* var. *epapillosa*, *Carex heteroneura* var. *heteroneura*, and *Carex atosquama* Taxonomic Study in North Central Washington

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**Background:** The taxonomy of this group of *Carex* species has been ever changing since 2000 when field crews were first challenged with determining the differences between *Carex heteroneura* (the name at that time) and *Carex atosquama* in the Pasayten Wilderness. With further examination of the herbarium records and the recently published Flora of North America, it became apparent *C. heteroneura* was a species not thought to occur north of the Columbia River. So it appeared those populations of *C. heteroneura*, being tracked by the Regional Forester's Sensitive species list and the Washington Natural Heritage Program, were likely *Carex epapillosa*. To confirm this assumption and clarify the confusion between *C. heteroneura* and *C. atosquama*, funds were provided by the Pacific NW Region ISSSSP in 2008 to summarize the status of the species, voucher specimens and confirm their identification. Once back from the field, examination of the specimens continued to be problematic. (Refer to the Taxonomic Study and Occurrence of *Carex atosquama*, *Carex heteroneura* var. *epapillosa* and *Carex heteroneura* var. *heteroneura* in North Central Washington 2008 report to the Region).

The species has undergone several name changes since 2000 when it was considered to be *C. heteroneura*. Once a few specimens were reviewed by taxa experts and found to be *C. epapillosa*, the Washington Natural Heritage Program (WNHP) changed the names of all the *C. heteroneura* Element Occurrences to *C. epapillosa* to reflect the nomenclature used in Flora of North America Volume 23. Since the fall of 2008 the name has changed once again. In 2009 the WNHP changed the name to *C. heteroneura* var. *epapillosa* to conform with the latest regional work completed by Barbara Wilson and others in 2008 (Field Guide to the Sedges of the PNW).

**Results:** Thirty-nine voucher specimens were reviewed by taxa experts Barbara Wilson PNW *Carex* Working Group with assistance from Peter Zika former *Carex* Working Group member and Joy Mastrogiuseppe. All individuals that reviewed these specimens are confident they are *Carex epapillosa*.

Joy Mastrogiuseppe found 16 of the 39 of the specimens (about 41%) were thought to be closest to *C. epapillosa* but "have features aberrant for *Carex epapillosa*, even though they look like *C. epapillosa*." Joy goes on to explain that others have a mixture of features of *C. epapillosa* and *C. atosquama*. These 16 look more closely to be *C. epapillosa* but Joy thinks they may not really that species and "something is going on, which may be some introgressive process."

Joy consulted with David Murray, the ultimate authority on this group of *Carex*. David shared the following comments on distinguishing features of *Carex epapillosa* and *C. atrosquama*.

"The ideal *atrosquama* is fairly narrowly circumscribed. The perigynia are ovate, tapering toward the beak (sloping "shoulders") and golden at maturity although the beak is black. Definitely papillose. The scales are always shorter than the perigynia and as broad as at the base. Spikes are rather short-pedunculate and erect. The spikes are generally approximate.

The ideal *epapillosa* is less narrowly circumscribed. I saw clear intermediates to *heteroneura* in the zone of contact. I recall in the Front Range of Colorado seeing connections of *epapillosa* to *chalciolepis*.

To me, the species has obovate perigynia, that is broadest at the summit with very rounded margins ("shoulders") and an almost shiny reddish-brown. Additionally, the scales are as long as and frequently longer than the perigynia and narrower than, thus much of the perigynia remain visible. Spikes are short- and long-pedunculate, thus erect (above) and divergent (below), lowermost pendent. The lowermost spike(s) can be some distance from the distal spikes."

David Murray also shared with Joy that he had recently seen *Carex epapillosa* from Montana that has papillose perigynia, deviating from the current assumption that the species does not exhibit any papillosity.

Barbara Wilson provided some useful comparisons to keep in mind when working with *C. epapillosa* and *C. atrosquama* in the field. She writes:

"*Carex atrosquama* has dark gold perigynia with brown beaks. They're +/- papillate all over. They're +/- elliptic. The achene takes up more room in the perigynium than it does in *C. epapillosa*.

*Carex epapillosa* has dark perigynia often with pale shoulders. They're +/- smooth, but have some papillae near the beak. They're wider, more circular. They're much larger than the small achenes.

Hold on to these differences, and don't worry much about whether scale midveins are pale or not."

**Conclusion:** It appears there is consensus that all the voucher specimens examined are *Carex epapillosa*, however, with some reservations. Prior to this effort, Joy Mastrogiuseppe had identified four specimens as *C. atrosquama* from our 2008 collection area. Our 2008 collections from these same locations have been renamed as *C. epapillosa* based on Joy's more recent understanding of these two species and consultations with David Murray. Two of these four populations Joy feels confident are *C. epapillosa* and two she feels are closest to *C. epapillosa* but not really that species. This information opens the door for further investigation of these species.

*Carex atosquama* populations currently being tracked by the WNHP should be revisited, vouchered and identification confirmed. Many of these populations may prove to also be *C. epapillosa* or a variant of this species as this study has demonstrated. As a result of this study, this species may be rarer than previously thought.

The *Carex epapillosa*, nomenclature used for the species in Flora of North America, does not agree with what is currently being used by the authors of the Field Guide to Sedges of the PNW or the Washington Natural Heritage Program. *Carex heterouneura* var. *epapillosa* is the accepted name identified by the Royal Botanic Gardens World Checklist of Selected Plants, however, the ultimate use of this accepted name or *C. epapillosa* is the responsibility of the user. Regionally, *Carex heterouneura* var. *epapillosa* appears to be the selected name of preference.

2009 ISSSSP Carex Taxonomic Study: Final Summary of Vouchers Reviewed by Taxa Experts Barbara Wilson (BW) and Joy Mastrogiuseppe (JM).

Collection	Determination	Location	J.M. Comments	Conclusion	Current NRIS Identification #
to-ja-080808-5	Carex epapillosa Mackenzie	Airplane Ridge	Some perigynia papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400289
to-ja-080808-6A	cf. Carex epapillosa Mackenzie	Airplane Ridge	but perigynia with sloping "shoulders," papillose distally; pistillate scales shorter than perigynia but width more or less equal	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400288
to-ja-080808-6B	cf. Carex epapillosa Mackenzie	Airplane Ridge	but perigynia with sloping "shoulders," distinctly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400288
to-dv-ja-081008-3b	cf. Carex epapillosa Mackenzie	Bald Mtn.	Many perigynia with sloping "shoulders"	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400102
to-ja-dv-081008-1	Carex epapillosa Mackenzie	Bald Mtn.	Some perigynia papillose distally. Achenes not developed	Previous: CAAT8 confirmed by JM voucher #to-rc-080701-2 @WSU. NRIS 06080400104 CAAT8. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400104
to-ja-dv-081008-2	Carex epapillosa Mackenzie	Bald Mtn.		Previous: NRIS 06080400108 CAEP3 Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060400108
to-ja-dv-081008-3A	Carex epapillosa Mackenzie	Bald Mtn.		Previous: NRIS 06080400107-CAEP3 & NRIS 06080400102-CAAT8. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400102
to-081108-5	cf. Carex epapillosa Mackenzie	Border Ridge	but most pistillate scales more or less cover perigynia; perigynia papillose distally	Previous: none 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400284

Collection	Determination	Location	J.M. Comments	Conclusion	Current NRIS Identification #
to-081108-6	Carex epapillosa Mackenzie	Border Ridge		Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400283
to-dv-081108-3	cf. Carex epapillosa Mackenzie	Border Ridge	but perigynia with sloping "shoulders"	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060400286
to-dv-081108-4	Carex epapillosa Mackenzie	Border Ridge	Some perigynia slightly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060400285
to-073108-1	Carex epapillosa Mackenzie	Hart's Pass	but most pistillate scales as wide as perigynia nearly to tip, often as long as perigynia	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060400267
to-081808-1a	cf. Carex epapillosa Mackenzie	Hart's Pass	but pistillate scales shorter than perigynia; most perigynia with sloping "shoulders," some perigynia ovate, papillose distally C12	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060400268
to-081808-1b	cf. Carex epapillosa Mackenzie	Hart's Pass	but culms slightly scabrous distally; pistillate scales shorter than but as wide as perigynia slightly papillose distally	Previous: none 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060400272
to-082508-1a	cf. Carex epapillosa Mackenzie	Horseshoe	but culms + scabrous, pistillate scales more or less equaling perigynia; perigynia papillose distally. Some perigynia distorted by insects	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060900272
to-082508-1b	Carex epapillosa Mackenzie	Horseshoe	Perigynia more or less papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060900272
to-082508-2	Carex epapillosa Mackenzie	Horseshoe	Perigynia papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060900269
to-082508-3	Carex epapillosa Mackenzie	Horseshoe	Perigynia more or less papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080900266

Collection	Determination	Location	J.M. Comments	Conclusion	Current NRIS Identification #
to-082508-4	cf. <i>Carex epapillosa</i> Mackenzie	Horseshoe	but perigynia distinctly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060900267
lk-080307-05	<i>Carex epapillosa</i> Mackenzie	Parachute Meadows	Perigynia sparsely papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060900304
lk-080307-06	cf. <i>Carex epapillosa</i> Mackenzie	Parachute Meadows	Some perigynia distinctly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060900304
lk-081007-01	<i>Carex epapillosa</i> Mackenzie	Parachute Meadows	Some perigynia distinctly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060900304
to-ja-080908-1	cf. <i>Carex epapillosa</i> Mackenzie	Rommel Lake	Some perigynia papillose distally	Previous: NRIS #0608040098 CAAT8. Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400098
to-ja-080908-3a	<i>Carex epapillosa</i> Mackenzie	Rommel Lake	Some perigynia sparsely papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400287
to-ja-080908-4b	<i>Carex epapillosa</i> Mackenzie	Rommel Lake	Some perigynia sparsely papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400282
to-ja-080908-5	<i>Carex epapillosa</i> Mackenzie	Rommel Lake /Lazamis Camp		Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 08060400281
to-080601-2b	cf. <i>Carex epapillosa</i> Mackenzie	Spanish Creek	but pistillate scales mostly more or less covering perigynia; perigynia with sloping "shoulders", some papillose distally. Many perigynia distorted by insects	Previous: 2001 voucher #to-rc-0800601-2 verified by JM as CAAT8 - voucher #2b is from same site. Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400275

Collection	Determination	Location	J.M. Comments	Conclusion	Current NRIS Identification #
to-dv-081108-1a	Carex epapillosa Mackenzie	Spanish Creek	but perigynia more or less papillose distally	Previous: NRIS #0608040100 CAAT8. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400100
to-dv-081108-1b	Carex epapillosa Mackenzie	Spanish Creek	Some perigynia sparsely papillose distally	Previous: possibly a subpopulation to NRIS #0608040100 CAHEE. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400271
to-dv-ja-080708-1a	cf. Carex epapillosa Mackenzie	Spanish Creek	but pistillate scales more or less covering perigynia; perigynia sparsely papillose distally	Previous: CAAT8 EO#2, 2001 voucher confirmed by JM as CAAT8. Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400275
to-dv-ja-080708-1b	cf. Carex epapillosa Mackenzie	Spanish Creek	but most perigynia distinctly papillose distally	Previous: CAAT8 EO#2, 2001 voucher confirmed by JM as CAAT8. Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400275
to-dv-ja-080808-1a	Carex scopulorum T. Holm	Spanish Creek		Previous: none Current: 2009 annotation is CAEP3 by BW and CASC by JM.	is within the population of CAHEE 06080400275
to-dv-ja-080808-1b	Carex epapillosa Mackenzie	Spanish Creek	but perigynia papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400275
to-dv-ja-080808-1c	Carex epapillosa Mackenzie	Spanish Creek	Perigynia sparsely papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400275
to-ja-080808-2a	cf. Carex epapillosa Mackenzie	Spanish Creek	but pistillate scales more or less covering perigynia; perigynia papillose distally	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 06080400270
to-ja-081008-4	Carex epapillosa Mackenzie	Spanish Creek	A few perigynia sparsely papillose distally	Previous: none Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400280
to-ja-081008-5	Carex epapillosa Mackenzie	Spanish Creek	but perigynia more or less papillose distally	Previous: NRIS #0608040103 CAAT8. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400103

Collection	Determination	Location	J.M. Comments	Conclusion	Current NRIS Identification #
to-ja-081008-6	Carex epapillosa Mackenzie	Spanish Creek	Some perigynia papillose distally	Previous: NRIS# 06080400099 CAAT8. Current: 2009 annotation is CAEP3 by JM & BW.	CAHEE - 06080400099
lk-080407-20	cf. Carex epapillosa Mackenzie	Tiffany Meadows	Perigynia distinctly papillose distally	Previous: none Current: 2009 annotation is CAEP3 by BW. JM believes the specimen is "closer to CAEP3 but they are not really that species."	CAHEE - 08060900303