

Summary of the Taxonomic Study and Occurrence of *Carex atosquama*, *Carex heteroneura* var. *epapillosa*, and *Carex heteroneura* var. *heteroneura* in North Central Washington.

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Acknowledgements: A big thanks goes out to Joe Arnett and David Giblin for all their help in fielding the many questions over the distribution and taxonomic issues surrounding these three species of *Carex*. It was invaluable to have both David and Joe accompany us into Spanish Camp this summer to help with the collections and puzzle, once again, over the taxonomic differences. This was especially true for Joe who initially found many of these *Carex* sites back in the early 1990's. Another, thanks goes out to Dana Visalli who has helped with the inventory in both Spanish Camp and Sheep Mt. over the years. His help in coming to the rescue of the District program, when we are short handed, has been instrumental over the years in our ability to meet District targets. His quality work and extra effort to make sure the job is done right is much appreciated. And lastly the District wants to thank the Regional Office for funding this effort so the taxonomic issues around these species can be resolved.

Introduction and History of Species Status and Nomenclature: Prior to 2000, the Regional Forester's Sensitive Plant List and the Washington Natural Heritage Program (WNHP) listed two species of *Carex* as Sensitive. These were *Carex atrata* var. *atosquama* (syn: *C. atosquama*) and *Carex atrata* var. *erecta* (syn: *C. heteroneura*). In 2000 a trip into the Spanish Camp area of the Pasayten Wilderness revealed some confusion in splitting these two species apart in the field, given the best available keys at that time. The best taxonomic key at that time for use was the "Field Guide to Intermountain Sedges" (Hurd and others 1998) which included treatment of both *C. atosquama* and *C. heteroneura*. In 2001 and 2002 additional trips into the area involving several Forest, District, and BLM Botanists continued to use this key and Flora of the Pacific Northwest (Hitchcock and Cronquist 1973) to try and find a clear separation of the two species. Everyone continued to disagree on what they were really looking at in the field. As a result, the WNHP moved the two species off the Sensitive plant list and onto the Review Group 1 list, until further taxonomic work could be completed.

With the publication of Flora of North America (FNA) (Zaruchi, 2002), it became apparent that *C. atosquama* was now a separate species and *Carex heteroneura* was now split into two varieties; variety *heteroneura* south of the Columbia River and variety *epapillosa* to the north. According to FNA the habitat distribution of *Carex heteroneura* var. *heteroneura* was restricted to Oregon, California, Utah, and Nevada. *Carex heteroneura* var. *heteroneura* did not extend north of the Columbia River and *Carex heteroneura* var. *epapillosa* was only found north of the Columbia River. So what we likely have in Northern Washington is *Carex heteroneura* var. *epapillosa* (syn: *C. epapillosa*) and *C. atosquama*.

There are no herbarium records of *C. heteroneura* var. *heteroneura* north of the Columbia River. University of Washington, Burke Museum, Herbarium has specimens of *C. epapillosa* collected in 1906 from the Mt. Adams area. This is the only confirmed population of *C. epapillosa* south of this study area (Giblin, 2008) in Washington State and the site has not been revisited since the vouchers were collected in 1906 (Table 1).



Botanists Keying *Carex* 2002 trip to Spanish Camp
Photo by Denis Kirkland

Seven vouchers were collected in the Spanish Camp area of the Pasayten Wilderness in 2001 and 2002. *Carex* taxa expert, Joy Mastrogiuseppe, verified all these specimens as *Carex atosquama*. Seven voucher specimens, thought to be *C. heteroneura*, were gathered in 2003 from the Sheep Mountain area of the Pasayten. Taxa expert, Peter Zika confirmed six to be *C. epapillosa* and one as *C. atosquama*. One voucher specimen collected that was thought to be *C. atosquama* was confirmed as *C. epapillosa*. In 2005, five voucher specimens were gathered by Rarecare volunteers from one population of *Carex epapillosa* at Parachute Meadows in the Tiffany Mountain area. These were verified by Peter Zika to all be *C. epapillosa*. So what this has left us with, across the range of these two species, is *C. epapillosa* to the west, in the middle we have *C. atosquama*, and to the east it is once again *C. epapillosa*.

After these few voucher specimens were sent off and confirmed to be either *C. epapillosa* or *C. atosquama*, WNHP renamed all the previous *Carex heteroneura* populations to *C. epapillosa* and assigned *C. epapillosa* a Sensitive species status. *Carex epapillosa* is geographically isolated in the north central portion of the State, except for the one 1906 population at Mt. Adams, and comprises a handful of populations within the 24 square mile area. It has a G5TNR, S2 rank in Washington. All this helped provide the justification for the Sensitive status in Washington. Just across the boarder, in Canada, *C. epapillosa* has a global rank of GNR and provincial rank of S1S3. In BC *Carex epapillosa* is given a Red status (includes species that have been or are candidates for Extirpated, Endangered, or Threatened status in BC and are species at risk requiring further investigation) and the distribution map of *C. epapillosa* in BC shows it only occurs just across the US border in close proximity to this study area (BC Ministry of the Environment 2008).

Carex atosquama currently remains on the Review Group 1 list in Washington and will remain so until completion of this study. In BC, *C. atosquama* is given a Yellow status (includes species that are apparently secure and not at risk of extinction) with a global rank of G4? and a S5 provincial rank.

In 2008 the Region placed *Carex atosquama* on the Strategic list for Washington and took *Carex heteroneura* off the list. What to officially call the old *Carex heteroneura*, is still up for debate. Canada uses *C. epapillosa*, FNA calls what we have *C. epapillosa*, WNHP and UofW Herbarium are using *C. epapillosa* as they feel this is the most widely recognized name (Arnett, 2008). The Royal Botanic Gardens, World Checklist of Selected Plants states the accepted name for this species is *C. heteroneura* var. *epapillosa*. However, they emphasize the ultimate responsibility for accepting a taxa name lies with the user(s). (BC Ministry of the Environment 2008; Zaruchi, 2002; International Plant Names Index 2008).

Occurrence of the Species and Its Distribution: The goal of this project was to revisit as many populations of these two *Carex* species as possible and collect sufficient voucher specimens for taxa experts to review and help resolve these taxonomic and distribution issues. Since much of the disagreement between botanists looking at these two species in the field evolved around florets showing distinct characteristics of both species, frequently on the same plant. Could hybridization between these two species be occurring? They once were both considered varieties of *Carex atrata*. In Flora of North America the author states *C. epapillosa* and *C. heteroneura* are distinct species that are known to hybridize producing intermediates in California, Nevada, and Utah. Could hybridization between *C. epapillosa* and *C. atosquama* also be occurring in the northern Washington populations producing intermediates? This is a question that needs to be answered.

Table 1 is a summary of all the records of these three species that are known to occur in the State of Washington. There are 106 site locations across the state, only one population of *C. epapillosa* is known to occur south of this study are (1906 Mt. Adams population), no populations of *C. heteroneura* var. *heteroneura* are known to occur in the State, and only 20 sites of *C. atosquama* are known to occur, most of which are part of a bigger population.

Seventy-four percent of the *C. atosquama* and *C. epapillosa* sites are within six miles of Canada, 95% are within 18 miles, and all the populations are within 24 miles of the Canadian border. These sites are equally restricted from east to west with 99% of the sites being within 24 miles of one another. So the range of *Carex atosquama* and *Carex epapillosa* in Washington is a 24 square mile area that borders Canada. Broad, flat, gentle gradient valleys are typical of the terrain where these two species occur. This topography is where the greatest concentration of wetland habitats are found. The species distribution appears to be closely tied to these wetland habitats and other areas where water concentrates in these valleys. The highest concentration of wetland habitat, on the Okanogan, is within the Spanish Camp area of the Pasayten Wilderness. These wetlands also interface with the highest concentration of the rich forb meadow habitat favored by these two *Carex* species. Spanish Camp supports the highest concentration of wetlands, followed by Sheep Mt. and Horseshoe Basin, respectively. These areas also support more species commonly associated with the boreal forest and artic/tundra region to the north. The northern latitude and high concentration of wetlands appears to be what restrict these two species to this region.

During this effort, 44 voucher specimens were collected in 2007 and 2008 that will be sent to Joy Mastrogiuseppe and the *Carex* Working Group for further study. Table 2 shows where the

2007 and 2008 collections were made and how their characteristics best fit the FNA key. It also shows where previous collections were made and where taxa experts disagree on what species we are dealing with. Because of these discrepancies and the fact field identification in the past has not always resulted in an accurate identification, we feel we are not at liberty to definitely identify these specimens as *C. epapillosa* or *C. atosquama*.

Collections were made in five geographically separate areas. In the northeast portion of the species range is Horseshoe Basin, which borders Canada and is about eight miles from the central portion of the species range. Tiffany Mt. area is in the very southeast portion of the species range. Sheep Mt. represents the northwest portion of the species range and also borders Canada. Harts Pass collections represent the southwest portion of the range. The central and largest portion of the range is the Spanish Camp area which is located from the Canadian border south about six miles (Project Area Map). Within the Spanish Camp area, in 2008, there were five collection areas: Spanish Creek, Bald Mt., Rimmel Lake and vicinity, Airplane Ridge, and Border Ridge.

Limited collections were made in Spanish Camp in 2001 and 2002. These vouchers were sent to taxa expert Joy Mastrogiuseppe for verification. The Tiffany Mt collections were made in 2005 and 2007. The Sheep Mt collections were made in 2003. The Tiffany and Sheep Mt collections were sent to taxa expert Peter Zika for confirmation. All but the 2007 and 2008 specimens have been verified. Results of past collections can be found in Table 1.

A list of all the vouchers collected for this study effort can be found in Table 2 and on the Sheep Mt., Spanish Camp, Horseshoe Basin, Tiffany, and Harts Pass attached maps. Many of the sites collected from in 2001 and 2002 in the Spanish Camp area were revisited and additional collections were made for inclusion in this study effort. The information about past collections and populations sizes can also be found in Table 2. Eleven of the 44 vouchers collected in 2007 and 2008 were from areas with previous collections.

Habitat Requirements and Population Size: Population sizes for both species are variable, but in most the cases are made up of more than one site. Except for a few sites, the number of individuals per site are small, mainly less than 50 culms (Table 2). The three exceptions to this are one site in Spanish Camp and two sites at Harts pass where the number of culms estimated ranged from 100 to 150. No matter where it was found, it never dominated the species composition and the microsites are typically less than ½ acre and most average 1/5 acre plus or minus a little (personal experience of the authors).



Moist Forb Microsite with *C. epapillosa*. Airplane Ridge, Spanish Camp. Pasayten Wilderness. Photo by T. Ohlson.

Carex epapillosa appears to tolerate light grazing and tolerance to grazing by *C. atosquama* is unknown given the rarity of this species. Given that neither *C. epapillosa* or *C. atosquama* are rhizomatous, tolerance to grazing is not known. It appears to persist under light grazing pressure given where we find it; more often than not, it is in association with stock use. However, given the relatively small numbers of individuals associated with each site, the effect of grazing can not be overlooked. The microsite habitat is closely tied to rich forb moist meadow habitats described by Kovalchik and Clausnitzer (2004). With few exceptions, the preferred habitat is associated with the *Trollius laxus-Caltha biflora* rich forb meadow plant association. This is a dominant plant association in the Sheep Mt. and Spanish Camp areas. The rich forb meadow plant association also is found in association with largest concentration of wetlands and largest number of sites of both *Carex* species within the 24 square mile area. The *Trollius laxus-Caltha biflora* plant association is usually associated with broad, flat, gentle gradient valleys. It is closely associated with the Meadow Series plant associations that are dominated by moist-to-wet site members of the *Cyperaceae* and *Gramineae* families. *Trollius laxus* or *Caltha biflora* can be found at nearly all the *C. atosquama* and *C. epapillosa* sites inventoried ranging from uncommon to dominant components of the species composition.

In the Harts Pass area, the site supporting the largest number of *Carex epapillosa* individuals would best fit the *Lupinus latifolius* plant association (see photo below) given the dominance of *Lupinus polyphyllus* at the site. Both this plant association and the *Trollius laxus-Caltha biflora* plant associations are found in subalpine and alpine environments. Both plant associations have a high percentage of overlapping associated species so the variability encountered between the areas may just be gradations between the two with most microsites tending toward the *Trollius laxus-Caltha biflora* plant association. Soils within the rooting zone of these two plant associations are saturated or flooded early in the growing season, becoming moist but well-aerated late in the season. Water table depth averages are 4" below the surface for the *Lupinus latifolius* plant association to 13" below the surface for the *Trollius laxus-Caltha biflora* plant association.

The Horseshoe Basin, Pasayten Wilderness, populations appear to be more restricted to wetter streamside habitats. Horseshoe Basin supports extensive meadow habitat, but little *Trollius laxus-Caltha biflora* habitat compared to the Sheep Mt, Spanish Camp, and Harts Pass areas.

The meadow community is predominately *Danthonia intermedia* and *Salix planifolia* in the wetter drainages, with only small inclusions of the moister forb habitat near spring seeps and along stream channels.



Danthonia meadows with *Salix* dominated drainages. Horseshoe Basin, Pasayten. Photo by T. Ohlson.



Trollius laxus-*Caltha biflora* rich forb meadow. Sheep Mt. Pasayten. Photo by T. Ohlson

The two photos, below, of habitat taken at Harts Pass show differing species composition and both of these sites support over 100 individuals each. These are two of three sites where individuals reach or exceed 100 individuals at a site. The third site is on the north side of Bald Mt.



Lupinus polyphyllus dominated moist meadow habitat. Harts Pass Area Photo by: T. Ohlson



Trollius-*Caltha* dominated moist meadow habitat. Harts Pass Area Photo by: T. Ohlson



Narrow side channel habitat about 2' wide along intermittent stream. Horseshoe Basin, Pasayten
Photo by: T. Ohlson



Arnica mollis dominated habitat along perennial stream. Horseshoe Basin, Pasayten Photo by: T. Ohlson



Where trails intersected spring seeps, *Carex epapillosa* was frequently found. Trail tread appears to provide additional moisture along the trail edge. Airplane Ridge. Pasayten. Photo by: T. Ohlson



Trollius laxus – *Caltha biflora* dominated transition zone between wetland and uplands with *Carex epapillosa*. Harts Pass. Photo by: T. Ohlson

Table 1: Summary Of All Known Sites Of *Carex atrosquama* And *Carex heteroneura* var. *epapillosa* And *Carex heteroneura* var *heteroneura* In The State Of Washington And The Species Name Currently Used For Tracking Them.

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAAT8	06080400020	CAAT8 PMCYP031B0*005*WA	7/19/2003	692338	5423621		40	20	29	ks-071903-02	Spanish Camp CA-Sheep Mnt.- Sandy Ridge	P.Z. confirmed as CAAT8. was thought to be CAHE8. Specimen is at UofW.
CAAT8	06080400025		7/18/2003	693567	5421890		40	20	33	to-071803-04	Spanish Camp CA-Corral Lake- Sheep Mnt.area	P.Z. & Barb Wilson confirmed as CAAT8 -- main population. Specimen is at UofW & MVRD
CAAT8	06080400025		7/18/2003	693597	5422005		40	20	33		Spanish Camp CA-Corral Lake- Sheep Mnt.area	
CAAT8	06080400103		8/10/2002	700581	5427148		40	21	18	to-ks-081002-01	Spanish Camp CA	J.M. confirmed as CAAT8. specimen is at WSU
CAAT8	06080400100	CAAT8 PMCYP031B0*002*WA	7/26/2002	700920	5427223		40	21	17	to-rc-080601-01	Spanish Camp CA- Small Pond Below Boundary Tr.	J.M. confirmed as CAAT8 (2 sites w/ same NRIS #) specimen is at WSU
CAAT8	06080400100	CAAT8 PMCYP031B0*002*WA	7/26/2002	701017	5427179		40	21	17			
CAAT8	06080400099	CAEP3 PMCYP035X0*016*WA	8/9/2001	701107	5427227		40	21	17	to-ks-081002-02	Spanish Camp CA- Boundary Tr. West of Spanish Camp	Suspect both species are here. WNHP EO's for both CAEP3 and CAAT8 at this location. J.M. confirmed as CAAT8. Specimen is at WSU. CAEP3 not yet verified.

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAAT8		CAAT8 PMCYP031B0*002*WA	8/10/2002	701109	5427216		40	21	17		Spanish Camp CA- Boundary Tr. West of Spanish Camp	NRIS CAAT8 #06080400099 -- this is basically the same location as above.
CAAT8		CAAT8 PMCYP031B0*002*WA	8/8/2001	701225	5426308		40	21	17		Spanish Camp CA-Bald Mt.. OG Camp Graze Site West	CAAT8 EO 2 & CAEP3 EO 16 both here. Priority to check in 2008.
CAAT8	06080400101		8/7/2001	701465	5426755		40	21	17		Spanish Camp CA- Near Charlie Brown Cabin	
CAAT8	06080400105		8/7/2001	701530	5426081		40	21	20	to-rc- 080701-01	Spanish Camp CA- Along tr.into Bald Mt..horse camp	J.M. confirmed as CAAT8. Specimen is at WSU
CAAT8	06080400104	CAAT8 PMCYP031B0*002*WA	8/7/2001	701961	5426272	040N021E S20 NWFNE	40	21	20	to-rc- 080701-02	Spanish Camp CA- Trail to Bald Mt..	J.M. confirmed as CAAT8. specimen is at WSU
CAAT8	06080400098	CAAT8 PMCYP031B0*002*WA	8/6/2002	702617	5426697		40	21	16	to-bk- 080602-05	Spanish Camp CA- Trail #533 to Rommel Lake	J.M. confirmed as CAAT8. Specimen is at WSU.
CAAT8		CAAT8 PMCYYP0C1B0*004*WA	1978			037N023E S23 SEOWSW	37	23	23		Rock Mountain	
CAAT8	06080900021		7/17/2006				37	23	34		Freezeout Ridge	In Whistler Basin
CAAT8	06080400102	CAAT8 PMCYP031B0*002*WA	8/8/2002			040N021E S17 S2	40	21	17		Spanish Camp CA- Bald Mt.. OG Camp Graze Site	
CAAT8	06080400102	CAAT8 PMCYP031B0*002*WA	8/8/2002			040N021E S18 S2OFNE	40	21	18		Spanish Camp CA- Bald Mt.. OG Camp Graze Site	
CAAT8	06080400102	CAAT8 PMCYP031B0*002*WA	8/8/2002			040N021E S19	40	21	19		Spanish Camp CA- Bald Mt.. OG Camp Graze Site	

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CAAT8	06080400102	CAAT8 PMCYP031B0*002*WA	8/8/2002				40	21	20		Spanish Camp CA- Bald Mt.. OG Camp Graze Site	
CAAT8	CAHE8 06080400107	CAAT8 PMCYP031B0*002*WA	8/6/2001	701979	5426508		40	21	17	to-rc- 080601-02		J.M. confirmed as CAAT8. Specimen is at WSU
CAEP3		CAEP3 PMCYPO35X3*001* WA	8/24/2007			037N018E S07 SEOFNW	37	18	7		Harts Pass	RareCare volunteer in 07 (R. Toonew) found population but taxonomy suggested both CAAT8 & CAEP3.
CAEP3	06080400117		7/21/2003	692451	5422167		40	20	32	to-072103- 01	Sheep Mt - Sand Ridge, south side	P.Z. confirmed as CAEP3. Originally thought to be CAAT8. Specimen is at MVRD
CAEP3	06080400034		7/20/2003	692517	5426590		40	20	17	to-072003- 04	Sheep Mt- Boundary Trail	P.Z. confirmed as CAEP3. Specimen is at UofW.
CAEP3	06080400033		7/20/2003	693092	5423275		40	20	28	bk-072003- 02	Sheep Mt-Gabril Creek Drainage	P.Z. confirmed as CAEP3. Specimen is at MVRD
CAEP3	06080400035		7/20/2003	693278	5426737		40	20	16	to- 072003/03	Sheep Mt-below OG Sheep Camp	P.Z. confirmed as CAEP3, Sheep Mt OG camp. Specimen is at UofW.
CAEP3	06080400032		7/20/2003	693301	5423756		40	20	28	ks-072003- 01	Sheep Mt-Gabril Creek Drainage	P.Z. confirmed as CAEP3. Specimen is at MVRD and UofW.
CAEP3		CAEP3 PMCYP035X0*014*WA	7/15/1994			040N020E S33 NEOWSW	40	20	33		CORRAL LAKE	

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CAEP3		CAEP3 PMCYP035X0*005*WA	8/28/1989			039N020E S23 NEOFSE	39	20	23	GW368	Middle Fox Lake Pasayten Wilderness	G. Wooten specimen confirmed as CAAT8 by B. Wilson. Need to change in WNHP DB. Specimen is at OSU.
CAEP3		CAEP3 PMCYP035X0*009*WA	7/27/1992			037N022E S26 S2OFNE	37	22	26		SOUTH TWENTY MILE PEAK	
CAEP3		CAEP3 PMCYP035X0*008*WA	7/27/1992			037N022E S24 SWOFSE	37	22	24		SOUTH TWENTY MILE PEAK	
CAEP3		CAEP3 PMCYP035X0*017*WA	1993			037N023E S18 NWOFFSE	37	23	18		TIMBER CREEK	
CAEP3		CAEP3 PMCYP035X0*010*WA	8/22/2005			037N023E S30 NEOFSE	37	23	30		Boulder Creek	RareCare 05 M. Foster could not find population
CAEP3		CAEP3 PMCYP035X0*006*WA	8/22/2005			037N023E S33 NWOFFNW	37	23	33		Brown's Meadow	RareCare 05 M. Foster could not find population
CAEP3		CAEP3 PMCYP035X0*022*WA	1990			037N023E S21 NEOFSW	37	23	21		TIFFANY MEADOWS	
CAEP3		CAEP3 PMCYP035X0*013*WA	7/25/1991			036N023E S28 SWOFNE	36	23	28		OLD BALDY	
CAEP3		CAEP3 PMCYP035X0*021*WA	1990			037N023E S22 NEOFFNW	37	23	22		TIFFANY LAKE TRAIL	
CAEP3		CAEP3 PMCYP035X0*018*WA	1990			036N023E S03 NEOFSW	36	23	3		HEADWATERS OF BERNHARDT CREEK	
CAEP3		CAEP3 PMCYP035X0*012*WA	1991				36	23	2		CLARK PEAK	
CAEP3		CAEP3 PMCYP035X0*023*WA	8/23/1995			036N023E S14 NWOFFSE	36	23	14		MOUNT MCCAY	

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CAEP3		CAEP3 PMCYPO35X0*003 WA	8/22/2005			037N23E S16 NWOFSSE	37	23	16	rarecare #1 & GW329	Parachute Meadows	RareCare 05 volunteer (M. Foster) made collections. P.Z. confirmed as CAEP3 (NAD83 UTM11 282327-5398543) Specimens are at MVRD. Speicmen GS329 is at OSU & verified by B. Wilson as CAEP3.
CAEP3		CAEP3 PMCYPO35X0*003 WA	8/22/2005				37	23	16	rarecare #2	Parachute Meadows	RareCare 05 volunteer (M. Foster) made collections. P.Z. confirmed as CAEP3 (NAD83 UTM11 282359 - 5398306)
CAEP3		CAEP3 PMCYPO35X0*003 WA	8/22/2005				37	23	16	rarecare #3	Parachute Meadows	RareCare 05 volunteer (M. Foster) made collections. P.Z. confirmed as CAEP3 (NAD83 UTM11 282425 - 5399066)
CAEP3		CAEP3 PMCYPO35X0*003 WA	8/22/2005				37	23	16	rarecare #4	Parachute Meadows	RareCare 05 volunteer (M. Foster) made collections. P.Z. confirmed as CAEP3 (NAD83 UTM11 282261-5398528)
CAEP3		CAEP3 PMCYPO35X0*020*WA	1990			037N023E S23 E2OFSW	37	23	23		ROCK MOUNTAIN	
CAEP3		CAEP3 PMCYPO35X0*020*WA	1990			037N023E S26 NEOFNW	37	23	26		ROCK MOUNTAIN	
CAEP3		CAEP3 PMCYPO35X0*019*WA	1990			037N023E S27 SEOFSW	37	23	27		TIFFANY MOUNTAIN	
CAEP3		CAEP3 PMCYPO35X0*007*WA	8/22/2005			037N023E S30 S2OFS2	37	23	30		Boulder Creek	RareCare 05 volunteer M. Foster could not find population.
CAEP3		CAEP3 PMCYPO35X0*025*WA	8/4/1995			037N023E S33 NEOFNE	37	23	33		BROWN MEADOW	D. Visalli 2007 surveyed and was unable to find

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CAEP3		CAEP3 PMCYPO35X0*025*WA	8/4/1995			037N023E S34 NWOFNW	37	23	34		BROWN MEADOW	D. Visalli 2007 surveyed and was unable to find
CAEP3		CAEP3 PMCYPO35X0*019*WA	1990			037N023E S34 NWOFNE	37	23	34		TIFFANY MOUNTAIN	
CAEP3		CAEP3 PMCYPO35X0*004* WA	8/26/1990			040N023E S09 SEOFNE	40	23	9		Horseshoe Basin	
CAEP3		CAEP3 PMCYPO35X0*004* WA	8/26/1990			040N023E S10	40	23	10		Horseshoe Basin	
CAEP3		CAEP3 PMCYPO35X0*004* WA	8/26/1990			040N023E S15 NWOFSE	40	23	15		Horseshoe Basin	
CAEP3		CAEP3 PMCYPO35X0*004* WA	8/26/1990			040N023E S16 E2	40	23	16		Horseshoe Basin	
CAEP3		CAEP3 PMCYPO35X0*004* WA	8/26/1990			040N021E S16 N2OFSE	40	23	16		Horseshoe Basin	
CAHE8	06080400027		7/19/2003	692285	5423314		40	20	29		Spanish Camp CA	
CAHE8	06080400029		7/21/2003	692435	5422265		40	20	32		Spanish Camp CA-Ashnola Mt.- Whistler Pass	
CAHE8	06080400029		7/21/2003	692538	5422298		40	20	32		Spanish Camp CA-Ashnola Mt.- Whistler Pass	
CAHE8	06080400029		7/21/2003	692633	5422350		40	20	32		Spanish Camp CA-Ashnola Mt.- Whistler Pass	
CAHE8	06080400028		7/20/2003	692643	5426722		40	20	17		Spanish Camp CA-Boundary Trail East of Peeve Pass Barker Brown Cabin	

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAHE8	06080400028		7/20/2003	692751	5426589		40	20	17	can not find? to-072003-?	Spanish Camp CA-Boundary Trail East of Peeve Pass Barker Brown Cabin	P.Z. confirmed as CAEP3 and specimen is at UofW, if not lost.
CAHE8			7/16/2003	692790	5422373		40	20	32	to-071603-01	Whistler Pass, Sheep Mt., Pasayten	P.Z. confirmed as CAEP3, CANO2, CAPA14. Specimen is at UofW
CAHE8	06080400030		7/17/2003	693241	5423882		40	20	28	to-071703-06	Spanish Camp CA	P.Z. confirmed as CAEP3. Specimen is at UofW
CAHE8	06080400026		7/20/2003	693361	5426625		40	20	16	to-072003-01	Spanish Camp CA-Sheep Mt.. Area	P.Z. confirmed as CAEP3. Specimen is at UofW and MVRD
CAHE8	06080400039		7/20/2003	693514	5423015		40	20	28		Sheep Mt.. -Crow Lake	
CAHE8	06080400031		7/20/2003	693551	5423590		40	20	28		Spanish Camp CA-Gabril Drainage	CANO2 also found here
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	699631	5428210	040N021E S07 SW	40	21	07		Bob Creek	
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	699643	5430311		40	21	06		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2002	700069	5427865		40	21	07			
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	700259	5430105		40	21	06		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	700353	5430067		40	21	06		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	7/28/2002	700867	5426025		40	21	19		North Face of Bald Mt	
CAHE8		CAEP3 PMCYP035X0*016*WA	2001	701219	5427084		40	21	17		NW of Spanish Camp	from Rod's list of just utms SW of NW sec 17. CAAT8 likely

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAHE8	06080400107	CAEP3 PMCYP035X0*16*WA	8/8/2001	701225	5426308	040N021E S17	40	21	17		Spanish Camp CA-Bald Mt.. OG Camp Graze Site West	CAAT8 & CAEP3 both likely here both have EO #. Priority to check in 2008.
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	701319	5429331	040N021E S08	40	21	08		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2002	701365	5428640		40	21	08		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2001	701421	5427745		40	21	17		Airplane Ridge	3 of 3 sites airplane ridge
CAHE8		CAEP3 PMCYP035X0*016*WA	7/26/2002	701428	5427170		40	21	17		NW of Spanish Camp	CAAT8 likely here also.
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2001	701484	5427617		40	21	17		Airplane Ridge	2 of 3 sites airplane ridge
CAHE8	06080400108		8/7/2001	701530	5426081		40	21	20		Spanish Camp CA-Along Tr.Into Blad Mt.. Horse Camp	
CAHE8		CAEP3 PMCYP035X0*016*WA	2001	701600	5427569		40	21	17		Airplane Ridge	from Rod's list of just utms NE of NW sec 17
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2001	701615	5427628		40	21	17		Airplane Ridge	1 of 3 sites airplane ridge
CAHE8		CAEP3 PMCYP035X0*016*WA	8/10/2001	701667	5427886		40	21	17		Airplane Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	2001	701744	5427674		40	21	17		Airplane Ridge	from Rod's list of utms NW of NE sec 17
CAHE8		CAEP3 PMCYP035X0*016*WA	7/25/2002	701850	5428628		40	21	08		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*16*WA	8/6/2001	701979	5426508		40	21	17			need to check if CAAT8 also here in 2008.
CAHE8		CAEP3 PMCYP035X0*016*WA	7/24/2002	702132	5427696		40	21	17		Airplane Ridge	
CAHE8			7/24/2002	702497	5428132		40	21	09		Border Ridge	
CAHE8		CAEP3 PMCYP035X0*016*WA	7/27/2002	703676	5426191		40	21	21		trail to Rimmel Lake	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/6/2002	703964	5427003		40	21	16			

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002	704676	5426129		40	21	22		East end of Rimmel Lake	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N020E S12	40	20	12			WNHP has a legal of 040N021E S42, but sec 42 does not exist. District data suggests is in section 12
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N021E S24 NEOFNE	40	20	24			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	7			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	8			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	16			
CAHE8		CAEP3 PMCYP035X0*016*WA	7/17/1994				40	21	17			01-02 inventory looked for population, but it was never relocated -west side bald
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N021E S18 E2OFNE	40	21	18			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	18			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N021E S19 N2OFN2	40	21	19			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	19		East site of Bald	unable to find the subpop on the east side of Bald -- original site
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N021E S21 N2OFN2	40	21	21			
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002				40	21	21		trail to Rimmel Lake	
CAHE8		CAEP3 PMCYP035X0*016*WA	8/12/2002			040N021E S22 NWOFNW	40	21	22			

PLANT CODE	NRIS #	WNHP EO_#	Most Recent EO Visit	NAD 27 UTM10 Easting (X)	NAD 27 UTM10 Northing (Y)	WNHP legals w/ QTR sections	Town	Rng	Sec	Collection #	SITE_NAME	NOTES
CAEP3			7/3/1988			037N020E s20 SEOWSW	37	23	20	GW323	Round Creek	G. Wooten specimen verified as CAEP3 by B. Wilson. Specimen is at OSU.
CAEP3		CAEP3 PMCPY035X0*002*WA	8/1/1906			008N011E S21	8	11	21	UofW Herbarium 1906-08-01	Mount Adams, Wodans Vale	C. epapillosa verified by P. Zika from 41906 UofW herbarium specimen

Table 2: Summary Of Carex Collections Made And The Distinguishing Species Characteristics Of Each Using Flora Of North America Species Characteristics.

Location & Collection Number	Population Size	Population Note	<i>Carex atosquama</i>						<i>Carex heteroneura</i> var. <i>epapillosa</i>							
			Bract Not Hyaline	Peri $\leq 3.5\text{mm}$ X $\leq 1.75\text{mm}$	Peri Golden Brown	Peri Elliptic	Peri Full	Papillose	Stem Scabrous	Bract hyaline	Peri 3.5 - 4mm X 2 - 3mm	Peri green/brown	Peri Round to Obovate	Peri 1/2 full	Not Papillose	Stem Not Scabrous
Spanish Creek																
to-dv-ja-080708-1a	30-40 stems	voucher taken from CAAT8 EO#2 site. 01 voucher confirmed as CAAT8 by J.M. voucher # to-rc-080601-01 is at WSU								x	x	x	x	x	x	x
to-dv-ja-080708-1b	20-30 stems	voucher taken from slightly drier area just above CAAT8 EO#2 site								x	x	x	x	x	x	x
to-dv-ja-080808-1a	10-20 stems	population below cabin in draw -- healthy populations found in microsites down through draw.	x	x	x	x			x					x	x	
to-dv-ja-080808-1b	10-20 stems	2nd microsite going down draw.			x				x		x	x	x	x	x	
to-dv-ja-080808-1c	10-20 stems	3rd microsite going down draw.							x	x	x	x	x	x	x	
to-dv-081108-1b	<30 stems	this population is about 150' down slope from 1a in draw.								x	x	x	x	x	x	x
to-ja-080808-2a	20-50 stems	population along Boundary trail west of cabin									x	x	x	x	x	x
to-ja-080808-2b	1 clump	just west of Col# 2a on Boundary trail near spring seep with falls.								x	x	x	x	x	x	x
to-dv-081108-1a	<30 stems	Site is small pond below boundary trail. Population was vouchered in 2002 and verified as CAAT8 by Joy M. Voucher # to-rc-080601-01 is at WSU.								x	x	x	x	x	x	x

Location & Collection Number	Population Size	Population Note	<i>Carex atosquama</i>						<i>Carex heteroneura</i> var. <i>epapillosa</i>						
			Bract Not Hyaline	Peri $\leq 3.5\text{mm}$ X $\leq 1.75\text{mm}$	Peri Golden Brown	Peri Elliptic	Peri Full	Papillose	Stem Scabrous	Bract hyaline	Peri 3.5 - 4mm X 2 - 3mm	Peri green/brown	Peri Round to Obovate	Peri 1/2 full	Not Papillose
to-ja-081008-5	few scattered in small area off trail	2002 voucher taken very close to this area confirmed as CAAT8 by J.M. Voucher #to-ks-081002-1 is at WSU. Unable to relocate location w/ certainty in 2008.							x	x	x	x	x	x	x
to-ja-081008-6	few plants <20 stems	found w/in 10' of trail where trail intersects moist microsite in dry danthonia-fescue meadow. Confirmed by J. M. as CAAT8. voucher # to-ks-081002-2 is at WSU.			x				x	x	x	x	x	x	x
to-ja-081008-4	8 stems	growing along dry steam channel.							x	x	x	x	x	x	x
to-080601-2b	<50 stems	2001 collection # to-rc-080601-2 was verified by J.M. as CAAT8 -- this specimen is from the same site.							x	x	x	x	x	?	x
Bald Mountain															
to-dv-ja-081008-3a	evenly scattered throughout	Horse graze area west of Bald Mt OG camp.							x	x	x	x	x	x	x
to-dv-ja-081008-3b	few plants <20 stems	suspect hybridization of CAAT8 & CAEP3 w/ this collection.			x			?	x	x		x	x	x	x
to-dv-ja-081008-1	6 to 8 plants	On the trail to Bald Mt OG camp. 2001 collection confirmed as CAAT8 by J.M. Voucher # to-rc-080701-2 is at WSU.			x	x			x	x			x	x	x
to-dv-ja-081008-2	100-150 stems in 75X75' area	trail goes right through center of population.	x		x		x		x	x	x	x	x	x	
Airplane Ridge															
to-ja-080808-05	<20 stems	~20' along trail going from cabin to Airplane Ridge.	x	x	x	x			x				x	x	

Location & Collection Number	Population Size	Population Note	<i>Carex atosquama</i>						<i>Carex heteroneura</i> var. <i>epapillosa</i>						
			Bract Not Hyaline	Peri \leq 3.5mm X \leq 1.75mm	Peri Golden Brown	Peri Elliptic	Peri Full	Papillose	Stem Scabrous	Bract hyaline	Peri 3.5 - 4mm X 2 - 3mm	Peri green/brown	Peri Round to Obovate	Peri 1/2 full	Not Papillose
to-ja-080808-06a	common in moist microsites	common in moist forb microsites scattered through drier danthontia/fescue meadow							x	x	x	x	x	x	x
to-ja-080808-06b	common in moist microsites	2nd microsite sampled w/in large meadow complex.							x	x	x	x	x	x	x
Rommel Lake & Area															
to-ja-080908-1	widely scattered in habitat, but not common	~1/4 mile up trail to Rommel Lake from Spanish Camp. 2002 voucher taken confirmed by J.M. as CAAT8. Specimen is at WSU.							x	x	x	x	x	x	x
to-ja-08-0908-3a	Few, not abundant, not robust	S. side of Rommel Lake, heavy graze area			x	x			x	x			x	x	x
to-ja-080908-5	100+ stems scattered throughout	Lesamiz Camp							x	x	x	x	x	x	x
to-ja-080908-4b	<20 stems	E. end of Rommel Lake							x	x	x	x	x	x	x
Border Ridge															
to-081108-6	few plants <30 stems	concentrated along ~30' of trail where trail intersects moist forb microsite.							x	x	x	x	x	x	x
to-dv-081108-3	few plants <30 stems	small depression w/ suitable habitat.							x	x	x	x	x	x	x
to-dv-081108-4	few stems widely scattered	small population w/in large block of suitable habitat.							x	x	x	x	x	x	x
to-081108-5	<50 stems	concentrated along ~ 20' of trail edge where trail intersects moist forb microsite		x		x			x		x		x	x	x

Location & Collection Number	Population Size	Population Note	<i>Carex atosquama</i>						<i>Carex heteroneura</i> var. <i>epapillosa</i>						
			Bract Not Hyaline	Peri $\leq 3.5\text{mm}$ X $\leq 1.75\text{mm}$	Peri Golden Brown	Peri Elliptic	Peri Full	Papillose	Stem Scabrous	Bract hyaline	Peri 3.5 - 4mm X 2 - 3mm	Peri green/brown	Peri Round to Obovate	Peri 1/2 full	Not Papillose
Harts Pass															
to-073108-1	large pop 100-150 stems	proposed area for trailhead & stock handling expansion project							x	x	x	x	x	x	x
to-081808-1a	100 + stems	small isolated microsite -- S. side of basin. CAEP3 EO#1. 07 RareCare volunteer suspects more than 1 species.						x	x	x	x	x	x	x	
to-081808-1b	5 to 10 stems widely scattered in habitat	Large contiguous area of suitable "looking" habitat but supports few individuals. CAEP3 EO#1							x	x	x	x	x	x	x
Tiffany Mountain															
tho-072507-01	<10 stems	Tiffany Lake inlet 2007 collections currently at U of W Herarium waiting species verification													
tho-073107-02	<50 stems	S side of Tiffany Lake scattered along the lake shore where spring seeps are. 07 collection currently at UofW Herarium waiting species verification													
tho-073107-05	<10 stems	bench above Tiffany Lake-very small moist site in burned ABLA & PICO stand. 07 collection currently at UofW Herarium waiting species verification													
tho-073107-04	few scattered individuals	Honeymoon Pass. 07 collection currently at UofW Herarium waiting species verification													
lk-080407-20	1 clump	Tiffany Meadows Specimen at MVRD													

Location & Collection Number	Population Size	Population Note	<i>Carex atosquama</i>							<i>Carex heteroneura</i> var. <i>epapillosa</i>						
			Bract Not Hyaline	Peri $\leq 3.5\text{mm}$ X $\leq 1.75\text{mm}$	Peri Golden Brown	Peri Elliptic	Peri Full	Papillose	Stem Scabrous	Bract hyaline	Peri 3.5 - 4mm X 2 - 3mm	Peri green/brown	Peri Round to Obovate	Peri 1/2 full	Not Papillose	Stem Not Scabrous
lk-080307-06	scattered & uncommon	Parachute Meadows -- extra specimen for comparison. Specimen at MVRD. 2005 P.Z. confirmed RareCare specimen from same population as CAEP3.														
lk-080307-05	scattered & uncommon	Parachute Meadows -- extra specimen for comparison. Specimen at MVRD. 2005 P.Z. confirmed RareCare specimen from same population as CAEP3.														
lk-081007-01	scattered & uncommon	Parachute Meadows -- extra specimen for comparison. Specimen at MVRD. 2005 P.Z. confirmed RareCare specimen from same population as CAEP3.														
Horseshoe Basin																
to-082508-1a	3 plants	peri 3.75 x 1.75mm. Voucher culm only.		x	x			x	x	x			x	x		
to-082508-1b	<30 culms	2 specimens in voucher w/ different characteristics. ~300' south of collection 1a		x	x	x	x	?	x	x	x	x	x	x	?	
to-082508-2	<30 culms									x	x	x	x	x	x	
to-082508-3	scattered & uncommon	peri measured are 3mm long x 2mm wide		x	x	x		x		x				x	x	
to-082508-4	<20 culms				x			x		x	x		x	x	x	

Taxonomic Summary of Issues Surrounding *Carex atosquama* and *Carex epapillosa*:

The primary issue that needs to be addressed and rectified is that there are different interpretations of how to separate and identify *Carex atosquama* and *Carex epapillosa* in different references, which becomes a conundrum for field botanists.

1. Different taxonomists appear to use slightly different characteristics to separate *C. atosquama* and *C. epapillosa* which do not always agree with the most recent accepted authority on the subject, the *Flora of North America* (FNA). Unfortunately in the FNA the primary defining difference between the two species in the key is *C. epapillosa* having lower lateral spikes “spreading or pendent” and *C. atosquama* having lower lateral spikes “erect” (see key on page 403 in Volume 23 of FNA). This reference is made with what appears to be a variable and therefore undependable character. Our experience is that this characteristic is variable in the field and cannot be used to separate these two species.

2. Lacking clarity in the leading current authority (as described above), field botanists in the PNW turn to a strategy of comparing the characteristics of these two species as described in the available references, those being the *Field Guide to Intermountain Sedges* (FGIS, published in 1998), *Illustrated Flora of British Columbia* (2001), the *Flora of North America* (2002) and the *Field Guide to Sedges of the Pacific Northwest* (SPNW, 2008). Unfortunately defining characters of the two species vary between the texts. There are a number of discrepancies; we cite just one here. For the length of the perigynium of *C. atosquama*, FNA gives 2.5-3.5 mm, FGIS gives 4-4.5 mm, and SPNW gives 2.5-3.5 mm. Note that the FGIS measurement is completely outside the range of the other two references.

For *C. epapillosa*, FNA offers a perigynium length of 3.5-4, FGIS gives 3-4 mm, and SPNW gives 3.5-4.5 mm. If you compare these measurements, all three books claim that the two species have distinctly different perigynium lengths, but they disagree among themselves as to what these lengths are. Thus the character becomes useless as a defining feature for the field botanist.

In our field work, we found other potentially defining characteristics to be too variable to be definitive. These include peri color, peri shape, degree of inflation of the peri by the achene, and the scabrosity of the stem.

3. A third issue is that we have contradictory species determinations of a given population from a distinct site by different PNW sedge taxonomy experts. Given the discrepancies in taxonomic treatments this is not surprising, but this fact further complicates the challenge as field botanists in defining these two species.

4. One physical feature does emerge from the confusion of taxonomic characters that apparently does stand up to scrutiny and definitively separates *C. atosquama* from *C. epapillosa*, and that is the presence (in the case of *C. atosquama*) or absence (for *C. epapillosa*) of papilosity on the perigynium (the name *epapillosa* of course translates from the Latin as “not papillose”). The confusion for field botanists is that of the texts mentioned above, only FBC uses this character in the key to split the two species. *Flora of North America*, as mentioned previously, uses a comparison of erect versus nodding lower spikelets (a variable trait), FGIS uses peri size and color (which are also variable traits with disagreement among authorities as to peri size), and SPNW uses peri color only (which varies through the season). All four volumes do mention in the species descriptions the presence of papilosity in *C. atosquama* and its absence in *C. epapillosa*.

5. Given that papillosity of the upper (distal portion) of the perigynium is characteristic of *C. atosquama*, and this papillosity is absent from the perigynium of *C. epapillosa*, we suggest that this feature be used in the reference keys henceforth to split the two species, and that this be the feature used by field and herbarium botanists to make their species determination.

6. We have in our Methow Ranger District/Okanogan-Wenatchee National Forest collections specimens that have been vetted as being *C. atosquama* that do not fit the definition described in point 5 above; that is, they do not have papillose perigynia. We suggest it may be necessary to re-evaluate specimens and collections based on the potentially definitive character of papillose perigynia in *C. atosquama* and the absence thereof in *C. epapillosa*. And for taxa experts to come to some agreement on what other characteristics are critical for identification of these two species by field botanists.

7. In *Vascular Plants of the Pacific Northwest*, Part 1, the authors state *Carex atrata* consists of a number of geographical varieties, with two of the four varieties known in North America being in our area (those being var. *atosquama* and var. *erecta*). *Carex atrata* var. *atosquama* is described as occurring mainly in the Canadian Rockies and adjacent northwest Montana, and occasionally to central Idaho. *Carex atrata* var. *atosquama* is also described as being “well marked, but wholly integrated” with *C. atrata* var. *erecta*, which is not known to occur north of Mt. Adams. The description of *C. atrata* var. *erecta* states it is “only obscurely or scarcely papillate-roughened” which doesn’t fit with current taxonomy of the species having no papillosity. Given the authors also suggest *C. atrata* var. *atosquama* is not likely to occur in N. Central Washington and *C. atrata* var. *erecta* is not known north of Mt. Adams. The N. Central Washington populations involved in this study are either a range extension for the species or we are dealing possibly with what the authors are referring to as the “wholly integrated” traits. This may be adding to some of the confusion between the levels of papillosity and other conflicting traits we are seeing in the field.

Relevant quotes:

SPNW pg 25: Scientific names used in this guide follow the *Flora of North America*, except that we treat *C. heteroneura* and what can be called *C. epapillosa* as varieties within *C. heteroneura* because so many Oregon specimens are intermediate between the two taxa....Hey!—there are no rules.

Joe Arnett, 9/08: I would think that with the FNA treatment *C. epapillosa* is the most widely recognized name, which David [Giblin] also recommends.

Therese Ohlson, 9/08: International Plant Names Index: <http://www.ipni.org/index.html> The above website is one Rod [Clausnitzer] sent me and is his justification for not wanting to use *C. epapillosa*. When you search for *C. epapillosa* it comes up as a synonym and shows *C. heteroneura* var *epapillosa* as the accepted name.

Joe Arnett: I tried the search on the IPNI site and got responses for both *C. epapillosa* (referencing Fl. Rocky Mts 1917) and *C. heteroneura* var. *epapillosa* (referencing Rhodora 70:421, 1968). Nowhere did it identify which was the accepted name vs. the synonym. Is there some other part of this web site that presents that decision?

Response from Therese: If you go into the International Plant Names website and I think it is under FAQs there is a qualifier stating it is up the discrepancy of the user on which name they

use. So keeping *C. epapillosa* is not going against any written hard fast rule. I agree with you in keeping with the *C. epapillosa* as it is more widely used i.e. same as Canada uses.

Joe Arnett 9/25/08: David Murray did not have a definitive answer to our question about which name is best to use, so we will have to battle it out locally and make our best collective decision about which name to use for *C. epapillosa* / *C. heteroneura* var. *epapillosa*. I could go either way at this point. In general I think the NW sedge group did a careful job, and I would lean toward trusting their judgment if it is not in violation of ICBN rules [they use *C. heteroneura* var. *epapillosa*]

David Murray did offer to look at specimens for us, when I described the difficulty with *C. epapillosa* and *C. atosquama* from the Pasayten. I suggest we look at those collections at the herbarium at UW, ask Peter Zika to look at a few if he has time, and possibly send a selection to David Murray, whether or not we can arrive at agreement among ourselves.

David Giblin 9/30/08: Another clarification worth mentioning is that there is no governing body determining which name is accepted and which is a synonym. Consulting IPNI for the accepted name is no different than consulting FNA, the Carex Working Group treatment, Illustrated Flora B.C., H&C, Jepson, etc. You get to choose what you want to follow.

Cumulative note from David Murray 9/08: (author of the *Atratae* section of *Carex* in the FNA): Maybe I lacked sufficient specimens from your area and didn't appreciate the complexity there. I assume the Field Guide [to Sedges of the PNW] authors are using var. in the sense of subsp. There is an area of complexity, but there are also huge non-overlapping areas for each species and stacks of specimens that are clearly one or the other. I appreciate that if you are living in the area of overlap and working with equivocal specimens, you tend to see the similarities. I elected to emphasize the differences....

Carex epapillosa is truly without papillae on the beak and 'shoulders' (distal portion) of the perigynia, and the shape of the 'shoulders' tends to be broadly rounded. On the other hand, *C. atosquama* is papillose with sloping 'shoulders'. The pistillate scales in both species tend to be narrower than the perigynia, but in *epapillosa* they are equal in length or longer than the perigynia, whereas in *C. atosquama* the pistillate scales are always shorter. Dave [Murray]

Joe Arnett 10/10/08: On the topic of *Carex* nomenclature, after communicating with David Murray, David Giblin, and Peter Zika, and looking more carefully at the Field Guide to the Sedges of the Pacific Northwest, I decided that the Natural Heritage Program will use *Carex heteroneura* var. *epapillosa* as the name for what we had called *C. epapillosa* (among other things in the past). I think the field guide is well done, and it makes sense to me to conform with a current regional technical work, even if in this case it differs from FNA. In this case it also conforms with USDA PLANTS, not our bottom line reference, but obviously one that is widely referred to. NO doubt *Carex* systematics will continue to change!

Summary Thoughts: After reviewing the specimens collected and revisiting those previously submitted for verification by taxa experts, we field botanists are unable to definitively identify these species. We are making arrangements for Joy Mastrogiuseppe and members of the Carex Working Group (Peter Zika, Barbara Wilson, Bruce Newhouse, and Fred Weinmann) review these specimens. After their review, they should provide field botanists with a better set of criteria to use in the field for identification of these questionable *Carex* in our area.

After the specimen identifications have been verified, the Forest Service Regional Office, Forest, and District Botanists need to work with the Washington Natural Heritage Program staff to determine the future status of these species. The nomenclature used has varied over recent years between and within agencies. The Washington Natural Heritage Program staff has recently decided to use *Carex heteroneura* var. *epapillosa* for what was previously referred to as *C. epapillosa* and *C. heteroneura* by the Regional Office (see Arnett dialog below dated 10/10/08). Given the small geographical area where these species are found and the small number of individuals associated with each site, along with the fact nearly every site documented experiences some level of stock use, re-instating a Sensitive status should be considered. In addition, the habitat for these species is moisture dependent and could potentially experience habitat loss due to warming climates, further increasing the need to reconsider a Sensitive status.

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2008 Carex Project Area

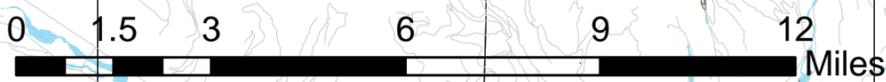
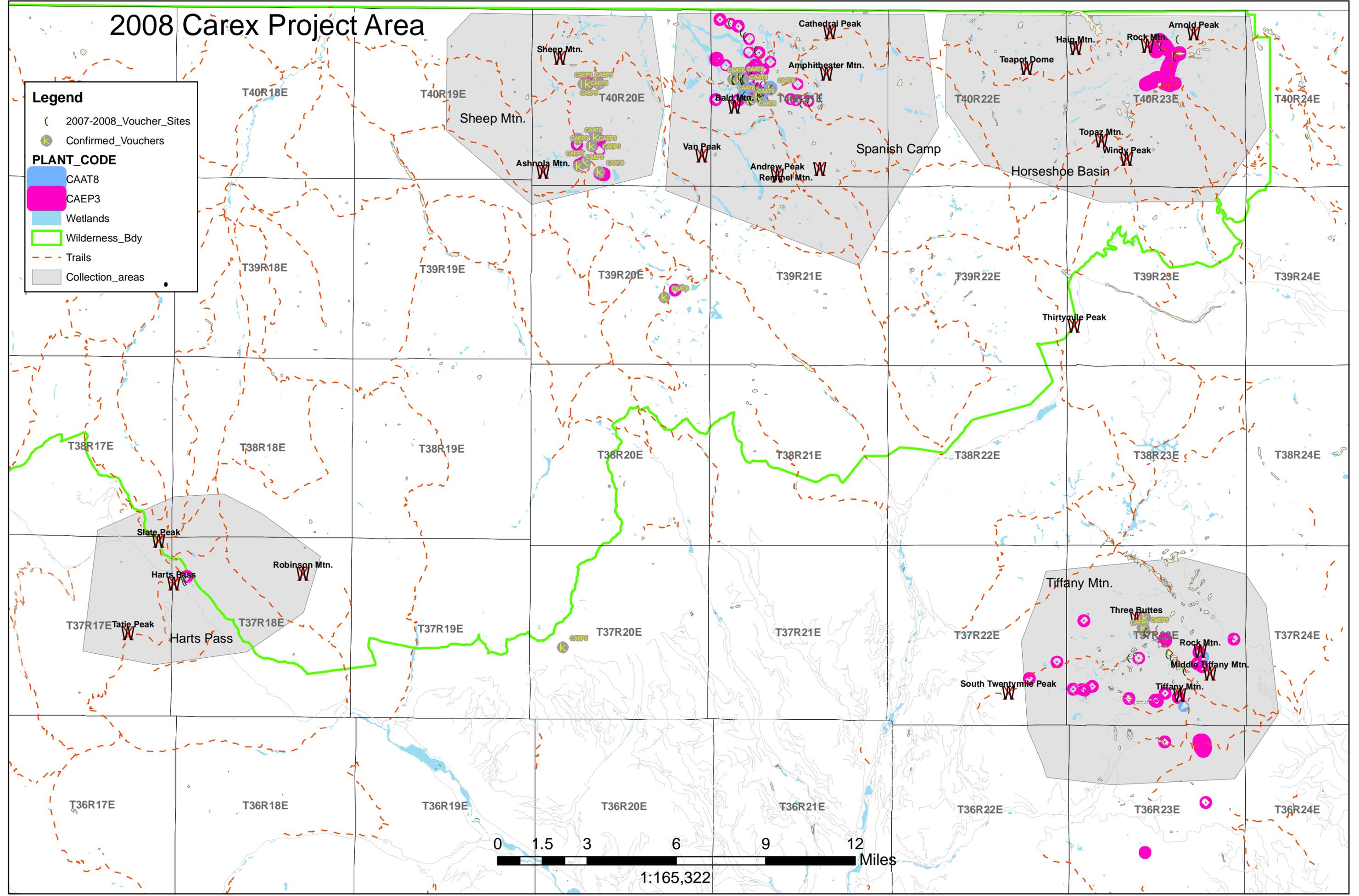
Legend

- () 2007-2008_Voucher_Sites
- (●) Confirmed_Vouchers

PLANT_CODE

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- CAEP3

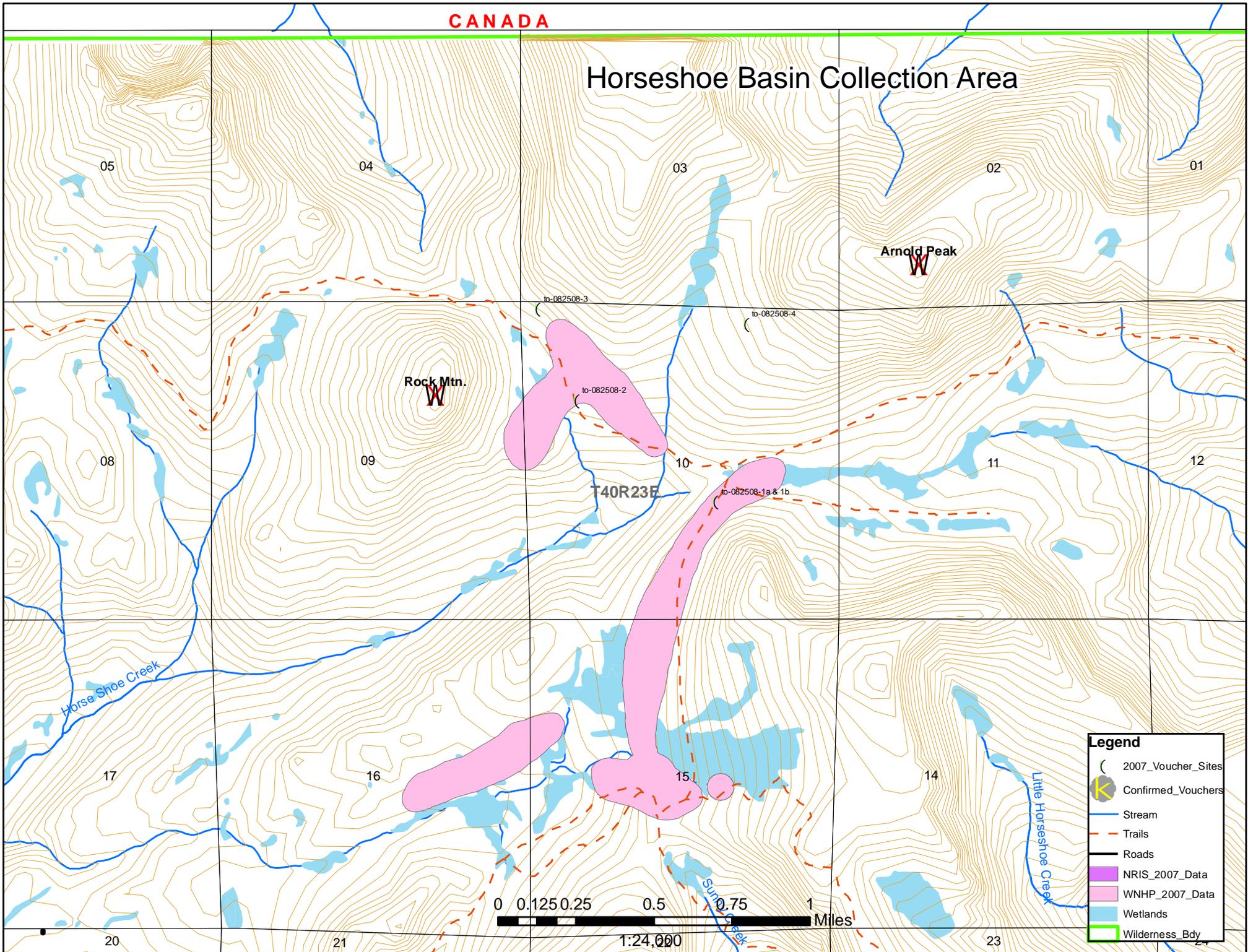
- Wetlands
- Wilderness_Bdy
- Trails
- Collection_areas



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CANADA

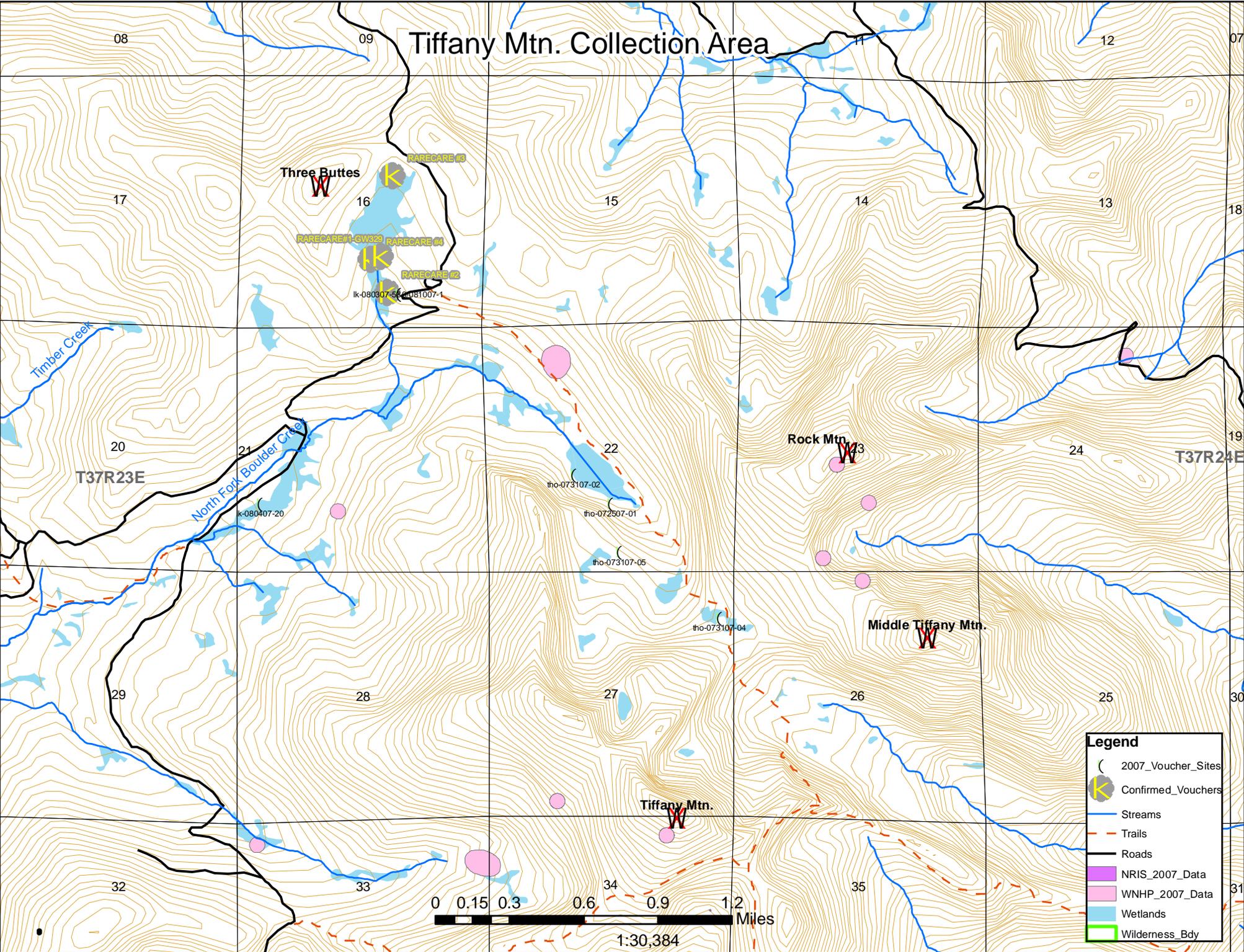
Horseshoe Basin Collection Area



Legend

- () 2007_Voucher_Sites
- (K) Confirmed_Vouchers
- Stream
- Trails
- Roads
- NRIS_2007_Data
- WNHP_2007_Data
- Wetlands
- Wilderness_Bdy

Tiffany Mtn. Collection Area

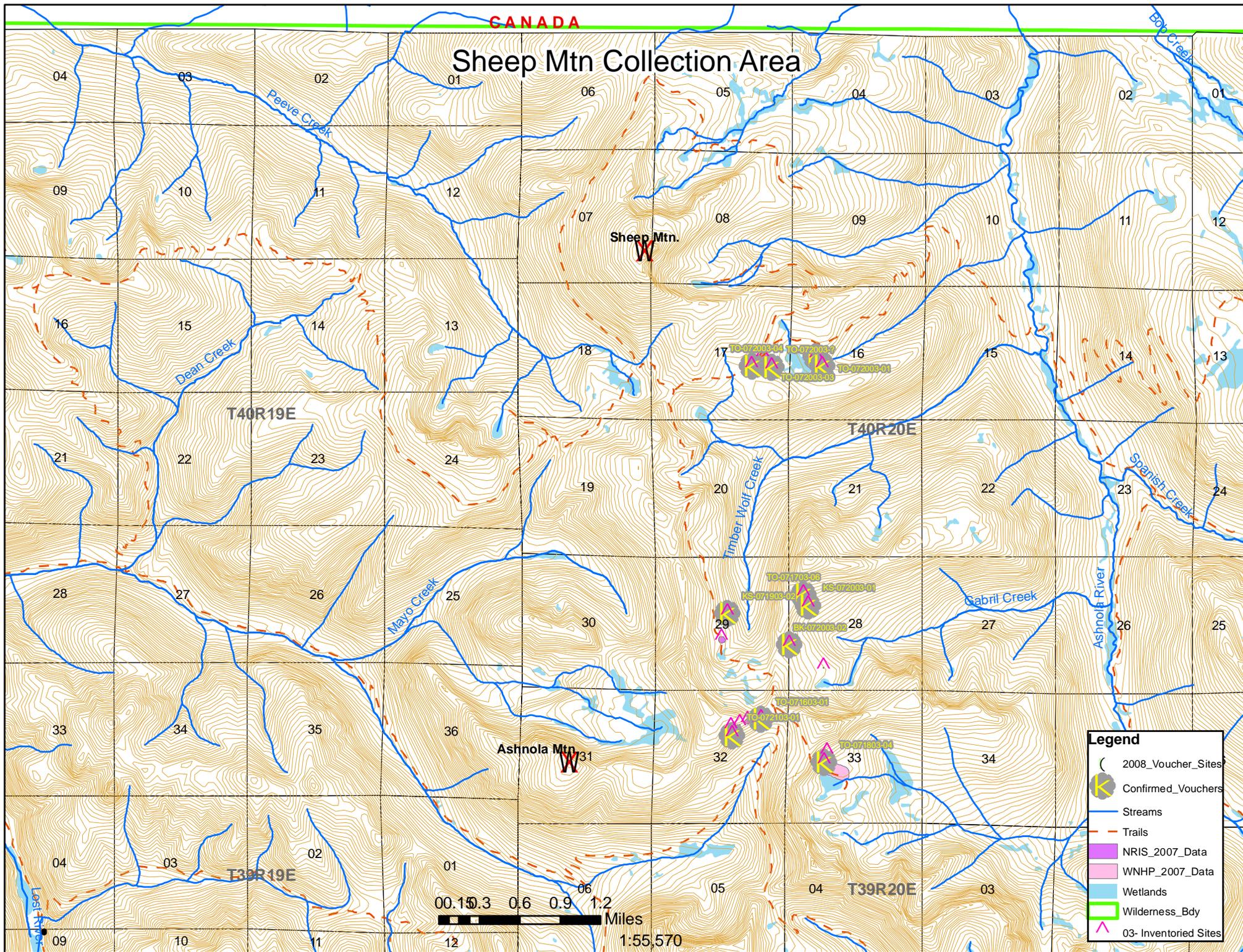


Legend

- () 2007_Voucher_Sites
- (K) Confirmed_Vouchers
- Streams
- Trails
- Roads
- NRIS_2007_Data
- WNHP_2007_Data
- Wetlands
- Wilderness_Bdy

CANADA

Sheep Mtn Collection Area

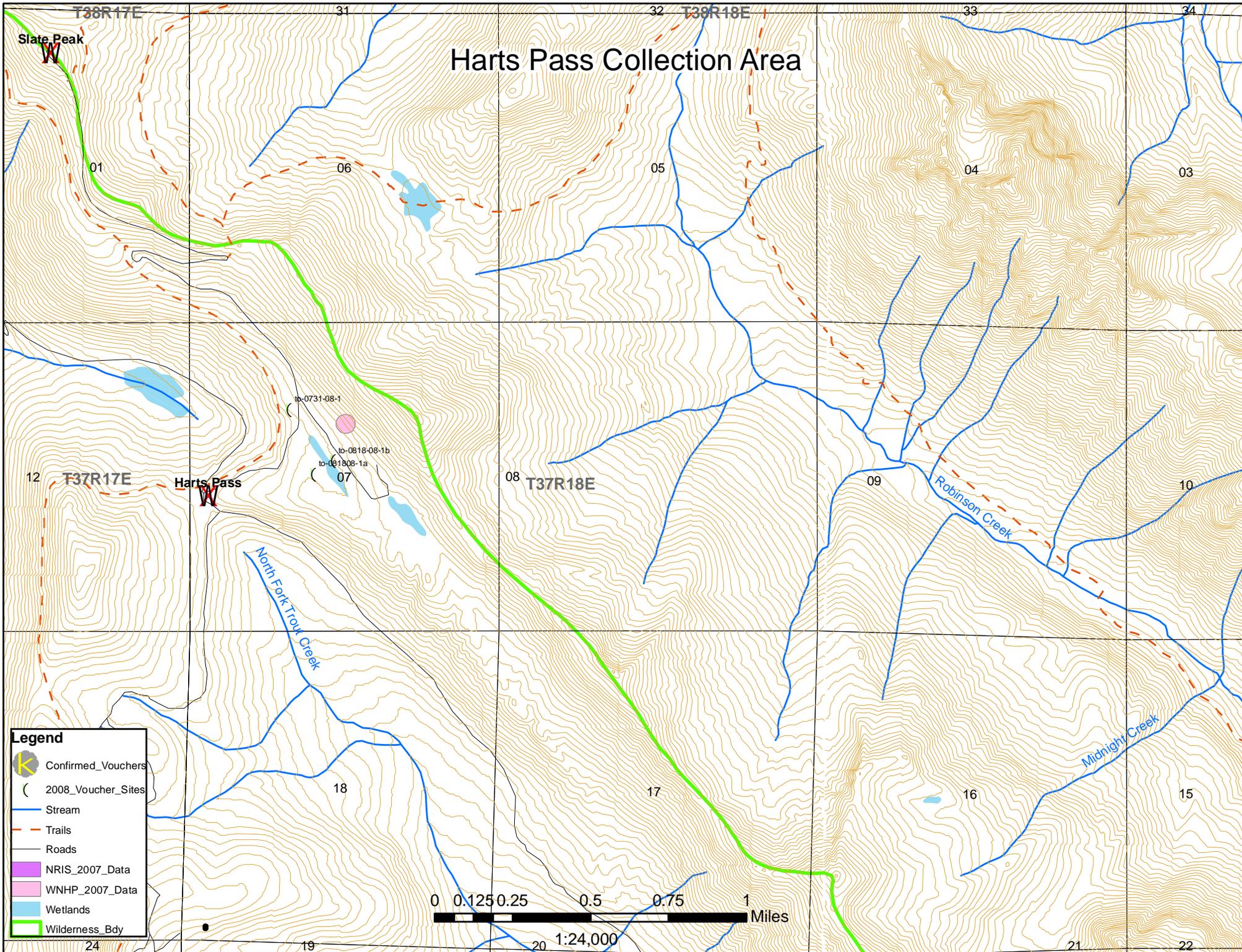


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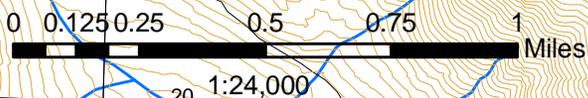
- () 2008_Voucher_Sites
- (K) Confirmed_Vouchers
- Streams
- - - Trails
- NRIS_2007_Data
- WNHP_2007_Data
- Wetlands
- Wilderness_Bdy
- 03- Inventoried Sites

00.15.3 0.6 0.9 1.2 Miles
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Harts Pass Collection Area

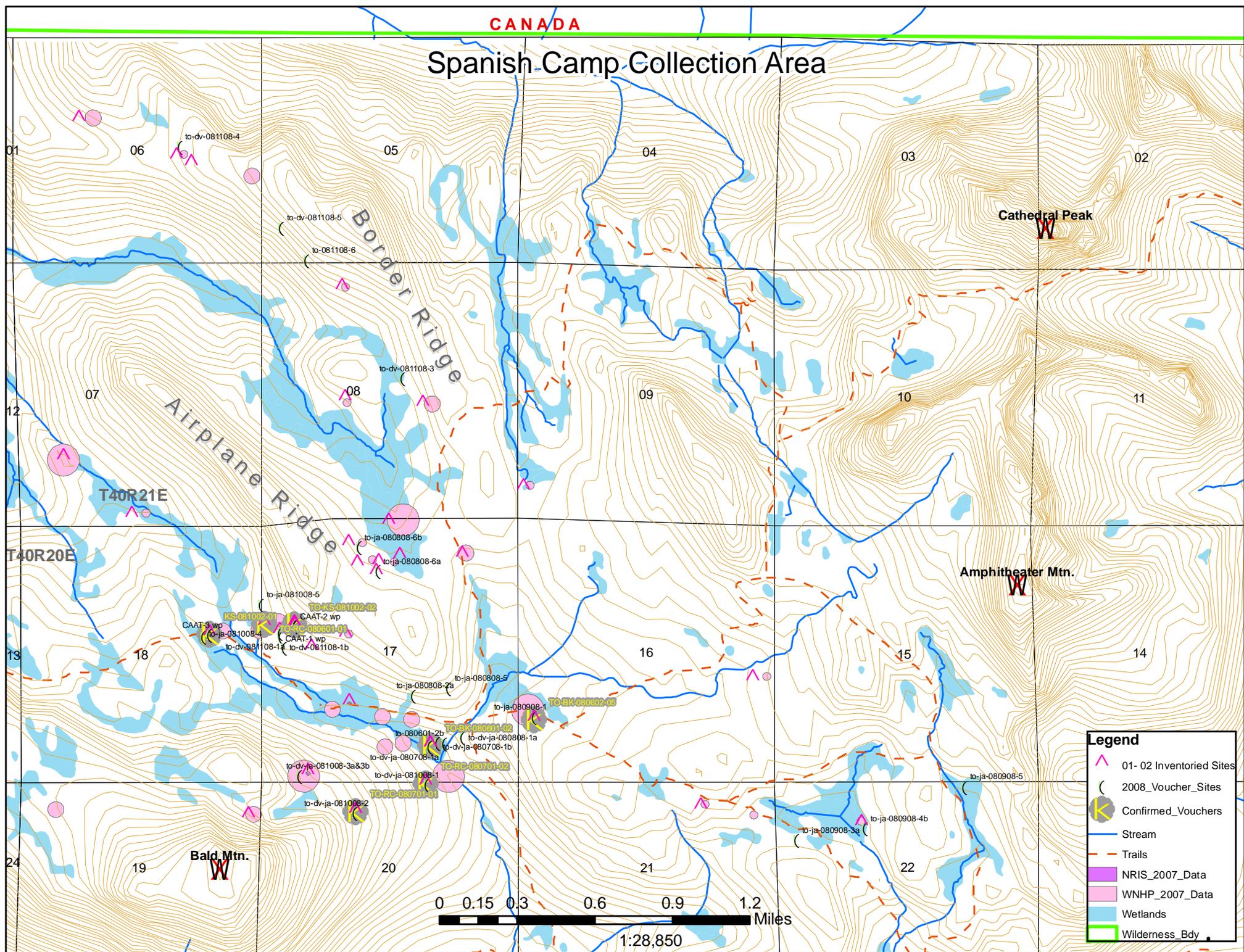


- Legend**
- Confirmed_Vouchers
 - 2008_Voucher_Sites
 - Stream
 - Trails
 - Roads
 - NRIS_2007_Data
 - WNHP_2007_Data
 - Wetlands
 - Wilderness_Bdy



CANADA

Spanish Camp Collection Area



Legend

- 01- 02 Inventoried Sites
- 2008_Voucher_Sites
- Confirmed_Vouchers
- Stream
- Trails
- NRIS_2007_Data
- WNHP_2007_Data
- Wetlands
- Wilderness_Bdy

