

## SYMPATRY IN *TIARELLA* (SAXIFRAGACEAE) IN NORTH CAROLINA

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### ABSTRACT

*Tiarella cordifolia* (without stolons) and *T. australis* (stoloniferous) are sympatric in western McDowell Co., North Carolina, where populations occur in close proximity and overlap in distribution — a map of the area shows sampled localities. Elsewhere, the two species are allopatric. *Tiarella austrina* and *T. stolonifera* appear to have a geographic discontinuity near the Buncombe-Yancey county border, but further study is needed to clarify their distribution and interaction.

Five species of *Tiarella* (Saxifragaceae) have been recognized in the eastern USA (Nesom 2021). The taxa are mostly allopatric but range overlap occurs between some (Fig. 1) — this was documented with field study between *T. austrina-nautila* and *T. nautila-wherryi* and was mapped between *T. wherryi-stolonifera* on the basis of herbarium collections. In the region where *T. cordifolia*, *T. austrina*, and *T. stolonifera* are in close proximity, herbarium collections suggest that they are parapatric — this hypothesis was tested with more detailed mapping and with field study and collections from west-central North Carolina in April 2024 (Table 1).

### *Tiarella austrina* and *Tiarella cordifolia*

*Tiarella austrina* and *T. cordifolia* are allopatric except in western McDowell County, where populations of the two species occur in close proximity (Figs. 2, 3). *Tiarella austrina* has stolons and stem leaves (bracts), while *T. cordifolia* has neither, and the distinction is made primarily on this basis.

In western McDowell County there appears to be no distinction between *Tiarella austrina* and *T. cordifolia* in habitat or phenology. Both characteristically occur there on terraces immediately adjacent to creeks and rivers and on moist slopes or slope bases near the bottom of drainage areas (see comments below regarding plants of the Craggy Gardens area). *Rhododendron maximum* is almost always a conspicuous feature of associated vegetation. In late April, both species are in full flower.

Populations in the area of sympatry of *Tiarella austrina* and *T. cordifolia* are consistent in the production or non-production of stolons, but stem leaves in the stoloniferous populations are produced inconsistently and vary in size, from relatively large (half leaf-sized) to tiny bracts, or they are absent in some individuals. The possibility of introgression probably requires molecular evidence. *Tiarella cordifolia* has not been observed immediately to the west in Buncombe County (Fig. 4).

### *Tiarella austrina* and *Tiarella stolonifera*

The distinction between *Tiarella austrina* and *T. stolonifera*, both of which produce stolons, is harder to discern. Stem leaves apparently are never produced over the geographical range of *T. stolonifera*, at least north of central North Carolina, but they are consistent features in plants of *T. austrina*, although populational variation in the latter occurs even in the central part of its range (Fig. 1), where some individuals may lack stem leaves. Distinctions in leaf shape (Nesom 2021) are somewhat variable but the longer sepals of *T. stolonifera* (2.5–3.5 mm vs. 1.5–2 mm) appear to be diagnostic.

- a. Leaf lobes usually obtuse to rounded, terminal not prominently extended ..... ***Tiarella stolonifera***
- a. Leaf lobes usually acute-acuminate, terminal prominently extended ..... ***Tiarella austrina***

Extension of stolons, and apparently sometimes their initiation, occurs mostly after flowering, and early-flowering plants often have only remnants of the previous year's stolons. Field collections sometimes are made of a plant seemingly without stolons but taken from a stoloniferous population. Oliver and Oliver (2006) suggested that the time of stolon initiation is variable in cultivars and perhaps a heritable feature. They also noted that one cultivar (Running Tiger) produces stolons in the second year and implied that the number of stolons and stolon length vary among cultivars.

There appears to be a discontinuity in the distribution of *Tiareella austrina* and *T. stolonifera* near the Buncombe-Yancey county border (parapatric? at Mt. Mitchell in Yancey Co.), but *austrina*-like plants occur northward (Roan Mt., North Toe River, Grandfather Mt.) (Fig. 2) and further field work and populational study is needed to clarify the interaction of these two species.

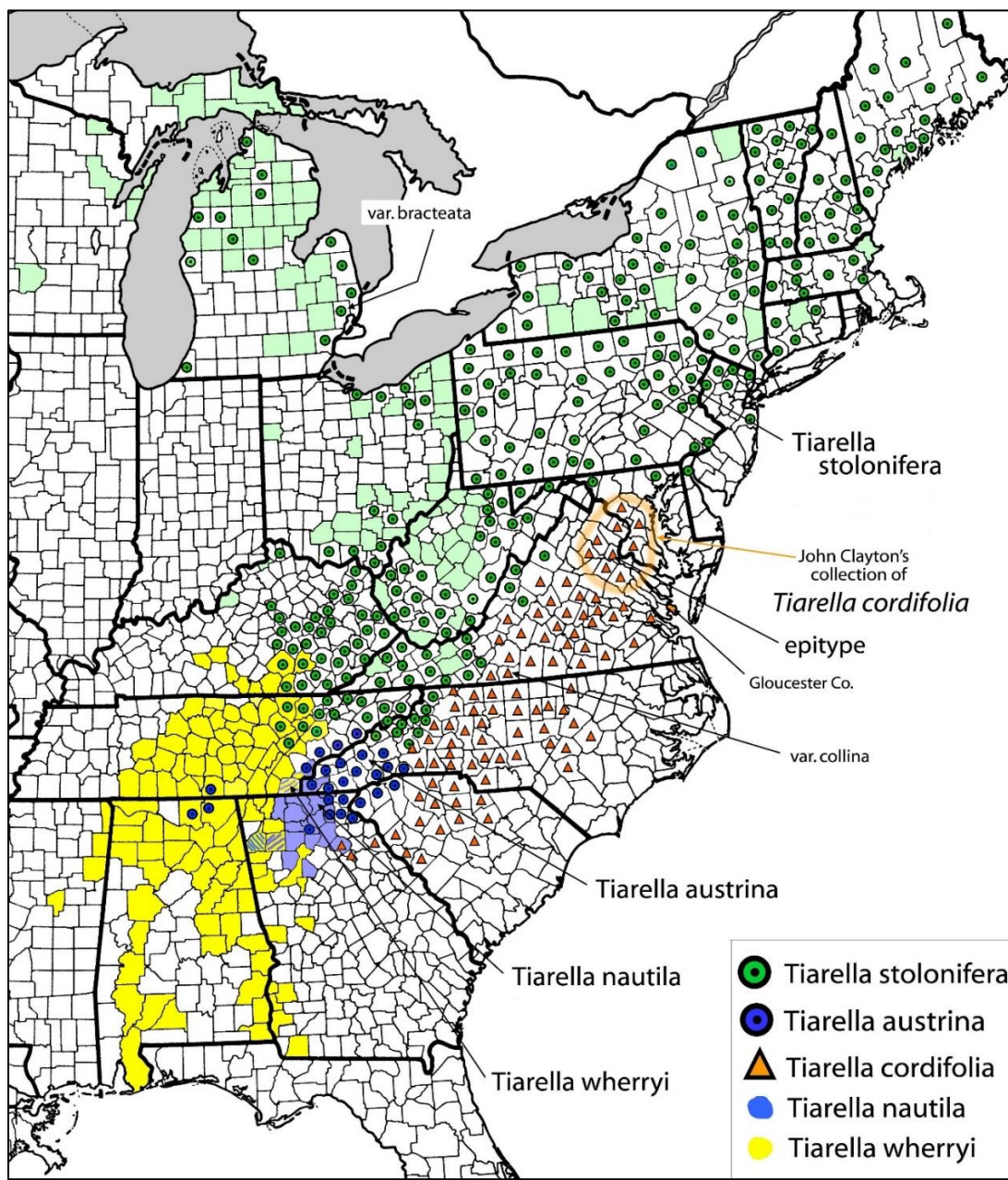


Figure 1. Distribution of *Tiareella* species in the eastern USA, with pointers to type localities. Slightly modified from Nesom (2021, Fig. 4).

Plants in the area of Craggy Gardens along and just off the Blue Ridge Parkway at elevations of 5500-5600 feet, identified here as *Tiareella austrina*, are later in phenology than those of surrounding populations. On 27 April (2024), trees there had not yet begun to produce leaves, but 500 feet below, trees were in leaf and flowering was conspicuous in many herbaceous species (e.g., *Sanguinaria*, *Smilacina*, *Tiareella*, *Trillium* spp.) that were not in flower above. **Buncombe Co.:** Craggy Gardens, mtn side, rich damp woods, 11 Jun 1938 [flower/fruit, stolons, stem leaves], *Caughey 211* (DUKE, ECU); BR Pkwy along trail between Bearpen Gap and Pinnacle Gap, heath bald, 5200 ft, 31 May 1992 [full flower, stolons, stem leaves], *Danley 5034* (WCUH); near summit of Craggy Pinnacle, heath bald, 29 Jun 1958 [fruit, stolons, no stem leaves], *Ramseur 4793* (NCU). A collection from northwest of Craggy Gardens along the Blue Ridge Parkway, also was made at a high elevation and unusually dry habitat for the species: Craggy Dome, W slope near summit, shrub bald, [ca. 6050 ft], 10 Jul 1956 [past fruit, stolons, no stem leaves], *Ramseur 854* (NCU). A collection from slightly north of Craggy Gardens and Craggy Dome but at ca. 4400 ft (near Waterfall Creek, 18 Jun 1974 [fruit], *Boufford 14473*, NCU) also has stolons but no stem leaves. Lack of stem leaves in some of these plants is interpreted here as populational variation.

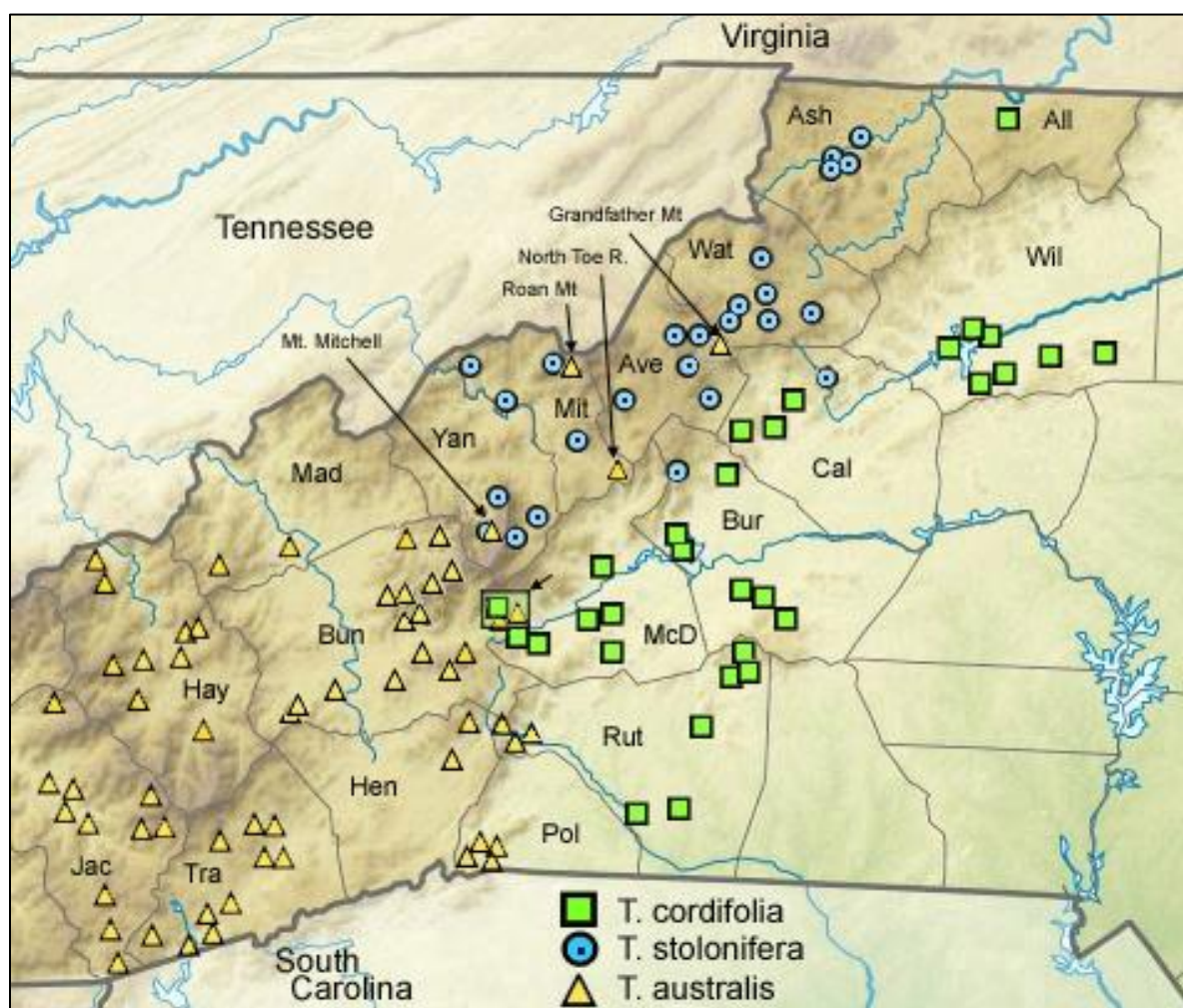


Figure 2. Distribution of *Tiareella cordifolia*, *T. austrina*, and *T. stolonifera* where their ranges meet in west-central North Carolina. *Tiareella austrina* and *T. cordifolia* apparently are sympatric only in western McDowell County (box with arrow pointer, see detail in Fig. 3). Both species occur in Burke and Caldwell counties — the few available collections suggest they are not sympatric there but field work is needed. Collections of *T. austrina* within the range of *T. stolonifera* are uncommon (Mitchell and Watauga cos., see Table 2) but indicate that distributions in this area need further study. Map points are from herbarium records via SERNEC, from US, and from personal collections (to NCU).



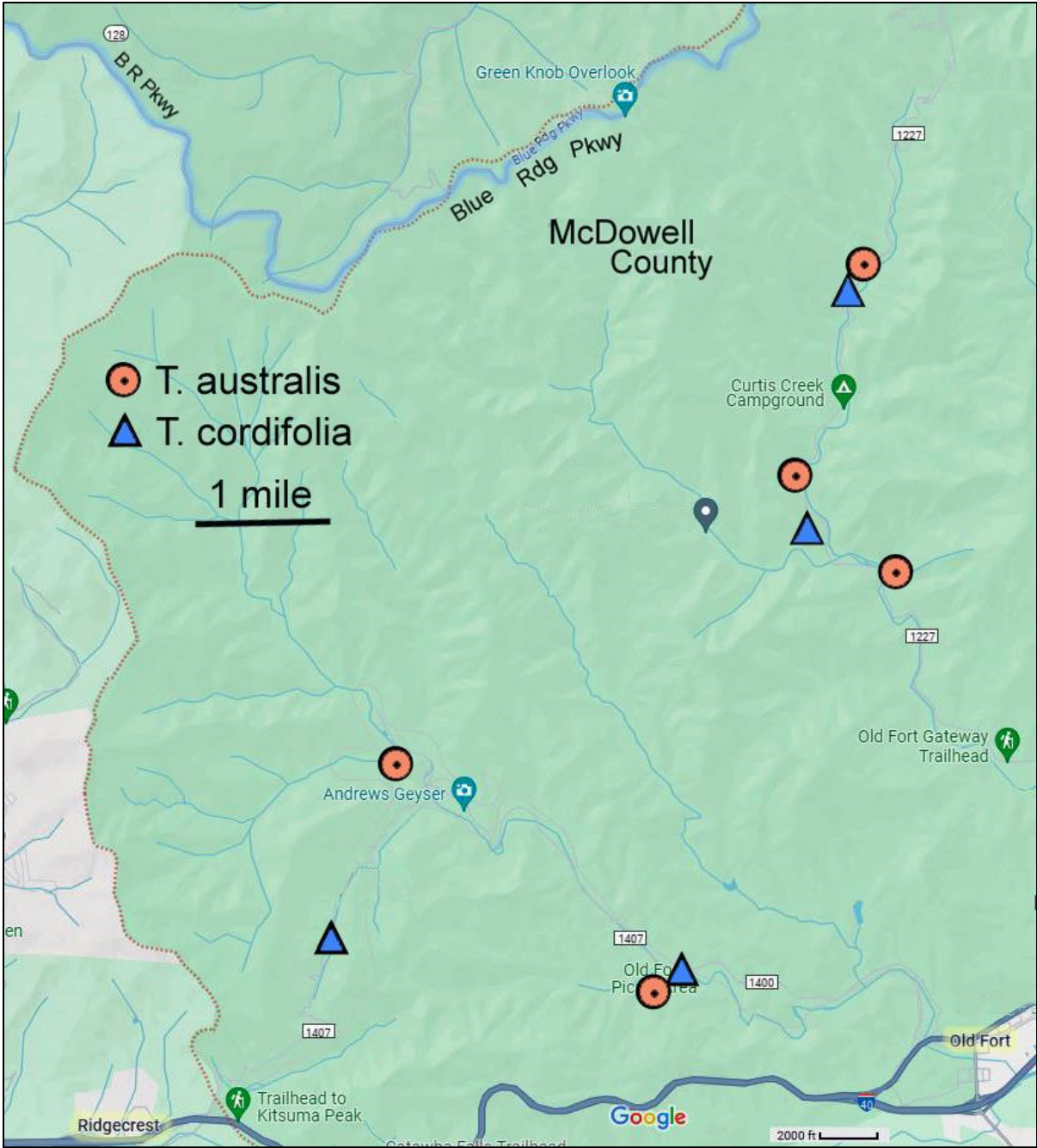


Figure 3. Distribution of *Tiarella australis* (stolons) and *T. cordifolia* (without stolons) in western McDowell County.

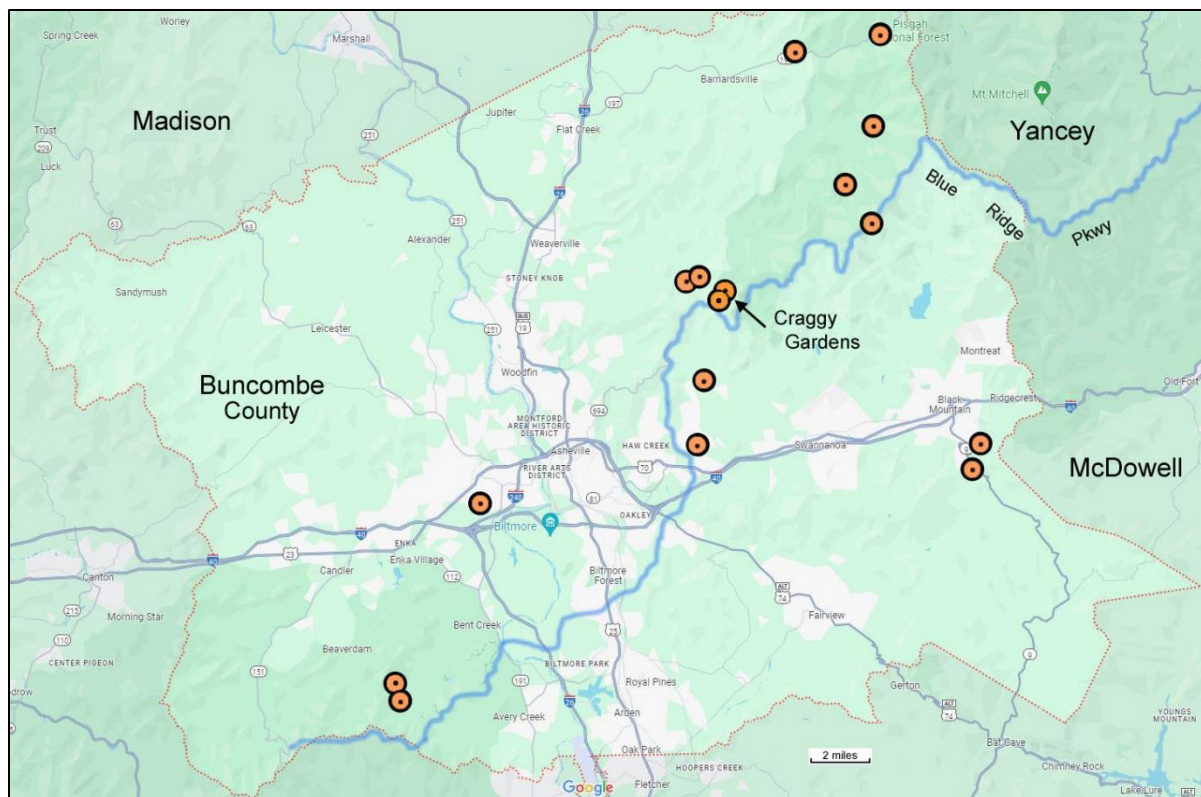


Figure 4. Distribution of *Tiareella* in Buncombe County — all identified here as *T. australis*. See text for comments regarding plants from the Craggy Gardens area.

#### ACKNOWLEDGEMENTS

The April field trip and study were made in the company of enthusiastically observant daughter Genevieve.

#### LITERATURE CITED

- Nesom, G.L. 2021. Taxonomy of *Tiareella* (Saxifragaceae) in the eastern USA. *Phytoneuron* 2021-31: 1–61.
- Oliver, C. and M. Oliver. 2006. *Heuchera, Tiarella, and Heucherella: A Gardeners Guide*. B.T. Batsford Ltd., London.

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 Table 1. Collections of *Tiareella austrina* and *T. cordifolia* from western McDowell Co., North Carolina, 26-27 April 2024.

##### **T2024-3 *Tiareella australis***

McDowell Co.: Curtis Creek Rd (Hwy 1227) along Curtis Creek at confluence with Tantrough Branch, E of jct with Newberry Creek Rd, 35.6738033, -82.1920054, ca. 3 mi N of jct with Hwy 70 NE of Old Fort, steep roadside bank above creek on S side of road, area of *Rhododendron*, 1640 feet, uncommon, stolons and stem leaves consistently present, 26 April 2024, *Guy Nesom T2024-3* with Genevieve Nesom

##### **T2024-4 *Tiareella cordifolia***

McDowell Co.: Curtis Creek Rd (Hwy 1227) along Curtis Creek, 0.2 mi N of jct with Newberry Creek Rd, ca. 4 mi N of jct with Hwy 70 NE of Old Fort, steep roadbank and terrace along creek, *Rhododendron*, *Adiantum*, *Smilacina*, *Viburnum*, 1730 feet, scattered but common, consistently without stolons or stem leaves, 26 April 2024, *Guy Nesom T2024-4* with Genevieve Nesom

**T2024-5 *Tiarella australis***

McDowell Co.: Curtis Creek Rd (Hwy 1227) along Curtis Creek, ca. 0.5 mi N of jct with Newberry Creek Rd, 0.5 mi S of Curtis Creek Campground, ca. 4 mi N of jct with Hwy 70 NE of Old Fort, steep bank along road, *Rhododendron*, *Viburnum*, ca. 1750 feet, a few small colonies, stolons and stem leaves consistently present, 26 April 2024, *Guy Nesom T2024-5* with Genevieve Nesom

**T2024-6 *Tiarella cordifolia***

McDowell Co.: Curtis Creek Rd (Hwy 1227) along Curtis Creek, 0.6 mi N of Curtis Creek Campground, 35.696656, -82.197237, ca. 4 mi N of jct with Hwy 70 NE of Old Fort, steep roadside bank with dense *Rhododendron*, 3470 feet, scattered but abundant, without stolons and stem leaves, 26 April 2024, *Guy Nesom T2024-6* with Genevieve Nesom

**T2024-7 *Tiarella australis***

McDowell Co.: Curtis Creek Rd (Hwy 1227) along Curtis Creek, 0.7 mi N of Curtis Creek Campground, W side of Curtis Creek just N of bridge crossing, 35.698789, -82.196769, ca. 4 mi N of jct with Hwy 70 NE of Old Fort, steep banks in area of *Rhododendron*, 2100 feet, common but scattered, stolons and stem leaves consistently present, 26 April 2024, *Guy Nesom T2024-7* with Genevieve Nesom

**T2024-8 *Tiarella cordifolia***

McDowell Co.: Mill Creek Road (Hwy 1407) at Bernard Mountain trailhead, W side of Long Branch, 35.639315, -82.257663, ca. 2 road mi NE of jct with Hwy 70 just E of Ridgecrest, terrace of creek, with *Rhododendron*, *Chamaelirium*, *Sanguinaria*, *Smilacina*, *Trillium*, *Clintonia*, *Geranium*, 2300 feet, scattered but very abundant, no stolons, stem leaves rare, 27 April 2024, *Guy Nesom T2024-8* with Genevieve Nesom

**T2024-9 *Tiarella australis***

McDowell Co.: Paris Creek Road, 0.2 mi W of jct with Graphite Road near Brookside Missionary Baptist Church, just N of jct with Mill Creek Road at a hairpin bend, 35.655956, -82.249509, ca. 3.5 road mi NE of jct with Hwy 70 just E of Ridgecrest, terrace of Paris Creek, *Rhododendron*, *Lindera*, *Polystichum*, *Sanguinaria*, *Urtica*, *Geranium*, 1900 feet, abundant, stolons consistently present, stem leaves on some but not all, many plants not in flower, 27 April 2024, *Guy Nesom T2024-9* with Genevieve Nesom

**T2024-10 *Tiarella australis***

McDowell Co.: 50 ft E of jct of Mill Creek Rd (Hwy 1407) and Old US Hwy 70W (Hwy 1400) and entrance to Old Fort Picnic Area, ca. 2.5 mi WNW of Old Fort, steep roadside bank of Hwy 1400, *Rhododendron*, 1600 feet, few plants, stolons and stem leaves present, 27 April 2024, *Guy Nesom T2024-10* with Genevieve Nesom

**T2024-11 *Tiarella cordifolia***

McDowell Co.: Old Fort Picnic Area, just S of the jct of Mill Creek Rd (Hwy 1407) and Hwy 1400, ca. 2.5 mi WNW of Old Fort off Mill Creek Road, base of dense *Rhododendron* slopes around edges of picnic area and along the terraces of Swannanoa Creek and a small tributary, 1750 feet, scattered but abundant, consistently without stolons, stem leaves rarely produced, 27 April 2024, *Guy Nesom T2024-11* with Genevieve Nesom

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Table 2. Collections of *Tiarella* aff. *austrina* (stolons and stem leaves present) from Mitchell, Watauga, and Yancey cos., North Carolina (mapped in Fig. 2).

**Mitchell Co.**

North Toe River, 6 May [no year given], *Ashe s.n.* (NCU); Roan Mt., 6000 ft, 1 Aug 1880, *Chickering s.n.* (US); Roan Mt., 1900 m, 8 Aug 1892, *Merriam s.n.* (US).

**Watauga [as on the label] Co.**

Grandfather Mt., 16 Jun 1891, *Small & Heller 248* (US).

**Yancey Co.**

1.2 mi N of Pensacola on NC 197, wooded slope, 27 Apr 1958, *Ahles 39146* (NCU).