

**Survey for *Stephanomeria fluminea* on the
Bridger-Teton National Forest**

Prepared for the Bridger-Teton National Forest and the Region 4 Forest Service Office



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Abstract

Stephanomeria fluminea is a recently-described plant species endemic to northwest Wyoming, found in stream beds and on terraces of large creeks and rivers flowing from the Gros Ventre and Absaroka ranges. A survey was conducted to determine the distribution and abundance of this species on the Bridger-Teton National Forest (BTNF). Seven drainages and three tributaries were examined, and plants were found in all but one of these. A total of 7580 plants was observed, representing a rough count of the number of plants occurring on the BTNF. The survey documents an increase of 62% over the previously known number of individuals, determined through an inventory conducted in Grand Teton National Park, and provides a rough estimate of the distribution upstream from the Park. The largest single population occurs partly within the Park and partly within the BTNF, with a large percentage of the plants occurring on the BTNF.

Although these surveys have provided baseline data concerning numbers and locations of populations, additional studies are still needed to assess the biological requirements and long term viability of the species.

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Introduction

Stephanomeria fluminea is a recently-described plant species endemic to northwest Wyoming. While the species had been collected numerous times in the past, the specimens had always been assigned to an existing species or not identified at all. Examination of collections, and observations in the field by Gottlieb (1999) disclosed morphological and ecological differences between this entity and all other known species in the genus. These plants most closely resemble *S. tenuifolia*, but have notably broader leaves, and occur in a very different kind of environment. While *S. tenuifolia* grows on cliffs, ledges, and rocky outcrops, *S. fluminea* grows in the beds of large creeks and rivers. Based on the morphological character and unique habitat preference, Gottlieb described it as a new species (Appendix A).

The narrow range and habitat specificity of this plant quickly raised questions concerning the long-term viability of the species. In 2001, a survey was undertaken to determine its abundance and distribution in Grand Teton National Park (GTNP) (Markow, 2001). The study disclosed that the plant was abundant in the Park (over twelve thousand plants were observed in six drainages). It also elucidated the range of environmental conditions that the plants occur under, and identified potential threats to their well-being.

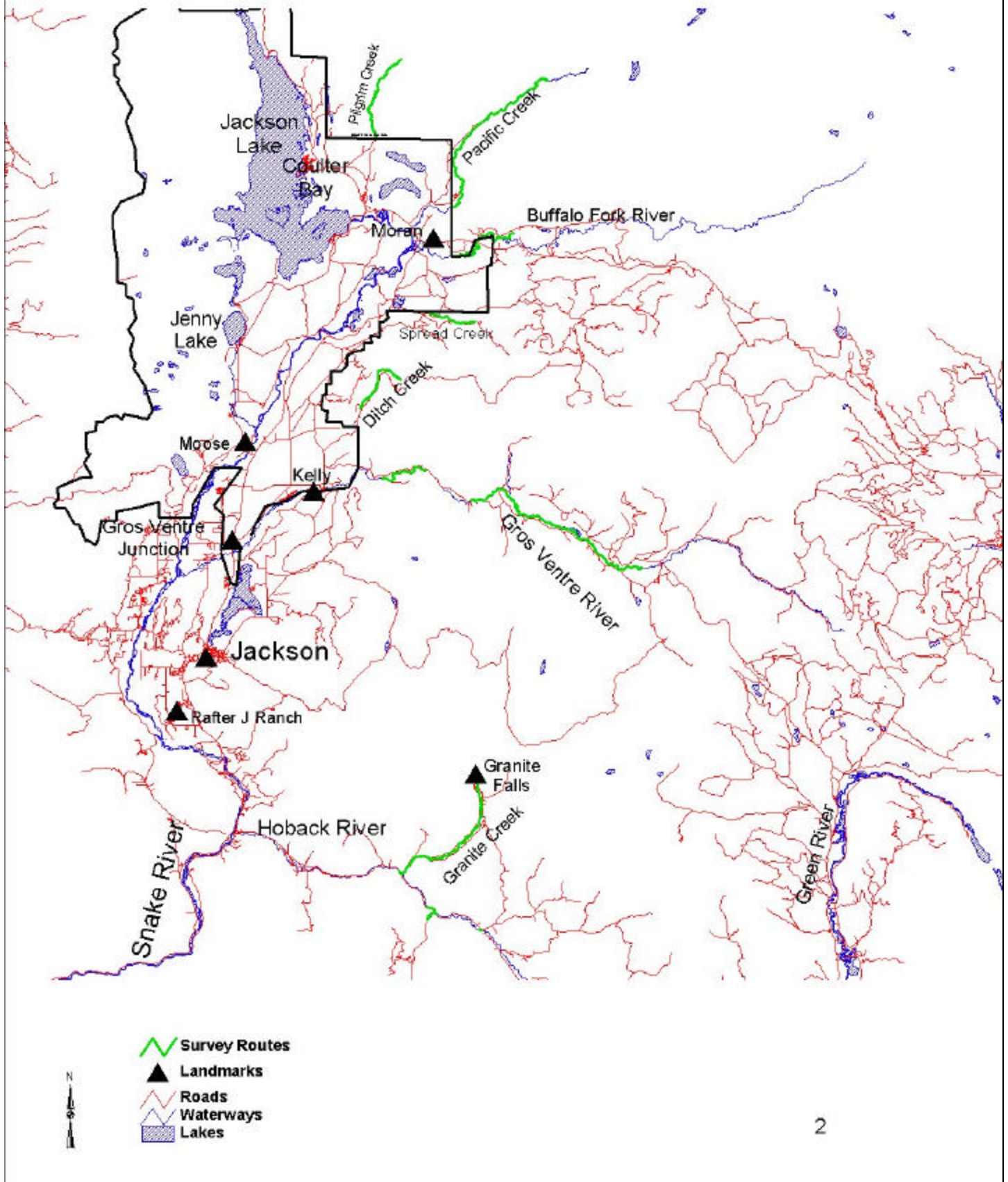
A serious shortcoming (necessitated by time and funding constraints) of the study was the limited area examined. The survey was restricted to the artificial boundaries of GTNP, even though it was quite clear that the populations extended well to the outside. While the survey provided a good understanding of the species representation within the Park, it left serious gaps in our understanding of the total range of occurrence.

In 2003, a follow-up survey was conducted to provide an understanding of distribution and abundance on the Bridger-Teton National Forest (BTNF). Essentially, the survey picked up where the previous survey left off, at the boundary between GTNP and the BTNF. Additional drainages that appeared to have suitable habitat were also examined. Objectives guiding the survey were:

1. Survey appropriate habitats throughout the BTNF for the presence of *Stephanomeria fluminea*.
2. Document location, distribution, ecological parameters, population size, and potential threats for each site located.

Table 1 identifies the drainages examined, and Figure 1 displays those drainages within the survey area. More detailed maps and the locations of populations observed are provided in Appendix 2.

Figure 1.
Survey routes for *Stephanomeria fluminea* on the BTNF



Methods

Systematic survey procedures were essentially the same as those described by Markow (2001), with some modification as circumstances demanded. From 20 July to 26 July, and from 15 August to 28 August, 2003, each of the drainages (Table 1) was surveyed by walking within the streambed, upstream from the GTNP/BTNF boundary, to a point that appeared from printed copies of digital orthophotographs (Wyoming Geographic Information Science Center 1994) and/or actual reconnaissance where the surroundings no longer provided suitable habitat. The other side of the creek was surveyed on the return trip. Those streambeds that were too wide to be surveyed in a linear fashion were criss-crossed to insure good visual coverage.

Survey of the Hoback River and Granite Creek was performed in a somewhat different manner. Potential habitat within these drainages is widely spaced and, in most cases, can be identified from the adjacent road. Thus, only those sites that appeared from the road to provide suitable conditions were examined. To a lesser extent, the Gros Ventre River was surveyed in a similar manner.

Approximately 51 miles of streambed were examined along the 10 drainages and their tributaries, as displayed in Figure 1. Information recorded within each drainage included locations of populations, elevation range, habitat conditions, number of individuals present, and perceived threats (if any). Voucher specimens (Appendix C) representing significant distribution records or unusual habitats were collected and deposited in the Rocky Mountain Herbarium. Locations of all sub-populations encountered were mapped (Appendix B) on U. S. G. S. quad maps (1:24000), and GPS coordinates (Appendix D) were recorded for use in accurate mapping of these coordinates.

Results

These surveys disclosed the presence of 7580 individuals occurring in the survey area. The number of individuals occurring in each population and within each drainage are provided in Table 1. Additional information concerning each drainage is provided in Appendix B.

The most extensive series of subpopulations was found on the Gros Ventre River. These occur from the GTNP boundary above Kelly to the confluence with Cottonwood Creek, a distance of approximately 12 miles. However, the largest number of individuals (6853) was found on Spread Creek, in a discontinuous population between the Park boundary and Rock Creek (Figure 13). No plants were found on Ditch Creek, Granite Creek, or the Hoback River.

Table 1: Drainages surveyed for *Stephanomeria fluminea*

Drainage	Miles surveyed	Number of plants recorded
Blackrock Creek *	2	218
Buffalo Fork River	6	24
Ditch Creek	5	0
Granite Creek	10	0
Gros Ventre River *	12	140
Hoback River	1	0
Lava Creek *	insignificant	19
Pacific Creek/Whetstone Creek *	8	291
Pilgrim Creek	4	54
Spread Creek	3	6853
TOTAL	51	7580

* Indicates drainage in which specimens were collected (Appendix C).

Discussion

Abundance and distribution

This survey has provided increased understanding of the abundance and distribution of *Stephanomeria fluminea* on the BTNF, having greatly increased the known range of the species within some of the drainages. Similarly, it has slightly modified our understanding of the preferred environmental conditions as we currently understand them.

Some of the more significant discoveries are populations within drainages in which the species was not previously known to occur. Such populations were documented for Whetstone Creek, Blackrock Creek, and Lava Creek, all of which are tributaries of larger watercourses that were intensively surveyed. Time constraints prevented a more thorough investigation of these drainages, but it seems likely that there are more plants occurring within them than were actually observed.

There are many additional sites of potential habitat that were not surveyed. Islands and gravel bars on the opposite sides of the streams being surveyed were often inaccessible where the water was too deep to safely wade across. This situation occurred on the Gros Ventre River, Buffalo Fork River and, in some cases, Pacific Creek. Also, many areas adjacent to the streams surveyed are privately owned. A large portion of shoreline along the Gros Ventre River, Buffalo Fork River, and Lava Creek, remains un-surveyed for that reason.

Finally, surveys were terminated where it appeared that the major habitat ended (or would soon end). However, these watercourses continue for several miles and, although there may be no additional major populations further upstream, it is likely that there are more individuals not accounted for.

Because of these difficulties involved with access, the number of plants counted should be considered a conservative estimate of the plants actually occurring on the BTNF and adjacent areas. Also, because of the unstable habitat that these plants grow in, populations probably fluctuate from one year to the next.

On each of the six drainages which flow through both BTNF and GTNP, there were, with few exceptions, more individuals counted within the Park. Also with few exceptions (e. g., Spread Creek, Pacific Creek), population size diminishes greatly as one moves upstream.

This situation is probably attributable to a variety of factors. In the case of Ditch Creek, the wide stream bed and gravel bars simply were not present as they were in the lower reaches within the Park. However, Pilgrim Creek has these features well beyond the Park boundary, but the populations on the Forest were no where near as large as those in the Park. The same is true on the Gros Ventre River. It is not clear why this is so.

On the other hand, population size on Spread Creek is greater on the Forest than in the Park. The situation is not surprising considering that the conditions within the Park are the same as those beyond the boundary, and the population is essentially continuous up to the point (Rock Creek) where the survey was terminated. This segment of the population represents a significant portion (35%) of known numbers range-wide.

Ecological conditions

As this survey slightly expands on overall understanding of the distribution of the species, it also added new information to what we know about habitat preference (Markow 2001, Appendix A). Perhaps the most profound example of the expanded range of habitat conditions is seen in one population found on a bench, high (at least 50 feet) above the streambed of the Gros Ventre River. This occurrence is a decided departure from previously cited reports of habitat, which usually place the species in the streambed, or very near to it, and indicates that annual flooding is not a habitat requirement.

Potential threats

As pointed out in Markow (2001), there appears to be few threats pressuring *S. fluminea* under current BTNF and GTNP land management. Gravel removal and water diversion for irrigation have been identified as potential impacts, but most of the habitat occurs within the Park, Teton Wilderness, or the Washakie Wilderness where human-induced disruption is unlikely to occur. However, if future land use patterns or flooding regime were to change, the viability of some populations could be at risk.

Although most of the plants and the best habitat (with the exception of Spread Creek) occur within GTNP, the drainages flowing through the Park all originate on the BTNF. Therefore, it is important that these drainages remain as un-altered as possible, as disruption in the upper parts can potentially have far-reaching effects on downstream vegetation. This is particularly true on Spread Creek, where the most concentrated

population occurs, and where streamflow has historically been manipulated through damming and diversion.

Natural influences seem to impose minimal, if any negative impact. Plants show little evidence of herbivore or insect damage, presumably due to the strong odor emitted. Recreational use of habitat poses minimal risk to populations, as these sites are rarely used by anyone other than fishermen. Very few people were observed in *Stephanomeria* habitat during the surveys.

Concluding remarks

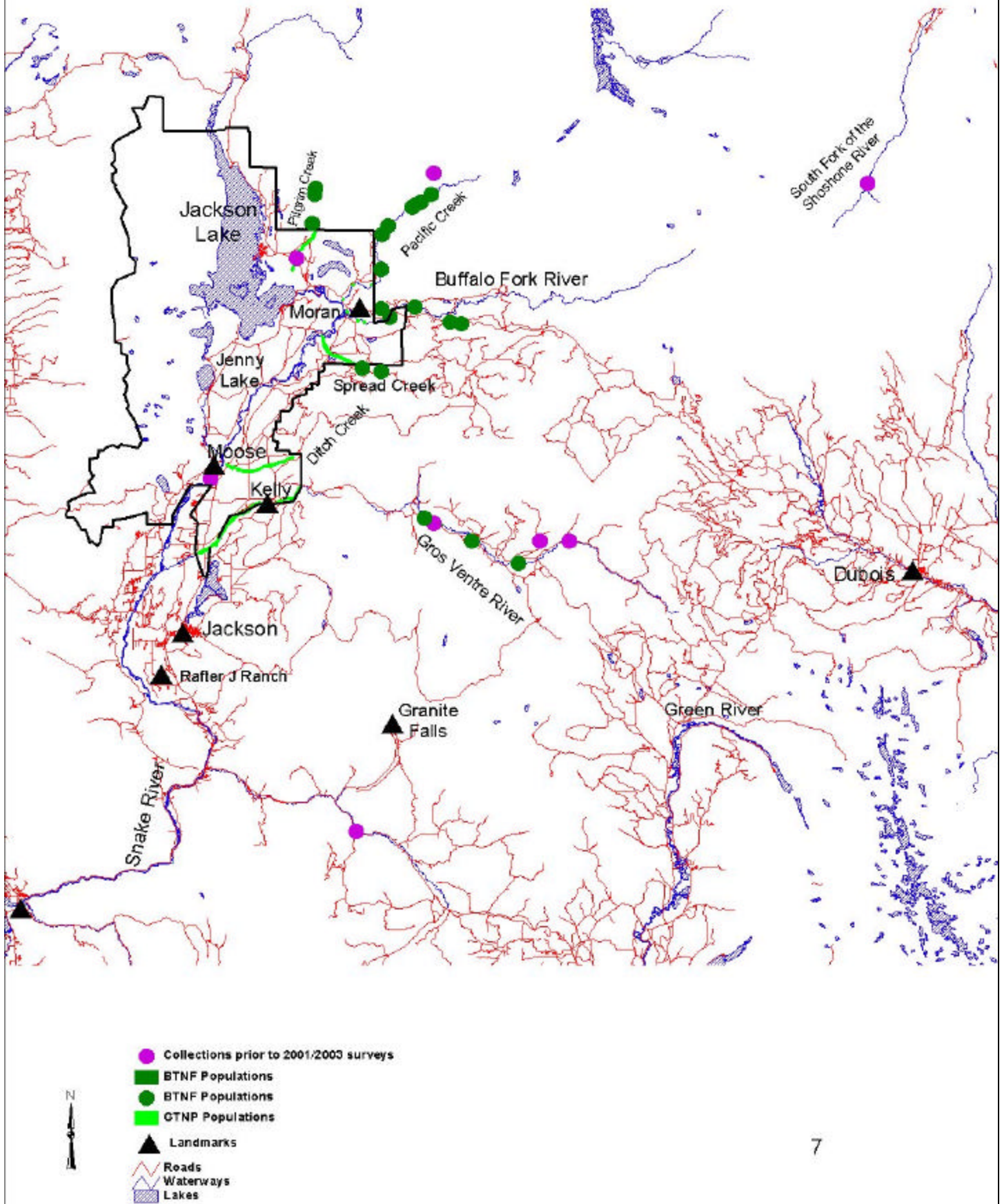
This survey has generated a rough estimate of the abundance of *Stephanomeria fluminea* on the BTNF. Given the number of plants counted (7580) and the widely spaced population, the species appears to be reasonably secure. However, 6853 plants (91%) were concentrated in one population on Spread Creek. If this population were disregarded, the total number of plants on the Forest would be small. Under current land management, these populations are probably in little danger, but extensive disturbance of the watercourses could threaten both these populations and those within GTNP. This survey, along with that conducted in GTNP (Markow 2001), has provided a better understanding of abundance and distribution on those properties. However, the species is also known to the Shoshone National Forest from a single collection (*Hartman 19617*) along the South Fork of the Shoshone River. No surveys specifically targeting *Stephanomeria* have been conducted on that Forest. Thus, the distribution and abundance in that area remain unknown.

Figure 2 displays the rangewide distribution as it is now known from recent and historical collections. However, distribution is largely unexplored outside of federal agency lands. Populations very likely occur on private property along the Gros Ventre River, Lava Creek, and Buffalo Fork River, but these areas have not been surveyed. Report of a population along the Snake River near Wilson is plausible but unconfirmed. There are still many uncertainties concerning the species' total range of occurrence.

Additionally, little is known about the basic biology of the species, including pollination, reproduction, life history, population fluctuation trends, and even the unique combination of environmental influences which determine whether the plant will become established or not. Most likely, several factors are involved in the creation of viable habitat, and these have not been investigated to any degree. Additional work remains to be performed.

Ultimately, the viability of the species depends on management of the watersheds in which the populations reside. Based on current information, the BTNF harbors approximately 38% of all recorded individuals, and nearly all of the headwaters that support them. Concern for the populations should be a significant factor in the decision-making process involving the modification of any component of these watersheds.

Figure 2.
Range of occurrence of *Stephanomeria fluminea*



Literature Cited

- Fertig, W. 2000. *Stephanomeria fluminea*. State species abstract. Wyoming Natural Diversity Database, Laramie, Wyoming. Posted electronically at: <http://www.uwyo.edu/wyndd/>.
- Gottlieb, L. D. 1999. A new species of *Stephanomeria* (Asteraceae) from northwestern Wyoming. *Madrono* 46:58-60.
- Markow, S. 2001. Report on a survey for *Stephanomeria fluminea* in Grand Teton National Park. Unpublished document prepared for the Greater Yellowstone Inventory and Monitoring Project. Wyoming Natural Diversity Database, Laramie, Wyoming.
- Wyoming Geographic Information Science Center. 1994. Digital aerial photos. Available at: <http://www.wygisc.uwyo.edu/>.

Appendix A. Species information

Classification

Scientific Name: *Stephanomeria fluminea* Gottlieb (Gottlieb, 1999).

Holotype: USA: Wyoming, Teton County, gravel bars in Pilgrim Creek, north of trailhead in Bridger-Teton National Forest, north of boundary with Grand Teton National Park, T46N R116W S20 E1/2. 7200 ft., 15 May 1998. *Gottlieb and Ford 9807* (DAV).

Common Name: streambank wirelettuce, Teton wirelettuce

Family: Asteraceae (sunflower family).

Status

US Fish and Wildlife Service: None

Agency status: None

Heritage Rank

Global: G2 State S2

WYNDD Plant list: State endemic (Very high Wyoming Conservation Rank)

Description

Stephanomeria fluminea (Figure 3, 4) is a perennial forb from creeping rhizomes, with short-tomentose stems, branches and leaves. Basal leaves are oblong or oblanceolate with entire to sparsely-toothed margins. Stem leaves are 35-45 mm long and 2-5 mm wide with oblong-oblanceolate blades with entire margins. Heads are subtended by 5 main bracts 8-10 mm long, surrounded by shorter bractlets 2-4 mm long. Each head has 5 (rarely 6) pink or white ray flowers. Fruits are tan, ribbed achenes 4-4.5 mm long, with pappus of white, plumose bristles (Gottlieb, 1999; Fertig, 2000).



Figure 3. *Stephanomeria fluminea*, flower heads and habit.

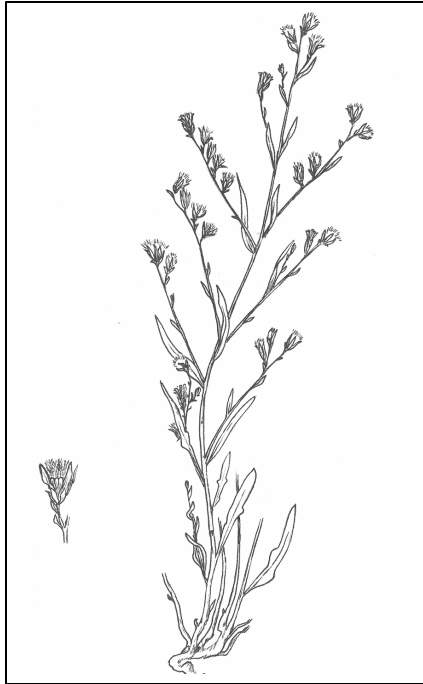


Figure 4. Line drawing of *Stephanomeria fluminea* by W. Fertig (from Fertig, 2000)

Similar Species

Stephanomeria tenuifolia has narrow stem leaves less than 2 mm wide. *S. runcinata* has leaves with lobes pointing backward toward the base. *Lygodesmia juncea* is glabrous and has smooth pappus bristles (Fertig, 2000).

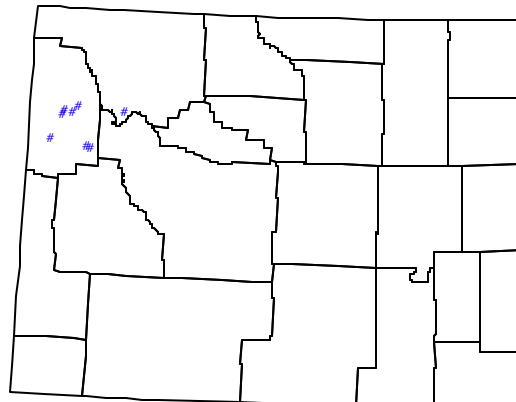
Flowering/Fruiting Period

Late July-September.

Distribution

Endemic to Absaroka and Gros Ventre ranges and Jackson Hole in Park, Sublette and Teton Counties (Figure 5), Wyoming (Fertig, 2000).

Figure 5. Wyoming distribution of *Stephanomeria fluminea*.



Habitat

Gravel/cobble bars and alluvial terraces along large creeks and rivers (Figure 6) at 6300-7800 feet.



Figure 6. Habitat of *Stephanomeria fluminea* along the Gros Ventre River.

Managed Areas

Grand Teton National Park, Bridger-Teton and Shoshone National Forests.

Threats

Gravel quarrying, water diversion for irrigation.

Appendix B. Description of drainages surveyed for *Stephanomeria fluminea*

**Blackrock Creek - Blackrock Ranger Station to 1.5 miles east of
Blackrock Ranger Station**

Blackrock Creek is a small tributary of the Buffalo Fork River, converging with it just west of the Blackrock Creek Ranger Station. For the most part, shoreline is crowded with willows including *Salix boothii*, *S. lasiandra* var. *caudata*, and *S. melanopsis*, but there are occasional open gravel bars that provide good habitat for *Stephanomeria*. Two such sites were discovered (Figure 7), one with 211 plants, the other with 7 plants, representing another drainage for which the plant had not been previously reported. Accompanying species include *Populus angustifolia*, *Heterotheca depressa*, *Epilobium suffruticosum*, and *Glycyrrhiza lepidota* (a very typical complement of associates).

Below Blackrock Ranger Station, the Creek passes through private property, and this portion was not surveyed. In the other direction, the Creek continues as far east as Togwotee Pass. Observation from the highway discloses what appears to be unsuitable habitat which was not surveyed.

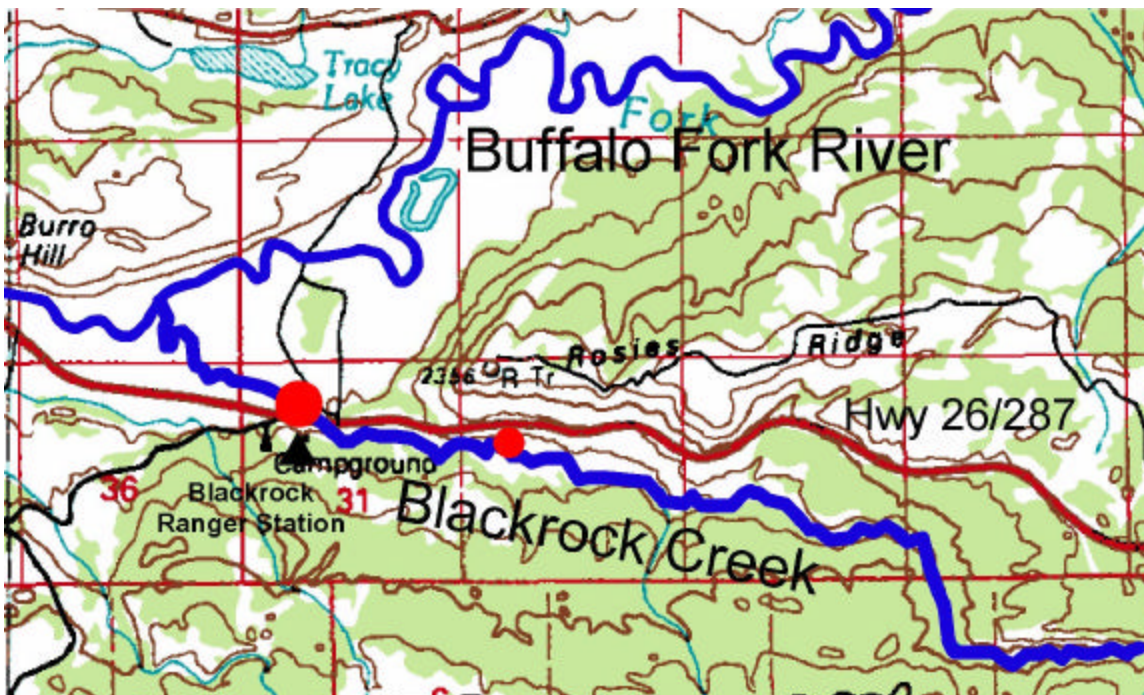


Figure 7. Populations of *Stephanomeria fluminea* along Blackrock Creek .
(Rosies Ridge Quad)

Buffalo Fork River - Lava Creek to confluence with Blackrock Creek

The Buffalo Fork River above Lava Creek is characterized by low topographic diversity and lack of coarse textured sand and gravel bars. Streamside is typically either a steep embankment or a flat, beach-like sand bar. For the most part, water is restricted to a single deep channel. Vegetation on the sand bars consists of narrow-leaf cottonwood saplings, along with a number of weedy forbs including *Artemisia biennis*, *Cirsium arvense*, *Chenopodium album*, *Rumex salicifolius*, and *Chrysanthemum leucanthemum*. Dominant plants up on embankments are generally conifers or willows.

Much of the property adjacent to the River is privately owned and, thus, not surveyed. However, because the channel is narrow in this section, there was fair visual coverage of this property from the public side of the stream, disclosing little suitable habitat. The lack of propagations sites was manifested in the low number of plants observed. Two populations were discovered, one with a total of eight plants, the other with sixteen. Locations of these are displayed in Figure 8.

The Buffalo Fork is a large river system which extends far up into the mountains. It is possible that additional populations occur above the survey area. However, based on populations discovered so far, any such populations are likely to be few and small.

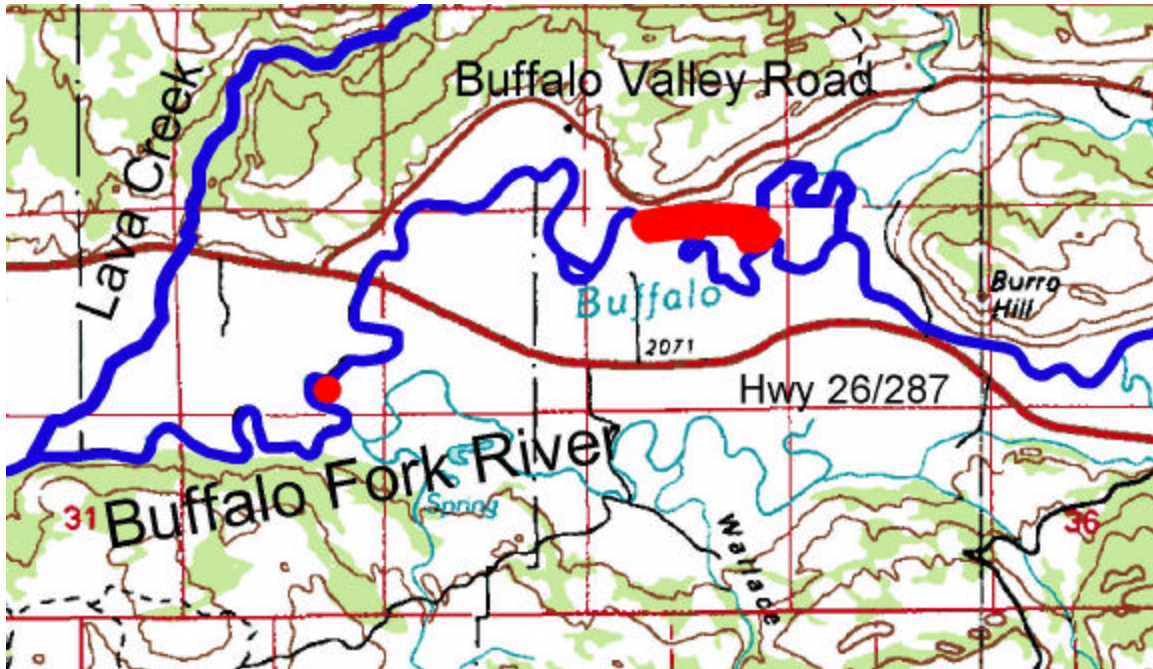


Figure 8. Locations of *Stephanomeria fluminea* along Buffalo Fork River. (Davis Hill Quad)

Ditch Creek - Park/Forest boundary to confluence of north and south forks.

Although this drainage supports high densities of *Stephanomeria* within the Park, the habitat and populations are severely reduced as it approaches the eastern boundary. As noted in Markow (2001), just below the Park boundary, the creek bed narrows and shoreline is crowded with dense stands of willows and other shrubs. Upstream, the situation remains largely the same. The creek is confined to a relatively narrow channel with nothing approaching the broad gravel bars occurring below.

Streamside vegetation consists largely of willow thickets with *Salix drummondiana*, *S. geyeriana*, *S. eriocephala*, and *S. boothii*, interspersed with stretches of coniferous forest comprised of *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. Not surprisingly, no new populations of plants were discovered in this drainage. Because of the low water flow and steep walls, it is unlikely that a significant number of new plants occur outside the area surveyed.

Granite Creek - Hoback River to Granite Falls

Granite Creek is a large, fast-moving creek with few braids or gravel bars, offering very little habitat for *Stephanomeria*. Potential sites were easily identified from the adjacent road, and subsequently examined. Most of these sites are cobble bars populated by willows including *Salix boothii*, *S. drummondiana*, *S. melanopsis*, and *S. lasiandra* var. *caudata*, with a variety of forbs and graminoids. *Agrostis stolonifera*, *Aster ascendens*, *Aster foliaceus*, and *Carex utriculata* are particularly common.

The poor habitat was reflected in a complete lack of *Stephanomeria* sightings. Unless conditions are significantly different above Granite Falls, it is unlikely that many (if any) occur within this drainage.

Gros Ventre River - Park boundary to Fish Creek

The Gros Ventre River is another drainage that is characterized by very large, dense populations of *Stephanomeria* within the Park, which quickly diminish upstream of the Park boundary. Generally, the habitat outside the Park is less suitable, but for many miles upstream, there are stretches that appear that they should be as supportive as those within the Park. Populations do occur in these areas, but in numbers that do not even approach those found downstream. Densities are much lower and the plants tend to be much more scattered.

For the most part, the water is fast-moving and more or less channelized. Because it is very deep, and difficult to negotiate, the surveys tended to be discontinuous and, to some degree, opportunistic. Some areas which appeared to be good or excellent habitat were not surveyed because they were inaccessible.

Streamside vegetation varies greatly along such an extensive stretch of river. Large areas are forested with *Pseudotsuga menziesii*, *Picea engelmannii*, and *Populus angustifolia*, with an understory of *Elaeagnus commutata* and *Shepherdia canadensis*. Broad gravel and cobble bars are characterized by *Salix boothii*, *Populus angustifolia*, *Salix eriocephala* var. *watsonii*, *S. lasiandra* var. *caudata*, *S. melanopsis*, and *Elaeagnus commutata*. Herbaceous vegetation generally includes *Equisetum arvense*, *Aster foliaceus*, *Glycyrrhiza lepidota*, *Rumex salicifolius*, and *Juncus balticus*.

A total of 140 plants was found in four populations (Figure 9). Additional populations have been documented (*Hartman 28285*, *Nelson 20332*, *Fertig 16286*) in tributaries to the east, but no information concerning population size was reported. Undoubtedly there are others, but based on the known populations in the area, they are probably small.

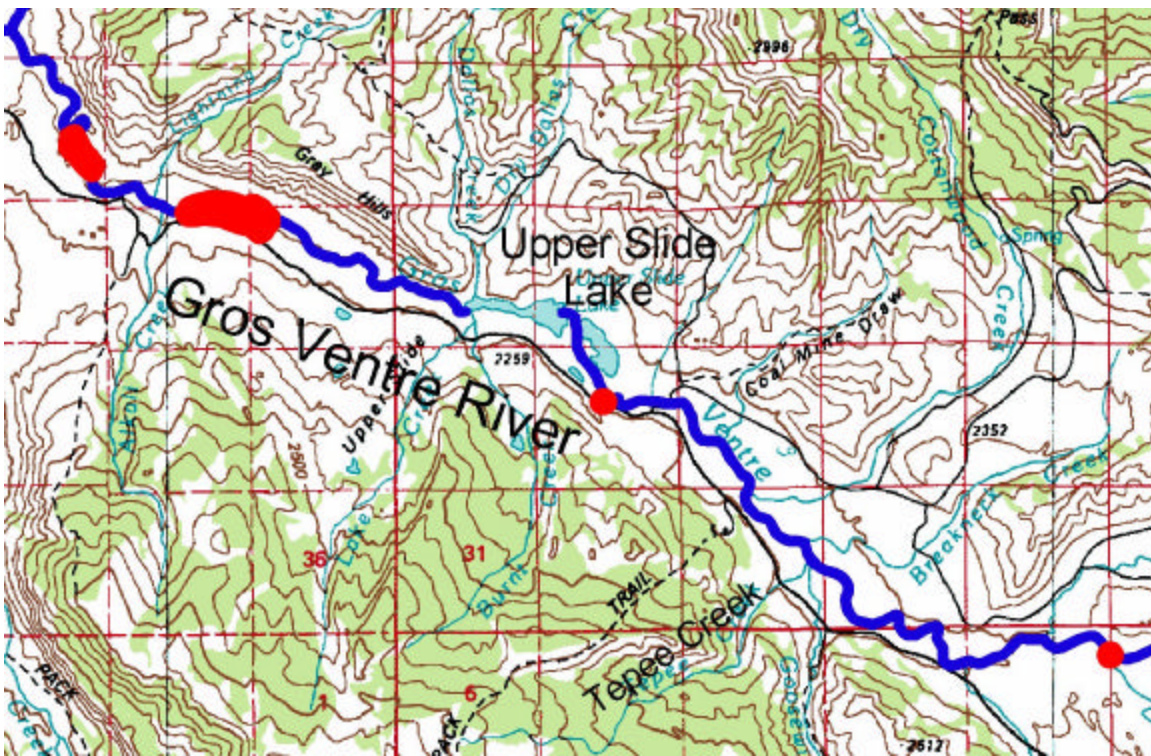


Figure 9. Locations of *Stephanomeria fluminea* along the Gros Ventre River. (Burnt Mtn. Quad, Grizzly Lake Quad, Sheridan Pass Quad, Upper Slide Lake Quad)

Hoback River - Confluence with Snake River to Dell Creek

The Hoback River was the largest watercourse surveyed, albeit only superficially. A large portion of the river is bordered by private property, and an equally large portion offers no suitable habitat (or what we now believe to be suitable habitat) for *Stephanomeria*. Examination of selected sites (Figure 1) revealed no new populations within this drainage. These sites were typically cobble or coarse gravel bars with an

assortment of willows including *Salix boothii*, *S. eriocephala*, *S. melanopsis*, and *S. lasiandra* var. *caudata*, with an herbaceous layer of *Aster foliaceus*, *A. occidentalis*, *Agrostis stolonifera*, and *Melilotus officinalis*.

A single specimen (*Payson 3076*) from 1922 documents the occurrence of *Stephanomeria* within the Hoback drainage, with a stated collection location of "near Cliff Creek". Therefore, the area around Cliff Creek was examined particularly carefully. The site appears to be marginally suitable, but no plants were found. Any former population(s) may have been disrupted by a flooding event, or some other disturbance.

It is possible that *Stephanomeria* does still occur somewhere within the Hoback River system. However, given the predominant habitat conditions, it is unlikely that populations would be many or large.

Lava Creek - Below Highway 26/287

Most of Lava Creek between the highway and confluence with Buffalo Fork River passes through fenced, private property and is thus inaccessible. However, this drainage has the physical attributes (i. e., broad, undulating gravel bars) that suggest excellent habitat for *Stephanomeria*. A small portion of approximately 50-75 feet is outside the fenced area, and supports a small population of 19 plants (Figure 10). Above the highway, the drainage quickly narrows, and no plants were found.

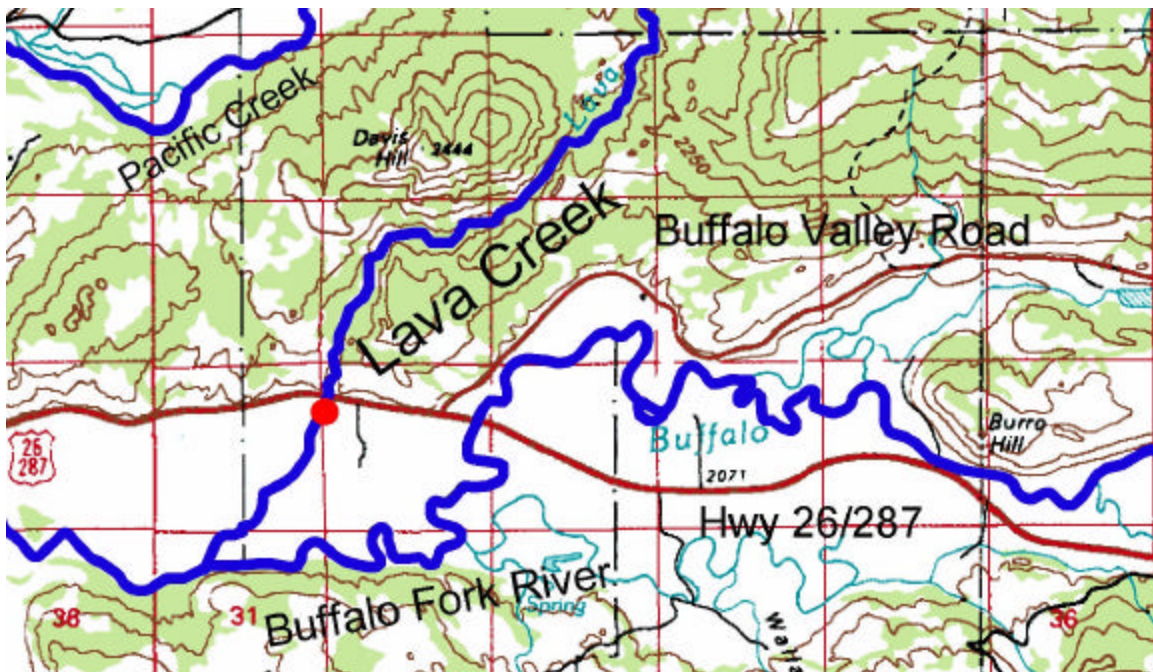


Figure 10. Location of *Stephanomeria fluminea* on Lava Creek.
(Davis Hill Quad)

Pacific Creek - Park boundary to Gravel Creek

Pacific Creek is another relatively large drainage, with extensive gravel and cobble bars occurring well beyond the Park boundary. However, populations of *Stephanomeria* are small and widely scattered. Only 12 plants in three populations were encountered within the Park (Markow, 2001). Gottlieb (1999) reported a population of 250 to 500 plants but did not specify a location.

These bars have a similar compliment of plants as the other major drainages surveyed, but dominant species vary. While some of the cobble bars are nearly barren, gravel bars tend to be well vegetated with willows, cottonwoods, and a modest selection of consistently occurring herbaceous species. Common willows include *Salix boothii*, *S. melanopsis*, *S. drummondiana*, *S. geyeriana*, and *S. lasiandra* var. *caudata*. Herbaceous species that consistently appear are *Equisetum arvense*, *Melilotus officinalis*, *Oxytropis sericeus*, *Epilobium suffruticosum*, *Agrostis stolonifera*, *Aster ascendens*, and *Achillea millifolium*. *Heterotheca depressa*, a species that almost always occurs with *S. fluminea*, is present, but scattered and in low abundance.

Whetstone Creek, a tributary of Pacific Creek, supports a small population of plants, extending to about 1/4 mile upstream from the confluence. Twenty-four plants were counted, but there are probably more that were not noticed. This creek flows from the north off a steep slope on to the broad, flat valley of Pacific Creek. Additional plants would most likely be restricted to the low-gradient portion of the drainage.

A total of 291 plants in 6 populations (Figure 11) was recorded. This number appears small in light of the large gravel bars present throughout the drainage, providing what is currently considered to be good habitat. Hypotheses concerning mineralogy and streambank topographic diversity as limiting factors are presented in Markow (2001), but these provide little more than speculation. Reason for poor representation of *Stephanomeria* within the Pacific Creek drainage remains unknown.



Figure 11. Location of *Stephanomeria fluminea* along Pacific Creek.
(Whetstone Mtn. Quad)

Pilgrim Creek - Park boundary to Middle Pilgrim Trail

Within the Park, Pilgrim Creek has all the characteristics that appear conducive to supporting large populations of *Stephanomeria*. In fact, with the exception of Spread Creek, this drainage supports the most individuals of any of those surveyed, in or out of the Park, with 5,942 individuals counted between the eastern Park boundary and Jackson Lake (5.8 miles) (Markow, 2001).

North of the boundary, the stream bed quickly narrows, and most of the side channels disappear. Gravel bars are intermittent and mostly relatively small. Vegetation along this watercourse is typical of the drainages flowing westerly into Jackson Hole. Willows including *Salix geyeriana*, *S. boothii*, *S. lasiandra* var. *caudata*, *S. drummondiana*, and *S. boothii* are common, as are *Populus angustifolius* saplings. Herbaceous species such as *Agrostis stolonifera*, *Chenopodium album*, *Aster ascendens*, *Epilobium ciliatum*, and *Equisetum arvense* crowd the shoreline. The faithful indicator of *Stephanomeria*, *Heterotheca depressa*, is also present but widely scattered and in low numbers.

Predictably, the large, continuous population of *Stephanomeria* was replaced by small, widely spaced patches (Figure 12). Over a five-mile section of stream, only 54 plants in 3 populations were discovered, in contrast to the large numbers encountered in the Park.



Figure 12. Location of *Stephanomeria fluminea* along Pilgrim Creek.
(Two Ocean Lake Quad)

Spread Creek - eastern Park boundary to .3 miles east of Rock Creek

From the Park boundary nearly to Rock Creek, the bed of Spread Creek is largely the same as within the Park, where 2199 plants were counted. This section of streambed probably displays the best habitat on the Forest, with wide, diverse gravel bars, and little competing vegetation. Between the boundary and the diversion dam (a distance of about 1 mile), the only other plant species represented in any abundance were *Heterotheca depressa*, *Lupinus polyphyllus*, *Epilobium suffruticosum*, *Rumex salicifolius*, *Populus angustifolia*, and *Chrysanthemum leucanthemum*.

Above the dam, the creek passes through a narrow, rather steep-walled section, for about 1/2 a mile, where no plants were found. Above this constriction, the creek again opens out into broad sand and gravel bars, supporting thousands of plants.

Within the 3-mile stretch of creek bed surveyed (Figure 1, 13), 6,853 plants were counted. This number represents the highest density ever recorded for the plant, in any of the drainages examined. Above Rock Creek, the drainage again narrows, and the habitat for *Stephanomeria* disappears. Whether additional populations occur upstream is unknown.

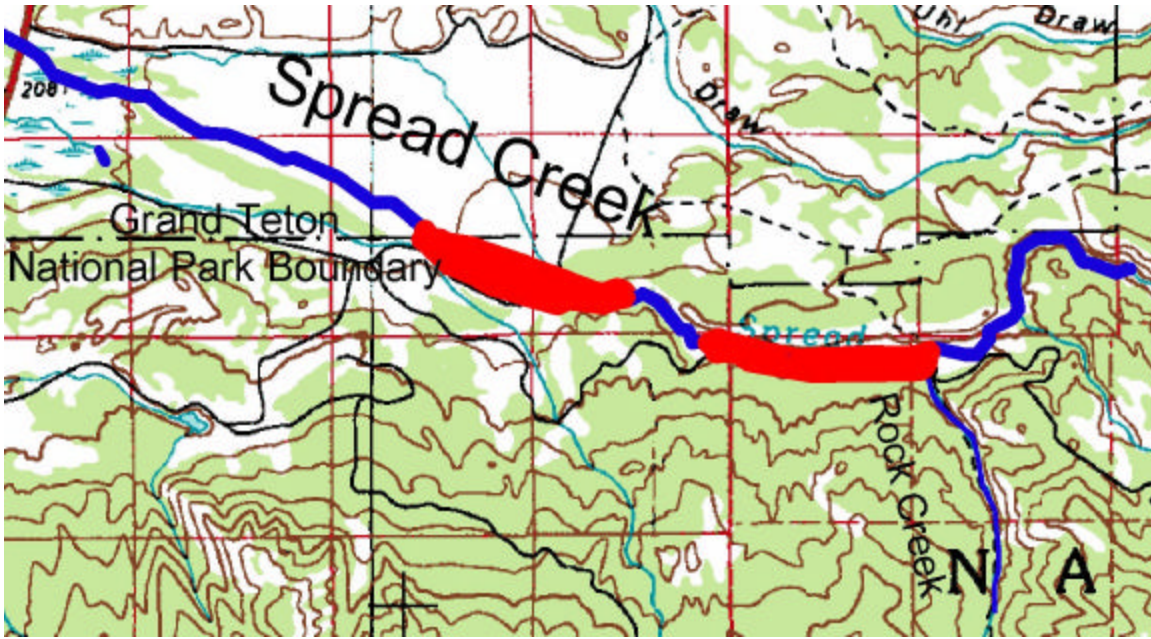


Figure 13. Locations of *Stephanomeria fluminea* along Spread Creek.
(Davis Hill Quad)

Appendix C. Collection data, *Stephanomeria fluminea*

Wyoming, Teton Co. T42N R112W S29 Center. Bridger-Teton National Forest: south side of Gros Ventre River, ca 100 yds. south of and ca 50 ft above river bed, ca 14 air mi E of Kelly. North-facing slope and bench with *Heterotheca depressa*, *Artemisia dracunculus*, *Cymopterus terebinthinus*, *Epilobium angustifolium*, *Melilotus officinalis*. Elev. 7370 ft. 19 Aug 2003. *Markow 12520*.

Wyoming, Teton Co.: T45N R112W S31 NW1/4. Bridger-Teton National Forest: south side of Blackrock Creek, below and 50 yds. NW of where it passes under U. S. Hwy 26/287, across hwy from Blackrock Ranger Station. Gravel bar with *Heterotheca depressa*, *Populus angustifolia*, *Epilobium suffruticosum*, *Glycyrrhiza lepidota*. Elev. 6900 ft. 24 Aug. 2003. *Markow 12523*.

Wyoming, Teton Co.: T54N 113W S29 NW1/4. Bridger-Teton National Forest: both sides of Lava Creek, S of and ca 20 feet below U. S. Hwy 26/287, ca 7 1/2 air mi E of Moran. Riparian with *Populus angustifolia*, *Heterotheca depressa*, *Elymus hispidus*. Elev. 6850 ft. 24 Aug. 2003. *Markow s. n.*

Wyoming, Teton Co.: T46N R113W S15 NE1/4. Bridger-Teton National Forest: south side of Whetstone Creek, ca 100 yds N of confluence with Pacific Creek, ca 7.5 air mi NE of Moran. Sandy flood plain with *Heterotheca depressa*, *Salix* spp. Elev. 7150 ft. 25 Aug. 2003. *Markow 12523b*.

Appendix D. GPS coordinates (UTMs, CONUS 27, Zone 12) and elevations (feet) of populations of *Stephanomeria fluminea*

Blackrock Creek

0552080E	to	0552400E	0553602E
4852386N		4852000N	4852190N
Elev. 6900		6900	7000

Buffalo Fork River

0544658E		0547230E	to	0548200E
4852386N		4854243N		4854300N
Elev. 6800		6800		6800

Gros Ventre River

0548886E	to	5049459E	0550222E	to	0551056E
4827665N		4827111N	4826899N		4826855N
Elev. 7100		7100	7200		7200

0554818E		0560562E
4824875N		4821999N
Elev. 7350		7500

Lava Creek

0543599E
4853982N
Elev. 6850

Pacific Creek

0543650E		0543635E	to	0543801E
4858850N		4863300N		4863498N
Elev. 6880		6950		6950

0544086E	to	0544850E	0547451E	0547882E
4864101N		4864839N	4866800N	4866999N
Elev. 6960		7000	7100	7120

0548301E 4867411N	to	0548825E 4867661N	0549850E 4868488N	
Elev. 7150		7150	7150	
Pilgrim Creek				
0535150E 4864599N		0535321E 4868396N	0535450E 4869001N	to 0535448E 4869392N
Elev. 7100		7300	7300	7300
Spread Creek				
0540248E 4846988N	to	0541500E 4846562N	0542660E 4846165N	to 0544400E 4845960N
Elev. 7050		7200	7200	7350