



# Sego Lily

Newsletter of the Utah Native Plant Society

July 2011 (volume 34 number 4)

## *The Penstemon Issue*



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*Above: Bush or Gilia penstemon (Penstemon ambiguus), is one of the showiest of Utah's 96 beardtongue taxa. It also has the most distinctive flower. Unlike other Utah beardtongues, the upper lip is reflexed and the lower lip projects outward, giving the blossom the appearance of a Phlox. When in full bloom, the entire plant is a rounded mass of white or pinkish flowers. Bush penstemon grows best in sandy soil and can reach a height of 2 feet and width of 4 feet. Plants can tolerate high temperatures and wind, but should not be over-watered. Photo by Walter Fertig.*

## Utah Native Plant Society



## Utah Native Plant Society

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### Many thanks to Xmission for sponsoring our website.

For more information on UNPS: Contact Bill King (801-582-0432) or Susan Fitts (801-756-6177), or write to UNPS, PO Box 520041, Salt Lake City, UT, 84152-0041 or [unps@unps.org](mailto:unps@unps.org)

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## Chapter News

**Fremont (Richfield area):** The Fremont chapter is hosting professional photographer Krieg Rasmussen on June 30 at 7 PM for a photography workshop. Kreig loves the outdoors, and has had a camera in his hand since he got his first 35 mm SLR when he was 12 years old. He studied photography at Snow College and Brigham Young University and currently works for the Forest Service as a wildlife biologist. - *Lisa White* [congratulations to Lisa for recently bringing a new chapter member into the world last month]

**Manzanita (Kane County):** The chapter hosted the annual *Penstemon* festival in June (see page 4 for full story). Special thanks to Steve and Nicola Dahl, Larry Baer, and Merrill and Robert Johnson for helping make the festival a rousing success! - *W. Fertig*

**Southwestern/Bearclaw Poppy:** Ken Kingsley will talk about "Pollinators and their



Conservation" at the June 21 meeting of the chapter in Springdale. - *Margaret Malm*

**Utah Valley:** At the last chapter meeting we elected new officers for the group. Jason Alexander and Robert Fitts will serve as co-presidents, Randall Nish will remain the treasurer, and Susan Sims will be Secretary. - *Celeste Kennard*

*Below: Example of Krieg Rasmussen's work: Digitalis and Senecio.*





## Bulletin Board

**2012 UNPS Calendar Project Needs your Chapter's help!** Hello Utah Native Plant Chapter members. Have you missed it? We have. The Utah Native Plant calendar that is. Our Fremont Chapter wants to bring back the calendar and produce one for 2012. The time is upon us. Calendars need to be ready by August for fall and winter sales. Calendars are great marketing tools. They make great gifts. They are an effective medium to get pictures and stories about native plants out to everyone. Let's not preach to the choir but spread our news as far as possible.

Our focus is to highlight each of your chapters with a photo of your choice and a brief paragraph about your chapter including any special accomplishments. Your contributions are due by July 8. Don't be left out. Share your story and a photo; we are anxious to receive them. The task of organizing the calendar, including the layout, graphics and fundraising is all donated by chapter members. If your chapter is able to help sponsor the printing cost, we would appreciate any financial contribution you can make.

We're looking forward to receiving your news. Take a few minutes now to help us; you will enjoy seeing your chapter spotlighted in the calendar. If you can participate, or have questions, please contact Janett Warner (janett@wildlandnursery.com) - Thanks - Fremont Chapter Calendar Committee

**Sixth Annual Cedar Breaks Wildflower Festival:** High snow levels this winter and spring have pushed back the start of the annual Cedar Breaks Wildflower Festival to July 8-24. Hopefully, the wait will be well worth it. High precipitation usually corresponds with exceptional wildflower viewing opportunities at Cedar Breaks National Monument, located approximately 20 miles east of Cedar City on the west rim of Cedar Mountain. Join local plant enthusiasts for free guided walks at 10 Am and 1 PM each day of the festival.

**New Life Member:** UNPS treasurer Charlene Homan is the latest life member of the Utah Native Plant Society—thanks Charlene!



Left: Cut-leaved kittentails, *Synthyris laciniata*, from Cedar Breaks National Monument. Many early-blooming wildflowers are still on display at Cedar Breaks this summer, thanks to an abundance of winter and spring snow and cool temperatures. Photo by W. Fertig.

## UNPS News

2011 Scholarship winner Blake Wellard (photographed below and still smiling before being stabbed by glochid spines while preparing a hybrid *Opuntia phaeacantha* specimen for pressing at Zion National Park) wrote the UNPS board a nice thank you note:

“Dear Utah Native Plant Society— It is with gratitude that I write to express my thanks for your generous grant in the amount of \$1000. I feel both humbled and honored that you trust me with your funds to further my research with the hybrid oak population. Your wonderful grant will assist me with my study and my research”. - Blake Wellard, University of Utah, 3 May 2011 (Blake is



the recipient of the UNPS 2011 student scholarship, which is funded with proceeds from the UNPS online store and generous donations of society members).

The UNPS board recently voted to provide Dr. Renee Van Buren of Utah Valley University a grant of \$1000 to help defray printing costs for her forthcoming book on woody plants of Utah (being published by Utah State University Press later this year). The board also recently awarded \$250 to help in the tree planting at the Four Corners Monument on Earth Day (see page 11).

## Penstemon Festival 2011

Several years ago, Merrill Johnson had an idea: bring native plant lovers together for a weekend to celebrate penstemons. In 2009, Merrill held the first penstemon festival at his nursery, Great Basin Natives, in Holden. Merrill provided dinner and a slide show, and the next day took participants on a field trip to see many of the colorful beardtongues of the eastern Great Basin.

In 2010, a second festival was planned, but had to be cancelled because Mother Nature did not cooperate (the cool, wet spring kept the penstemons from flowering in time). Hoping for better luck in 2011, the festival was planned for early June and moved to the more *Penstemon*-friendly confines of Kane County, Utah.

The Manzanita/Kane County Chapter of UNPS took up the challenge of hosting the 2011 festival. Merrill was invited to sell his native trees, shrubs, and wildflowers (including many *Penstemons*, of course) at a plant sale to kick off the festivities on Friday afternoon, June 3. More than 30 local plant lovers descended on the Kanab Farmer's Market to buy up the plants.

Later that evening, a group of 30 plus penstemon aficionados assembled at the Kanab Holiday Inn for a catered Italian dinner and presentation on "Stalking wild *Penstemons* in Utah and Wyoming" by your UNPS President. The lecture focused on basics of beardtongue taxonomy, biology, and ecology (an excerpt of the talk is on pages 6-7), illustrated with photos of a variety of common and rare western species. Heather Heaton of Cedar City won the door prize (a Bigtooth maple generously donated by Merrill) by correctly identifying the mystery beardtongue photo at the end of the slide show.

On Saturday, June 4, 35 penstemoniacs took a morning field trip to Lick Wash on Grand Staircase-Escalante National Monument to see some beardtongues in the wild. At our first stop, along the Skutum-



pah Road, we found a healthy patch of Utah penstemon (*Penstemon utahensis*) and Eaton's firecracker (*P. eatonii*) in full bloom. I handed out a key to the *Penstemon* species of the Grand Staircase and led the group in a quick lesson on plant identification and the simple pleasures of peeling open *Penstemon* flowers to examine the anther morphology. Siler's penstemon (*P. linarioides* var. *sileri*), named for local pioneer rancher and amateur plant hunter Albert Siler, was also in bloom.

At Lick Wash the group found the charming mat-forming Thompson's penstemon (*P. thompsoniae*) in full bloom at the mouth of the slickrock canyon. This species is named for Kanab's other pioneer botanist of the 19th Century, Ellen Powell Thompson (sister of John Wesley Powell). We were also momentarily sidetracked by other blooming species, including the rare Paria breadroot (*Pediomelum pariense*). Lick Wash itself presented a challenge for hikers to make it through a recent boulder slide. While we saw many interesting wildflowers (including Lori's columbine, *Aquilegia loriae*), we were stymied in our hunt for the unusual burgundy

Above: Thompson's penstemon (*Penstemon thompsoniae*) is characterized by its matted growth form and spoon-shaped leaves covered by scale-like hairs. It was observed on the limey Carmel Sandstone outcrops at the mouth of Lick Wash on the 2011 *Penstemon* Festival field trip. Photo by Paul and Catherine Thalmann.

flowered *Penstemon x jonesii*, a hybrid between a red and blue beardtongue species. A springtime flash flood in the wash appeared to have scoured out the site where this species had been found in previous years.

The festival concluded with a lunchtime stop at Kanab Master Gardener Larry Baer's farm at Deer Springs. One of Larry's specialties is the cultivation of wild penstemons, and the crowd was not disappointed. One of the most unusual finds in the Baer garden was Sand-loving penstemon (*P. ammophilus*), a local endemic that apparently seeded itself into Larry's flowerbed. At day's end, each participant received a potted penstemon from Mr. Baer.

Merrill Johnson would like to take the penstemon festival on the road again next year. Wouldn't your chapter like to sponsor the 2012 event? - W. Fertig



## ***Wildflower Photography Techniques: Use this Checklist to Improve Your Pictures***

By Steve Hegji

I'm going to give you a six-step checklist you can follow that will instantly improve your wildflower photographs. Even better, it requires no technical knowledge. I've printed this checklist on a business card and keep it in my camera bag. When I find myself getting sloppy, I pull it out for a quick reminder of what I ought to do.

Step 1: Before you take the picture, think for a minute and try to define what elements of the scene attracted your attention. It may be a single element such as color, form, or contrast with the background. More often it's a couple elements in conjunction. Think about it until you can define what excites you about the picture. As an example, take a look at my photograph of Utah Penstemon (*Penstemon utahensis*), and see if you can discern what attracted my attention. I'll give you my answer at the end of the article.

Step 2: Imagine the composition that will emphasize the elements you picked out in step 1. If you do this, you'll stand a better chance of composing a picture that highlights those elements and minimizes everything else. For example, don't snap the first flower you come to, look for the best one you can find - in terms of flower condition, lighting, and background. Be aware of your focal plane and depth of field so that your image is sharp where you want it to be. In my photograph of the Utah Penstemon, I positioned myself so that the background was well outside the area of focus, and so that the long dimension of the corolla and calyx lay along the focal plane, making their images nice and sharp.

Step 3: Check the camera settings before you snap the picture. I've often taken a series of pictures and moved on, only to later realize that the camera settings were all wrong - either because I'd left them that way previously, or the act of pulling it



out of my bag moved a dial. Learn from my mistakes.

Step 4: Make the camera as stable as possible. Tripods make nice stable "triangles" and I carry one, but probably only use it on a couple pictures out of every 1000. You can make impromptu triangles with your body and objects around you. Lay on the ground with your elbows forming two legs of a triangle and with the camera held tightly to your forehead as the third leg. Hold the camera against a tree, or a rock. Even resting it on top of your hiking pole is better than nothing.

Step 5: Adjust your camera to get the effect you want and take the picture. For those of you with highly adjustable cameras this can get technical. I suggest you make yourself familiar with the tutorials at [www.cambridgeincolour.com](http://www.cambridgeincolour.com).

Step 6: Check the results, and retake the picture if necessary. This might be the most important

*Above: Utah Penstemon (Penstemon utahensis) is one of the earliest beard-tongue species to bloom in Utah, often appearing by early April. Unlike other reddish-flowered penstemons that are adapted for hummingbird pollination, Utah penstemon has a prominent lower lip suitable for bees to land. Utah penstemon closely resembles the aptly-named Penstemon confusus with pale pink to magenta colored flowers. Hybrids occur in the Pine Valley Mountains. Photo by Steve Hegji.*

step so don't hesitate. After all, it's just digital and costs you nothing extra except a little discipline.

I hope you find these six steps simple and eminently usable. I know that if you follow them you'll be pleased with your results. Give it a try next time out! Oh, and by the way, the areas that interested me about the Utah Penstemon were the glands on the flower and the color of the margins of the calyx lobes. Did you find your eye drawn to those elements?

## Ten Things You Might Not Know About Penstemons (but were afraid to ask)

Text & Photos by Walter Fertig

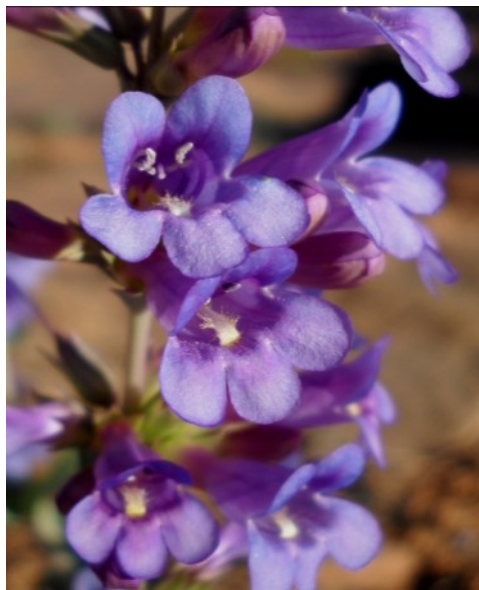
It is difficult to find anyone who does not like penstemons. But the true penstemonophile should be able to demonstrate a high PIQ (*Penstemon* Intelligence Quotient). The following ten *Penstemon* factoids are offered to help *Penstemon* fanatics impress their friends and neighbors.

### 1. Just what is a *Penstemon*?

Penstemons are perennial wildflowers characterized by large, colorful petals fused into a slender to inflated, bilaterally symmetrical corolla tube. The mouth of the corolla resembles a pair of lips, with the upper lip consisting of two lobes and the lower lip with three. In some species the rim of the corolla or the tube is hairy or glandular. The majority of *Penstemon* species have blue or purple flowers, though occasional species are white, pink, yellow, or red.

2. The scientific name *Penstemon* does not translate as “five stamens” as often cited in the popular literature. It is true that the Greek suffix “penta” means five (as in a five-sided shape, or pentagon). But according to beardtongue expert Noel Holmgren, the “pen” in *Penstemon* comes from the Latin word *paene* meaning “nearly”. Thus *Penstemon* actually means “nearly a stamen”, in reference to the sterile fifth stamen found in each beardtongue flower. If the genus were named for having five stamens (hardly a unique character among dicots), the name would be “Pentastemon”!

3. The common name beardtongue also refers to the sterile, fifth stamen, technically known as the staminode. Typically, the staminode is widest at the tip (vaguely resembling a tongue in shape) and beset with crinkly, golden-yellow hairs (the beard). In a few species, the staminode lacks hairs, and is thus beardless. Unlike the other four stamens of the *Penstemon* androecium, the staminode lacks anther



Above: *Fleshy penstemon* (*Penstemon carnosus*) from the canyon of the Escalante River, Garfield County, Utah. Note the white-hairy staminode below the bluish-white fertile anthers in each flower.

sacs and is incapable of producing pollen. Staminodes may function to either block nectar robbers from gaining access, or help position pollinators to receive a blast of pollen to the correct portion of their anatomy (see more on staminode function on page 9).

4. Traditionally, penstemons have been placed in the figwort family (Scrophulariaceae), along with such familiar genera as *Castilleja*, *Mimulus*, and *Pedicularis*. Recent genetic studies suggest that the scrophs are an unnatural assemblage of genera that really belong to multiple families. If accepted, the Scrophulariaceae becomes greatly reduced, consisting only of *Limosella*, *Scrophularia*, *Verbascum*, and *Buddleja* in Utah. *Penstemon*, along with *Collinsia*, *Veronica* and others would be transferred to the Plantaginaceae or plantain family (formerly a small family of minutely 4-petaled weedy species). While this may reflect evolutionary origin, the

Plantaginaceae is now difficult to define based on morphological characters and appears quite “unnatural” to the casual observer. Of course, future biosystematic research may undo these latest assumptions as well—stay tuned for where *Penstemon* and other conventional scrophs end up!

5. *Penstemon* is the largest genus of vascular plants restricted to North and Central America. Some 240-270 species are recognized, ranging from Alaska to Guatemala. In the past, a single beardtongue species was recognized in eastern Asia, but that species has been transferred to its own genus, *Pennellianthus*. Only *Carex* (sedges) and *Astragalus* (milkvetches) have more species in North America than *Penstemon*.

Utah has the largest number of *Penstemon* taxa of any state, with 73 species and an additional 23 distinct varieties. At least 34 species and varieties are endemic to the Beehive State. With 31 taxa, Garfield County, Utah has more types of *Penstemon* than any other county in the United States.

6. Anther characteristics are among the most useful features for identifying different species of *Penstemon*. Each of the four fertile stamens of a *Penstemon* flower consists



of a pair of anther sacs joined at the base by a long stalk or filament. The area where the two anther sacs meet is called the connective. *Penstemon* anther sacs split open at maturity to release their pollen along one or two lines of dehiscence. These sutures may be located at the very tips of each anther sac, across most of the sac's face (sometimes including the connective), or only across the top of the connective. Anthers also differ in size, color, degree of hairiness, and shape (with sacs either oriented at right angles to each other or being horseshoe-shaped). The variability in anther appearance and dehiscence is frequently correlated with the pollination biology of the *Penstemon* plant.

7. Flower color and shape in *Penstemon* is largely driven by its primary pollinators: bees or hummingbirds. Beardtongues with blue, purple, pink, or white flowers tend to be pollinated by bees, while those with orange, yellow, or red flowers are serviced by hummingbirds. Among the bee-pollinated species, those with inflated (ampliate) corolla tubes are usually pollinated by large-bodied bees, while those with slender tubes are visited by small bees. Most bee-pollinated flowers have a sturdy lower lip to provide a landing platform. Hummingbird-pollinated species have flowers that are droop-

*Below: Palmer's penstemon (Penstemon palmeri), one of the few strongly aromatic beardtongue species.*



ing and do not offer a landing surface. The anthers of hummingbird flowers also tend to release their pollen quickly, to take advantage of their speedy pollinators.

8. Why are there so many *Penstemon* species? Beardtongue evolution has been greatly facilitated by the ability of different species to hybridize when they come into close contact. Some hybrids have even formed between blue and red-flowered species that normally have distinct pollinators. One such example is *Fuchsia penstemon* (*P. x jonesii*), a burgundy-colored species restricted to southern Utah that originated from crosses between the blue-flowered Smooth penstemon (*P. laevis*) and red-flowered Firecracker penstemon (*P. eatonii*). Dr. Mikel Stevens of Brigham Young University is currently studying the genetic diversity of Utah *Penstemon* species to uncover past episodes of hybridization and back-crossing.

A recent study by Dr. Andrea Kramer and colleagues from the Chicago Botanic Garden and University of Illinois at Chicago suggest that pollinator behavior may also influence genetic structure and divergence of *Penstemon* populations. Kramer's research team studied two bee-pollinated species (*P. deustus* and *P. pachyphyllus*) and one hummingbird-pollinated one (*P. rostriflorus*) on isolated mountain tops across the Great Basin and found that the bee-pollinated taxa were more genetically distinct in each mountain range than the bird-pollinated species. The researchers attributed this to the limited foraging range of honeybees, which were far less likely to cross valleys between mountain ranges to spread pollen than the wide-ranging hummingbirds. Genetic isolation on mountain tops can, over time, result in the formation of new varieties or species. Not surprisingly, there are many more blue and purple (bee-pollinated) taxa of *Penstemon* than there are red or orange (hummingbird-pollinated) forms.

9. Just about every famous (and not so famous) western botanist of the last two centuries



*Above: Atwood's penstemon (P. atwoodii), a Utah endemic from the Kaiparowits Plateau.*

seems to have a *Penstemon* named in their honor. Among those immortalized are Duane and Judy Atwood, Rupert Barneby, D.C. Eaton, Seville Flowers, Ben Franklin, John C. Fremont, Albert Garrett, Edward Graham, Sheryl Goodrich, Larry Higgins, Marcus E. Jones (twice), the entire Holmgren family, Edward Palmer, Edwin Payson, Per Axel Rydberg, Ellen Powell Thompson, Ivar Tidestrom, Lester Ward, and Sereno Watson. Clearly, with so many species to name, taxonomists ran out of morphological characters and place names to describe new taxa!

10. A large number of *Penstemon* species are vulnerable to extinction. In recent years, two narrow endemics of the Uinta Basin (*Penstemon grahamii* and *P. scariosus* var. *albifluvis*) have been candidates for potential listing under the Endangered Species Act. In all, 24 of Utah's penstemons are ranked as species of extremely high, high, or watch conservation priority by the Utah Native Plant Society. Many of these species are threatened by mineral development, off-road vehicle recreation, grazing impacts, habitat destruction, or over-collection by gardeners. Because rare penstemons occur in so many different habitats and regions, they are a good umbrella for the conservation of less showy or charismatic wildflowers.

## ***Graham's Penstemon Wins Reprieve***

*Judge rules that US Fish and Wildlife Service acted "capriciously" in claiming threats were no longer present*

On June 9, 2011, US District Court judge Walker D. Miller sided with conservation groups and ordered the US Department of Interior to reconsider a decision denying Endangered Species Act (ESA) protection to Graham's penstemon (*Penstemon grahamii*). This pinkish-purple wildflower in the figwort family (Scrophulariaceae) is threatened by oil and gas drilling, oil shale development, off-road vehicle disturbance, and sheep grazing in its limited range in the Uinta Basin of north-eastern Utah and adjacent Colorado.

Graham's penstemon was proposed for listing as Threatened under the ESA in January 2006, following a court settlement between the US Fish and Wildlife Service (USFWS) and several conservation groups, including the Center for Native Ecosystems and the Utah and Colorado native plant societies. In December 2006, USFWS withdrew its listing proposal, citing a lack of imminent threats to the species. Judge Miller's ruling overturns the Service's 2006 no-listing decision, citing it as "arbitrary and capricious". The court reinstated the 2006 proposed rule to list the species as Threatened and ordered the USFWS to make a new, final decision on the plant's protection.

"The court's decision makes it clear that FWS cannot set aside science and avoid full consideration of the multiple threats that incrementally push a species closer to extinction," says Meg Parish, attorney for the conservation groups.

The Service's decision to not list Graham's penstemon in 2006 was strongly influenced by testimony provided by the Bureau of Land Management (BLM). According to a 2009 report by the Union of Concerned Scientists, BLM officials in Washington provided misleading statements about the potential for Graham's penstemon to co-occur with sites proposed for oil shale development and oil and gas drilling and downplayed the threats to the species. In particular, the BLM "no listing team" suggested that the penstemon occurred primarily on steep slopes where drilling or development would not occur. The BLM also convinced USFWS that it would develop its own conservation measures for Graham's penstemon that would make listing under the ESA unnecessary.

Unfortunately, data from independent scientists did not corroborate the BLM's assertions. The majority of known populations of Graham's penstemon occur on flat or gently sloping sites, well within the parameters for mineral development. Furthermore, recent BLM-funded studies of pollination biology showed that existing penstemon populations were not growing and there were concerns about the survival of the plant's pollin-



*Above: Graham's penstemon in flower, by Susan Meyer. Penstemon grahamii is restricted to the Uinta Basin of north-eastern Utah and adjacent Colorado and has been under consideration for listing under the Endangered Species Act since 1975.*

ators. All three outside reviewers of the Service's draft listing decision agreed with the need to protect this species under the ESA.

In the June 2011 ruling, the court found the USFWS failed to consider the best available science showing the threat posed by oil and gas development, livestock grazing, and off-road vehicles. "Proper multiple use management of public lands requires a balanced approach. In Utah's Uinta Basin, that balance has been tremendously skewed. The American people must demand that its government officials act with honesty and integrity, and that they solely use the best available science in making natural resource decisions without undue influence by other policies, agendas, or interests. This decision is a step in that direction" says Tony Frates, conservation co-chair of the Utah Native Plant Society. –*W. Fertig, from wire sources*



## Listing Denied for Gibbens' Beardtongue



In August, 2009, the US Fish and Wildlife Service announced it was reviewing the status of 29 of 206 plant and animal species petitioned for listing under the Endangered Species Act by the

WildEarth Guardians. On June 8, 2011, the Service issued a final decision on five of these species, including the Gibbens' beardtongue (*Penstemon gibbensii*), a narrow endemic of SC Wyoming and adjacent NE Utah and NW Colorado. The Service ruled that Gibbens' beardtongue did not warrant listing under the Act because they "...found no factors that cause [this] species to be endangered or threatened". USFWS also noted in their decision that Gibbens' beardtongue is already listed as Sensitive by the BLM in Wyoming and Utah and one population is protected by the Wyoming Nature Conservancy.

Gibbens' beardtongue is presently known from 9 locations in the tri-state area, covering about 270 acres. The species occurs mostly on barren, erosive shale or sandstone slopes of the Browns Park Formation and Laney member of the Green River Shale. Population size is estimated at 11,000-14,000 plants, with the majority occurring in Wyoming. The primary threats to Gibbens' beardtongue are loss of habitat from mineral exploration, road and pipeline construction, OHV recreation, herbivory, and drought. Recent monitoring studies in Wyoming suggest several populations have declined since the 1990s.

The only Utah population of Gibbens' beardtongue is found on state lands in the Browns Park area on the Colorado state line. - *W. Fertig*

## What Good is a Sterile Staminode?

By Peter Lesica

Reprinted from *Kelseyia*, the newsletter of the Montana Native Plant Society

Penstemons are one of our favorite and most familiar groups of native plants. That's understandable because there are lots of them and most have colorful, showy flowers. In fact, *Penstemon* is the largest genus of plants among those found only in North America. Of the 250 species, the majority occur in the western U.S. The great diversity of penstemons makes them a great group for gardening, but it also allows us to study how flowers evolve without having to go too far from home.

Beardtongue is the common name applied to many members of the genus *Penstemon*. It refers to the fact that all penstemons have a sterile stamen called a "staminode" that is hairy to some extent in the majority of species. Penstemon flowers are pretty simple, so the staminode is easy to see. There are six slender, whitish stalks inside the corolla. Four have elongate sacs at their tips; these are the fertile stamens, and the sacs contain pollen. One of the two remaining stalks comes from the top of the ovary; this is the style that carries pollen tubes to the young seeds. The other sacless stalk is the staminode.

Evolutionary biologists believe that the pollen-bearing function of the staminode was lost during the evolution of penstemon's two-sided, two-lipped flower from more primitive, radially symmetrical tube flowers. Flowers of these less advanced groups have five functional stamens. But five doesn't divide evenly into the two halves of the bilaterally symmetrical penstemon flower, so apparently the function of one of the five stamens was lost as flowers evolved toward being two-lipped.

Organs that no longer serve their primary function are called vestigial. Vestigial organs eventually meet one of two fates: they cease to be produced, or they evolve to serve a new function.

There has been a good deal of speculation about the function of the penstemon's staminode. Some researchers considered it useless, while others felt it prevented nectar robbing or otherwise facilitated pollination.

Recently two biologists from Calgary sought evidence for staminode function in two hummingbird and two bee-pollinated penstemons. Lawrence Harder and his student Jennifer Walker-Larsen removed the staminode in some flowers through a small slit they cut at the base of the corolla. In red, bird-pollinated penstemons there was no difference in pollination between flowers with and without a staminode. However, the bee-pollinated species were a different story. In the narrowly tubular flowers of *Penstemon ellipticus*, the staminode impeded visiting bees. They spent more time in the flower and consequently went away with more pollen on their bodies. Researchers also looked at *Penstemon palmeri*, a species with a pouch-shaped corolla. In it, the staminode acts like a lever, causing the style to be pressed against the back of the bees when they land in the spacious flower.

The results of Walker-Larsen and Harder's study suggest that the evolution of the staminode is taking several different directions within the genus *Penstemon* ... depending on the shape and color of the flowers.

## Bridges' Penstemon

By Walter Fertig

The vast majority of *Penstemon* species have blue, purple, or rarely white flowers and are pollinated by bees or other members of the insect order Hymenoptera. A much smaller subset of penstemons have evolved orangish or red flowers and are pollinated by hummingbirds. In addition to differences in flower color, bee-pollinated beardtongues tend to have stout, tubular flowers that will support the weight of a bee, present their flowers at right angles to the stem to provide a level landing platform, and release their pollen slowly.

Despite their reputation for industriousness, bees can be sloppy about picking up pollen and much can be wasted. Flowers are wise to be thrifty in dispensing their pollen, especially as additional bees are always likely to come along anyway. By contrast, hummingbird-pollinated penstemons have downward-pointing flowers and don't need to offer a landing site. These species also tend to dispense their pollen quickly to maximize the visit from a hummingbird, as the birds are more efficient at pollen collection and delivery than bees.

Bridges' penstemon (*Penstemon rostriflorus*) is a scarlet-red flowered penstemon with most of the normal adaptations for hummingbird pollination: red blossoms, downward-pointing corollas, and no specialized landing surface for smaller insect visitors (indeed the lower lip of the corolla is distinctly coiled backward and shorter than the upper lip). A research team led by Maria Clara Castellanos recently discovered that this species differs from the typical hummingbird model in being quite miserly in its dispersal of pollen. Part of this may be due to the unusual shape of the pollen-producing anthers of *P. rostriflorus*, which open only across the top of the anther, rather than along all or most of its length as in



*Above and right: Bridges' penstemon (Penstemon rostriflorus) is one of 4 red or scarlet-flowered Penstemon species native to Utah. All of the red-flowered species are pollinated by hummingbirds which are attracted to red blossoms. Photo by Al Schneider (www.swcoloradowildflowers.com).*

other *Penstemon* species. *P. rostriflorus* is the only species with this anther type that is not blue or bee-pollinated. Taxonomists speculate that it may have evolved from a blue-flowered species to take advantage of the more reliable pollination services of hummingbirds, but changes in anther morphology have been slower in occurring than changes in flower color or shape.

*Penstemon rostriflorus* grows in shady canyons or dry mountain slopes with Gambel's oak, Ponderosa pine, sagebrush, or pinyon-juniper vegetation. It ranges from the Sierra Nevada of eastern California to southern Utah and Colorado and south to northern Arizona and New Mexico. In Utah, Bridges' penstemon occurs from Piute and Millard counties south to the Arizona border. Its range overlaps with that of Beardlip penstemon (*P. barbatus*), a look-alike that differs in technical anther characters.

The species was originally named *P. bridgesii* by Asa Gray after its first collector (a Mr. Bridges), which accounts for its common name. Years later, taxonomists learned that Albert Kel-



logg's name *P. rostriflorus* preceded *bridgesii* and had to be used instead due to the rules of botanical nomenclature. In fairness, "*rostriflorus*" or beaked flower is a more descriptive name. Unfortunately, the original type specimen of *P. rostriflorus* was destroyed in the 1906 San Francisco earthquake and fire, despite the heroic efforts of Alice Eastwood of the California Academy of Sciences to rescue most of the invaluable type collection.



## Utah Botanica

### Odds and Ends from Utah Botany

**Purging the Spurge:** Myrtle spurge (*Euphorbia myrsinites*) is a perennial, yellowish green-flowered succulent that has been planted as a nursery species in the Salt Lake area since at least the 1950s. In recent years the species has escaped from cultivation in northern Utah and started to displace native vegetation in the foothills of the Wasatch Range. Alarmed by its spread and potential health risks (the milky sap from broken stems is an irritant), Salt Lake County added Myrtle spurge to its official noxious weed list in August 2007.

On May 14, 2011, the Salt Lake County Weed Program and its partners (including Salt Lake Conservation District, REI, US Forest Service, Bonneville Cooperative Weed Management Area, Utah Division of Forestry, Fire and State Lands, and the Utah Native Plant Society) sponsored the fifth annual “Purge your Spurge” event at the 3300 South REI store in Salt Lake City. Members of the public who brought bagged Myrtle spurge plants dug up from their yards or community were rewarded with free native plants to grow as replacements.



On the same day over 30 volunteers (including Salt Lake County Mayor Peter Corroon) pulled Myrtle spurge and Dalmatian toadflax (*Linaria dalmatica*) infestations from nearby Grandeur Peak open space area (above). Each of the hardy spurge purgers received vouchers for free native plants for the REI plant sale.

Of course the battle to purge Myrtle spurge continues every day—have you bagged your spurge yet?



#### Four Corners Tree Planting:

Though an arbitrary point on the map, the Four Corners where Utah, Colorado, New Mexico, and Arizona all share a common border, has long attracted interest. The Four Corners monument celebrates native culture and provides visitor services to intrepid travelers, but has long lacked a botanical education component.

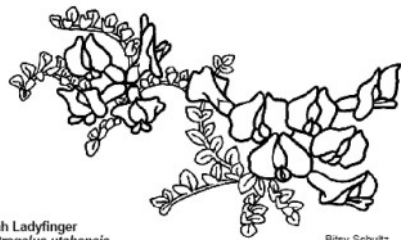
This oversight was corrected on Earth Day, April 22, 2011, when dozens of volunteers descended on the monument to plant native trees, shrubs, and wildflowers. In all, 58 specimens were planted, each blessed by Ute Mountain Ute and Navajo tribal members and celebrated with dancing, drum and flute music, and feasting.

The event was sponsored by Plant a Wish, the Four Corners Monument Heritage Council, and

*Above: Juniperus monosperma and Cercocarpus ledifolius at the Four Corners monument. Photo by Plant a Wish. Left: Spurge purger at Grandeur Peak. Photo by Tony Frates.*

the San Juan/Four Corners Native Plant Society. Additional funding for the plantings came from the San Juan Chapter of the Native Plant Society of New Mexico; the Arizona, Utah, and Colorado native plant societies; the Garden Club of Durango, the Soil Sisters of Durango, Mesa Verde Gardeners, the Farm and Ranch Enterprise of the Ute Mountain Ute Indian tribe, and many individual donors.

This summer educational signs will be placed at the plantings to provide the Navajo, Ute, English, Spanish, and scientific names of each of the native plant species.  
- *Tony Frates, Al Schneider, and Walter Fertig*



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