Henderson's checkermallow:
The natural, botanical, and conservation history of a rare estuarine species

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When Louis Henderson collected the type specimen of Henderson's checkermallow (*Sidalcea hendersonii*) in 1887, he could scarcely have foreseen that this beautiful species of Pacific Northwest coastal estuaries would become a forgotten and overlooked member of the region's flora, nor that his namesake would, over 100 years later, become the focus of intensive research and conservation initiatives to rescue it from the brink of extinction. While the plight of this rare member of the Malvaceae is disheartening, research on Henderson's checkermallow has yielded fascinating tales of botanical history, physical peril, sexual intrigue, predatory insects, and scientific discovery. In addition, conservation efforts for this species have provided a useful case study in grassroots activism, endangered species bureaucratic processes, and initiation of recovery actions.

Botanical History

Early Collections

The first recorded human contact with Henderson's checkermallow dates back to explorations of the Wilkes Expedition of 1838-1842 and yielded a specimen preserved in the US National Herbarium Washington DC. For more information on the Wilkes Expedition, see Mariana Bornholdt's article on page 16. The checkermallow was collected in what is now the state of Washington; the label identifies the location as the Satchop (Satsop) River, but it was probably found in tidal areas of the lower Chehalis River. Although undated, the specimen was no doubt collected on July 30, 1841 by botanist William Brackenridge as the Expedition embarked from Fort Nisqually on Puget Sound to begin mapping Gray's Harbor. Originally identified as "*S. malvaeflora*," the specimen was not recognized as *S. hendersonii* until examined by Eva M.F. Roush for her 1931 monograph of the genus.

Following its initial discovery in Washington, Henderson's checkermallow was collected twice in Canada. In 1858, David Lyall (1817-1895), a Scottish surgeon-naturalist posted to the Canadian-American Boundary Survey, collected it on Saturna Island, British Columbia; his specimen is preserved in the Gray Herbarium at Harvard. Initially identified as "*S. campestris*" by Asa Gray, annotations on the sheet indicate that Roush corrected the name to *S. hendersonii*, with later confirmation by C. L.

Sidalcea hendersonii at Cox Island, Oregon, July 2004. Photo by Gail Baker.

Hitchcock. In 1883, the well-known Pennsylvania botanist Thomas Meehan found the checkermallow near Victoria on Vancouver Island; his specimen can be seen at the Academy of Natural Sciences in Philadelphia. Meehan called his specimen "*S. malvaeflora*" but his label reveals that he had his doubts about the identification. Eva Roush recognized the specimen as *S. hendersonii* in 1931.

Henderson's checkermallow did not gain its recognized scientific name until 1887, when two Oregon pioneer botanists collected it almost concurrently. Although Louis F. Henderson and Thomas Jefferson Howell often worked together, their respective discoveries of this species were made independently. Howell's collection on June 15th at the mouth of the Umpqua River was the first in Oregon. He labeled it "*Sidalcea campestris*." Two weeks later (July 3rd), Henderson encountered it in the Columbia River estuary, at a location he identified as "near Clatsop Bay." This site does not appear on maps but "Clatsop Beach" is indicated on an early map in the vicinity of Fort Stevens State Park near present day Hammond. Both Howell and Henderson sent their specimens to Harvard, where the Howell specimen was apparently overlooked for a number of years, while Henderson's was named for the collector by Sereno Watson. Both collections can be studied at the Gray Herbarium today.

Other early collectors of *Sidalcea hendersonii* in Oregon included Morton E. Peck of Willamette University who found it at Nestucca Spit in 1909, and at Sand Lake and Cannon Beach in 1924. LeRoy Abrams of Stanford collected it at Seaside in 1922, and Henderson collected it two more times, first at Cannon Beach in 1929 and again at Florence in 1931. C. L. Hitchcock of the University of Washington made a collection north of Reedsport in 1951.

Holotype of *Sicalcea hendersonii* collected by Louis F. Henderson "near Clatsop Bay, Oregon" on July 3, 1887. Note annotations by Eva M. F. Roush, and C. L. Hitchcock. Courtesy of the Gray Herbarium, Harvard University.

Sidalcea Origins and Taxonomy

The genus *Sidalcea* A. Gray (Malvaceae) comprises annual and perennial herbs inhabiting western North America from the Rocky Mountains west to the Pacific coast, and from Mexico north to British Columbia. Although Eva Roush (1931) suggested that *Sidalcea* originated in Mexico and spread northward, recent molecular studies do not completely support this theory (e.g. Andreason and Baldwin 2003). Steven R. Hill, author of the treatment for Malvaceae in The Jepson Manual (Hickman 1993), has studied phytogeographic evidence for *Sidalcea* and proposes that a California-Sierran origin is more likely (Hill, pers. comm.). Floras recognize at least 18 species in California (Hickman 1993), 13 species in Oregon, and 3 species in Washington (Hitchcock *et al.* 1961), and 2 species are known from Mexico (Fryxell 1998). Among checkermallow species, *Sidalcea hendersonii* has the most northerly distribution, with several populations scattered up the British Columbia coastline and a single occurrence discovered in 2003 near Juneau, Alaska. The latter represents the first record of Malvaceae in Alaska's diverse native flora. A conspicuously tall plant, Henderson's checkermallow reaches nearly 5 feet in height, and is distinguished from other checkermallows primarily by its habitat and by its glabrous foliage and smooth carpels. Henderson's checkermallow is found only in tidally influenced areas where fresh water from lakes or streams meets salt water of the Pacific Ocean. Some of its salt marsh-adapted associates include Pacific silverweed (*Argentina egedii* ssp. *egedii*, syn. *Potentilla anserina* ssp. *pacifica*), western yarrow (*Achillea millefolium*), seacoast angelica (*Angelica lucida*), and tufted hair-grass (*Deschampsia caespitosa*). No other

Sidalcea species is known to occupy estuarine habitats.

Although other *Sidalcea* species with overlapping ranges can hybridize (Gisler 2003), interspecific mating is unlikely in Henderson's checkermallow because it is isolated by its estuarine habitat. *Sidalcea hendersonii's* nearest taxonomic relative is not entirely clear. While Roush (1931) thought *S. hendersonii* most closely resembled *S. candida* and *S. oregana*, Hitchcock and Kruckeberg (1957) ultimately placed it with *S. cusickii* on the basis of pubescence, flower size, and carpel characteristics. More recently, Andreasen and Baldwin (2003) positioned *S. hendersonii* closest to *S. virgata* based on a genetic analysis of nuclear ribosomal DNA, but their study did not include *S. cusickii* or *S. campestris*. If one of these species is the progenitor of *S. hendersonii*, then the latter likely evolved in the estuaries of the central Oregon coast, where drainages from interior valleys provide migration corridors to the Pacific Ocean for both putative ancestral progenitors.

Modern Conservation Status: Where have all the flowers gone?

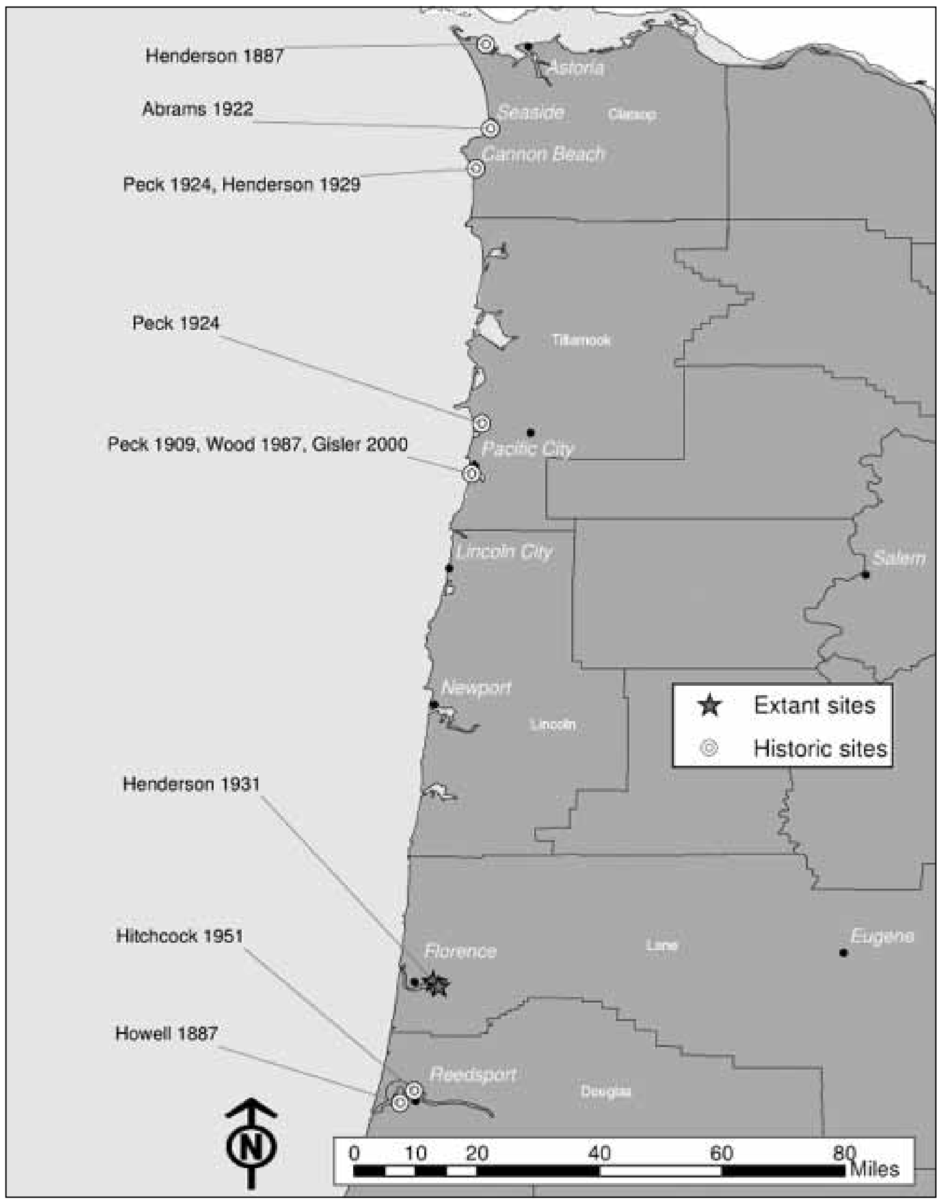
Historically, Henderson's checkermallow was neither rare nor ephemeral. Indeed, pollen dating back approximately 3700 years (Mathewes and Clague 1994) infers the long term presence of *S. hendersonii* in British Columbia. The early collections of Henderson's checkermallow in Oregon, Washington, and British Columbia indicate that this species was once much more common than it is today.

Regrettably, the gradual decline of this species long proceeded unnoticed, despite the disappearance of its showy pink flowers and the obvious loss of estuarine habitats to agricultural and urban development. In 2002, during her biographical investigations of pioneer botanist, Louis Henderson, Rhoda Love realized that there had been few recent reports or collections of *Sidalcea hendersonii* in Oregon. Furthermore, the botanical community had little knowledge of extant populations. Her concern was translated into a mobilization of population searches in the summers of 2003 and 2004. These searches revealed reduced abundance and distribution in Oregon, where known populations have decreased from ten to only one (Love 2003). Fortunately, the species has fared somewhat better in Washington and British Columbia, although it is still considered rare in these regions. Worldwide, it is believed fewer than 100 sites remain for this species, most occurring within vulnerable, privately owned habitats (Love 2003).

Sidalcea hendersonii fruit, a 5-9 seeded schizocarp. Photo by Helen Kennedy.

Status in Oregon

Jean Siddall (1930-1997), founder of the Oregon Rare and Endangered Plant Project, together with Kenton L.



Extant and historic *Sidalcea hendersonii* populations in Oregon are referenced by the last name of the reporter and year of collection or sighting. The only extant population is located in the Siuslaw River estuary near Florence.

Chambers of Oregon State University, instituted searches of historic Oregon *Sidalcea hendersonii* sites in the 1970s. Alarmingly, the estuarine checkermallow was relocated at only one site, in Tillamook County. For reasons not well understood, this extinction rate did not trigger automatic listing of the plant by the Oregon Department of Agriculture Plant Conservation Biology Program following its establishment in 1987. The US Fish and Wildlife Service has, thus far, not listed the plant as threatened, perhaps because extant populations remain in Washington. However, when alerted in April 2003 by the Native Plant Society of Oregon (NPSO) to the fact that the species seems on the point of disappearing from our state, the Oregon Natural Heritage Information Center at OSU upgraded *Sidalcea hendersonii* to its List 1 (Endangered or threatened throughout its range) and raised its global rank to G3 (Rare, threatened or uncommon throughout its range).

The Only Known Population in Oregon

Today, the only known surviving population of Henderson's checkermallow in Oregon occurs in the Siuslaw River estuary of Lane County. Intensive field searches of historic *Sidalcea hendersonii* sites and potential habitat by nearly two dozen botanists in 2003 and 2004 failed to relocate the species elsewhere in the state, aside from a single individual near Sand Lake in Tillamook County. The largest of the Siuslaw River occurrences is located on Cox Island, about three miles east of Florence. The Nature Conservancy (TNC) acquired the island in 1976 as a gift from a timber company, Champion International. The importance of *Sidalcea hendersonii* on this 188-acre island was taken into account in 1995 when the TNC established a conservation management plan for the island. Monitoring of the species by the Conservancy began in 1999.

Today approximately 545 individuals of Henderson's checkermallow are protected on Cox Island. Robert Frenkel of Oregon State University, an expert on salt marsh ecosystems, has written of the population, "The habitat is not too encouraging for the long-term survival of the species. It is mostly confined to the upper edge of the salt marsh which tends to be a highly disturbed habitat where logs, boards, wracks of algae and other flotsam accumulate and roll around under high tide conditions" (R. Frenkel, pers. comm.). Successional changes and invasion by non-native species also threaten its long-term survival on Cox Island.

Conservation Efforts in Oregon

Conservationists hope that increased public awareness of Henderson's checkermallow will yield reports of additional populations. If they are found on private land, we will endeavor to protect them under a conservation agreement or convert the land to public ownership where it can be managed for native estuarine species. While several checkermallow occurrences are known from the Siuslaw estuary area, currently only the Cox Island population is protected. However, the McKenzie River Trust of Eugene is working to acquire conservation easements at the other sites.

Recovery of Henderson's checkermallow in Oregon may ultimately require a reintroduction program. NPSO is supporting a study through the Leighton Ho Memorial Field Botany Award that will identify appropriate habitats for reintroduction of Henderson's checkermallow. Cultivation of this species is not expected to be a barrier to reintroduction efforts as the Institute for Applied Ecology in Corvallis has already propagated Henderson's checkermallow from seed collected at Cox Island Oregon in 2003. Although germination was low, seedling survival was high, and the majority of the plants flowered in the first year. Currently, several hundred healthy, potted Henderson's checkermallow plants await transplanting to the Oregon coast. Given the success of reintroduction programs for other rare checkermallow species (Gisler 2002), we are optimistic that these transplanting efforts will result in new populations when suitable and secure introduction sites are found.

Legal Protection: NPSO Petitions State and Federal Agencies

In late 2003 the NPSO Board of Directors voted to petition the Oregon Department of Agriculture (ODA) Plant Conservation Biology Program and the United States Fish and Wildlife Service (USFWS) for listing of *Sidalcea hendersonii* as Threatened. NPSO

Sexual Dimorphism

Spotting female Henderson's checkermallow plants in the field, even from a distance, is easier than it might sound. Female flowers can readily be distinguished from bisexual flowers not only by a lack of pollen, but also because female flowers are substantially smaller and of darker pink pigmentation. Interestingly, male-sterility in gynodioecious species is frequently associated with a reduction in flower size (Darwin 1877, Ashman and Stanton 1991, Delph 1996). The mechanism responsible for the floral dimorphism is not completely understood. Darwin (1877) suggested that this pattern had nothing to do with natural selection; rather it was due to a developmental connection between stamens and petals. Indeed, experimental evidence suggests that hormones associated with pollen development are at least partially responsible for the relationship between flower size and sex. In another gynodioecious species, Plack (1957) found that removing the stamens of bisexual flowers at bud stage reduced their corollas to the size of female corollas. She could reverse this process by adding gibberellic acid, a hormone associated with male sex expression.

One field guide suggested a possible trimorphism for *Sidalcea hendersonii*: "A remarkable feature is the occurrence of 3 kinds of flowers. In addition to the large 1 inch, perfect flowers…occasional flowers in the spike-like racemes are but ½ inch wide (though perfect), and there are also similar small blooms that are imperfect, lacking anthers" (Clark 1973). However, after measuring the petals of thousands of female and hermaphrodite individuals in six populations, Marshall (1998) concluded that only two floral forms exist: large-flowered bisexual and small-flowered female flowers. The impression of trimorphic flowers is understandable because females occasionally exhibit "dummy" (sterile) stamens.

petitions, delivered to the agencies in December 2003, summarized the decline of the species and made a case for granting it legal protection. In response, Dr. Robert Meinke of ODA stated that NPSO's petition justified a "full status review." The Acting Regional Director of USFWS in Portland replied that their initial review of the petition did not indicate that an emergency situation existed, and they anticipated making an initial finding in Fiscal Year 2005.

Despite frustration with the slow pace of agencies in the process of listing, NPSO remains optimistic for legal protection of the species and looks forward to working with ODA and USFWS to assist the recovery of Henderson's checkermallow in Oregon.

A striking sexual dimorphism in Henderson's checkermallow is readily apparent by comparing the large, pollen producing bisexual flowers (right) with small, dark pink, female flowers lacking pollen (left). Photo by Helen Kennedy.

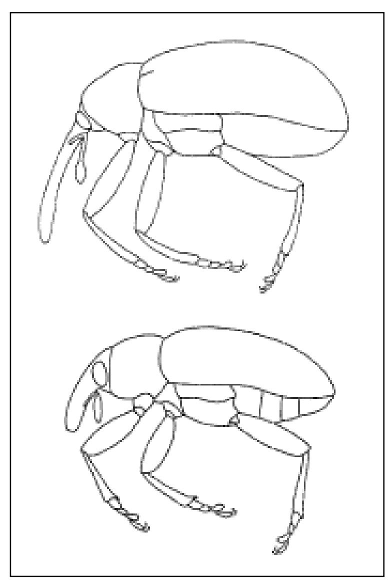
Mysterious Mating System

Cloaked behind its distractingly attractive displays of bright pink flowers, Henderson's checkermallow exhibits an unusual and evolutionarily perplexing sex life. Many students of botany are familiar with the three routine plant mating systems: bisexual flowers (male and female organs on the same flower), monoecy (separate male and female flowers on the same plant), and dioecy (male and female flowers on different plants). Henderson's checkermallow, however, possesses an uncommon mating system often overlooked in basic botany texts called "gynodioecy." Gynodioecious populations contain two (coexisting) types of plants: plants with all bisexual flowers and plants with all female (male-sterile) flowers. Gynodioecy is considered to be derived from the bisexual system, often as an intermediate step in the evolution of dioecy (Lloyd 1974). It is estimated that gynodioecy occurs in only 7% of species (Richards 1986), but the fact that it exists at all has baffled evolutionary biologists since the time of Charles Darwin (1877). How are females maintained in these populations when they seem to have a reproductive disadvantage? Female plants contribute genes to the next generation only through their ovules (which become seeds), whereas bisexual plants have two opportunities to pass on their genes, through both pollen and ovules. Female plants must produce significantly more seeds than bisexual plants for male sterility mutations to be maintained in gynodioecious populations (Charlesworth and Ganders 1979).

In the case of Henderson's checkermallow, Marshall and Ganders (2001) showed that females did indeed exhibit higher fitness, producing more surviving offspring than bisexual plants in an experimental population. However, when seed production was compared in natural populations in British Columbia, no female fitness advantages were evident. Moreover, the average female frequency in these same populations was 39%, greatly exceeding the 20% frequency exhibited by most gynodioecious species. If these high female frequencies weren't attributable to higher seed production, could it be alternatively explained by the genetics of male-sterility inheritance? After all, complex interactions between genes in the nucleus and cytoplasm favor female offspring and are common in other gynodioecious species, including the related species, *S. oregana*. ssp. *spicata* (Ashman 1992). However, crosses in *S. hendersonii* indicated simple Mendelian (nuclear) patterns of inheritance, offering no genetic advantages to females (Marshall and Ganders 2001). By this point, it looked like evolution of gynodioecy in *Sidalcea hendersonii* would remain an unsolved mystery.

A surprise explanation for females

In Henderson's checkermallow the persistence of the unusual breeding system, gynodioecy, could not be explained by higher female fitness or genetic control of male sterility. But in the fall of 1994, in a musty, dimly lit hotel room, researchers from the University of British Columbia made a fascinating discovery. While inspecting *S. hendersonii* fruits collected earlier that day from Vancouver Island, it became evident that many seeds were damaged by weevils, and most of this damage occurred on seeds from bisexual plants. It followed that although production of seeds was equivalent between female and bisexual plants, actual seed survival was much lower in bisexual plants due to selective predation by weevils (Marshall and Ganders 2001). This discovery may explain why female plants are maintained in Henderson's checkermallow populations. Until that time, the role of seed



Anthonomus melancholicus (top) and *Macrorhoptus sidalcea* (bottom). *Anthonomus* preferentially consumed bisexual seed in BC populations (Marshall and Ganders 2001), while *Macrorhoptus* did not appear to be a sex-biased predator. Female *Macrorhoptus* weevils oviposit eggs in immature carpels and the larvae complete their development in the fruit. The larvae feed on the interior of each seed, moving from one seed to the next through small tunnels they create. In contrast, *Anthonomus* weevils appear to consume the entire fruit, leaving only fat larvae and frass resting in the bottom of an empty calyx. Weevils are approximately 3 mm long. Drawing by L. Lucas.

Henderson Collects Type Specimen

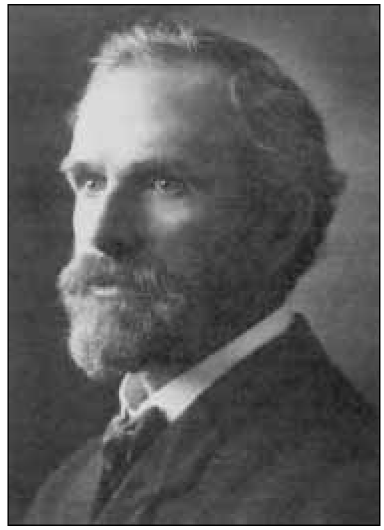
by Rhoda M. Love

The date was Sunday, July 3, 1887 – the day before Independence Day. No bridge spanned the Columbia River at Astoria, no dams impounded the great river, and the Corps of Engineers had just begun work on the South Jetty. The American Frontier was moving westward; Oregon had achieved statehood, but Washington would remain a Territory for two more years. Democrat Grover Cleveland was President, and Asa Gray was curator of the herbarium at Harvard University.

On this day Louis F. Henderson set out to indulge in his favorite pastime, searching for new plant species. Henderson was 34; he had been married to his wife Kate for four years and had a year-old daughter, Margaret. (Their second daughter, Constance, would be born the following year.) Henderson was a teacher of languages, elocution and botany at Portland High School. He and his family frequently spent summers at the beach home of his mother-in-law at Ilwaco near Long Beach, Washington Territory. It seems probable that, to botanize the salt flats and marshes between Point Adams and Young's Bay of Oregon on this holiday weekend, he crossed the broad mouth of the Columbia River on a private fishing vessel.

Once amid the grasses and reeds of the Columbia estuary, Henderson no doubt began to get his feet wet in the muddy, channeled soil that had just begun to dry out after the river's annual spring floods. The weather was likely gray and wet in the morning, fog mixing with the tang of salt spray from nearby Clatsop Spit. Peering through the mist, the botanist must have spotted the waist-high spikes of bright pink flowers and recognized the plant as a checkermallow. Two species had previously been identified from Oregon: *Sidalcea oregana* in 1849, and *Sidalcea campestris* in 1885. Carefully he picked a flowering stem with basal leaves and folded it into a bed of damp grasses in his tin vasculum. When he returned to Ilwaco that evening he would have added a label with date and location and pressed the specimen between newspapers and blotters.

We do not know what other species Henderson collected that day at "Clatsop Bay," because most of his specimens burned in a tragic herbarium fire at the University of Idaho in 1906. However, this particular checkermallow, which Henderson may have recognized as a new species, was sent to Harvard's Asa Gray for identification. Unknown to Henderson at the time was the fact that Asa Gray was ill; the Harvard botanist would die the following January, before dealing with the salt-loving checkermallow. It fell to Gray's successor Sereno Watson to name the plant. Watson honored the young schoolteacher-explorer in 1888 by giving it the name *Sidalcea hendersonii*, Henderson's checkermallow. As for Henderson himself, our guess is that he returned to his family at Ilwaco that Sunday evening tired and muddy, with wet shoes and socks, put his plants in press, slept well, and awoke the next morning to enjoy the festivities of an American Independence Day.



Louis F. Henderson (1853-1942) as the botanist appeared about the time he collected the type specimen of *Sidalcea hendersonii*, named for him by Sereno Watson. Photo courtesy of the Henderson family.

predation in breeding system evolution had received minimal consideration.

Two species of Curculionid beetles (weevils) parasitize seeds of Henderson's checkermallow, *Macrorhoptus sidalcea* and *Anthonomus melancholicus* (identified by Dr. Horace Burke, Professor Emeritus, Texas A&M University, and Dr. Robert Anderson, Canadian Museum of Nature), but only one of these has been identified as a selective predator. At a mainland BC population harboring only *Macrorhoptus* weevils, female and bisexual plants experienced equal levels of seed predation, while at five populations on Vancouver Island where *Anthonomus* weevils were dominant, sex-biased seed predation was obvious. At these island populations, weevil larvae destroyed significantly more seeds from plants with bisexual flowers. Not surprisingly, more female plants occurred in populations that experienced this preferential feeding pattern. *Sidalcea hendersonii* provided the first clear evidence that sex-biased predation may be responsible for high female frequencies in a gynodioecious species. The reason for discrimination between bisexual and female flowers was not investigated, but adult *Anthonomus* weevils are known to feed on pollen, and scientists suspect that pollen (obviously lacking in female flowers), is what attracts weevils to bisexual flowers. After dining on pollen, weevils have little incentive to migrate elsewhere before mating and laying their eggs.

Applying Breeding System and Seed Predation Research to Conservation

Although breeding system issues may not pose the most significant threat to the survival of Henderson's checkermallow, subtle effects can undermine resilience and survival when populations are small and threats are numerous. As populations shrink and become isolated, the probability of inbreeding increases (Jain 1976). Marshall and Ganders (2001) found that inbreeding in Henderson's checkermallow was correlated with reductions in seed production, germination, survival, and flowering. Also, high numbers of females in gynodioecious populations could limit pollen flow, thus impacting seed production and recruitment of new individuals. Pollen flow could be a particularly important concern at the North Fork of the Siuslaw River, where the frequency of females within Oregon's last remaining Henderson's checkermallow population exceeds 50%. Future reintroduction efforts should endeavor to plant an adequate number of bisexual individuals in key locations near females.

Likewise, seed predation should not be overlooked as a potentially formidable threat. The infamous boll weevil, another

Anthonomus species, parasitizes cotton crops (another member of the Malvaceae) causing at least 200 million dollars worth of damage each year (White 1983). In the Threatened species *Sidalcea nelsoniana*, weevils have been identified as a primary threat to reproductive success and population viability (Gisler and Meinke 1997). In Oregon's Siuslaw estuary, both *Anthonomus* and *Macrorhoptus* weevils were collected from Henderson's checkermallow plants. *Anthonomus melancholicus* weevils can be voracious predators, occasionally consuming every seed produced by a plant (Marshall 1998). A preliminary evaluation of 340 fruits from 18 individuals at Cox Island revealed a reduced reproductive capacity for these checkermallow plants, with 31% of seeds destroyed by weevils and an additional 32% of seeds either unfertilized or aborted (M. Gisler, unpublished data).

Suddenly overtaken by the tide while studying a Henderson's checkermallow population on Vancouver Island BC, Melanie Gisler treads water to protect collections. Photo by Lesley Esford.

Conclusion

Henderson's checkermallow is vulnerable to numerous anthropogenic, environmental, and biological threats. We are fortunate that one population still exists in Oregon, though its long-term survival is uncertain. Active intervention through continued research, legal protection, habitat management, land acquisition, and reintroduction will all be necessary if we hope to restore this fascinating and beautiful salt marsh species in our state.

Acknowledgments

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Tides!

By Melanie M. Gisler

For adventurous souls wishing to see Henderson's checkermallow in its native habitat, I feel compelled to share one of my salt marsh field experiences with you. Having spent the majority of my life in the landlocked, desert state of New Mexico, I was completely unprepared for the vicissitudes of a Northwest estuary. Joined by my invaluable field assistant, Lesley, and trusty canine, Zooey, I foolhardily set out on the first field excursion of my graduate thesis. The objective of our day's work was to count Henderson's checkermallow females and measure flower petals with digital calipers at Ladner Marsh, near Vancouver, BC. Our clumsy attempts to carry out this delicate work were initially amusing, as we found ourselves repeatedly stumbling into treacherous, muddy tidal channels concealed by dense vegetation. By late afternoon we were deep into the marsh. While Zooey busied himself stalking and attacking innocent cattail heads, Lesley, the pragmatic member of our group, began nervously eyeing the water, which was climbing ever higher on our rubber boots.

Unconcerned, we opted to ignore the rising tide and collect more data before calling it a day. However, only minutes later the cool seawater rapidly rose from ankle to mid-calf. Although my shepherd-cross is a good sport in most situations, at this point even he seemed doubtful we could navigate or swim through the overpowering plant life and avoid plunging into the surprise channels, now completely filled with the rising water. As the advancing tide continued to envelop us, we realized that we could drown! Hastily securing data and equipment, we dragged ourselves through the quagmire, desperately clinging to injuriously sharp sedges for stability. When the chilling cold water topped our boots, I experienced a sickening feeling of claustrophobia. I was responsible for my friend, my dog, my own life, and my data. Succumbing to panic, I suddenly noticed that Zooey was intentionally avoiding particular sections of marsh for no reason apparent to my comparatively dull human senses. Investigating with a stick I realized that he was somehow able to detect the dangerous channels, now submerged under several feet of water. The canine became our leader. With clothing now drenched up to our waists and our field equipment and data raised high above our heads, we scrambled and splashed through one last obnoxious clump of purple loosestrife before miraculously floundering onto dry land. Looking like creatures from the black lagoon, we gawked at the nightmare from which we just emerged. Now that we were safely removed, the estuary somehow no longer seemed so threatening. In the distance we could see the lovely pink wands of checkermallow flowers swaying gently with the motion of the tide, as if waving goodbye. Peace restored, we vowed from that day forward to study tide charts religiously and carry a small inflatable raft (just in case).

Henderson's checkermallow. We are grateful to Neal Hadley and Kevin Anderson for their good work with Henderson's checkermallow while TNC stewards for Cox Island. Thanks also to Frank Lang, Susan Kephart, and Fred Ganders for reviewing the manuscript and to Steven R. Hill for his insights on *Sidalcea*.

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Authors' Note: As this issue of *Kalmiopsis* was going to press, NPSO was notified by the Oregon Department of Agriculture that its petition to list *Sidalcea hendersonii* as Threatened in Oregon had been denied. Please watch for more information in the NPSO Bulletin.