

SILVERSPOT BUTTERFLY NATURAL HISTORY SUMMARY
and
SURVEY PROTOCOL



Cover Photos:

Top – Female silverspot butterfly by Steve Cary, 1994.

Bottom – Male silverspot butterfly by Terry Ireland, US Fish and Wildlife Service, 2018.

Version: May 28, 2025

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INTRODUCTION

This protocol includes survey guidelines for both the silverspot butterfly (*Speyeria* (= *Argynnis*) *nokomis nokomis*) and its larval host plant *Viola nephrophylla*/*V. sororia* var. *affinis* (northern bog violet, hereafter just called bog violet or violet unless specified). The protocol is intended to guide general inventory surveys by Federal agencies when carrying out programs for conservation of endangered and threatened species as directed under section 7(a)(1) of the Endangered Species Act of 1973, as amended (Act). It can also be used by State, Tribal, or local governmental agencies or non-governmental entities including private landowners to help manage lands for conservation and recovery of the silverspot butterfly. Furthermore, the protocol provides survey guidelines for when project-specific surveys are planned through the Interagency Cooperation (consultation) procedures under section 7(a)(2) of the Act. Interagency consultation occurs when a proposed project is federally funded, permitted, or authorized (i.e. they are considered Federal actions) and may affect a federally listed species. Surveys for section 7(a)(2) purposes will be considered valid only if they follow this survey protocol and are conducted by Federal, State or Tribal environmental personnel or environmental consultants trained in identification of bog violets and similar looking species and the silverspot and similar looking species. Likewise, people conducting surveys for voluntary conservation efforts should be trained in violet and silverspot butterfly identification but should at least confirm species identification with personnel in U.S. Fish and Wildlife Service (FWS) offices listed in the Contact Information section at the end of this document.

All land managers and landowners need to ensure that their actions do not “take” federally listed species, including the silverspot, as provided by section 9 of the Act and, for threatened species, under section 4(d) of the Act, which incorporate section 9(a)(1) prohibitions of the Act. Take prohibitions apply to federally listed species whether or not there is a federal action that would result in the need for section 7 consultation. Take means to “harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”. Section 4(d) also allows for exceptions to incidental take for threatened species and a 4(d) rule was written for the silverspot that allows for exceptions of take for certain activities (see the “Silverspot Butterfly Federal Status and Distribution” paragraph below for reference to the final listing and 4(d) rules). Federal agency funding, permitting, or authorizing actions still need to comply with section 7(a)(2) of the Act for excepted activities under the 4(d) rule.

NATURAL HISTORY SUMMARY

Silverspot Butterfly Federal Status and Distribution

The listed silverspot butterfly is one of five subspecies of *S. nokomis* in the United States (U.S.) and Mexico (Cong et al. 2019). A final rule listing the silverspot butterfly as threatened under the Act was published in the Federal Register on February 15, 2024 (89 FR 11750). A 4(d) rule accompanied the listing, providing exceptions to take of the butterfly from specific activities that could cause incidental take. The silverspot is distributed in southeastern Utah, southwestern Colorado, and north-central New Mexico (Figure 1).

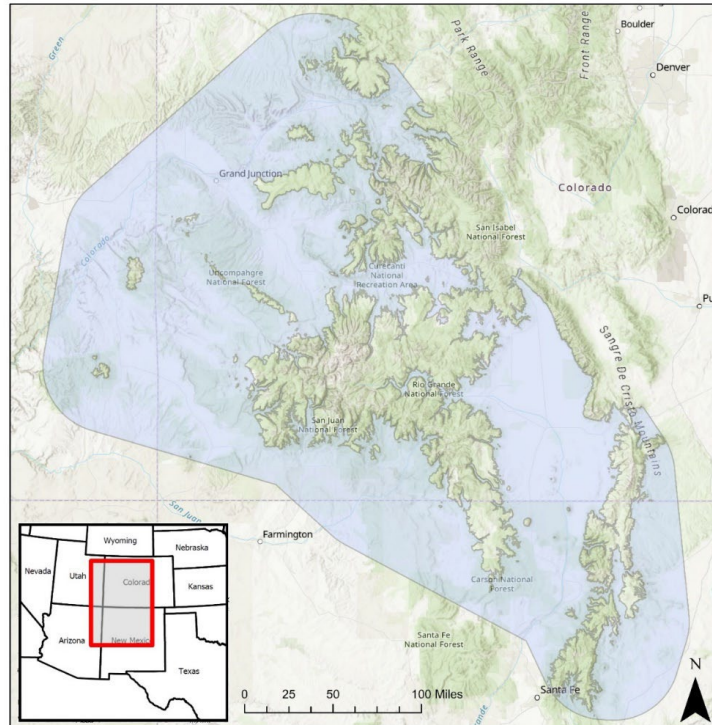


FIGURE 1. CURRENT RANGE OF THE SILVERSPOT BUTTERFLY (*S. n. nokomis*). THE RANGE EXCLUDES ELEVATIONS ABOVE 9,300 FEET (2835 M). COLONY AND POPULATION LOCATIONS ARE NOT SHOWN TO PROTECT THE SUBSPECIES.

Suitable Habitat

The bog violet is widely distributed in the U.S., but in the arid west, it only occurs in naturally scarce habitats described below. Associated herbaceous vegetation typically includes sedges (*Carex* spp.), rushes (*Juncus* spp.), spike rushes (*Eleocharis* spp.), grasses, and forbs (Scott 1986, p. 326; Selby 2007, p. 22). More specifically, the bog violet grows in areas with the following characteristics:

1. The site meets the soil, vegetation, and hydrologic criteria for being classified as a wetland (Environmental Laboratory 1987, commonly referred to as the Corps of Engineers Wetlands Delineation Manual).
2. Violet and butterfly habitats are found within palustrine persistent emergent and/or palustrine shrub-scrub wetlands (Federal Geographic Data Committee 2013; also referred to as Cowardin et al. 2013).
3. Most soils on the site must be saturated by a highly reliable and abundant surface or groundwater source. Field indicators are that at least some areas on the site are wet enough in all seasons to require waterproof boots, and some surface water is almost always flowing out of the wetland in micro-channels. These sources include but are not limited to;
 - a. springs,
 - b. seeps, and
 - c. alluvial groundwater provided by rivers and streams.

4. Within the wetland, there must be small (0.1 acre minimum) to large herbaceous meadows. The most suitable sites are dominated by:
 - a. sedges,
 - b. rushes, or
 - c. spike rush.
5. Small meadows within shrub or tree-dominated sites appear to be an essential element for the occurrence of the larval foodplant violets, as well as behavioral space for adult butterflies.

Additional landscape factors that may be beneficial for violet and butterfly occurrence include wetlands that are part of a complex linked by riparian corridors (for the silverspot riparian corridors are also called transitory corridors), areas with beaver activity including exposed sedge meadows from breached beaver dams, streams with occasional overbank flooding and channel realignment, abundant native or non-native nectar sources, and ungrazed or seasonally grazed wetlands (preferably only in the winter and spring). Wetlands outside of agricultural areas and that don't receive pesticide spraying are more likely to harbor the violet and butterfly. Irrigation return flows can provide groundwater and be beneficial, but only where native spring-fed meadows persist. Decaying logs that are sometimes interspersed in meadows have been observed to have violets growing along them (Ireland 2021, pers. comm.).

Individual violet plants grow in small clumps of leaves. Leaf petioles (stems) are often only 1 to 5 inches (2.5-8 centimeters (cm)) tall (Greene 1896) but may grow as tall as 8 inches (20 cm). Most leaves are heart-shaped with small, rounded, teeth and are often curled inward, especially younger leaves (Figures 2-5). Some leaves have pointed tips, but others are rounded. Especially leaves with rounded tips can look kidney-shaped (or reniform) as noted by Botanist Edward Lee Greene, who gave the violet a scientific species name of *nephrophylla*, meaning kidney-leaf (Greene 1896). The leaves were also described as firm and almost subcoriaceous (leather-like) as well as having crenate (rounded or scalloped-toothed) or crenate-serrated (rounded and jagged-toothed) margins (Greene 1896). The elevation of the bog violet in Utah, Colorado, and New Mexico ranges from 2,750 feet to 11,500 feet (838-3505 meters (m)), both within and outside of the range of the silverspot.

Forbs that serve as nectar sources for adult silverspots include native and introduced thistles (for example *Cirsium* spp. and *Carduus* spp.), horsemint (*Agastache* spp.), joe-pye weed (*Eupatorium maculatum*), milkweed (*Asclepias* spp.) and other native or introduced forbs, often including blue and yellow composites (Scott 1986, p. 327; Ellis 1989, p. 18; Selby 2007, p. 23).

The silverspot has a more restricted elevation range than the bog violet. Silverspot **colonies** are currently known to occur from roughly 5,200 feet (1,585 m) to just over 8,300 feet (2,530 m) but an individual butterfly was observed at 9,250 feet (2,819 m) in central Colorado (Ellis and Fisher 2020, pers. comm.). Consequently, (giving a 50-foot (15-m) elevation buffer), **the current elevation range is 9,300 feet (2,835 m) or below.**



FIGURE 2. V. NEPHROPHYLLA/V. SORORIA VAR. AFFINIS (BOG VIOLET). PHOTO BY TERRY IRELAND, USFWS, AUGUST 2018.



FIGURE 3. *V. NEPHROPHYLLA/V. SORORIA* VAR. *AFFINIS* (BOG VIOLET). PHOTO BY TERRY IRELAND, USFWS, AUGUST 2018.

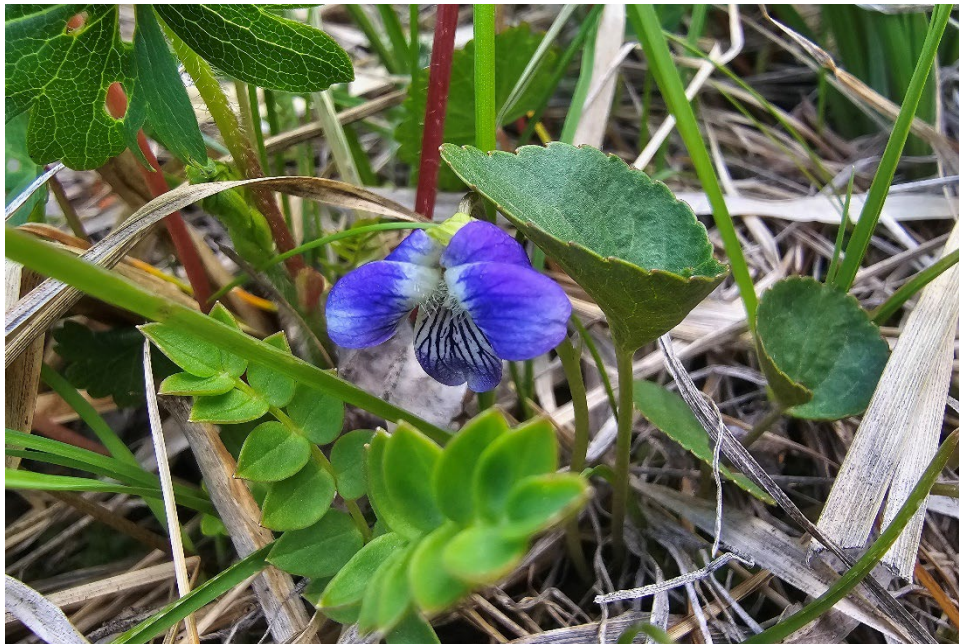


FIGURE 4. *V. NEPHROPHYLLA/V. SORORIA* VAR. *AFFINIS* (BOG VIOLET). PHOTO BY CREED CLAYTON, USFWS, MAY 2024.



**FIGURE 5. *V. NEPHROPHYLLA/V. SORORIA* VAR. *AFFINIS* (BOG VIOLET).
PHOTO BY CREED CLAYTON, USFWS, MAY 2024.**



**FIGURE 6. WET MEADOW HABITAT WITH LEPIDOPTERIST SCOTT ELLIS LOOKING AT *S. N. NOKOMIS* IN UNAWEAP CANYON. PHOTO BY
TERRY IRELAND, USFWS, AUGUST 2018.**

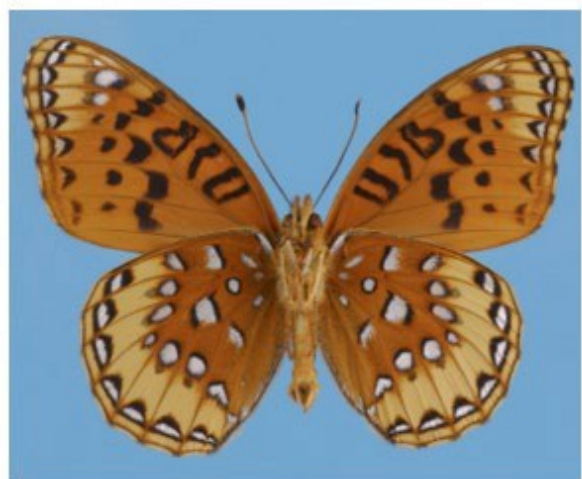
Degraded Habitat

Degraded areas that do not provide for violet and silverspot habitat are streams with highly modified flows from agricultural diversions and dams, areas where groundwater has been depleted by groundwater pumping for irrigation, artificial wetlands maintained only by irrigation seepage, areas with year-round grazing especially without protection of violets by woody vegetation, headcut streams where steep, dry, banks remain (though if erosion is not too intense groundwater seepage at the edge of down-cut banks can allow for colonization of violets), wetlands tilled and planted to tame grasses (e.g. smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*)), and wetlands colonized by aggressive non-native grasses (e.g. reed canary grass (*Phalaris arundinacea*)).

Silverspot Butterfly Identification and Life History

Adult Identification

S. n. nokomis adults have wingspans from 2.5 to 3.1 inches (6.3-7.9 cm) (Selby 2007, p. 14). The adult butterflies are sexually dimorphic (Figures 7-8); the upper side of the male's forewings and hindwings are orange-brown basally and bright orange distally. The upper side of the female's forewings and hindwings is brown to black and cream to yellow. The underside forewing of both sexes is similar to one another, being primarily light brown to orange with the most distal part shifting to cream, yellow, or light orange with a few silvery-white spots, but the female forewings typically have a more vibrant orange next to the distal yellow part. The underside hindwing of both sexes has numerous silvery-white spots, and is where the generic common name, silverspot butterfly, is derived. These spots are wholly or partially surrounded by thick dark bands or chevrons. The wings of both sexes also have separate dark vermiculate markings, chevrons, and spots. In addition, the primary features of the male's underside hindwing are light brown to burnt-orange basal discs (Figure 7, bottom photos). The female's discs are deep olive or brown with a yellow or cream crescent (Figure 8, bottom photos). The males have hairy orange bodies; the females have dark brown or black bodies with light brown to orange heads. The top photos of males in Figure 7 (taken at locations about 250 miles (402 kilometers (km)) apart) are nearly identical above, but some males can have short feathery extensions from their thorax that are brownish or even green. Both sexes have brownish-orange antennae, and the black clubs are tipped with orange.



**FIGURE 7. MALE *S. n. nokomis* UPPER SIDE (TOP PHOTOS) AND UNDERSIDE (BOTTOM PHOTOS).
 LEFT-HAND PHOTOS BY BOB FRIEDRICH, TAOS COUNTY, AUGUST 2022.
 UPPER RIGHT PHOTO BY CREED CLAYTON, USFWS, GRAND COUNTY, AUGUST 2022.
 BOTTOM RIGHT PHOTO BY MIKE FISHER, OURAY COUNTY.**



**FIGURE 8. FEMALE *S. n. nokomis* UPPER SIDE (TOP PHOTOS) AND UNDER SIDE (BOTTOM PHOTOS).
LEFT-HAND PHOTOS BY ROBB HANNAWACKER, NPS, SAN JUAN COUNTY, AUGUST 2020.
RIGHT-HAND PHOTOS BY BOB FRIEDRICHS, TAOS COUNTY, AUGUST 2022.**

Egg, Larvae, and Pupae Identification

The FWS does not require surveys for eggs, larvae, and pupae; these life stage are very difficult to detect, so surveys would not accurately represent occupancy at any particular site. Pictures of larvae and pupae can be viewed in Version 1.1 of the Species Status Assessment (SSA) at <https://ecos.fws.gov/ServCat/DownloadFile/245233>.

Life Cycle

For survey purposes, it is important to know that the exact timing of the silverspots' life cycle varies annually, depending on a variety of factors such as climatic conditions and elevational gradients. Larvae may emerge and start feeding on violets as early as mid-April, for instance, at lower elevation colonies. They then enter the pupa phase in mid-summer. The 45-day adult period is the length of the adult flight season for each sex of the butterfly. The males eclose (emerge as an adult) and begin flying before females, from around July 25th to September 15th. The females emerge and fly from approximately August 7th to September 24th. The full life cycle

is shown in detail in Figure 9 below. Despite the adult flight season lasting approximately 45 days for each sex, one study determined individual butterflies have a daily survival of 0.77 to 0.93 and could live from 3.8 to 13.5 days, though it was suspected that immigration and emigration from nearby seeps or colonies played a part in those estimates (Arnold 1989). Two species experts suspect the average life spans are between 10 to 30 days (Ellis 2025, pers. comm.; Fisher 2025 pers. comm.). It appears that further study is warranted but at a minimum the calculations and estimates reveal that some adults will emerge later than those first emerging, thereby extending the overall flight season to about 45 days for each sex of the butterfly.

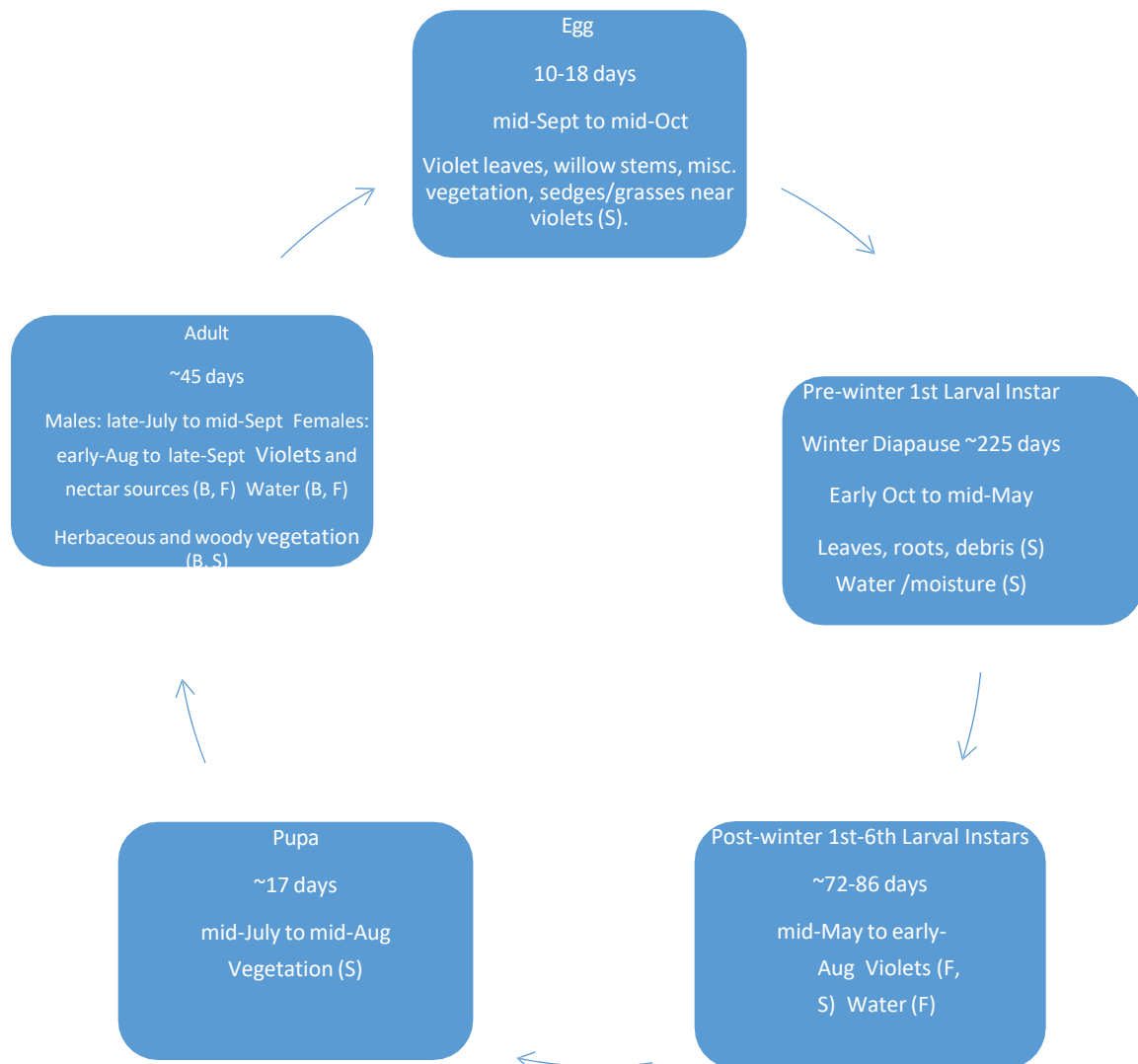


Figure 9. Life cycle diagram including resource needs; B: breeding; F: feeding; S: sheltering (Scott and Mattoon 1981, pp. 12, 14; Scott 1986, p. 326; Selby 2007, p. 21)

SURVEY PROTOCOL

Below, we will discuss the timing of protocol surveys and how often they should occur based on the needs and goals of the surveyor. These protocols are designed to ensure that surveys are scheduled when adult butterflies are most likely to be flying and active. Adult butterfly surveys are the best way to ensure that a population or colony is detected and that proper species conservation can commence.

Determining areas to survey

Pre-survey Research for Project-specific Surveys

For project-specific surveys (also called clearances), consultants or land management agency personnel should first enter the project location in the FWS's Information for Planning and Consultation system (IPaC) to determine if the project is within the geographic and topographic range of the species. If the silverspot appears on the IPaC list, then pre-field investigation of habitat, especially if it's winter, can occur by use of agency or publicly available wetland and riparian models, maps, or aerial imagery. If local, detailed, wetland and riparian models are not available, sources could include the FWS's National Wetland Inventory (NWI) maps ([National Wetlands Inventory | U.S. Fish & Wildlife Service](#)), USGS 7.5-minute maps ([Topographic Maps | U.S. Geological Survey](#)), or other available sources. Individuals trained in suitable habitat and violet identification should subsequently proceed to the project location during spring to fall for a ground-truthing overview of the habitat to further determine suitability. Although aerial imagery, such as Google Earth®, can be a good first step to identify large wet meadow habitats it is not detailed enough to pick out many of the smaller or narrower places the violet occupies.

During survey planning not only should the project footprint be located and examined for habitat suitability, but if a water source for suitable habitat is expected to be altered or depleted all suitable moist-soil habitat downstream of an area proposed to be altered should be considered within the project's action area. To the maximum extent practicable, the entirety of the potentially impacted suitable habitat (such as down to the confluence with a stream or another significant source of water) should be included in the plans for a survey. If the next downstream water source occurs on someone else's property, but they do not grant access to survey, and it appears that suitable habitat could be present and effected, then that information should be recorded in the notes section of the "Bog Violet and Silverspot Butterfly Survey Data Form" (Survey Form) (see Appendix A).

Pre-survey Research for General Inventory

In contrast to project-specific surveys, land managers such as the US Forest Service and Bureau of Land Management, private landowners, or others may want to know where violets (and silverspot colonies) occur for broader land management decisions and general conservation and recovery efforts. The sources and process of looking at wetland and riparian models, maps, and aerial imagery will be the same for locating potentially suitable habitat but may be over a much

larger area than for a specific project. When examining aerial imagery be aware that depending on the time of year the images were taken some areas with violets can look brown rather than green and, again, for narrow patches of violets in small channels or streams banks the resolution of aerial imagery is likely not good enough to identify suitable habitat.

Bog Violet Surveys – Project-specific Surveys for Interagency Cooperation

Bog violets within the range of the silverspot butterfly can start growing as early as mid-April and be present into October or the first hard frost, but to better ensure presence surveys need to occur between May 15 to September 15. At higher elevations, such as above 7,500 feet (2,286 m), or as local conditions dictate, the start of surveys might need to be delayed until late May or early June depending on snowmelt or temperature conditions in a given year.

Bog violets produce purple and white flowers typically from late-April into June depending on the elevation and annual climatic conditions. Flowers are not necessary to detect the violet as their leaves are visible throughout the summer, but other violet species can be confused with bog violets and can grow in the same habitat or an immediately adjacent habitat. Consequently, if flowers are not present on violets and it is indeterminable which species is occurring in an area then assume they are bog violets and survey for silverspot butterflies during the adult flight season. In addition to other violet species, several plants look similar to the violet either at mature or early life stages (such as watercress (*Nasturtium* spp.), young burdock (*Arctium* spp.), and other plants). Therefore, surveys by trained individuals will reduce misidentification.

Only one bog violet survey is necessary for project-specific purposes, but to be rigorous it must follow this survey protocol. Additionally, with limited exception, the entire action area must be surveyed prior to any construction activities for s.7 consultation purposes. If no violets are detected, then no further surveys are needed for 3 consecutive years, should the project not occur immediately or should another project take place in the area. It is preferable to conduct violet surveys before silverspot butterfly surveys to determine areas where the violet is absent, such that surveyors are not spending valuable time looking for violets when they could be looking for the silverspot in known violet patches. However, violet surveys and the initial silverspot survey can occur at the same time (starting in August).

Surveyors should take a couple photos of the general habitat before entering the site. When violets are found in new locations, or if surveyors are unsure of identification, surveyors should take several (at least two but up to 10) photos of potential bog violets and send the photos to the contacts or offices listed below for species confirmation, preferably soon after the survey. Photos should include:

- a. flowers, if present,
- b. spurs on the back side, the leaves, and
- c. the stem growth from the ground up.

There may be more than one species growing at a site so violet leaves and other vegetation will likely need to be brushed aside to get good photos of stem growth from the ground up. The Survey Form (Appendix A) includes a reminder to take photos in the field or to state why photos were not taken.

Because bog violets grow close to the ground, surveyors cannot see the plants more than 5 to 10 feet (1.5-3 m) away. Consequently, bog violet habitat should be systematically surveyed by walking transect lines 10 feet (3 m) apart throughout the entire habitat area (see illustration in Figure 10 below). An attempt can be made to record transect lines pre-field by using a Global Positioning System (GPS) device or application however, most survey areas will have willow and other woody vegetation, tall herbaceous vegetation, and occasional deep-water areas that make it difficult to walk on pre-determined GPS'ed lines. Consequently, after assessing the best way to survey a suitable looking habitat patch a surveyor can place start and stop lines every 10 feet just outside of the suitable habitat and attempt to follow those lines. The start and stop locations can be measured with a measuring tape and marked with flags or placed with a GPS device. A surveyor can lay straight transect lines if an area is relatively flat and has no obstructions as in the example below (Figure 10). However, navigation of curved transect lines that match the topography around a lake or base of a hill for example can also be followed as long as the surveyor continues to maintain a 10 foot (3 m) spacing within suitable looking habitat. After navigating around a shrub or water area, return to the line and continue to fully survey the habitat area. Trackways for surveys should be recorded on the GPS device and included with the biological assessment for the section 7 consultation.

While walking the transects, look for violets within 5 feet (1.5 m) on either side of the transect line, including under and around willows and other woody vegetation. It is recommended to have two or more people surveying, especially in large patches or in areas with lots of willows, other woody vegetation, or tall herbaceous vegetation that may be obscuring violets (and for safety). If a survey occurs in areas with thick thatch of dry sedge or rush from the previous year(s), the thatch should occasionally be brushed aside to see if violets are growing underneath.

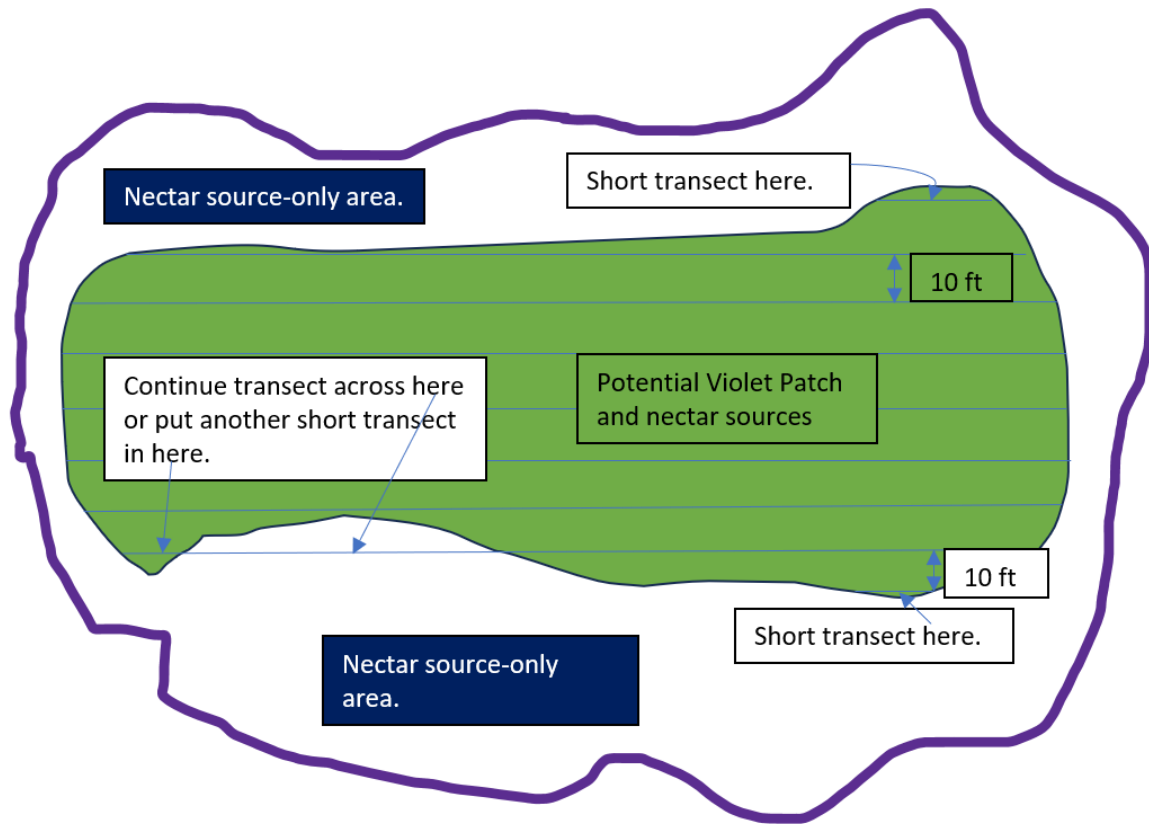


FIGURE 10. TRANSECT PLACEMENT FOR BOG VIOLET SURVEYS (BIRDS-EYE VIEW). THE GREEN AREA REPRESENTS POTENTIAL HABITAT, AND THE SQUARE REPRESENTS A POTENTIAL VIOLET PATCH WITHIN SUITABLE HABITAT.

Figure 10 is a simplistic drawing, but the green area representing the violet patch may comprise several patches of dense violets mixed with scattered violets in close proximity. Indicate in field notes or preferably on a map where the denser violet patches occur (typically where it is difficult to walk through without stepping on violets, but density can be relative to the rest of the patch). Density does not need to be measured with Daubenmire plots or other techniques.

If a violet patch is found (either *V. nephrophylla* or a mix of violet species), record the exterior boundary of the patch. Especially in small project areas and where there is not a lot of visual obstruction, it can be beneficial to first mark the outer-most violets around a patch with marker flags, rather than a GPS device, because location adjustments will need to be made when additional violets are undoubtedly discovered. Using flags first may, therefore, prevent having to delete and rerecord points on a GPS device, but will also cause a need to rewalk routes to pick up flags, consequently surveyors can use either technique. It may be possible to draw outermost points on a GPS device so the more interior points can be ignored unless they are marking where the dense patches of violets occur. If violets are dense enough where it is difficult to walk through without stepping on them, STOP, back out as necessary, and place a flag or GPS point to mark that location, then walk around the dense patch, marking the dense edge along the way, and resume transect lines on the other side of the dense patch. Walking around the dense patches will

minimize potential impacts to life stages of the butterfly in addition to the violets themselves but care should be taken to not step on any violets.

If violets are discovered, nectar source areas (i.e., where flowers are growing) are also to be mapped to better ensure conservation of the nectar source areas in addition to the area with violets (Figure 10). The nectar sources must be mapped during the silverspot survey window (see the Silverspot Butterfly Surveys – General Inventory section below). Mapping nectar sources in the silverspot “shoulder” seasons of the last week in July and third week in September are acceptable to record nectar source areas. This timing will best capture the nectar sources present when adult silverspots are present. Nectar sources are typically mixed in with violet patches, but nectar sources can also be present in dryer ground around violet patches and are often in nearby moist soil environments where violets are not growing. Nectar source-only areas surrounding the violet patch are preferably mapped in the field, but if nectar sources extend onto adjacent property without access, best estimates of the full extent of nectar sources can be mapped using aerial imagery (see reporting below). Nectar sources often extend up or downstream corridors, so include the nectar source area until it ends or narrows down to a very narrow point. If violets extend onto adjacent property without access, note the potential extent.

When delineating a patch of violets that has a mix of species do not attempt to parse out each clump of violets by species, simply map the entirety of the violets then note the co-occurring species on the Survey Form. However, if there is a distinct boundary between *V. nephrophylla* and other species of violets, map each species’ area and also note that on the Survey Form. Map and report all violets, even if only a single clump is found.

Figure 11 illustrates how violet patches, surrounding proximal nectar source areas, and transitory riparian areas should be mapped if there are multiple patches that may form a complex for a silverspot metapopulation. In this example, with the assumption that silverspots were found, the patches of violets and proximal nectar sources represent colony areas or areas where reproduction of silverspots most frequently occur (production areas). If no silverspots are found, mapping would be the same, but the “colony” areas would simply be mapped as violet and proximal nectar source habitat. Transitory corridors between the colony production areas are typically narrower strips of riparian habitat that may have a clump or two of violets but not always. Although silverspots can traverse over areas without nectar sources, transitory corridors with nectar sources provide energy for transitory butterflies and are important for maintaining gene flow between colonies. If silverspots are not found, habitat should still be mapped per these guidelines and the “colony” areas would simply be “habitat patch A, B, C”, etc.

Use gaps of approximately 1,300 feet (400 m) or more between violet patches to delineate separate patches even if nectar sources are continuous between the two. If there’s a single violet clump or even a couple violet clumps in the middle of two violet patches, such as between Colony A and B (Figure 11), record that on the map or in the notes but don’t place it in a patch or colony. If there’s a string of single or 2-3 violet clumps that aren’t too far away from the edge of a potential production area/colony (60 or 100 feet (about 20 or 30m)), such as Colony B, then

include those in the habitat patch or colony boundary. Placement of colony boundaries is somewhat subjective where there is a continuous transitory nectar source corridor and less distinct constriction of habitat, so use professional opinion to delineate and map these categories of habitat and known silverspot colonies.

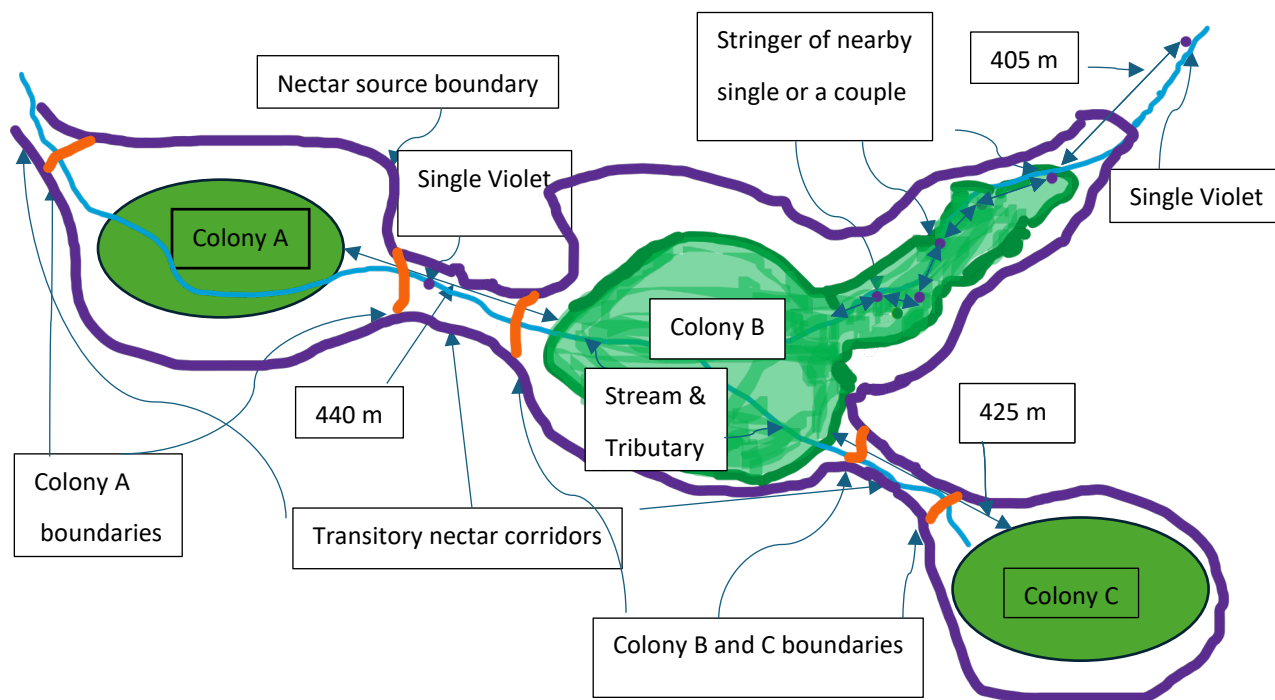


Figure 11. Mapping example (not to scale).

Bog Violet Surveys – General Inventory

Besides project-specific surveys for s.7 consultation purposes, general inventory surveys for bog violets can occur to determine their presence and to indicate the possibility of silverspot butterflies. Federal agencies, Tribes, State agencies, researchers, other land managers, and private property owners can benefit from knowledge of violet locations to inform voluntary management and avoid actions that might impact the habitat and potentially the silverspot. General inventories should also be conducted only by people who have been trained in violet identification or show ability to identify violet species. If violets are found in a new location species identity needs to be confirmed by FWS or a person officially trained in violet identification but photos for new locations still need to be submitted to FWS (see Contact Information below).

General inventory surveys must occur during the same annual survey window as project-specific surveys; from May 15 to September 15th (or after and before the first hard spring and fall frosts

at higher elevations). Ensure considerations for elevational differences and annual climatic differences influencing emergence and senescence of the violet. For general inventory, surveyors do not need to follow 10-foot (3 m) spaced transect lines, but certainly can to more thoroughly cover the ground. Nonetheless, surveyors, or survey transects, should not be more than 50 feet (15m) apart when conducting general inventory surveys. At this distance if violets are present and relatively abundant, even if dispersed, it is likely they will be discovered. Single clumps of violets or extremely few violet clumps are easy to miss but are not likely to harbor the silverspot anyways. Nonetheless, however many violet clumps are found they need to be recorded on the Survey Form.

Unlike project-specific surveys for s.7 consultations, if there is a very large patch of suitable looking habitat, not all of it needs to be surveyed in a single year. However, it will likely benefit the land manager or owner to have a full picture of the habitat in a single year. If not all suitable looking habitat in an area is surveyed in one year, the remainder of the habitat patch should be surveyed and mapped in the subsequent year to provide a complete picture of violet presence. The Survey Form needs to be filled out each time a survey takes place. However, surveyors need to note if the entire habitat is not surveyed, and record that on a map and/or state the approximate percentage surveyed that year.

Silverspot Butterfly Surveys – Project-specific Surveys for Interagency Cooperation

Visual surveys for adult silverspots can occur during the flight period in late summer and early fall. All surveyors should be familiar with the phenology at their survey locations and how it influences habitat and thus the butterfly's life cycle. Elevation, latitude, and interannual variation should all be considered when planning silverspot surveys to best observe silverspots during optimal conditions.

Surveyors can contact the FWS offices' species leads listed near the end of this document for questions regarding the necessity to survey. The minimum violet patch size, or violet and nectar patch size, requiring silverspot surveys will be determined in the future based on additional information.

Surveys need to occur 3 times in one season for project-specific surveys and need to occur over a 6-week period between August 1 and September 15. The surveys need to be between 7 to 14 days apart. Females may not be present in the first week of August, but males are likely to be present and are readily viewable due to their bright orange color and their tendency to vigorously patrol colonies for females. If a silverspot butterfly is seen on any one of the surveys, the area is considered occupied; hence, if a silverspot is seen on the first survey, the second and third surveys would not be necessary. However, surveyors can choose to conduct additional surveys to estimate the number of butterflies over the season or better determine all the habitats used by the butterflies for more accurate habitat mapping. An example of possible survey schedules is shown in Table 1.

Table 1. Alternative Schedules for Silverspot Butterfly Surveying

Option 1	1 st week August	3 rd week August	1 st week September
Option 2	2 nd week August	4 th week August	2 nd week September

Surveys need to take place for a minimum of 1 hour starting between 9 AM and 1 PM (Daylight Saving Time). It is less likely that silverspots will be seen after 2 PM and especially after 3 PM. If a survey starts at 1 PM during the first survey, and the butterfly is not seen, the next survey period should start between 9 to 10 AM. Surveys should occur on sunny, relatively calm days or days with a thin cloud layer, which is ideal for female flight (Fisher 2018). The best temperature range for flight conditions is 65 to 85 degrees Fahrenheit (18-29 Celsius) (Ellis 2018). Surveys will **not** be considered valid below 55 degrees (13 Celsius) or above 95 degrees (35 Celsius), on rainy or very cloudy days, or if winds are above 12 mph (19 kmh). If surveys are thorough, conducted within weather parameters stated, and three surveys are conducted without finding silverspots, the surveys will be valid for two years.

Transect line placement is not necessary for silverspot surveys but surveyors need to ensure the full extent of the habitat is visually surveyed; some habitat might be on the other side of willow patches, other vegetation, or hills that are difficult to see around. If the habitat patch (violet and nectar sources) is very small, such as 0.5 acre or less, viewing from one vantage point is acceptable as long as the entire habitat patch can be seen. If a silverspot is suspected to have been observed, then enter the habitat to take verification photos. Otherwise, stay out of the habitat as much as possible to minimize trampling. For a larger patch, or where not all a patch can be seen from one vantage point, wandering around or through the patch will be necessary. Binoculars can help if the patch is very large, but the entire habitat patch (violets and nectar source areas) needs to be surveyed. The area should be slowly walked through to minimize trampling or breaking of violets and other vegetation, but occasional standing or sitting and observing in all directions should occur. The butterflies, especially the males, can typically be seen flying around a violet patch as they are strong fliers, but they will land on nectar sources, such as thistles or other flowers, and can be viewed more easily there for identification and photo taking. If a butterfly is flushed from a flower during an attempt to take a photo stay back 2-3 feet (0.6-0.9 m), stay still, and wait for the butterfly to come back. Silverspots will often fly around and return in a minute or two, or another silverspot may come to the flower. When they come back let them settle for at least 5 seconds then slowly focus and take a photo. Allow them to leave the flower and the general vicinity before moving away. If a suspected female silverspot is seen and it appears to be laying eggs take a photo or two, remain still, and let it fly away or crawl further into the vegetation before leaving. Make sure not to step where it appeared to be laying eggs and exit the habitat. Surveyors do not need to take photos of both male and females. One of the genders is sufficient and it's usual to see only males.

Silverspot Butterfly Surveys – General Inventory

General inventory surveys for the silverspot butterfly should also occur during August 1 to September 15 and follow the same daily time frames and weather conditions as for project-specific surveys. At least one survey should occur in mid-August but preferably there should be a survey the second week in August and if no butterflies are found then an additional survey in the last week in August or first week in September is recommended. Surveys the last week in July or third week in September can also occur as ancillary surveys, but there is less likelihood of seeing butterflies then and they will not be considered valid if those are the only time frames when surveys are conducted. Nonetheless, surveys during late July or late September can help with scientific knowledge about adult seasonality. Again, it will save time during the short adult flight season to conduct violet surveys prior to August, especially if numerous sites are planned to be surveyed in a given year, but violet and silverspot surveys can occur at the same time.

SURVEY REPORTING

Please submit photos of violets to the FWS offices in the “Contact Information” section below during a project-specific survey or general inventory when it is the first time violets have been recorded at the location. If it’s been 10 years or more since a survey was conducted at the location, new photos should be taken and submitted to FWS to show confirmation that bog violets are still present. If a surveyor is uncertain of violet identity, submit photos to FWS within seven days if found during the violet survey window but before the silverspot survey window (i.e. during May 15-July 24) or within two business days if found within the silverspot butterfly survey window and when the violet survey window ends (July 25-September 15). If violet identification remains uncertain or the FWS does not reply within seven days or before silverspot butterfly surveys are needed, then assume the plants are bog violets and conduct silverspot surveys.

If silverspot butterflies are found or are suspected to have been found, take photos and submit to the respective FWS Field Office for the State the surveyors are working in (UT, CO, or NM) **within two business days**. Especially for project-specific surveys this will allow FWS to confirm identification and, if the butterfly is indeed the silverspot, will allow the lead Federal agency or State or Tribal partner and/or consultant to quickly initiate discussion on conservation measures beneficial to the silverspot and its habitat. At the end of the field season results of bog violet and silverspot butterfly surveys must be reported and submitted by March 31. All survey results, whether positive or negative for the violet and butterfly must be reported so that FWS can input the findings into a database. Survey forms for each survey, maps for each survey (preferably digital), and a report summarizing results for the season should be submitted to the FWS Field Office within the state being surveyed and the FWS’s Colorado Field Office (see Contact Information below). Due to the rarity of the silverspot, please keep reports confidential and do not distribute to parties outside of the FWS offices listed below.

HABITAT AND NON-NATIVE WEED AWARENESS

Habitat Awareness

Surveyors should minimize trampling of violets and nectar sources to the maximum extent practicable once violet locations are known and while carrying out subsequent activities in the area. As mentioned above, do not walk in the middle of dense patches of violets and avoid breaking and crushing violets and nectar source plants to the extent possible. If a surveyor finds themselves in dense patches of violets preferably back up and skirt the edge of the patch. If it will cause less damage to continue to walk through a dense patch do so, but step where it will minimize impacts to violet plants to the utmost extent. Additionally, before and after surveys and when surveying with a group of people and where trails do not already exist, avoid walking the same routes inside suitable habitat or near suitable habitat as much as possible so trails do not form and weeds are less likely to colonize. If trails already exist through habitat then, during non-survey periods, you can walk on the trails to minimize chance of crushing violets, nectar sources, and life stages of the silverspot. Especially where sedges or other vegetation is dense it's nearly impossible to not step on violets, but surveyors should do their best to minimize crushing and have a light impact.

Non-Native Weeds

Surveyors should ensure they are not transporting non-native weeds from one area of a habitat patch to another and between different patches. For surveyors that have gone through an area with non-native weeds, check for weed seeds on footwear, clothing, and gear and remove or destroy the seeds before going any further. Weed seeds can be placed in a (preferably compostable) bag for later destruction or disposal. Also, prior to entering vehicles from the field check again for non-native weeds on footwear, clothing, and gear AND ensure vehicles do not have weeds caught in them to avoid transportation of weeds to other areas.

EQUIPMENT, GEAR, AND SAFETY

Surveyors will need:

- Backpack to carry gear, water, etc.
- Copies of the survey data sheets (3 individual pages recommended)
- Clipboard for writing on data sheets
- Pencils or permanent pens (at least two)
- GPS unit, tablet, or phone with GPS app
- Fully or adequately charged cell phone for photos, time keeping, and communication
- Camera for better photos*
- Wristwatch, if preferred, for time keeping*
- Accurate thermometer

- Marker flags*
- Binoculars*
- Rubber boots, hiking boots, or shoes that can get wet and muddy
- Good pants, preferably with heavy padding on the knees for rose bushes, thistles, etc.
- Water
- Food
- Hat
- Sunscreen
- Bug spray*
- First aid gear and medications as needed (asthma inhaler, epipen, etc.)
- Baggies (preferably compostable) for non-native weed seed containment
- Devices to measure soil moisture content and soil and water chemistry*
- Violet and similar looking plant field guide*
- Silverspot and similar looking butterfly field guide*

*Optional

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CONTACT INFORMATION

Colorado Field Office: Terry Ireland, U.S. Fish and Wildlife Service, Ecological Services, 445 West Gunnison Ave., Suite 240, Grand Junction, CO 81501; terry_ireland@fws.gov, (970) 238-7243 or grandjunctiones@fws.gov.

New Mexico Field Office: Betsy Bainbridge, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna Rd NE, Albuquerque, NM 87113; elizabeth_bainbridge@fws.gov, (505) 761-4736.

Utah Field Office: Lark Willey, U.S. Fish and Wildlife Service, Ecological Services, 2369 West Orton Circle, Suite 50, West Valley City, UT 84119; lark_willey@fws.gov; (801) 239-0553.

Appendix A. Bog Violet and Silverspot Butterfly Survey Data Form and Instructions

Survey Data Form Instructions (for non-self-explanatory fields)

Date of Survey: Provide date for the violet or silverspot survey the day it's being conducted, do not put a range of dates even if performing the 3 surveys for silverspots.

Name of Person Filling Out This Form, and Affiliation, Email, and Phone: May be different than surveyors if another person is transcribing field data sheets to final forms. Important information to know if FWS has questions.

Name of Surveyors: May be different than person filling out form if forms are being transcribed by another, but FWS may also wish to ask specific surveyors questions.

Survey Type: If the violet or silverspot survey is NOT being conducted for a specific project that is associated with a federal permit, authorization or funding, even if occurring on Federal land, then the survey will be considered a "General Inventory" survey. If the survey is for a project associated with a federal permit, authorization, or funding and surveys are conducted as part of section 7 Interagency Cooperation under the Endangered Species Act of 1973, as amended, then it is for a "Project-specific" survey.

Species Surveyed: If a survey for both bog violets and silverspots is conducted at the same time then select "Combined". DO NOT select "Combined" if you conduct violet surveys then subsequently conduct silverspot surveys on another day (during the appropriate survey window). Each sheet is for a specific day, not the season. If conducting violet and silverspot surveys independently then select either "Bog Violet" or "Silverspot".

Site Name: Provide a general name for a site while being as specific as you can. If a very large stream drainage is being surveyed, such as Butterfly Creek, for example, but there are discrete patches of suitable looking habitat, whether or not containing violets, provide additional, sub-site names such as "Butterfly Creek Parcel 1" or "Butterfly Creek Springhead". Suitable habitat patches within a site can be labeled as A, B, C, etc., on the Survey Form and maps. Use 400 m as a guide between violet patches to label individual patches.

Central Coordinate or Coordinate at Edge of Habitat: Please provide as a single point for quick reference for Survey Form reviewers. Maps of surveyed areas will provide further detail of location and transects walked.

Violets Located: Circle "Yes" even if the violets do not appear to be *V. nephrophylla*.

Is identification of violet species known: If no, explain why in the notes section, such as a different looking flower or growth form that doesn't match known violet species.

Approximate acres and hectares of bog violets (or mixed species): If the species are distributionally mixed so they do not separate out into identifiable areas by species then circle the word "mixed" in the question on the Survey Form and note that they are mixed, down to species if possible, on the Survey form on the line with this question. Surveyors can also record the area of non-bog violet species if distinct separation occurs.

If present, are dense violet patches mapped: A patch is dense if it is difficult to walk through an area without stepping on violets. Density can be visually estimated by comparing to surrounding distribution of violets and does not need to be methodically measured.

Percentage of flowering violet clumps (<5% and 10% increments): Flowering is most common in May and June. The percentage can be visually estimated by violet clump and does not need to be methodically measured. This information will provide data on reproductive strategy and phenology.

Photos of suspected violets and broader habitat attached: Please included at least two photos, and up to 10 photos of violets or suspected violets when first found at a location. If flowering violets are found make sure to take photos of flowers as well as leaves and stalks down to the ground. Photos will be used as records for violet locations and, especially if a surveyor is unsure of identification, will be submitted to FWS for species identification. At least two photos of the broader or general suitable habitat area should be submitted as well to provide a visual idea of the overall setting. If photos were not taken, please explain why (e.g. photos were taken of the general area and verified bog violets less than 10 years ago; forgot camera, etc.). If photos were not taken and is the first time violets were observed at the survey site, please try to go back to the survey area another day with a phone or camera and take photos. If that is not possible then see next data field below.

Describe flower colors if no photos taken: If flowering violets are present, violets were observed at the location for the first known time, and no photos are taken, please describe the flowers in order to indicate whether the flowers are bog violets or another violet. Look at color, length of spur, and shape of spur. The spurs are almost always rounded rather than pointed on *V. nephrophylla*, but not always.

Photos of silverspot attached: Please attempt to take clear photos of the upper side and underside of suspected silverspot butterflies. The photos should be submitted to FWS for verification within two business days. If the butterflies are followed and flushed 3 times in an attempt to take a photo do not attempt to take more photos. The butterflies often land for only a minute or two on a flower then fly off, but we do not want to unduly flush the butterflies when they are trying to nectar.