

# FINAL PROJECT REPORT

## Butterfly Monitoring and Inventories Spring Mountains National Recreation Area Clark County, Nevada

October 15, 2011

Prepared For:

Desert Conservation Program  
Project #2005-PINYON-570C  
Clark County Department of Air Quality and Environmental Management  
Atrium Business Tower  
333 North Rancho Drive, Suite 625  
Las Vegas, NV 89106

Attention: Ms. Heather Green

Pinyon Project #1/09-726-01.8301

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Errata for the Report: Butterfly Monitoring and Inventories Spring Mountains National Recreation Area  
Clark County, NV

October 15, 2011

Andrea Sever

2005-PINYON-570C, Butterfly Monitoring in the Spring Mountains

SNPLMA PROJECT # CC-32

On page 7 the author incorrectly cited Boyd (2004) among the reports postulating that *Chrysothamnus nauseosus* may be a larval host plant for *Chlosyne acastus robusta*. In his 2004 report, Boyd does not make this assertion. Additionally, as of January 25, 2012 such a relationship between the species had not been established (personal communication, Corey Kallstrom, U.S. Fish and Wildlife Service, Southern Nevada Field Office.)

On page 25, table 5, the author listed *Adelpha bredowii*, *Callophrys johnsoni*, and *Colias philodice* among the common butterfly species sighted during the project. No voucher specimens or photographs were made of the common butterflies, and these two species sightings should be considered inconclusive (personal communication, 25 January 2012, Corey Kallstrom, U.S. Fish and Wildlife Service, Southern Nevada Field Office.)

#### References

Boyd, B. 2004. Report on Butterfly Investigation in the Spring Mountains, Nevada, 2002-2003. Unpublished report prepared for the U.S. Forest Service, Spring Mountains National Recreation Area in cooperation with the U.S. Fish and Wildlife Service. Prepared on 30 September 2004.

-Susan Wainscott, Adaptive Management Coordinator, Desert Conservation Program



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*This work was supported by the Clark County Desert Conservation Program and funded by the Southern Nevada Land Management Act as project # 2005-PINYON-570C, to further implement and develop the Clark County Multiple Species Habitat Conservation Plan.*

## 1.0 Executive Summary

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In 2010 and 2011, Pinyon Environmental Engineering Resources, Inc. (Pinyon), conducted a two-year study in the Spring Mountains National Recreation Area (Spring Mountains) (Figure 1) consisting of monitoring and inventorying butterflies, with a focus on the Mount Charleston blue butterfly (*Icaricia (Plebejus) shasta charlestonensis*) (MCB) and the Spring Mountains checkerspot (*Chlosyne acastus robusta*) (SMC). These are two of eight species of butterflies that have been designated by the United States Forest Service (USFS) as Species of Concern for the Spring Mountains (Species of Concern) (USFS and USFWS, 2007). Pinyon's study covered three areas delineated and targeted by Clark County, Nevada (County), for habitat mapping and butterfly inventory (Task Areas) (Figure 2) with three goals (as outlined in the contract and scope of work):

- Increase understanding of the size of the South Loop Trail MCB subpopulation;
- Provide population, distribution, and behavior information needed to conserve the SMC; and
- Identify additional MCB habitat and potential colonies that could be part of the South Loop Trail subpopulation.

These goals were the basis for work in each Task Area as follows:

- MCB presence/absence surveys in Task Area 1 along the South Loop Trail;
- SMC surveys and habitat mapping along the Griffith Peak Trail in Task Area 2; and
- MCB habitat assessment and mapping in portions of Task Area 1 that had not been previously mapped and all of Task Area 3.

Presence/absence surveys in Task Area 1 were augmented with permanent transect surveys for annual monitoring. Ten, 200-meter, transects were established and surveyed for MCB presence/absence and vegetation data was collected (Figures 3-5 and Appendix A). In addition to presence/absence surveys, the SMC and MCB were observed for activity such as nectaring, mating and ovipositing. Photographs, weather, habitat and Global Positioning System (GPS) data were obtained with each sighting. This information was also obtained upon sightings of the other butterfly Species of Concern (Appendix B and C).

After approval of the Work and Data Plans, Pinyon began fieldwork in June of 2010 and continued, seasonally, until August of 2011. Fieldwork was conducted to observe and count populations of the SMC and MCB as well as to map habitat (Figures 6 - 8). Two SMC were observed in 2010 and 59



were observed in 2011 (Figure 6). Sixty-three MCB were observed in 2010 (Figure 7) and 28 were observed in 2011 (Figure 8). Field observations provided information that allowed Pinyon to expand field survey areas to other areas of likely occurrence of SMC and MCB (Figures 6 and 8). These additional surveys areas were beneficial in obtaining increased SMC observations in 2011 but not MCB observations. However, for both species, additional suitable habitat was recorded and mapped for potential future monitoring (Figures 6, 8 and 9). Additionally, observation data for the other six Species of Concern was collected and mapped to contribute range information for these species (Figures 10 – 12). These surveys helped achieve the goals of the project through identification of SMC and MCB colony presence, distribution, habitat requirements and range.

## 2.0 Introduction

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Clark County, Nevada (County), contracted with Pinyon to complete monitoring and inventories of butterflies, with a focus on the Mount Charleston blue butterfly (*Icaricia (Plebejus) shasta charlestonensis*) (MCB) and the Spring Mountains checkerspot (*Chlosyne acastus robusta*) (SMC), in 2010 and 2011. This work was supported by the Southern Nevada Land Management Act (SNLMA) as project #2005-PINYON-570C, to further implement and develop the County Multiple Species Habitat Conservation Plan (MSHCP). The County is required to approve and implement conservation actions and activities over the 30-year term of the MSHCP Permit #TE034927-0 (USFWS, 2001). The contract was administered by the Department of Air Quality and Environmental Management Desert Conservation Program. This Final Project Report has been prepared per the guidelines and requirements of the Desert Conservation Program (DCP).

### 2.1 Project Location

The project is located in the Spring Mountains National Recreation Area (Spring Mountains), approximately 40 kilometers (25 miles) northwest of Las Vegas within the Humboldt-Toiyabe National Forest, Clark County, Nevada (Figure 1). This project vicinity is often called “Mount Charleston” in reference to the highest peak. The elevation range of the surveyed area is 2,400 to 3,633 meters (7,900 to 11,918 feet) above mean sea level.

### 2.2 Project Background

Eight species of butterfly have been designated by the United States Forest Service (USFS) as Species of Concern for the Spring Mountains (Species of Concern) (Table 1) (USFS and USFWS, 2007). Table 1 summarizes the eight species of concern with flight periods and larval host plant(s). This project focuses on the MCB and SMC. These two species, and their habitat, are described in the next two sections.

Table 1  
Spring Mountains Butterflies of Concern

Butterfly Scientific Name	Butterfly Common Name	Flight Period	Larval Host Plant Scientific Name	Larval Host Plant Common Name
<i>Icaricia (Plebejus) shasta charlestonensis</i>	Mount Charleston blue (MCB)	July - August	<i>Astragalus calycosus</i> var. <i>calycosus</i>	Torrey's milkvetch
<i>Chlosyne acastus robusta</i>	Spring Mountains checkerspot (SMC)	mid-May – July	<i>Chrysothamnus viscidiflorus</i>	Yellow rabbitbrush
<i>Euphilotes enoptes purpurea</i>	Spring Mountains Dark blue	May – August	<i>Eriogonum umbellatum</i>	Sulfur flower
<i>Euphydryas anicia morandi</i>	Morand's checkerspot	May – July	<i>Castilleja</i>	Paintbrush
<i>Hesperia colorado mojavensis</i>	Spring Mountains comma skipper	May – September	Perennial Grasses	Perennial Grasses
<i>Icaricia icarioides austinorum</i>	Icarioides blue	May – October	<i>Lupinus</i>	Lupine
<i>Limenitis weidemeyerii nevadae</i>	Nevada admiral	May – September	Salicaceae, <i>Populous</i>	Willow family, Aspen
<i>Speyeria zerene carolae</i>	Carole's silverspot	June - September	Violaceae	Violet family

The project was divided into three different areas delineated and targeted by the County for habitat mapping and butterfly inventory (Task Areas) (Figure 2). The tasks for each area are:

- MCB presence/absence surveys along the South Loop Trail in the Task Area 1;
- SMC surveys and habitat mapping along the Griffith Peak Trail in Task Area 2; and
- MCB habitat assessment and mapping in portions of Task Area 1 that had not been previously mapped and all of Task Area 3.

Presence/absence surveys in Task Area 1 were augmented with permanent transect surveys for annual monitoring. Ten, 200-meter, transects were established and surveyed for MCB presence/absence and vegetation data was collected (Figures 3-5 and Appendix A). During 2010, additional areas were observed that appeared to be suitable habitat for SMC and MCB (Figures 6 and 7). Therefore, Task Areas 1 and 2 were expanded for the 2011 field season. The additional areas were mapped for habitat and surveyed for MCB and SMC (as appropriate) with the same methodology as the original Task Areas. Maps illustrating the additional areas are included with the habitat mapping and observation results (Figures 6 and 8).

### 2.2.1 Mount Charleston Blue

The Mount Charleston blue is endemic to the Spring Mountains and was first described in 1980 based on seven males and seven females taken from Lee Canyon, Spring Range of Clark County, Nevada, from elevations of 2,515 - 2,682 meters (8,250 - 8,800 feet) (Austin, 1998b; 1980). It is considered to be the most distinct subspecies of the *P. shasta* group (Austin, 1981). Paul Opler is currently researching genetic variability in the *P. shasta* group and his results should provide additional understanding on the relationship of the Mount Charleston subspecies to other *shasta* species (Opler, 2011).

Life History: Adults are known to fly between July and August, with flight peaking in late July (Austin, 1980; Boyd and Austin, 1999). Females of this species tend to oviposit on multiple sites of the host plant such as leaves, petioles, stems, and seedpods (Scott, 1986). This species is presumed to be univoltine (one generation per year) (Opler, 1999; Scott, 1986). However, recent presence/absence surveys indicate population fluctuation that may be attributed to extended diapause and less-than-annual adult emergence (NewFields, 2008; UNLV, 2011). Additionally, Scott states that *P. shasta* is a biennial species: spending the first winter as an ovum and the second as a late instar larva (Scott, 1986). Shortly after snowmelt in mid June, post-diapause *P. shasta* larvae were located, leading to the conclusion that diapause is performed by partly grown larvae (Emmel and Shields 1978). The number of years the MCB can remain in diapause is unknown. Local experts have speculated that in response to unfavorable environmental conditions the MCB may have a prolonged diapause period (Scott, 1986; Boyd and Murphy, 2008). Pupation is presumed to take place on the underside of a rock or in nearby leaf litter with

adults emerging in a couple of weeks (Scott, 1986). Although many aspects of the MCB life history are unknown, knowledge of similar species is documented and may be comparable in many regards.

Habitat: Mount Charleston blues typically occur on open, exposed, sunny, gravelly, and well-drained flats, slopes, hilltops, or ridges. Although the species has been located in elevations ranging from 366 - 3,962 meters (1,200 - 13,000 feet), the subspecies MCB has only been observed in the Spring Mountains between 1,829 – 3,440 meters (6,000 – 11,286 feet) in the Lee and Kyle Canyons (USFWS, 2011; Weiss et. al., 1997; Austin, 1980). The MCB flies close to the ground around scrubby, low-growing, and relatively sparse cushion plants that are its host (Opler, 1999; Emmel and Shields, 1978). Host plants for the species include many Leguminosae although the subspecies *charlestonensis* relies upon Torrey’s milkvetch (*Astragalus calycosus* var. *calycosus*) for its only larval host plant in the Spring Mountains (Austin and Leary, 2008). Adults have been observed to nectar on Lemmon’s rubberweed (*Hymenoxys lemmonii*) and fleabane (*Erigeron clokeyi*) (Weiss et. al., 1997; Boyd and Murphy, 2008).

### Research Needs

Prior to 2010, the last confirmed sighting of the MCB was in 2007 on the South Loop Trail and none were detected during surveys funded by the County in 2008 (Boyd and Murphy, 2008; SWCA, 2008). The subpopulation along the South Loop Trail appears to be the most important remaining subpopulation (Boyd and Murphy, 2008). This area is one of only two remaining known occupied sites for the MCB. Evaluating whether or not this subpopulation is composed of multiple colonies is an important step in gaining understanding of the population structure and conservation requirements. The United States Fish and Wildlife Service (USFWS) indicates that little is known about the biology of the MCB and further research is needed to “determine the interactions among the butterfly’s flight and breeding period, larval host plant, and environmental conditions.” Another aspect of important research is the influence of environmental conditions on the phenology of the MCB (USFWS, 2011).

### 2.2.2 Spring Mountains Checkerspot

The Spring Mountains checkerspot is endemic to the Spring Mountains of Clark and southern Nye Counties, Nevada. The subspecies *robusta* was described as a distinct phenotype by Austin based on specimens collected in the Spring Mountains of Clark County, Nevada, in 1979 (Austin, 1998a).

Life History: Adults have been observed flying from mid May to mid July (Boyd, 2004; Kingsley, 2008). This univoltine subspecies has a short flight period and the subspecies is not common in the area despite the presence of its host (Weiss et. al., 1997). Eggs are laid in clusters on leaves, or buds, of larval host plants (Opler, 2011; Scott, 1986). Larvae eat the leaves and flowers of the host and it is speculated that post-diapause larvae may pupate in late May to early June (Boyd, 2004; Boyd et. al., 1999; Weiss et. al., 1997).

Habitat: Spring Mountains checkerspots have been observed at elevations ranging from 1,700 – 2,600 meters (5,570 – 8,700 feet) above mean sea level (Weiss et. al., 1997). Adults utilize streambeds, and dry washes in sagebrush-juniper, oak or mixed-conifer woodland (Opler, 1999). Adult males tend to patrol habitat that is generally shrubby with an open canopy (Kingsley, 2008). It has been reported that adult males can be observed “puddling” at mud (Boyd and Austin, 2002). Larval host plants are thought to be of the genus *Chrysothamnus* include both yellow rabbitbrush (*viscidiflorus*) and rubber rabbitbrush (*nauseosus*) (Weiss, et. al., 1997; Boyd and Austin, 1999; Boyd, 2004). Recent studies indicate that yellow rabbitbrush is a preferred host plant for larvae (Boyd, 2004; Thompson, 2011). However, there is a possibility that SMC larvae may utilize other plants and the host plants of other *C. acastus* should be studied (such as goldenhead (*Acamptopappus*) and tansyaster (*Machaeranthera canescens*)) (Boyd and Austin, 1999; Kingsley, 2008). Adult nectar sources include dogbane (*Apocynum*), Palmer’s penstemon (*Penstemon palmeri*), sweetclover (*Melilotus*), showy goldeneye (*Viguiera multiflora*), and groundsel (*Packera multilobata*) (Boyd et. al., 1999; Weiss et. al., 1997; Kingsley, 2008).

## 2.3 Goals and Objectives

As stated in the Contract there were three goals for this project:

1. Increase the understanding of the size of the South Loop Trail subpopulation of MCB. This is of critical concern for land managers because there are two remaining MCB subpopulations and long-term viability of the subpopulation in Lee Canyon is uncertain.
2. Provide population, distributional, and behavioral information needed to manage and conserve the SMC.
3. Identify additional MCB habitat and potential colonies that could be part of the South Loop Trail subpopulation. Also, identify habitat for other Spring Mountains butterflies that are Species of Concern and provide critical population and distributional information regarding the MCB South Loop Trail subpopulation.

These goals were met through the implementation of three project objectives:

1. Mount Charleston Blue Presence/Absence Surveys

Objective 1 was to monitor and count the number of individuals observed during surveys of the South Loop Trail and to evaluate whether this subpopulation is composed of multiple colonies (Figures 2, 7 and 8, Task Area 1). The County mapped the MCB habitat along the South Loop Trail in the summer of 2008. An objective of this project was to use the 2008 data collected by the County to help develop and implement a two-year sampling project to estimate how many individuals are present within this known site.

2. Spring Mountains Checkerspot

Objective 2 was to evaluate the Griffith Peak Trail colony of the SMC, which is believed to be the largest and most robust population (Figures 2 and 6, Task Area 2). Objective 2 hoped to provide population, distributional, and behavioral information needed to manage and conserve this MSHCP covered butterfly. The first task under Objective 2 was to develop and implement a two-year sampling strategy to estimate the relative abundance of butterflies present in this colony and map the extent of the butterfly habitat in the area. The Griffith Peak Trail colony is a known mate selection location. It is likely the species is also ovipositing at this site; however, prior to 2011 there was no conclusive evidence to support this assertion. (In 2011, the University of Nevada, Las Vegas (UNLV), working under contract with the USFS, located seventeen SMC larvae in the Griffith Peak Trail area (Thompson, 2011).) The second task under Objective 2 was to monitor for ovipositing and map the location with behavioral notes if it was observed.

3. Mount Charleston Blue Habitat Assessment

Objective 3 was to survey the surrounding ridgelines and alpine meadows, not included in the 2008 surveys, to identify additional MCB habitat and potential colonies that could be part of the South Loop Trail subpopulation, as well as identify habitat for other rare Spring Mountains butterflies (Figures 2 and 9, Task Area 3 and portions of Task Area 1). This information would provide critical population and distributional information that is needed to manage and conserve the MCB.





## 3.0 Project Activities and Methods

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Prior to beginning fieldwork, the surveyors reviewed images and literature describing past research, species identification, and habitat requirements. A “Final Work Plan” and a “Data Management Plan” were prepared for the project (Pinyon, 2010a and b). Fieldwork was conducted between June 1 and August 13, 2010, and again between June 24 and August 16, 2011. Dates were adjusted for 2011 based on: a) data obtained in 2010, and b) the later growing/flowering period due to a cold and wet spring.

### 3.1 Habitat Mapping – Task Areas 1, 2 and 3

Surveyors walked each Task Area and suitable habitat was identified for the appropriate species (MCB or SMC). Habitat was designated as good, moderate, poor, or none based on the presence of larval host plants, nectar hosts, ground cover and canopy density (visual estimate), and terrain features (i.e.; gullies and washes for SMC). In accordance with the goals of the project, habitat was mapped using GPS technology for SMC in Task Area 2 and MCB in Task Areas 1 and 3 (Figures 6, 8 and 9). The County mapped habitat for the MCB along the South Loop Trail in Task Area 1 in 2008 (SWCA, 2008). However, this mapping (in 2008) had not included all of the Task Area 1; therefore, Pinyon completed the mapping of Task Area 1 in 2011 (Figure 8). In February 2011, a change order was approved to add survey areas for 2011 to Task Areas 1 and 2 and habitat was mapped in these additional areas as well (Figures 6 and 8).

### 3.2 Mount Charleston Blue and Spring Mountains Checkerspot Surveys – Task Areas 1 and 2

Pinyon utilized survey techniques for MCB (Task Area 1) and SMC (Task Area 2) based on the modified Pollard technique (USFS and USFWS, 2007). However, the technique was adjusted to increase the likelihood of observing the target species. Surveyors walked transects at a rate of approximately 27 meters/minute (one mile/hour) and recorded all adult MCB and SMC observed. The modified Pollard technique requires surveyors to only monitor the area five meters in front of them, five meters above, and five meters on either side but, because these butterflies are so rare, Pinyon recorded all MCB and SMC observed (as stated in the Work Plan) (Pinyon, 2010a). These survey techniques are similar to the protocol used by Kingsley in 2008 and were based on the “Survey Protocol

for the Spring Mountains Butterflies of Concern in Southern Nevada” (USFS and USFWS, 2007).

Surveying guidelines dictated that surveys be conducted between the hours of 09:00 and 16:00 when wind gusts are less than 25 kilometers per hour (15 miles/hour), and the temperature is between 20 to 35 Celsius (C) (68 and 95 Fahrenheit (F)), with no precipitation. Surveying must also be halted whenever clouds obscure the sun. These guidelines were followed with some slight adjustments to temperature and time. It was noted that SMC were more active in the morning and MCB were often still active after 16:00. Surveyors adjusted the surveying time to accommodate this behavior by beginning surveys at 08:45 or continuing them until 16:00, weather and temperature permitting. In 2010, MCB butterflies were observed flying regularly in much cooler temperatures than was dictated by the survey protocol. Therefore, the protocol was adjusted and surveys were completed if butterflies were observed to be flying. Thus surveys were conducted in temperatures as cool as 13 C (55 F).

Data collected upon observation of an MCB or SMC included weather, wind, temperature, elevation, GPS location, sex (if determined), action, substrate (if not flying), and host (if applicable). Photographs of the site and the butterfly (if possible) were taken. Additionally, the surveyor observed behavior and habitat in order to gain additional information about the species such as patrolling, mating, nectaring, and ovipositing behavior. Photographs of species observed and habitat were taken with each observation and were submitted electronically to the County as part of the “Species Report” for each year. Additionally, species, habitat and host plant photos are located in a photo document in Appendix A. Vegetation data was recorded when an SMC or MCB was observed. The data included visual estimates of ground cover and canopy density, percent nectar source blooming, and percent host plant occurrence.

### 3.3 Other Species of Concern

The project focused on MCB and SMC observations; however, data was recorded if any of the six other Species of Concern (Table 1), as identified by the USFS, were encountered during surveys. Data collected upon observation of any of these species included weather, wind, temperature, elevation, GPS location, sex (if determined), action, substrate (if not flying), and host (if applicable). Photographs of the species were also obtained, if possible.

#### 3.3.1 Survey

##### Task Area 1

##### Surveys Blocks

Pinyon subdivided Task Area 1 into roughly equal-sized blocks based on vegetation and geographical features (Figure 3). Each block was surveyed for a similar amount of time during each survey repetition (approximately one hour and 24 minutes), thus totaling approximately seven survey hours for a complete repetition of all blocks. Each area was surveyed by staggering transects within each block through the best habitat areas. Thus the level of effort was consistent for each survey repetition, but each observer covered a slightly different transect within each block so that the same transects were not surveyed on consecutive days.

This technique allowed Pinyon to meet the goals of the project with a larger data set of observed species and to assess the perimeters of the target species habitat more accurately. However, one of the important goals of having designated transect locations and a standard observation distance, is that it allows for replication of methodology and comparisons of results between years. The block method developed for the MCB allowed Pinyon to have a consistent level of survey effort so that results may be compared between repetitions and years.

## Permanent Transects

Future surveyors are unlikely to be able to spend a similar amount of time surveying (seven full days during good weather conditions). In order to allow for repeatable future monitoring, Pinyon developed a second methodology that conformed more closely to the USFS and USFWS protocol and required less time than the block methodology (USFS and USFWS, 2007). This was implemented during the 2011 field season. Within the survey area, Pinyon set up 10, permanent, 200-meter long transects through habitat where MCB were observed in 2010 (Figure 4). Each transect was walked at least one time during 2011. All MCB butterflies observed were recorded and it was noted if any MCB were observed more than five meters from the transect line. A list of the UTM coordinates of the transects is in Appendix A and provided with the 2011 GIS data. This methodology is based on the USFWS survey protocol for the Pawnee Montane Skipper (CNHP, 2010).

Vegetation data was recorded from a plot every twenty meters of each transect. Each plot consisted of a 0.5 by 1.0 meter box at the beginning of each 20-meter increment along the transect. From the toe of the surveyor, the perimeters of the box would extend 0.5 meters to the right and left of the transect line and for a distance of 0.5 meters in front of the surveyor (Appendix A and Figure 5). Data recorded from each plot was percent bare ground, percent cover by the larval and nectar host plants (Torrey's milkvetch, Lemmon's rubberweed, and fleabane), percent nectar host plant blooming, and percent cover by woody shrubs less than 1.5 meters tall. For each 20-meter segment of each transect, the data recorded was: percent overstory cover, number of standing live trees greater than 1.5 meters tall, number of standing dead trees, and number of dead and down trees. Photographs were also obtained from each end of the transects, at 0 and 200 meters.

## Task Area 2

Due to the linear nature of habitat requirements for the SMC (drainages, washes, trails and roads) transects were aligned linearly within areas of "good" and "moderate" habitat. Each transect was surveyed for six repetitions.

### Additional Survey Areas

In February 2011, the Task 1 and 2 survey areas were expanded to add additional areas of potential MCB and SMC habitat. Task Area 1 was expanded to the north, west and south to areas that were observed to be suitable MCB habitat in 2010 (Figure 8). Task Area 2 was expanded above and below Forest Service (FS) road 104, primarily to incorporate a drainage that appeared to have similar features as areas where SMC were observed in 2010 (Figure 6). The additional areas were walked and mapped for suitable habitat in the same manner the rest of Task Areas were mapped. The good and moderate habitats were then surveyed for MCB and SMC.

In Task Area 1, the additional area was surveyed three times for MCB, or until an observation was made. If an MCB observation were made, that location would not continue to be surveyed, thus allowing surveyors to allocate efforts elsewhere. This method was only followed in the additional area.

There were two additional areas for Task Area 2, above FS 104 and below FS 104. These were approached as follows: once SMC were observed in the additional area above the road, surveyors would continue onto the second additional area below the road. In this way, surveying time would be utilized for discovering the presence/absence of the SMC in suitable habitat instead of numerous repetitions being conducted in areas where the SMC was already known to occur (in the additional areas only).

### 3.4 Data Management and Deliverables

The complete Data Management Plan was submitted to the DCP on February 10, 2010. The Deliverables and Milestones for the project are in Appendix D.



### 4.1 Mount Charleston Blue Presence/Absence: Task Area 1

In 2010, surveys were conducted from July 14 to August 13, during which 63 MCB were observed between July 28 and August 13 (Figure 7). The maximum seen in one day was 17 on July 28. Of the total for the season, 26 were male, 25 were female, and the rest were of unconfirmed sex. In 2011, surveys were conducted between July 27 and August 16, during which 28 MCB adults were observed between July 28 and August 16, with the single-day maximum observed at 13 on August 12 (Figure 8). Of the total for the 2011 season, 17 were male, nine female and two of unknown sex. MCB were observed at elevations ranging from 3,391 – 3,464 meters (11,125 – 11,364 feet). The complete data set for all species of concern observations in Task Area 1 is located in Appendix B. Table 2 indicates the data range of observations: mean, median, maximum and minimum for the date, time, temperature and wind.

Habitat for the MCB was mapped in Task Area 1 where the County did not map in 2008. The area that was added onto Task Area 1 in February 2011 was also mapped for habitat (Figure 8).

Mount Charleston blues were observed on the western half of Task Area 1 in primarily open habitat with rocky substrate. The MCB was the most abundant on west-facing slopes, but was observed on all aspects in the survey area (except north since there was no suitable survey area with a north aspect). The overstory was dominated by bristlecone pine (*Pinus longaeva*) at a typical density of 0-5% (visual estimate). The MCB occurred in clearings where the trees surrounded the habitat area. The groundcover was sparse with approximately 5-30% cover. Lemmon's rubberweed, fleabane, and Torrey's milkvetch were common. Other low growing species (below 13 centimeters (cm) in height) that often occurred in the habitat areas were narrowleaf paintbrush (*Castilleja linariifolia*), Charleston beardtongue (*Penstemon leiophyllus* var. *keckii*), groundsel, pussytoes (*Antennaria parvifolia*), and Clokey's thistle (*Cirsium clokeyi*).

Both sexes were observed nectaring on Lemmon's rubberweed and fleabane. Males were often noted as patrolling the area. Females were observed on the larval host plant. Behavior that appeared to be ovipositing was observed, but no eggs or larvae were found. It was also noted that females tended to be located along the edge of a clearing where the males were patrolling the main part of the clearing. Photographs of the male, female, host plants, and habitat are located in Appendix C.



Table 2  
Data Range of Mount Charleston Blue Observations

<b>2010 All MCB</b>	<b>Date</b>	<b>Time</b>	<b>Temp c</b>	<b>Wind kph</b>
<b>Max</b>	8/13/10	16:14	27	19
<b>Min</b>	7/29/10	9:57	19	0
<b>Mean</b>	8/11/10	12:55	22	6
<b>Median</b>	8/12/10	12:55	22	4
<b>2010 Female MCB</b>				
<b>Max</b>	8/13/10	18:58	27	19
<b>Min</b>	7/28/10	9:57	13	0
<b>Mean</b>	8/9/10	13:10	21	6
<b>Median</b>	8/12/10	12:42	22	4
<b>2010 Male MCB</b>				
<b>Max</b>	8/13/10	16:05	27	8
<b>Min</b>	7/28/10	10:00	13	0
<b>Mean</b>	8/9/10	12:48	21	4
<b>Median</b>	8/12/10	12:26	22	4
<b>2011 All MCB</b>				
<b>Max</b>	8/16/11	16:47	23	4
<b>Min</b>	7/28/11	10:01	17	0
<b>Mean</b>	8/13/11	13:04	20	2
<b>Median</b>	8/12/11	12:18	21	2
<b>2011 Female MCB</b>				
<b>Max</b>	8/16/11	16:47	23	4
<b>Min</b>	7/28/11	10:01	17	0
<b>Mean</b>	8/13/11	12:48	20	2
<b>Median</b>	8/13/11	12:11	21	2
<b>2011 Male MCB</b>				
<b>Max</b>	8/16/11	16:47	23	4
<b>Min</b>	7/28/11	10:01	17	0
<b>Mean</b>	8/12/11	12:46	20	2
<b>Median</b>	8/15/11	12:08	20	2

*\*Max, min, mean and median are referring to the data obtained at the time the observations were made.*

#### 4.1.1 Fixed Transects

One male and one female MCB were observed on Transect 5 during the fixed transect surveys (Figure 4). The results of these surveys are included in the totals for the MCB as discussed above. The complete data set of results for the fixed transects, including vegetation data and photographs, are located in Appendix A.

#### 4.2 Spring Mountains Checkerspot: Task Area 2

In 2010, surveys were conducted between June 15 and July 13, during which two SMC were observed on June 30 and July 1 (one each day) in Task Area 2. In 2011, surveys were conducted between June 24 and July 1, during which 59 were observed between June 24 and July 1 in 2011 with the single most observed in one day being 13 on July 1. Since the flight period for the SMC is brief, surveys were performed consecutively during peak flight to obtain a greater quantity of observed behavioral information and habitat data. Observations occurred between 1,957 – 2,636 meters (6,420 – 8,648 feet) in elevation. Table 3 indicates the data range of observations: mean, median, maximum and minimum for the date, time, elevation, temperature and wind. Figure 6 illustrates the locations SMC adults were observed in 2010 and 2011. The complete data set for Species of Concern observed in the Task Area 2 is located in Appendix B. Photos of SMC adult and habitat are also included in Appendix C.

Table 3  
Data Range of Spring Mountains Checkerspot Observations

<b>2011</b>	<b>Date</b>	<b>Time</b>	<b>Elevation m</b>	<b>Temp c</b>	<b>Wind kph</b>
<b>Max</b>	7/1	14:31	2635.61	28	11
<b>Min</b>	6/24	8:50	1953.77	21	0
<b>Mean</b>	6/28	11:27	2405.60	25	3
<b>Median</b>	6/28	11:32	2471.32	25	1
<b>2010</b>	6/30	13:29	2555	32	26
<b>2010</b>	7/1	11:05	2506	28	20

*\*In 2010 only 2 SMC were observed so max, min, mean and median were not calculated.*

Habitat for the SMC was mapped in Task Area 2. Two areas were added onto Task Area 2 in February 2011. These areas were surveyed for SMC and mapped for habitat (Figure 6).

Observations occurred on the southeast side of the Task 2 survey area. The SMC were primarily located in vegetated gullies and washes. The overstory consisted primarily of mountain mahogany (*Cercocarpus ledifolius*), gambel oak (*Quercus gambelii*), and conifers: white fir (*Abies concolor*), singleleaf pinyon (*Pinus monophylla*), ponderosa pine (*Pinus ponderosa*), limber pine (*Pinus flexilis*) and bristlecone pine (*Pinus longaeva*), at a density of 10 - 15% (visual estimate). There was also a mid-story that consisted of woody vegetation over 1.5 meters tall, such as mountain mahogany, rocky mountain maple (*Acer glabrum*) and current (*Ribes* sp.). The understory was dense at 75% cover dominated by low growing shrubs, especially desert snowberry, yellow rabbitbrush, and common juniper (*Juniperus communis*).

Flowering nectar sources during surveys consisted of: Lemmon's rubberweed, bastard toadflax, and desert snowberry, silver lupine (*Lupinus argenteus*), sulfur buckwheat (*Eriogonum umbellatum* var. *subaridum*), narrow-leaf paintbrush (*Castilleja linarifolia*), Clokey paintbrush (*Castilleja martini* var. *clokeyi*), firecracker beardtongue (*Penstemon eatonii*), goldeneye, skyrocket (*Ipomopsis aggregata*), groundsel and yellow rabbitbrush.

The SMC were most often observed patrolling gullies and washes in east-facing drainages and along the trail (that has a southwest aspect). They were observed perching on desert snowberry and gambel oak; nectaring on groundsel, bastard toadflax, Lemmon's rubberweed and desert snowberry; sunning on rocks in the road and trail; and patrolling the drainage. They appeared to claim territories along the drainages where they would perch and then pursue other butterflies that approached their territory. If another SMC approached, they would often engage in spiraling behavior until one would leave. This territorial action is similarly reported by others (Kingsley, 2008). There was a seep that surfaced in four sections in the gully to the west of the road in the additional survey area where many species were observed exhibiting "puddling" behavior. The SMC were observed in the area but they were never seen "puddling," the individuals observed would patrol the gully, ignoring the other butterflies at the seeps and did not stop to "puddle."

Yellow rabbitbrush, a confirmed larval host plant (UNLV, 2011) was surveyed for larvae periodically during field visits. Approximately 100 plants were studied in 2010 and 2011 but no SMC larvae were observed. Additionally, no mating or ovipositing behavior by adults was observed.

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### 4.3 Mount Charleston Blue Habitat Mapping: Task Area 3

No “good” MCB habitat was located in Task Area 3 (Figure 9). There were very few areas with host plants along most of the Griffith Peak Trail and much of it was densely wooded. The exception to this was the western most end of the Griffith Peak Trail, between the turn-off to the peak and the intersection with the South Loop Trail, where the host plant was present and habitat was fairly open with scattered trees and sparse herbaceous cover. These areas were mapped as moderate habitat. Further to the west, along the South Loop Trail, is a grassy meadow with some host plant. This area was mostly mapped as poor habitat because the grass was so dense. Near the east end of Task Area 1, the ground cover is sparser and host plants are more abundant. This area was mapped as moderate habitat. Between the west end of Task Area 1 and Mount Charleston, it is rocky scree with some areas of host plant presence. However, nectar sources are low and the climate cooler and windier, and thus was designated as poor habitat. Very few host plants were observed between Mount Charleston and Trail Canyon. Vegetation was sparse and rocky on the higher elevations (mainly along the west half of the section) and denser along the east half with a dirt substrate. Host plant occurrence was rare and both the tree canopy and the herbaceous overstory were thicker than in areas of moderate or good habitat. Trail Canyon was treed with little understory and no larvae host plant occurrence. At the top of the canyon, where the Trail forked, some nectar hosts were present but habitat was still poor. Along the North Loop Trail, between Trail Canyon and the Mummy Spring Trail/Rain Tree, the habitat was open forest, but almost no host plant was observed. Habitat around the Rain Tree was open bristlecone pine forest with sparse vegetation and some host plant. This was mapped as moderate habitat. There is open vegetation and host plants east of the Rain Tree to the edge of Task Area 3 and beyond. These areas appeared to be the best MCB habitat within the area and were mapped as moderate habitat.

Additionally, no MCB were observed during habitat mapping. The portion of Task Area 3 along the South Loop Trail was walked several times each year to get to the Task 1 study area and no MCB were observed at those times either.

#### 4.4 Other Species of Concern

As stated earlier, in addition to the MCB and SMC, there are six other species the USFS considers Species of Concern: Morand's checkerspot, (*Euphydryas anicia morandi*) (Morand's), Nevada admiral (*Limentis weidemeyerii nevadae*) (admiral), Spring Mountains comma skipper (*Hesperia colorado mojavenensis*) (comma skipper), Carole's silverspot (*Speyeria zerene carolae*) (Carole's), Icaroides blue (*Icaricia icariodes austinorum*) (icarioides) and the Spring Mountains dark blue (*Euphilotes enoptes purpurea*) (dark blue) (Table 1). GPS data was collected for these species when they were encountered during surveys and is included in Appendix B. A summary of the Species of Concern observed in all Task Areas is as follows (Table 4):

Table 4  
Observed Species of Concern in 2010 and 2011

Species		Number Observed			Dates Observed	
Scientific Name	Common Name	2010	2011	Total	2010	2011
<i>Euphydryas anicia morandi</i>	Morand's checkerspot	129	1040	<b>1169</b>	6/18 - 8/14	6/24 - 8/16
<i>Limentis weidemeyerii nevadae</i>	Nevada admiral	20	107	<b>127</b>	6/25 - 7/30	6/24 - 7/28
<i>Hesperia colorado mojavenensis</i>	Spring Mtns comma skipper	4	4	<b>8</b>	8/12 - 8/14	7/1 - 8/16
<i>Speyeria zerene carolae</i>	Carole's silverspot	97	31	<b>128</b>	6/26 - 7/31	6/24 - 7/1
<i>Icaricia icariodes austinorum</i>	Icarioides blue	28	15	<b>43</b>	6/24 - 8/12	6/24 - 7/1
<i>Euphilotes enoptes purpurea</i>	Spring Mountains Dark blue	1	12	<b>13</b>	6/26	6/25 - 7/1

Species of Concern were also mapped in Task Area 3. Most were observed in scrubby meadows with abundant flowers along the Griffith Peak Trail. High numbers of Carole's were observed there, as well as some icarioides (Table 4) (Figure 10). Along the north end of the Griffith Peak Trail and adjacent South Loop Trail, there are grassy meadows with scattered lupine. Figure 10 indicates the locations these species were observed in 2010 (Task Areas 1, 2 and 3) and Figures 11 and 12 show the locations for 2011 (Task Areas 1 and 2, respectively).

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#### 4.4.1 *Morand's Checkerspot*

Morand's were observed throughout the survey period in all Task Areas. A total of 129 were observed in 2010 and 1,040 were seen in 2011. In 2011, the most observed in a single day was 343 on July 28. In 2010, July 28 was also the day with the most observations, 76. They were one of the most common butterflies in Task Area 2, where 31 were observed in both open and forested habitats in 2011. They were seen from June 24 through the last survey on August 16. Morand's were observed nectaring on Lemmon's rubberweed, fleabane, coyote-mint (*Monardella odoratissima*), groundsel, and Charleston beardtongue; patrolling aggressively; and sunning on plants and rocks. On August 16, 2011, a female Morand's was observed ovipositing on Charleston beardtongue, a video of which was submitted with the digital photo log for the 2011 Species Report.

#### 4.4.2 *Nevada Admiral*

In 2010, 20 admirals were observed in both Task Areas 1 and 2. In 2011, 107 were noted during field surveys between June 24 and July 29. The majority of those were observed in Task Area 2 between June 24 and July 1 (106, average of 15 per day). They were noted in various habitats including parking lots, rocky slopes, and vegetated drainages. They were typically near wooded and/or brushy habitats amongst gambel oak, mountain mahogany, and conifers. The most common action noted was patrolling; however, numerous admirals were observed "puddling" in the Task 2 additional survey area.

#### 4.4.3 *Spring Mountains Comma Skipper*

Four comma skippers were observed each year. This butterfly was observed nectaring on Lemmon's rubberweed and occurred in open habitats with overstory canopy up to approximately 15% cover.

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#### 4.4.4 Carole's Silverspot

Ninety-seven Carole's were observed in 2010 and 31 were noted during surveys between June 24 and July 1, 2011, in Task Area 2. The large number observed in 2010 is attributed to the many seen during habitat mapping of Task Area 3 (that was not repeated in 2011). They were often observed acting territorially while patrolling and pursuing other butterflies. Carol's were most common in vegetated drainages and open areas with abundant wildflowers.

#### 4.4.5 Icaroides Blue

Icaroides were observed during surveys in all Task Areas. A total of 28 were observed in 2010 and 15 were observed between June 24 and July 1, 2011. Some were observed off the South Loop Trail on the way to Task Area 1, but were not counted as it was out of the survey area. They were observed patrolling, nectaring and resting in grassy meadows and near patches of lupine.

#### 4.4.6 Spring Mountains Dark Blue

Only one dark blue was observed in 2010. In 2011, 12 were observed between June 26 and July 1 in Task Area 2. They were observed flying around and nectaring on buckwheat. Mating behavior was also observed (see photos in Appendix C). The habitat was approximately 40% low herbaceous species with scattered pinyon and big sagebrush (*Artemisia tridentata*).

### 4.5 Common Species

Common butterfly species were noted as encountered during surveys. Table 5 below summarizes the observations.

Table 5  
Common Species Observed in 2010 and 2011

Species		Number Observed			Dates Observed	
Scientific Name	Common Name	2010	2011	Total	2010	2011
<i>Adelpha bredowii</i>	California sister	6	48	54	6/25 - 7/1	6/24 - 7/1
<i>Brephidium exile</i>	Western pygmy-blue	4	0	4	6/14 - 6/15	
<i>Callophrys johnsoni</i>	Johnson Hairstreak	0	1	1		6/25
<i>Callophrys spinetorum</i>	Thicket Hairstreak	2	13	15	6/30 - 7/1	6/25 - 7/1
<i>Callophrys spp</i>	Hairstreak	0	1	1		6/24
<i>Celastrina ladon</i>	Spring azure	44	24	68	6/14 - 7/13	6/24 - 7/1
<i>Colias eurytheme</i>	Orange sulphur	32	19	51	6/28 - 8/13	7/25 - 8/15
<i>Colias philodice</i>	Clouded sulphur	29	0	29	6/27 - 8/13	
<i>Colias spp.</i>	Unknown sulphur	13	41	54	7/17 - 8/13	7/1 - 8/15
<i>Danaus plexippus</i>	Monarch	0	1	1		8/15
<i>Echinargus isola</i>	Reakirt's blue	2	0	2	7/13 - 7/14	
<i>Erynnis meridianus</i>	Meridian Duskywing	35	12	47	6/1 - 6/30	6/24 - 7/1
<i>Glaucopsyche lygdamus</i>	Silvery blue	8	0	8	6/14 - 6/29	
<i>Hesperia juba</i>	Juba Skipper	0	3	3		6/24 - 8/15
<i>Hesperia spp.</i>	Unknown skipper	21	2	23	6/29 - 8/1	6/25
<i>Leptote marina</i>	Marine blue	35	0	35	6/2 - 7/1	
<i>Nymphalis antiopa</i>	Mourning Cloak	1	4	5	6/2	6/25 - 7/1
<i>Nymphalis californica</i>	California Tortoiseshell	3	0	3	6/2	
<i>Nymphalis milberti</i>	Milbert's Tortoiseshell	1	2	3	8/10	6/24 - 8/12
<i>Papilio polyxenes</i>	Desert Swallowtail	1	0	1	6/25	
<i>Papilio rutulus</i>	W. Tiger Swallowtail	4	10	14	6/29 - 6/30	6/24 - 6/30
<i>Polygonia gracilis</i>	Hoary Comma	2	12	14	7/1 - 7/27	6/24 - 8/12
<i>Polygonia sp.</i>	Comma	2	6	8	6/29 - 6/30	7/27 - 8/15
<i>Pontia sisymbrii</i>	Spring White	1	0	1	6/14	
<i>Vanessa annabella</i>	West Coast Lady	17	40	57	6/23 - 8/13	7/27 - 8/16
<i>Vanessa atalanta</i>	Red Admiral	0	1	1		7/25
<i>Vanessa cardui</i>	Painted Lady	147	6	153	6/29 - 8/13	7/28 - 8/15
<i>Vanessa sp.</i>	Lady	9	21	30	6/17 - 8/11	6/24 - 8/16
<i>Vanessa virginiensis</i>	American Lady	0	1	1		7/27
	Unknown blue	43	10	53	6/1 - 7/13	6/24 - 7/28
	Unknown white	19	0	19	6/1 - 6/23	





## 5.0 Discussion

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As discussed by Kingsley (2008), perceived populations of butterflies can fluctuate daily. This combined with the inability to recognize individual characteristics make population density estimates difficult to impossible. A mark-recapture study was discussed by Pinyon at the onset of the study, but due to the sensitive nature of the butterflies (both MCB and SMC) was dismissed. Mark-recapture would have been difficult to perform without risk of harming the sensitive species. Thus, in order to meet the goals of increased knowledge of both the MCB and SMC populations, Pinyon: a) completed multiple repetitions of surveys for MCB (Task Area 1) and SMC (Task Area 2) using a consistent level of effort; b) noted peak observation numbers to establish an order of magnitude; and c) noted habitat characteristics including elevation range, dates and times observed, temperature and weather characteristics to aid in future monitoring and habitat recognition elsewhere (based on known occupied sites).

### 5.1 Mount Charleston Blue Task 1

The South Loop population of MCB is a known, established population that has had confirmed sightings of the MCB sporadically since 1995 (USFWS, 2011). Before this study, no adults had been confirmed in the location since 2007 (USFS and USFWS, 2007). Concurrently, UNLV is conducting on-going research in the area under contract with USFS until 2012. UNLV has also detected MCB along the South Loop Trail in 2010 and 2011 (Thompson, 2011).

Between 2010 and 2011, there was an observed decrease in numbers and in the occupied habitat area. While the difference between the single highest daily count in 2010 (17) and 2011 (13) is not great, the occurrence of the consistently higher daily observation numbers in 2010 (17, 12, 10, 9, and 15) compared with 2011 (1, 13, 6, and 7) is indicative of a decrease in the number of MCB. The distribution of the MCB in the Task Area was notably reduced in 2011 (Figures 7 and 8).

Based on the 2010 observations, there seemed to be one subpopulation of MCB within Task Area 1. The butterflies were seen throughout a large area and also occasionally observed to be flying across some areas that did not appear to be ideal habitat (Figure 8). However, in 2011, when numbers were lower, there appeared to be two or three distinct colonies. Pinyon observed the most MCB within two small areas (potential colonies) west of the ridge and near Transect 10 (Figure 4). UNLV saw large numbers in 2011 near Transect 5 (Figure 4) (Thompson, 2011). Thus it appears that in years with lower numbers, MCB may persist in restricted core areas or colonies. Changes in

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distribution and quantity may be attributed to environmental differences between 2010 and 2011, butterfly biology, or both.

Further research of the MCB phenology would be beneficial. Various influences may affect the presence of this butterfly from year to year. The cool, wet spring in 2011 may have affected emergence. It is also questionable whether the MCB undergoes an extended diapause (Boyd and Murphy, 2008). Spring was longer and cooler in 2011 and may have affected butterfly emergence and delayed host plant blooming. The dates of observation of the MCB are nearly identical with the earliest observation on July 29 in 2010 and July 28 in 2011; however, the recorded numbers for July of 2011 were noticeably fewer than 2010. On July 27, 2010, it was cloudy in the morning and Pinyon only completed half a survey repetition in the afternoon. Then, on the following day (July 28, 2011), Pinyon observed many MCB (Appendix B), indicating that this was probably not the first day of emergence and the MCB likely began to fly at least a few days prior to the first observation. In 2011, surveys were conducted for three days in good weather before one MCB was observed on July 28<sup>th</sup>. Those observations suggest that the start of the flight period for the South Loop population was observed by Pinyon in 2011 and indicates the flight period start was later in 2011 than in 2010. When looking at the dates the common butterfly species were observed in 2010 and 2011, overall, the butterflies were observed later in 2011. However, the time of day MCB observations were made was not noticeably different between 2010 and 2011 (Table 2).

Upon behavioral observations of MCB, it was noted that females tend to remain near the boundaries of clearings while males tended to patrol the inner clearings. Host plant availability did not vary with the location of the female and male MCB, but protective cover for the females, either from aggressive males or predators, may play a role in this site selection difference. Also noted was that the MCB will fly in conditions harsher than anticipated with lower temperatures and higher winds prevalent. They may be able to adjust to these harsher conditions, because they fly close to the ground, and are protected from winds by rocks, vegetation, and small dips in the landscape. Temperatures may also be slightly higher closer to the ground because the sun warms the substrate.

The goals of this project for Task Area 1 was to increase the understanding of the size of the South Loop Trail population, map habitat, and identify potential areas of future surveying. The County mapped parts of the Trail in the Task Area (SWCA, 2008); these were not re-mapped, on a whole. However, the larval and nectar host plants were located in areas not identified by SWCA. These areas are identified on Figure 8. The Task Area was extended in 2011 to include additional areas of

potential habitat that may be utilized by this subpopulation. Good habitat was located in the additional areas, but no MCB were observed. This may be attributed to the fact that the dispersal of the South Loop Trail subpopulation was reduced in 2011 and it did not appear to be a “good” year for surveys (as opposed to 2010). If some of the “good” habitat is surveyed in a year when the MCB is more abundant, this butterfly may be observed in more locations. Fire appears to also play a significant role in habitat structure (Weiss et. al., 1997; Boyd and Murphy, 2008; USFWS, 2011). The area on the north edge of the Task Area has a sizable old burn area where habitat is good and MCB have been located. Natural small fires appear to keep the undergrowth clear and thin the canopy to a desirable density for MCB host plant growth.

## 5.2 Spring Mountains Checkerspot Task 2

In 2010, only two adult SMC were observed by Pinyon. Additionally, only one other adult was seen in the area in 2010 (by UNLV in an on-going study) (UNLV, 2011). Surveys were performed from June 1 – July 13, 2010, and from June 24 – July 1, 2011. The two adults that were observed at the end of June were located in a vegetated gully on the southeast side of the Task Area (Figure 6). Habitat notes were obtained and surrounding areas were assessed. In order to increase the likelihood of observations and identify habitat in 2011, survey areas were added to the Task Area to include similar gullies to the east.

In 2011 the SMC was located in the additional areas as well as along the trail and in the gullies that had been surveyed in 2010 with no (or few) observations made. In 2011, the most SMC observed in one day/survey repetition was 13 on July 1. Numbers on the six other days/survey repetitions ranged from two to twelve. The majority of the SMC were observed patrolling in the gullies and washes. Approximately 25% were observed along the trail or road. However, most of the SMC observed along the trail or road were only crossing it as they were patrolling intersecting washes. Approximately 15% were observed to be sunning on the road or trail.

The habitat that the SMC was observed patrolling was not dense with the (understood) larval host plant yellow rabbitbrush, and sometimes it was absent. However, the host plant may occur in satellite areas to the gully used for courtship and thus areas surrounding observations of patrolling SMC should also be considered habitat (Opler, 2011). The SMC appeared to fly up and down the gullies, periodically stopping to nectar or perch. The SMC observed by Pinyon appeared to be territorial but this is not confirmed behavior for the SMC (Opler, 2011). However, other Nymphalidae have been documented as being territorial (Benson et. al., 1989).

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The SMC was observed June 24 – July 1, in both 2010 and 2011, between the hours of 08:50 and 14:31. In accordance with Boyd's observations, the SMC was never observed after 14:31 and Kingsley didn't observe it after 12:00 (Kingsley, 2008). This should be taken into consideration for future monitoring. If the temperatures are warm enough, the SMC may even fly earlier; Boyd reported observations at 08:00.

Since the SMC repeatedly patrol open washes surrounded by thick vegetation, an accurate estimate of density within the wash is very difficult. Additionally, since SMC are patrolling in select areas and seem to only patrol for a part of a day, extrapolating a density estimate to make a population estimate would not be prudent. Without mark-recapture or other method of identifying specific individuals and intensely monitoring them, (which would be cost prohibitive and invasive to the sensitive species), then only general counts can be completed. If the survey effort is similar between years and/or repetitions, then the peak number observed likely yields the most useful index of the population (Kingsley, 2008). Based on Pinyon's results, the SMC population was higher in 2010 than in 2011. Spring Mountains checkerspot surveys were also completed in the Griffith Peak Trail area annually from 2000 to 2003. The maximum number observed per day was 19 in 2000, 104 in 2001, 50 in 2002, and 27 in 2003 (Boyd, 2004). Based on this data, there were large population fluctuations between years.

Approximately 100 larval host plants were surveyed for larvae between 2010 and 2011. No larvae were observed. UNLV located 17 SMC larvae on yellow rabbitbrush in 2011 in the Griffith Peak Trail area (preliminary data from an on-going study, Thompson, 2011).

## 6.0 Conclusions and Recommendations

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These presence/absence surveys assisted in the development of habitat assessment and mapping for two Species of Concern: the MCB and SMC. They also aided in further developing and documenting species knowledge. Permanent transects allow for repeatable future monitoring to assess fluctuations in range and overall numbers.

### 6.1 Mount Charleston Blue

There has been concern that populations of the MCB have been declining, but surveys have not been completed consistently. At the start of this contract, the MCB had not been seen since 2007 and it was thought that it might be extinct. Most of the surveys in the past five years have been done at the Las Vegas Ski and Snowboard Resort (LVSSR), which is thought to be one of the main MCB subpopulations. In 2010 and 2011, many MCB were observed along the South Loop Trail by both Pinyon and UNLV. Additionally, UNLV only observed one at LVSSR in 2010 (UNLV, 2011) and the 2011 figures have not yet been compiled. Based on data collected at LVSSR, this subpopulation does seem to be declining. In Task Area 1, there was an observed decrease in numbers and in the occupied habitat area between 2010 and 2011. This suggests that there may be large annual fluctuations in the MCB flight numbers. However, it is impossible to make any sort of conclusion about population trends in Task Area 1 since there is almost no data from earlier years. Routine annual monitoring should be completed to better track MCB numbers each year. Pinyon has established permanent monitoring transects in occupied MCB habitat along the South Loop Trail to facilitate this. Similar transects should be established at LVSSR and other known MCB locations. At a minimum, each known subpopulation should be visited each year during the flight period and the results reported to USFWS.

The habitat requirements of the MCB are thought to be fairly well understood. There are large portions of the Spring Mountains that are rarely, if ever, visited. There may be additional subpopulations of MCB in these areas. Areas of potential habitat should be identified based on variables such as elevation, aspect, slope, and vegetation using tools such as satellite imagery. The areas identified as potential habitat should then be ground-truthed and surveyed for the MCB.

## 6.2 Spring Mountains Checkerspot

Spring Mountains checkerspot are known from only a few locations in the Spring Mountains, and most surveyors have returned to the known areas year after year. These areas are typically washes where males patrol. During 2010, Pinyon noted that the SMC were patrolling a drainage that crossed FS 104 and that many apparently similar drainages crossed the road below Task Area 2. Thus, the study area was expanded in 2011 to include an additional wash outside Task Area 2, in which the SMC were located. Since these types of habitat are common within the Spring Mountains, presence/absence surveys for SMC should be completed in additional areas during the peak flight period.

Most of the SMC observations have been of males patrolling washes. It is thought that males tend to gather in washes to patrol, but that females are more dispersed throughout habitat areas and thus much harder to observe (Opler, 2011). Therefore, most of the habitat data collected thus far is for washes used by males, and more data is needed on the habitat requirements of females. In order to collect data on females, it may be necessary to visit areas where males patrol, wait for females to come to the area, and then follow the females when they leave the area. This is very labor intensive and will not work at all if no females can be located and/or if it is too difficult to follow them in the rugged terrain. UNLV is currently studying this species and in 2011 found 17 larvae on yellow rabbitbrush. They also have observed males and females (on-going study, Thompson, 2011). UNLV's study will continue in 2012 with more observations possible.

## 6.3 Recommendations

Based on Pinyon's observations, recommendations for habitat conservation are as follows:

- Create permanent monitoring transects in other known MCB locations. Each known subpopulation should be visited annually during the flight period and the results reported to USFWS for monitoring.
- Areas of potential MCB habitat should be identified based on variables such as elevation, aspect, slope, and vegetation using tools such as satellite imagery. Areas identified as potential habitat should then be ground-truthed and surveyed for MCB.
- Identify areas of potential SMC habitat based on variables such as elevation, aspect, slope, and vegetation using tools such as satellite imagery. Surveys should be performed in these areas during peak flight periods to identify other subpopulations of SMC.

- Study patrolling male SMCs for mating interactions and identify habitat utilized by females.
- Curtail off-road vehicular use in the Griffith Peak Trail and FS 104 road area. Off-road motorized vehicles have been intruding upon known occupied areas of SMC habitat near the Griffith Peak Trailhead. This recreation tramples host plants, reducing growth and potentially killing larvae.
- Grasses crowd out the cushion plants required by the MCB and also create too much ground cover, thus reducing potential habitat. Precautions should be taken to prevent establishment of grasses within MCB habitat by limiting the use of grass seed in revegetation projects. Horses may also introduce grasses to new areas. The requirement for use of native feed should continue. There should also be more signs and information on this requirement in areas used by horses.
- Weeds were minimal in the project study area, but dandelions were observed in portions of Task Area 1 near Transects 7 and 9 (Figure 4). Weed control is much less costly if done while numbers are low. A weed monitoring and control project should be implemented to prevent weeds from spreading.
- Educate the public along the South Loop Trail to stay on the trail to prevent trampling of sensitive plant species in the MCB habitat areas. Currently, shortcutting and side trails do not appear to be a problem, but pro-activity is recommended.

It appears the MCB habitat along the South Loop Trail is secure in that it is in a wilderness area and not threatened by vehicles, development, etc. However, further studies of these two species are recommended. A life history study of both species is critical to understanding the MCB and SMC populations. Information is needed to understand the immature life stages of each species including parasitoids, diapause, pupation, emergence and any symbiotic relationships with other arthropods. Additional data on the habitat requirements of SMC is also needed.





## 7.0 Acknowledgements

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Corey Kallstrom, US Fish and Wildlife

Paul Opler, Colorado State University

James Hurja, US Forest Service

Dan Thompson, University of Nevada, Las Vegas



## 8.0 References

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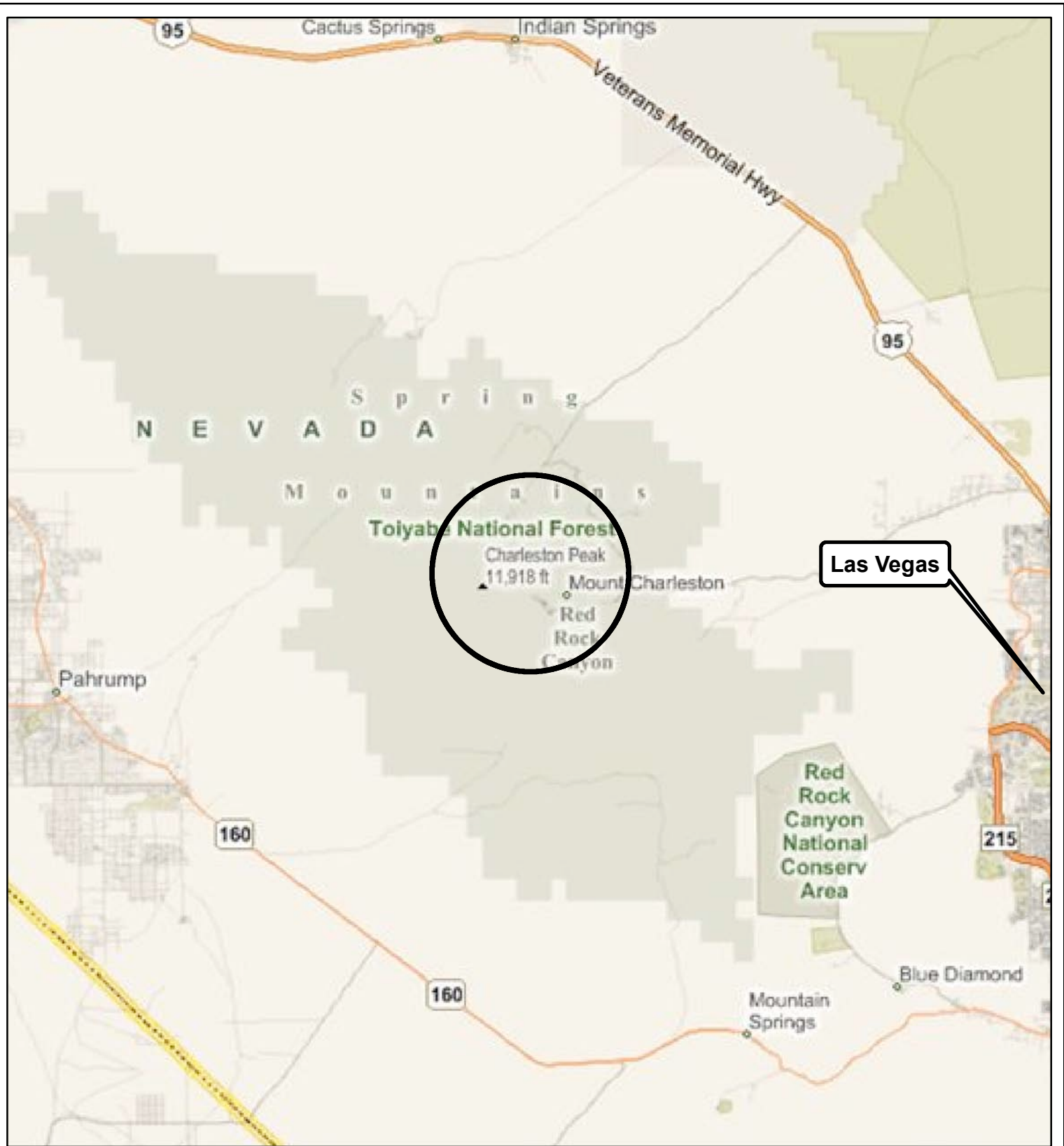
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**Legend**



Project Location

Not to Scale

**Pinyon** Environmental Engineering Resources, Inc.  
Environmental Engineering Resources

**PROJECT LOCATION**

*Butterfly Monitoring and Inventories  
 Spring Mountains National Recreation Area  
 Clark County, Nevada*

Site Location: Clark County, Nevada

Drawn By: MJS

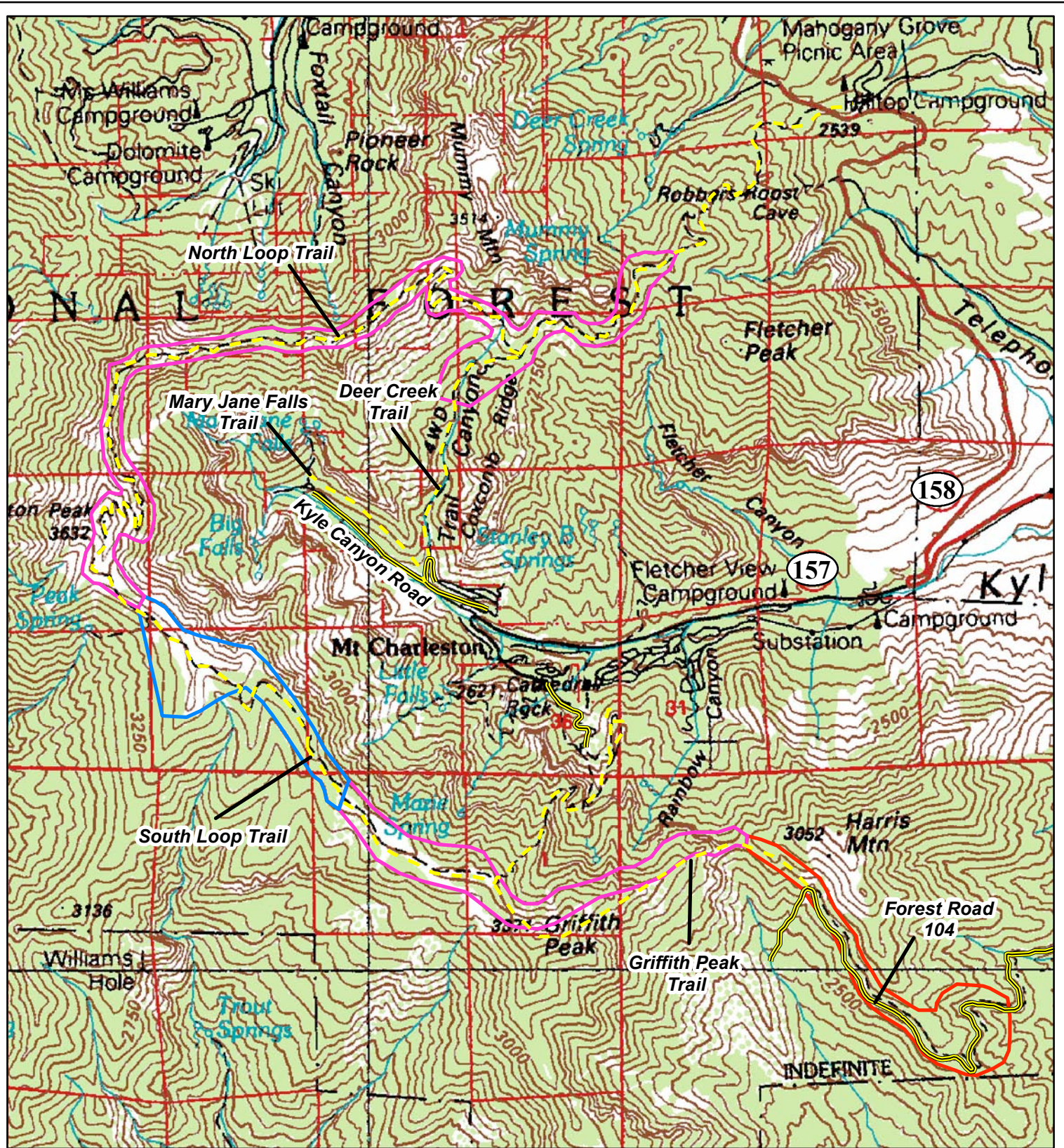
Figure 1

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Job No. 1/09-726-01.8301

Reviewed By: JNA



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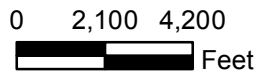


**Legend**

-  Task 1 Area
-  Task 2 Area
-  Task 3 Area

Notes:  
 Task 1-Mount Charleston Blue Surveys 2010 and 2011  
 Task 2-Spring Mountains Checkerspot Surveys 2010 and 2011  
 Task 3-Mount Charleston Blue Habitat Assessment 2010

-  Trail
-  Forest Service Road



**Pinyon** Environmental Engineering Resources, Inc.

**STUDY AREAS**

Butterfly Monitoring and Inventories  
 Spring Mountains National Recreation Area  
 Clark County, Nevada

Site Location: Clark County, Nevada

Drawn By: MJS

Figure 2

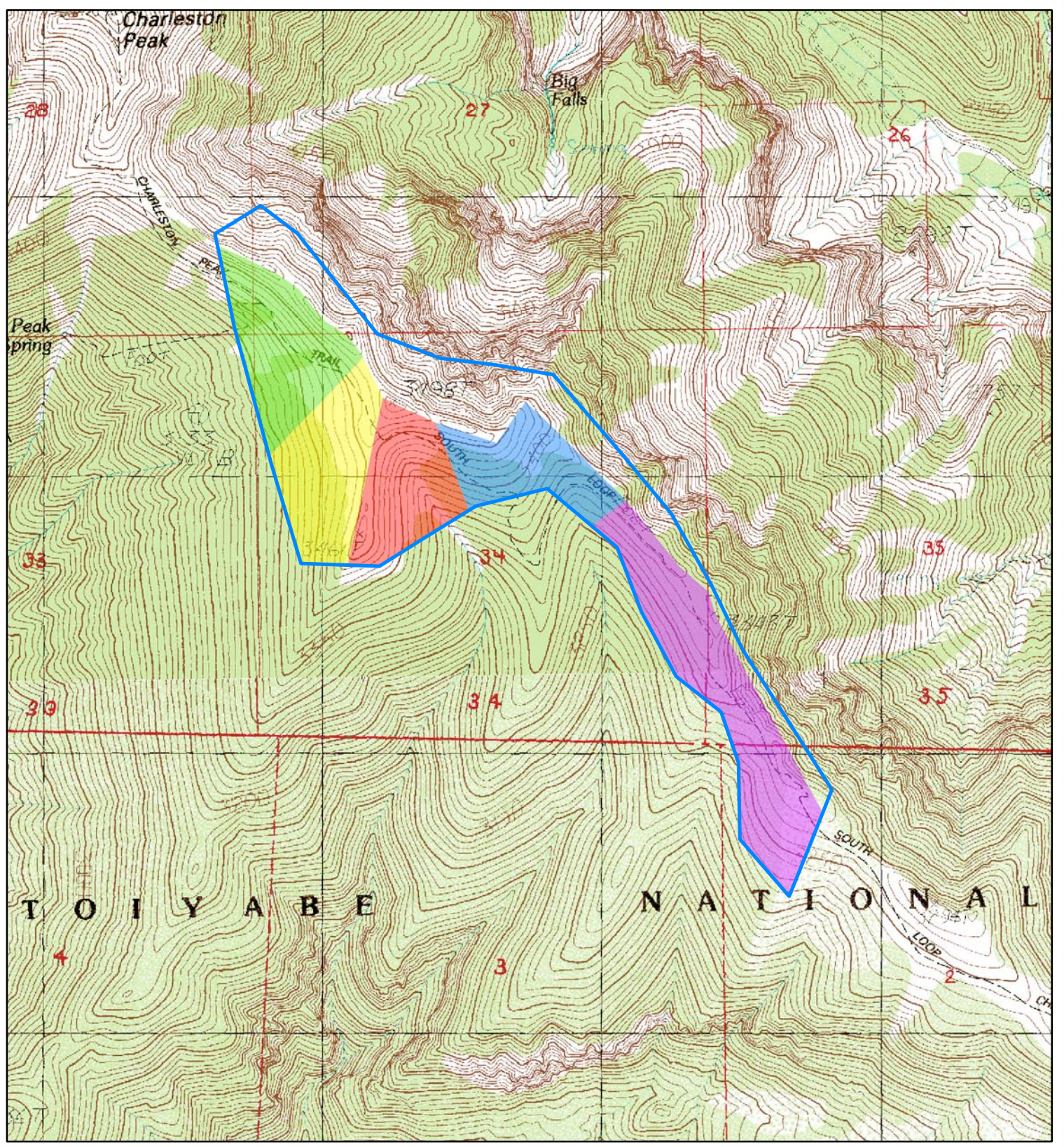
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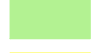




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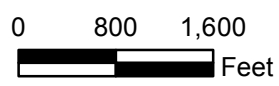
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**Legend**

-  N
-  Task 1 Project Area
-  Block A
-  Block B
-  Block C
-  Block D
-  Block E



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**TASK 1 SURVEY AREAS**  
*Butterfly Monitoring and Inventories  
 Spring Mountains National Recreation Area  
 Clark County, Nevada*

Site Location: Clark County, Nevada

Drawn By: MJS

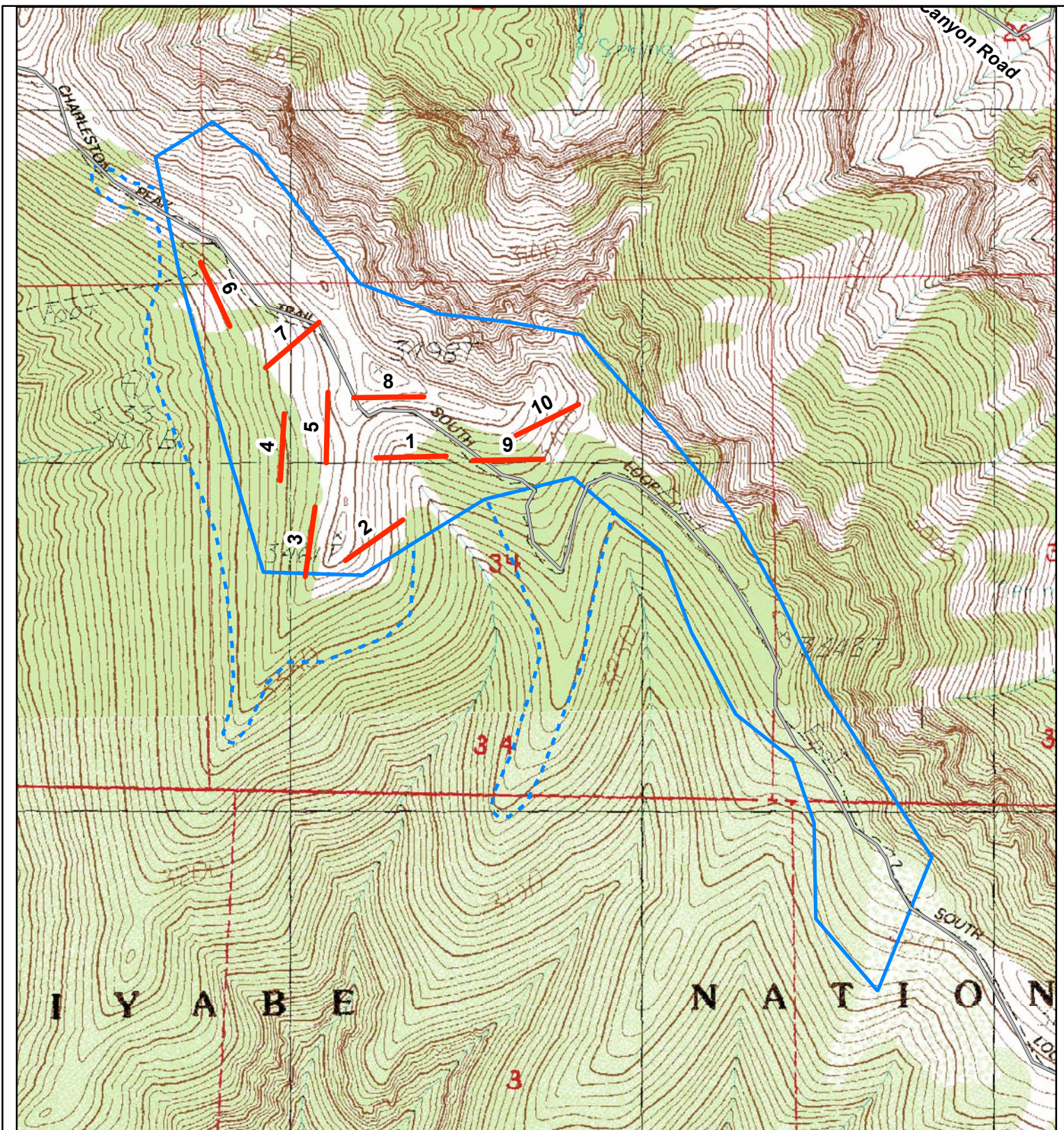
Figure 3

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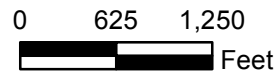
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**N Legend**

-  Task 1 Area
-  Task 1 Additional Areas
-  Transects



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**TASK 1 PERMANENT TRANSECTS**  
*Butterfly Monitoring and Inventories  
 Spring Mountains National Recreation Area  
 Clark County, Nevada*

Site Location: Clark County, Nevada

Drawn By: MJS

Figure 4

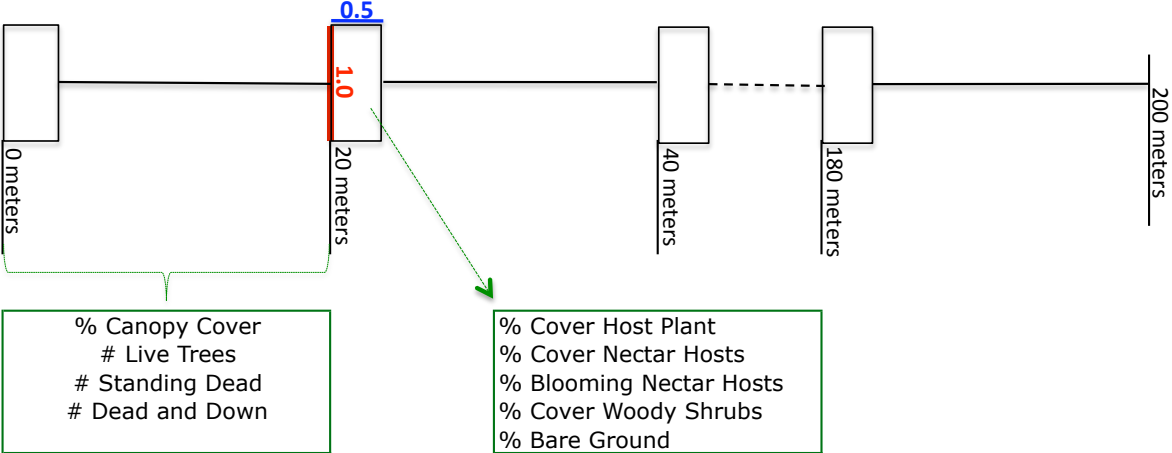
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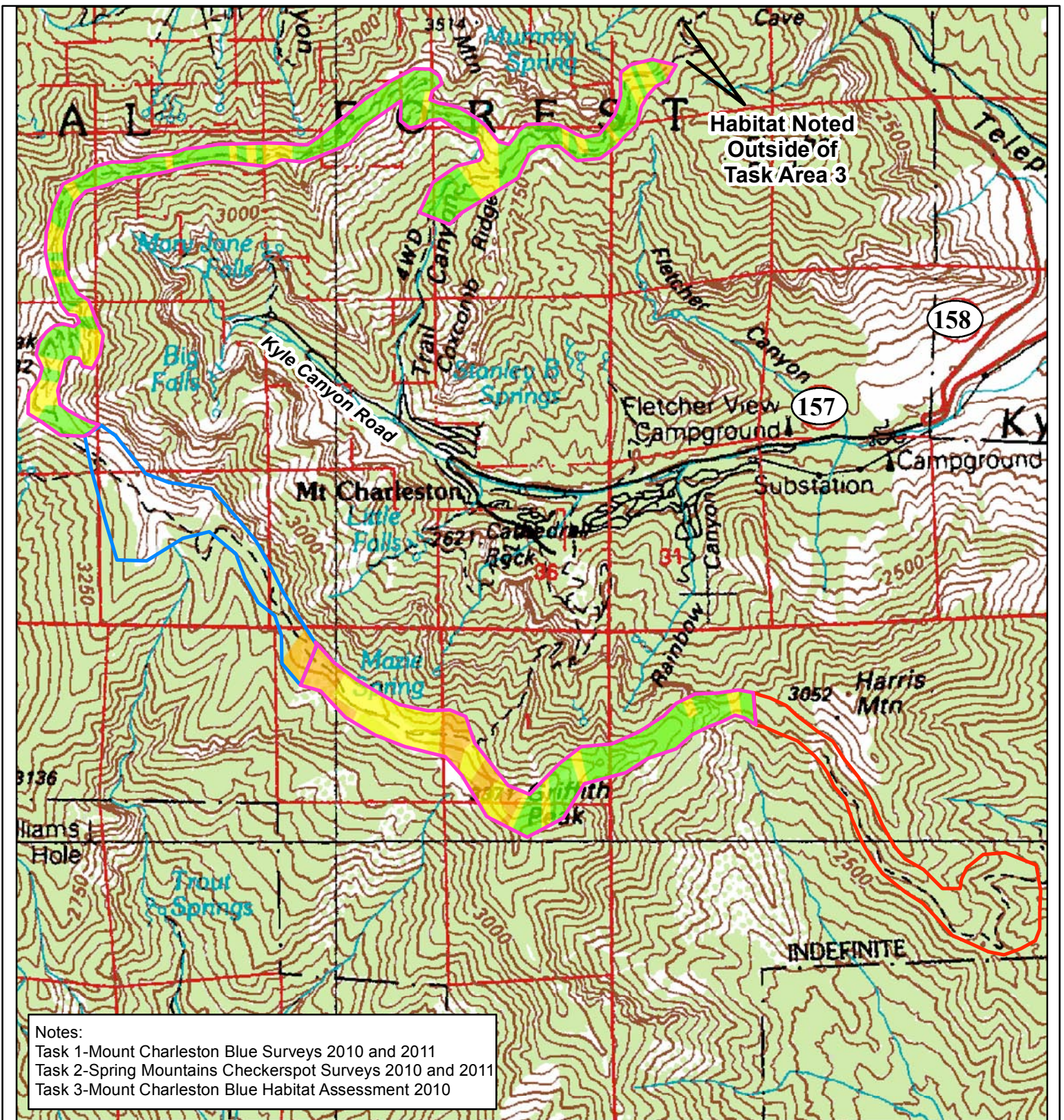
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Figure 5. Task 1 Permanent Transects Diagram

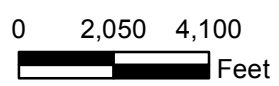




Notes:  
 Task 1-Mount Charleston Blue Surveys 2010 and 2011  
 Task 2-Spring Mountains Checkerspot Surveys 2010 and 2011  
 Task 3-Mount Charleston Blue Habitat Assessment 2010

**Legend**

	Task 1 Area		Good Habitat
	Task 2 Area		Moderate Habitat
	Task 3 Area		Poor Habitat
			No Habitat



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**MOUNT CHARLESTON BLUE HABITAT ASSESSMENT**  
 Butterfly Monitoring and Inventories  
 Spring Mountains National Recreation Area  
 Clark County, Nevada

Site Location: Clark County, Nevada

Drawn By: MJS

Figure 9

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Job No. 1/09-726-01.8301

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