



Project Name: Science Advisor
Project Number: 2005-DRI-574A-P
Deliverable Number: NA
Reporting Period: March 23 – June 30, 2009
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WAF574A0003: Covered Species Population Trends June 30, 2009

Executive Summary

In late March, 2009, the Clark County Desert Conservation Program (DCP) tasked the Desert Research Institute (DRI) with entering new (as of February 11, 2009) data for 11 selected species - excluding files that were not linked to a GIS - into a Species Tracking database, and entering or calculating summary statistics from existing and project data for these species where possible. The original database was developed by DRI, with DCP collaboration, as a template for future projects relating to covered species population tracking, as task 7 of DRI's Science Advisor contract for the DCP's Multiple Species Habitat Conservation Plan. The original database was completed in April, 2009.

The term "new data" in this context refers to data provided to Clark County DCP between June, 2007 and February 11, 2009. New data for the burrowing owl (*Athene cunicularia hypugaea*), phainopepla (*Phainopepla nitens*), Las Vegas bearpoppy (*Arctomecon californica*), Las Vegas Valley buckwheat (*Eriogonum corymbosum var nilesii*), white-margined beardtongue (*Penstemon albomarginatus*), and threecorner milkvetch (*Astragalus geyeri var. triquetrus*) from a total of 11 sources were entered into the species tracking database - which is in searchable Access format - and entries were verified by Clark County personnel.

Concurrently, DRI analyzed previously entered and new data at the population level for each of the 11 species, with the aim of calculating quantified population metrics capable of providing statistical summaries (such as mean and standard deviation), over a period of several years, from which a measure of population trend could be generated. The criteria applied included presence of population name and sample date, followed in a hierarchical fashion by population count (or estimate) and stated sample method. Information such as area surveyed was also recorded and additional information covering topics such as phenology, presence of young, and associated species were noted as they might prove useful in future analyses.

The group of all data provided by Clark County DCP for entry into the database had been provided by thirty sources, in a variety of formats and diversity of detail for observation from the period 1884 through 2008. The early years, up to the 1980s, are represented by isolated records for a limited number of populations, and provide interesting but not statistically “relevant” information. Many populations, for example the Las Vegas Valley population of bearpoppy, have records for numerous years – but these are provided by different sources, and data were obtained using a variety of sampling methods, recording information in several formats which are not necessarily comparable. For example, a count of 30 cannot be compared, or combined, with an abundance estimate of “rare (1-3)”. In general, across all populations of the 11 species analyzed, there were a number of undated records, and some with no provenance or population name. While these data may have been sufficient to meet the goals of each original collection effort, such data can neither be used to calculate summary statistics, nor measures of trend. However, rudimentary measures of population abundance for six populations, four for springsnails and one each for phainopepla and threecorner milkvetch could be summarized.

Relative, short-term measures of trend were obtainable for four populations of springsnail. At Grapevine Spring the species declined from abundant in 1992 to common in 1995. More dramatically, at Lost Creek snails which were abundant in 1992 were absent in 1998. Snails at Willow Creek Spring were scarce in 1992 and also in 1995, and were common at Horseshutum Spring in 1995 and also at Middle Horseshutum Spring in 1998. Insights concerning changes in spring environment, management and precipitation may make interpretation of these data more possible and potentially valuable.

There is too great a variability and uncertainty in the data for the Clark County phainopepla population to make calculation of summary statistics a meaningful exercise. However, cautious interpretation of relative trend in abundance, normalized around sample effort, suggests that this population may not have changed very much over the period 2004 through 2008.

Seven years of sampling were reported for the Sandy Cove threecorner milkvetch population, resulting in 224 records in the database. Sampling occurred at five locations in 1998, with a total population of 129 plants. Fifty locations in 2000 yielded a total of 1,477 plants with counts ranging from 1 to 158. There were 38 locations sampled in 2001 with a grand total of 3,038 plants counted, in numbers ranging from 1 to 500. Only 14 counts were made in 2003, ranging between 1 to 51, for a total of 108 plants. In 2004 the population total was 982, from 49 locations with numbers ranging from 1 to 285. Seventy one counts, ranging from 1 to 2,274 for a total of 8,081 constitute the 2005 results, whilst 2006 has only five locations listed totaling 69 plants with counts ranging from 0 to 4. In view of the similarity in survey methods, all seven years of data were used to indicate trend. Sampling effort was used to normalize data, by dividing the plant count by the number of observations – which resulted in relative abundances varying between 7.71 and 113.82, most likely in response to precipitation.

The data provided to DRI by the DCP for this analysis are a reflection of the diversity of data collection projects targeting the 11 selected species in Clark County. It is not that there has been insufficient sampling to generate summary statistics for most of the species investigated – but that collection methods and the format in which data are documented, are so variable as to prevent statistical comparisons over time. It appears that each survey was conducted to meet specific and unique goals, and the fact that goals may change is reflected in the changes in methods and data format over time – even when several inventories were conducted by the same entity. Formulation and implementation of species-specific science plans to standardize survey and data collection methodologies is highly recommended. In time, these plans will facilitate the generation of summary statistics concerning population status and trend for all covered species. Inter-agency cooperation to standardize these plans is greatly encouraged.

Introduction

The Desert Research Institute (DRI) is under contract to Clark County (County) to provide programmatic analysis and science advice to the Desert Conservation Program (DCP) and the Multiple Species Habitat Conservation Plan (MSHCP) Implementing Agreement signatory agencies for the period June 2007 through June 2009. There were 11 tasks involved, which were completed as scheduled by April 15, 2009.

One of these tasks (#7) was to develop a template for future projects relating to covered species population tracking. Based on available data provided by the Clark County DCP in June 2007, DRI was asked to and provide a prototype of a tool for tracking population data containing information on 12 of the covered species, as follows (not listed in priority order):

- Desert tortoise (*Gopherus agassizii*)
- Relict leopard frog (*Rana onca*)
- Mt. Charleston blue butterfly (*Icaricia shasta charlestonensis*)
- Southern Nevada springsnail (*Pyrgulopsis turbatrix*)
- Western burrowing owl (*Athene cunicularia hypugaea*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Phainopepla (*Phainopepla nitens*)
- Whipple's claopodium moss (*Claopodium whippleanum*)
- Las Vegas bearpoppy (*Arctomecon californica*)
- Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- White-margined beardtongue (*Penstemon albomartinatus*)
- Las Vegas Valley buckwheat (*Eriogonum corymbosum* var. *nilesii*)

Upon the completion of the prototype database, DRI and the DCP discussed next steps. As a result of this, in late March, 2009 the County issued a Work Authorization Form (WAF574A0003) under which DRI was tasked with entering new (as of February 11, 2009) data for 11 of the 12 entered species (excluding desert tortoise) into the database, and entering or calculating summary statistics from all entered datasets where possible.

New data entry

The term “new data” in this context refers to data provided to Clark County DCP between June, 2007 and February 11, 2009, and which excluded files that were not linked to a GIS. As provided to DRI, data originated from either Microsoft Excel spreadsheet files or GIS shapefiles. In the case of Microsoft Excel spreadsheet files, data relevant to the twelve selected species were entered into Microsoft Access tables in the MSHCP Species data intermediary database. Tables were given names identical to the original Excel files. In the case of GIS files, data relevant to the twelve selected species were exported from GIS as dbf4 files and then converted into Microsoft Excel files. After review in Microsoft Excel, the data were entered into Microsoft Access tables in the MSHCP Species data intermediary database. Tables were given names identical to the original shapefiles. Detailed information as to the spreadsheets and tables for the Access MSHCP intermediary database are given below.

D7A 581 Annual Data NBC Double Observer 20081201.xls

- Contains 3 pages
 - README
 - Survey_Conditions
 - Pointcount_Data
- Made into two Access tables in MSHCP
 - GBBO_AnnualDataNBCDoubleObserver20081201_PointCountData
 - Pointcount_Data page
 - “Time” (E1) Pointcount_Data name changed to “TimeDetected” to avoid duplicate field names
 - GBBO_AnnualDataNBCDoubleObserver20081201_SurveyConditions
 - Survey conditions page
 - README sheet included as metadata in the new tables.

D7A 581 Annual Data NBC 20081201.xls

- Contains 3 pages
 - README
 - Survey_Conditions
 - Pointcount_Data
- Made into two Access tables in MSHCP
 - GBBO_AnnualDataNBC20081201_PointCountData
 - Pointcount_Data page
 - “Time” (E1) Pointcount_Data name changed to “TimeDetected” to avoid duplicate field names
 - GBBO_AnnualDataNBC20081201_SurveyConditions
 - Survey conditions page
 - README sheet included as metadata in the new tables.

D7A 581 Annual Data Area Search Data 20081201.xls

- Contains 7 pages
 - README
 - Area Search Plot Summary

- Boundary UTM
- Survey Conditions
- Survey results
- Summary
- Point counts
- Made into 6 Access tables in MSHCP
 - GBBO_AnnualDataAreaSearchData20081201_PlotSummary
 - Area Search Plot Summary page
 - GBBO_AnnualDataAreaSearchData20081201_BoundaryUTM
 - Boundary UTM page
 - GBBO_AnnualDataAreaSearchData20081201_SurveyConditions
 - Survey Conditions page
 - GBBO_AnnualDataAreaSearchData20081201_SurveyResults
 - Survey results page
 - GBBO_AnnualDataAreaSearchData20081201_Summary
 - Summary page
 - GBBO_AnnualDataAreaSearchData20081201_PointCounts
 - Points count page
 - NOTE: The values were flagged and highlighted in the table below, because they were perceived to be incorrect. TempCode has a value that appears to be a time value. Examination of the nearby columns (StartTime, SkyCode, WindCode) suggests potential mis-labeling of columns.

Line Number	PlotNum_ID	Date	PointNum	Surveyor	StartTime	SkyCode	WindCode	TempCode	Time	Time2	Species	Sex/Age	Number	Distance	Inside-Outside Plot	Breeding Evidence
406	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	0to3 min	1	Bewick's Wren	U	2	100m	Out	No
407	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	0to3 min	1	Red-winged Blackbird	M	1	100m	In	No
408	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	3to5 min	4	Killdeer	U	2	100m	Out	No
409	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	5to10 min	6	Western Meadowlark	U	1	100m	Out	No
410	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	5to10 min	7	Unknown Unknown	U	1	Flyover	Out	No
411	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	5to10 min	8	Red-winged Blackbird	M	1	100m	Out	No
412	LR-RIFO_2008	06/28/08	B	G. Gonzalez	3	1	3	9:13	5to10 min	9	California Quail	U	1	MoreThan100m	Out	No

- Were changed to:
- NOTE: under the assumption that columns are mis-labeled, line numbers 406-412 were entered as shown below:

Line Number	PlotNum_ID	Date	PointNum	Surveyor	Start Time	SkyCode	WindCode	TempCode	Time	Time2	Species	Sex/Age	Number	Distance	Inside-Outside Plot	Breeding Evidence
406	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	0to3 min	1	Bewick's Wren	U	2	100 m	Out	No
407	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	0to3 min	1	Red-winged Blackbird	M	1	100 m	In	No
408	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	3to5 min	4	Killdeer	U	2	100 m	Out	No
409	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	5to10 min	6	Western Meadowlark	U	1	100 m	Out	No
410	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	5to10 min	7	Unknown Unknown	U	1	Flyover	Out	No
411	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	5to10 min	8	Red-winged Blackbird	M	1	100 m	Out	No
412	LR-RIFO_2008	06/28/08	B	G. Gonzalez	9:13	3	1	3	5to10 min	9	California Quail	U	1	More than 100m	Out	No

- o README sheet included as metadata in the new tables.

Arca Monitoring 2008_09232008.xls

- Contains 10 pages
 - o Valley of Fire – Poppy Plot Data
 - o Blue Point – Poppy Plot Data
 - o Gale Hills – Poppy Plot Data
 - o Species List
 - o VF – Community Ecology Data
 - o BP – Community Ecology Data
 - o GH – Community Ecology Data
 - o VF – # Poppy
 - o BP – # Poppy
 - o GH – # Poppy
- Made into 4 Access tables in MSHCP
 - o NPS_ArcaMonitoring09232008_PoppyPlotData
 - Combination of:
 - Valley of Fire – Poppy Plot Data page
 - Blue Point – Poppy Plot Data page
 - Gale Hills – Poppy Plot Data page
 - o NPS_ArcaMonitoring09232008_CommunityEcologyData
 - Combination of:
 - Valley of Fire – Community Ecology Data page
 - Blue Point – Community Ecology Data page
 - Gale Hills – Community Ecology Data page
 - Added “Species” field next to “SpeciesAbbreviation” field

- NPS_ArcaMonitoring09232008_PoppyNumbers
 - Combination of:
 - VF - # Poppy page
 - BP - # Poppy page
 - GH - # Poppy page
- NPS_ArcaMonitoring09232008_BurroAnimalTrailTracks
 - Combination of Burro dung and Animal Trail/Track:
 - Valley of Fire – Community Ecology Data page
 - Blue Point – Community Ecology Data page
 - Gale Hills – Community Ecology Data page

ASGE Monitoring 2008_09232008.xls

- Contains 3 pages
 - Plot Data
 - Species List
 - Sheet3 (blank)
- Made into 1 Access table in MSHCP
 - NPS_ASGE_monitoring2008_09232008
 - Added field for alive/dead
 - No known dates for dead plants
 - Added field for species list

582 D10 Annual Data 20090130.xls

- Contains 4 pages
 - transectdata
 - transectmetadata
 - reproductivedata
 - reproductivemetadata
- Made into 2 Access tables in MSHCP
 - USGS_582D10AnnualData20090130BurrowingOwlTransectData
 - USGS_582D10AnnualData20090130BurrowingOwlReproductiveData

Buckwheat.shp

- Exported attribute table as .dbf. Reviewed in Excel
- Made into BLM_DataForDCP_Buckwheat_shp

NNHP_combined.shp

- Exported attribute table as .dbf. Reviewed in Excel
- Made into BLM_DataForDCP>NNHP_combined_shp

Sensitive_pnts.shp

- Exported attribute table as .dbf. Reviewed in Excell
- Made into BLM_DataForDCP_Sensitive_pnts_shp

BearPoppy.shp

- Exported attribute table as .dbf. Reviewed in Excel
- Made into BLM_DataForDCP_BearPoppy_shp

Sos_points.shp

- Exported attribute table as .dbf. Reviewed in Excel
- Made into BLM_DataForDCP_Sos_points_shp
 - NOTE: The data below are highlighted, because there were perceived problems. The “date collected” column appears to have dates recorded as MM/DD/YYYY and DD/MM/YYYY. The column highlighted on the right lists how dates were entered.

DRI Data Entry from MSHCP_20090505 into SpeciesTracking_20090505

Data were copied from tables in the MSHCP Species intermediary database into the Species Tracking database. In the list below, source files (Microsoft Excel spreadsheet, GIS shapefile, and/or Microsoft Access table) are listed as a series of black bullets. Corresponding data entry records are listed as open-circle/white bullets, which are followed by record number and brief description of record.

New data starts at OBJECTID 12111

Burrowing Owl

- USGS_582D10AnnualData20090130BurrowingOwlTransectData
- USGS_582D10AnnualData20090130BurrowingOwlReproductiveData
- 582 D10 Annual Data 20090130.xls
 - 12111-12171 count
 - 12172-12190 reproductive

OBJECTID	SOS2003_	SOS2003_ID	REF_	FAMILY	GENUS	SPECIES	DATE_COLL	ENTERED AS	LOCATION	LATITUDE	LONGITUDE
2	2	2	NV-052-0083	Nyctaginaceae	Abronia	villosa	3/5/2003	3-may-2003	Toquop Wash	36.7550	-114.1840
3	3	3	NV-052-0084	Asteraceae	Antheropeas	lanosum	7/5/2003	7-may-2003	Lake Mead NRA	36.0150	-114.7880
4	4	4	NV-052-0085	Boraginaceae	Pectocarya	platycarpa	7/5/03	7-may-2003	Lake Mead NRA	36.0150	-114.7880
5	5	5	NV-052-0086	Onagraceae	Camissonia	brevipes	7/5/2003	7-may-2003	Lake Mead NRA	36.0150	-114.7880
6	6	6	NV-052-0087	Brassicaceae	Lesquerella	tenella	10/6/2003	10-jun-2003	Paiute Valley	36.6250	-114.9090
7	7	7	NV-052-0088	Asteraceae	Ambrosia	dumosa	11/6/2003	11-jun-2003	Jean Dry Lake	36.7800	-115.2220
8	8	8	NV-052-0089	Scrophulariaceae	Penstemon	albomarginatus	11/6/2003	11-jun-2003	Jean Dry Lake	36.7800	-115.2220
10	10	10	NV-052-0091	Cyperaceae	Carex	praegracilis	2/7/2003	2-jul-2003	Red Spring-RRNCA	36.1450	-115.4200
11	11	11	NV-052-0092	Zygophyllaceae	Larrea	tridentata	3/7/2003	3-jul-2003	Jean Dry Lake	35.8000	-115.2400
12	12	12	NV-052-0093	Polygonaceae	Eriogonum	trichopes	3/7/2003	3-jul-2003	Jean Dry Lake	35.7830	-115.2400
13	13	13	NV-052-0094	Boraginaceae	Hackelia	floribunda	9/7/2003	9-jul-2003	Clark Canyon	36.3220	-115.7510
14	14	14	NV-052-0095	Liliaceae	Calochortus	striatus	4/7/2003	4-jul-2003	Red Spring-RRNCA	36.1450	-115.4200
21	21	21	NV-052-0102	Polemoniaceae	Linanthus	nuttallii	5/8/2003	5-aug-2003	Clark Canyon	36.3220	-115.7510
22	22	22	NV-052-0103	Solanaceae	Nicotiana	attenuata	5/8/2003	5-aug-2003	Lovell Canyon Duck Creek Detention	36.1620	-115.5730
23	23	23	NV-052-0104	Scrophulariaceae	Penstemon	bicolor	7/8/2003	7-aug-2003	Basin area	36.0040	-115.3190
24	24	24	NV-052-0105	Capparaceae	Oxystylis	lutea	6/8/2003	6-aug-2003	Ash Meadows NWR	36.3580	-116.3030
25	25	25	NV-052-0106	Poaceae	Sporobolus	airoides	7/8/2003	7-aug-2003	Pahrnagat NWR	37.2330	-115.0910
26	26	26	NV-052-0107	Poaceae	Sporobolus	airoides	7/8/2003	7-aug-2003	Pahrnagat NWR	37.3120	-115.1260
27	27	27	NV-052-0108	Juncaceae	Juncus	balticus	12/8/2003	12-aug-2003	Bootleg Spring	36.0530	-115.5100
29	29	29	NV-052-0110	Fabaceae	Prosopis	pubescens	8/19/2003	19-aug-2003	Ash Meadows NWR	36.4040	-116.3020
30	30	30	NV-052-0111	Fabaceae	Prosopis	glandulosa	8/19/2003	19-aug-2003	Ash Meadows NWR	36.4040	-116.3020
32	32	32	NV-052-0113-	Scrophulariaceae	Penstemon	fruticiformis	8/9/2003	8-sep-2003	Ash Meadows NWR Rogers Spring-Ash	36.4380	-116.0000
33	33	33	NV-052-0114	Lythraceae	Lythrum	californicum	9/9/2003	9-sep-2003	Meadows NWR	36.4800	-116.3270
39	39	39	NV-052-0120	Poaceae	Andropogon	glomeratus	9/10/2003	9-oct-2003	Calico Spring-RRNCA	36.1500	-115.4230
117	0	0	NV-052-0081	Asteraceae	Senecio	spartioides	9/10/2002	10-sep-2002	Lee Meadow	36.3120	-115.6750

Threecorner milkvetch

- NPS_ASGE_monitoring2008_09232008
- ASGE Monitoring 2008_09232008.xls
 - 12295-12421 count (Column labeled as “cover” in xls sheet is assumed to be population count)
- BLM_DataForDCP_te_plants_Shp
- Te_plants_Shp
 - 15920-15932 point data from shapefile

Buckwheat

- BLM_DataForDCP_Buckwheat_shp
- Buckwheat.shp (“Buckwheat” no scientific name given. Species?)
 - 12532-12733 point data from shapefile**~~deleted later see note below~~
- BLM_DataForDCP_Sensitive_pnts_shp
- Sensitive_pnts_shp
 - Did not include Golden Buckwheat
 - OBJECT ID 1473-1486
 - OBJECT ID 1490-1560
 - OBJECT ID 1563-1576
 - OBJECT ID 11686

Changed individual to 1

White-margined beardtongue

- BLM_DataForDCP_Sos_points_shp
- Sos_points_shp
 - Only one record entered
 - 15901
- BLM_DataForDCP_te_plants_Shp
- Te_plants_Shp
 - 15933-15935 point data from shapefile

Phainopepla

- GBBO_AnnualDataNBCDoubleObserver20081201_PointcountData
- D7a 581 Annual Data NBC Double observer 20081201.xls
 - 15940-16007
- GBBO_AnnualDataNBCData20081201_PointcountData
- D7a 581 Annual Data NBC Data 20081201.xls
 - 16008-16104
- GBBO_AnnualDataAreaSearch20081201_Pointcounts
- D7a 581 Annual Data Area Search Data 20081201.xls
 - 16105-16132

DRI Minor Modifications to SpeciesTracking_20090505

In order to facilitate use of the Species Tracking form (frmresults), some blank entries were filled with:

- “unknown” for blank pop_name
- 0 for unknown sample year when date not known
- “unknown” for blank method
- “unknown” for blank population name

**Deleted Buckwheat entries 12532-12733 as requested by Clark County, as species name was not indicated.

Summary Statistics

Methods

The desert tortoise was excluded from this WAF activity, and no data were provided for Whipple's claopodium moss. Existing and new data at the population level for each of the remaining 10 species were analyzed for quantified population metrics capable of providing statistical summaries (such as mean and standard deviation), over a period of several years, from which a measure of population trend could be generated. The criteria applied included presence of population name and sample date, followed in a hierarchical fashion by population count (or estimate) and stated sample method. Information such as area surveyed was also recorded and additional information covering topics such as phenology, presence of young, associated species were noted as they might prove useful in future analyses.

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Data from numerous entities, referred to in this report as "sources", are included in the species tracking database, in a variety of formats. A summary of data type and metrics used in data sets used for this report is shown in Table 1. Source and data file names are written in full the first time they are mentioned in the text, and thereafter are abbreviated. Discussion of populations for which any analysis has been possible are highlighted in pale gray.

Results

Relict leopard frog (*Rana onca*)

One data set was provided by the DCP for this species, it is from the Nevada Natural Heritage Program (observed_centroids_2006_11_20) and yielded data for seven locations for two populations: Lake Mead and Colorado River. Sample areas and data type were consistent throughout, at 122 m² and a "count" of one. This data set does not contain population information and there was no date or even year associated with entries. As a result of the data format, no meaningful summary statistics can be generated.

Table 1. Summary of data formats for new and existing entries in species tracking database.

Source	Sample data file name	Data type	Population metric	Abundance metric	Notes, Info
Nevada National Heritage Program	observed_centroids_2006_11_20	Count	1, 2, etc.	Not given	No
		Count	1, 2, etc.	Not given	Yes
		Presence		>=1	No
		Presence	None	>=1	Yes
	NNHP_erconi_eos_200709	Count	1, 2, etc.	Not given	No
		Quality		“poor”	Yes
Desert Research Institute	SpringsDBMetadata.pdf	Quality		“Scarce” etc	No
US Geological Survey	USGS_582D10AnnualData20090130 BurrowingOwlReproductiveData	Not stated	None	Not given	Yes
	USGS_582D10AnnualData20090130 BurrowingOwlTransect	Not stated	1, 2, etc.	Not given	No
Great Basin Bird Observatory	GBBO_nevada_bird_count	Count	1, 2, etc.	Partial	No
		Count	1, 2, etc.		Yes
	GBBO_AnnualDataNBC20081201_Pointcount Data	Count	1, 2, etc.	Not given	Yes
	GBBO_AnnualDataNBC20081201_ Pointcounts	Count	1, 2, etc.	Not given	Yes
	GBBO_AnnualDataNBCDouble...20081201_ PointcountData	Count	1, 2, etc.	Not given	Yes
National Park Service	NPS_229_WIFL_detect04	Presence		>=1	No
	NPS_229_WIFL_detect05	Count	1	Not given	No
	NPS_229_birds_pt_sighting04	Count	1, 2, etc.	Not given	Yes
	NPS_229_birds_pt_sighting05	Count	1, 2, etc.	Not given	Yes

	NPS_ArcaMonitoring2008_09232008_CommunityEcologyData	Count	1, 2, etc.	Not given	No
	NPS_ArcaMonitoring2008_09232008_PoppyNumbers	Count	1, 2, etc.	Not given	Yes
	NPS_363_Arca_98to00obs	Presence		>=1	No
	NPS_363_ASGE_97to06obs	Presence	0	>=1	Yes
		Count	1, 2, etc.	Not given	Yes
Biological Resources Research Center	MSHCP_2001_BRRC1_muddyRv_birds3	Count	1	Not given	No
	MSHCP_2001_BRRC1_muddyRv_birds2	Count	1	Not given	No
	Martin&Geupel1993Nest-monitoring_plot.pdf	Nest count	1	Not given	No
Bureau of Land Management	BLM_updated_eis	Presence	0	>=1	No
		Count	1, 2, etc.	Yes	Yes
		Count	1, 2, etc.	Not given	No
	BLM_updated_eis_ssplants	Quality	0	"Rare(1-3)" etc.	No
		Presence	0	>=1	No
	BLM_updated_eis_nnhp1	Count	1, 2, etc.	Not given	No
	BLM_DataForDCP_Sensitive_pnts_Shp	No	No	No	No
	BLM_DataforDCP_PBSnJ_Pts	Count	1, 2, etc.	Not given	Yes
	BLM_DataForDCP_BearPoppy	Count	1	Not given	No
	BLM_sensitive_plants	Quality	0	"Rare(1-3)" etc.	No
Nevada Division of Forestry	ARCAsurvey_2005_pts	Count	1	Not given	No
The Nature Conservancy	TNC_rareplants	Presence		>=1	No
Unknown	Whitney_sen_plant	Count	1, 2, etc.	Not given	No

Mount Charleston blue butterfly (*Icaricia shasta charlestonensis*)

The Nevada Natural Heritage Program (NHP) also provided these data - for the Spring Mountains population of the butterfly, resulting in 11 data entries all of which included the year of collection. The survey area is 122 m², the data are counts and with the exception of 1928 (an isolated early record, at some distance from the others) vary between one and two. Based on these data, butterfly sightings totaled two in 1950, three in 1972, one in 1977 and six in 1995 – with 100 observed in 1928 at a location to the northwest. Information on data and survey method are too limited to generate a robust set of summary statistics.

Southern Nevada springsnail (*Pyrgulopsis turbatrix*)

There are twelve populations in the database, and data have been collected by the NHP, J. Landye and Don Sada – information from the latter two are in a DRI database (SprintsDBMetadata.pdf). The NHP are presence data, recorded as >=1, with no associated population information or notes. There are eight of these records in the database, three of which do not include a collection date. The DRI database is dated and comprises qualitative information of abundance using the words “extirpated, absent, scarce, common, abundant”. Where this information has been collected over time, a qualitative measure of relative trend is possible.

At Grapevine Spring the species declined from abundant in 1992 to common in 1995 (Table 2). More dramatically, at Lost Creek snails which were abundant in 1992 were absent in 1998. Snails at Willow Creek Spring were scarce in 1992 and also in 1995, and were common at Horseshutum Spring in 1995 and also at Middle Horseshutum Spring in 1998. Insights concerning changes in spring environment, management, and precipitation may make interpretation of these data more possible and potentially valuable.

Table 2. Relative trend for four populations of Southern Nevada springsnail (*pyrgulopsis turbatrix*)

Population name	1992	1995	1998
Grapevine Spring	Abundant	Common	
Lost Creek	Abundant		Absent
Willow Creek Spring	Scarce	Scarce	
Horseshutum/Middle Horseshutum Springs		Common	Common

Cane Spring, Harris and Wood Canyon Spring were only sampled once, so no statistical summary is possible. The other populations – Cold Creek, Le Madre, Lost Creek and Willow Spring - have been sampled by the NHP and DRI and collection methods are incomparable, meaning that no indication of trend or summary statistics are possible.

Western burrowing owl (*Athene cunicularia hypugaea*)

There are three years of survey data for the owl, 2005, 2006 and 2008, the first two of which were generated by the US Geological Survey (USGS) and the third by the Great Basin Bird Observatory (GBBO).

In total, three data collection methods were used, two of which were transects and the third which targeted breeding pairs and fledglings. Data on the GBBO transects were recorded as a count of “1” or “2” whilst the USGS recorded population size of “0” for transects but notes for the breeding-oriented sites. There are also considerable differences in the amount of data collected by the two organizations, from five locations each in 2005 and 2006 and 69 in 2008. Based on the information provided the owl population was six in 2005 and also in 2006, and 51 in 2008. The differences in methods mean that summary statistics would yield misleading results – however, the USGS effort would seem to provide thorough baseline data for succeeding surveys providing the same methods were employed.

Southwestern willow flycatcher (*Empidonax traillii extimus*)

The database contains 26 entries for this species, covering six populations with data from multiple sources and resulting from different collection methods. There are data from just one location collected by the Biological Resources Research Center (BRRC) and the National Park Service (NPS) conducted shoreline surveys in 2004 and 2005. The NHP provided most of the Virgin River population data, the only records for Corn Creek and Indian Springs populations, and data from one location for the Colorado River population.

The Virgin River population has been quite extensively surveyed, there are seven years of data collection, by three entities. The NHP compiled data from three locations in 1996 using taped calls. Information was recorded as a count of “1” which was described in the notes as “2 individuals”, another count of one was described as “suspected pair”; and from the third location, a count of “3, all males”. The survey area was also recorded for surveys in 1999, 2003, 2004 and 2005 listed in the NHP observed centroids dataset, with counts of “presence”, 7, 1, 2, 4, 1, and 7. The GBBO collected point count transect data in 2003, 2004 and 2006 and recorded sightings at two, one and one locations respectively and the BRRC collected data in 2001 at one location – in all these cases data are “1”s with no other information provided. Systematically recorded, on a long-term basis, survey area and population count will provide a measure of abundance, which might be one indication of population status and trend. However, the differences in sampling strategy make statistical summaries on these data unreliable, as there is a high probability of “comparing apples to oranges”.

Four of the populations only have one year of records: 1932 for Indian Springs, 1995 for Willow Creek Campground, and 2005 for both Corn Creek and Oliver Ranch. Data collection methods varied, with “count, one” coming from the NHP observed-centroids data set, and also from GBBO point count transect strategies employed at Willow Creek Campground and Oliver Ranch respectively. The NHP source included

the 1932 data, but the observation notes for this survey provide the information that three nesting pairs were observed – the date is July 11. There are two other July dates (in 2005) from NPS Lake Mead National Recreation Area (LMNRA) surveys of the Colorado River population, but disappointingly the method provided a count of one in each case with no further information in the notes. The Colorado River population also has data from 2004, also from the LMNRA but with a different method – providing an abundance of ≥ 1 in both cases. None of the above data are suitable for trend or summary statistical analysis.

Phainopepla (*Phainopepla nitens*)

There are 747 records in the DRI Species Tracking database for the phainopepla, for five populations – although the Mojave County, Arizona population is represented by only one undated entry. There are 15 other undated records, a few for each population. Many of the records for this species in 2002 and 2003 are from a BRRC data set, and consist of information collected by Lisa Crampton

There are numerous records, for seven years, for the Clark County phainopepla population. There is variability in sampling method and recording of data, and methods are described as point count transects, nest searches, territory plot mapping, point counts, and double observer point counts depending on the data source. In 2001 and 2002 there are consistent population counts of “1” for each of the sampling locations, 40 and 67 respectively, regardless of survey method. However, for a nest search the population of “1” may in fact be a pair or more of birds – and as there is no information to help interpret the 2002 data collected by this method the generation of summary statistics for that year is not viable.

The bulk of Lisa Crampton’s data were collected in 2003, and that year also saw a GBBO point count survey. The two sampling efforts resulted in 173 data points, some of which are population “1” nest counts (131) and some of which (59, from the GBBO data set) are actual “number of birds” counts, and the latter varies from one to six individuals. The different sampling strategies and lack of ancillary information make statistics on this years’ data inherently unreliable.

Again there are two main data collection methods for the Clark County population in 2004, although just one location was reported in the observed centroids data set, which did not include a description of the survey method. The GBBO was the surveyor for both main methods, although the point count transect data were obtained from the sightings04 data set. All appear to be actual counts, although there is variability within the NPS data set with a note referring to a count of one as “3 birds together, family group” which casts doubts on an interpretation of “pop size 1” being one bird. The multiple birds notes add 14 to the 117 phainopepla counted in 2004 at 81 locations, and there are a few instances where “nestlings” and “2 fledglings” mentioned in the notes are associated with a count of one. These inconsistencies make including this year in any trend plot or calculation of summary statistics a risky proposition.

However, the same methods and surveyors and data sources were applied in 2005 at 43 locations for a total of 64 birds plus five extras mentioned in notes. In view of the similarity in methods, both 2004 and 2005 data are included in Table 3. Sampling effort was used to normalize data, so “normalized abundance” is therefore the product of dividing the bird count by the number of observations.

Also for the Clark County population, point count transect data were collected by the GBBO in 2006, from 36 locations at which 52 birds were observed. The GBBO also reported on a 2008 survey, using a point count method with notes indicating that the objective of the survey was possibly to confirm breeding. The population size data appear to be actual numbers, 253 birds from 193 locations.

There is too much variability and uncertainty in the data for the Clark County phainopepla population to make the generation of summary statistics a meaningful exercise, however cautious interpretation of a plot of relative trend in abundance, normalized around sample effort (Table 3) suggests that this population has not experienced major declines over the period 2004 through 2008.

Table 3. Abundance of the Clark County population of phainopepla normalized by sample effort (plant count divided by number of observations)

Description of metric	2004	2005	2006	2008
Bird count	131	69	52	253
Number of observations	81	43	36	193
Normalized abundance	1.62	1.60	1.44	1.31

A contrast in data availability is provided by the Lincoln County phainopepla population, for which only two dated records were provided, both from 2001, both “nest count” records - for one nest each. Nye County has one record in 2001, 13 in 2002 and 35 in 2003 – all with a population count of 1 and consistent nest count methodology. What is being recorded by this method is the number of nests, which make summary statistics for a bird population rather “risky”. Similarly, the San Bernardino, California, population has seven nest count records for 2001, 18 in 2002, and 22 in 2003.

Las Vegas bearpoppy (*Arctomecon californica*)

A BLM data set for 1993 (“sensitive_pnts_shp”) includes no coordinates or sample method and no plant counts or abundance information. Though the data within the shapefile do plot spatially in the ArcMap program, there are no listed coordinates in the shapefile’s attribute file. Also, it is for an unknown population of bearpoppies. Data for 14 populations are included in the species tracking database, totaling 4497 records. Sampling methods vary from community ecology plots, a plot/quadrat method - both of which provide plant counts, and a preliminary assessment; three BLM EIS surveys with different ways of recording data, plus three unknown sampling methods for a total of six BLM data sources; field surveys by the Nevada Division of Forestry (NDF) and an

unknown surveyor (Whitney_sen_plant). The NHP observed centroids and TNC (TNC_rareplants) surveys complete the source list for this species.

The Las Vegas Valley bearpoppy population has data for 28 years represented by 1757 records in the database. The earliest record is from 1884 with a count of 175 but no other information. It is included in the BLM updated eis nnhp data set, together with records from 1917, 1934, 1938, 1939, 1960, 1962, 1969, 1972, 1980 and 1991 all of which show sampling from one or two dates in a “presence, abundance >=1” format. In 1978 there are data from three dates, two are in the “abundance >=1” format, whilst the other is “count 40” (Table 4). Count data continue intermittently through the ‘80s – one in 1983 and another in 1988, the latter is “20,000” but unfortunately there is no other information in that record. 1989 has four records, all counts – two of 2,000, one of 40 and one of 7 – and 1990 has two records, one is a count (40) the other is an “abundance >=1”. All the preceding information comes from the same BLM data set, but has different recording formats – or possibly different sampling methods, it is not possible to tell as no information on the methods is available.

Table 4. Variability in data format over time for the Las Vegas Valley bearpoppy population

Description of metrics	1884	1917	1934	1938	1939	1960	1962	1969
Very limited observations	count	>=1	>=1	>=1	>=1	>=1	>=1	>=1
	1972	1978	1980	1983	1988	1989	1990	
Limited observations and inconsistent or multiple methods and data format	>=1 count	>=1	>=1	count	count	count	>=1 count	
	1991	1993	1995	1997	1998	2000		
Inconsistent or multiple methods and data format	>=1	qualitative and count	qualitative and count	qualitative and count	qualitative and count	>=1		
	2002	2004	2005	2006				
Inconsistent or multiple methods and data format	qualitative	count = 1 and qualitative	count = 1	count = 1				

The mix of formats continues through the 1990s and 2000s, with an additional source (BLM_updated_eis_ssplants) starting in 1993. Data from ssplants are qualitative, with abundance estimates provided in two categories, “common 26-50” and “occasional 4-25” and there are 94 records for 1993, 97 for 1995 some of which are expressed as “rare 1-3”, 109 in 1997, seven in 1998, and 18 in 2002. These are interspersed with a few BLM nnhp and updated_eis records in the “count” format. In 2000 the ssplants data appear for 13 records as “abundance >=1”. . There are also records for 1993, 1995, 1997, 1998, 2000, 2001 and 2002, from the BLM Sensitive_pnts_Shp data set, which do not include population information.

Three records from a Nevada Division of Forestry (NDF) survey exist for 2004, all of which are in a “count 1” format. The same data set includes 35 records for 2005 and 12 for 2006. For 2004 the BLM Sensitive_pnts.shp data set consists of 441 records which are qualitative, with population sizes as “1”, “2-5” and “5-10”. There is no sample method or provenance associated with these data, however they are in a similar format to the BLM ssplant data described in the preceding paragraph. Despite the 28 years of records for this bearpoppy population, and periods of potentially comparable data, differences in sampling effort and recording would result in an inherently rather “risky” trend plot.

Data for four of the bearpoppy populations – Gold Butte, Grand Canyon, Meadview and White Basin – do not include a sample date, or even year when data were collected, and are therefore of very marginal value. Data for the Blue Point population was acquired in one year only, 2008, and three other populations have some undated records as well as records from one year only - Bitter Springs, Government Wash, Las Vegas Dunes. Summary statistics cannot therefore be calculated for eight bearpoppy populations.

The Arizona population has data from 1992, from the Nature Conservancy Rare Plants data set, and from 1998 from the NPS LMNRA survey. Both organizations collected “presence” data, recorded as a “0” population size and “>=1” abundance respectively. No additional information which would help to generate trend or summary statistic analyses is provided. There are also undated records for this population.

Data were collected in 2003 and 2005 for the Clark County population. The former is part of the BLM “updated eis” data set and the latter a Nevada Department of Forestry survey. The data are very limited, at just one location in 2003 a “count 100” was recorded, and one date of survey in 2005 yielded 10 sample locations, all recorded as a population size of “1”. These two datasets have such different records that summary statistics would not provide useful information.

The Gale Hills population has undated records in the database, as well as data from 1998 and 2008. The NPS survey of 1998 (mentioned above in the Arizona population discussion) with its “>=1” abundance data (totaling at least 45 plants) would have been comparable to TNC rare plants survey results as they are recorded in the same format. These may be GPS locations for individual plants or clumps thereof, but,

frustratingly, the TNC data set is undated. There are many hundreds of records from TNC surveys, representing a huge volume of work, but without dates they are meaningless.

The 2008 Gale Hills data were collected by one organization as a result of two survey methods (NPS “ArcaMonitoring” data set), which are described as “community ecology plot” and “plot, quadrat” however in both cases the population size is probably a plant count – and if taken together the result is 198 plants. Unfortunately the data generated in 1998 and 2008 are so different that generation of summary statistics is not possible.

The Sunrise Valley population has database entries for 1993, 1997, 1998 and 2007 presented in BLM, TNC, NPS and Whitney sensitive plants data sets. There are also 1553 undated records from TNC and the NHP observed-centroids data set for this population, with unknown sample methods and unknown surveyors.

The 1993 data are qualitative, based on abundance estimates of “occasional (4-25)” and “common (25-50)”, are dated and provenanced. In 1997 data were collected at one location and included in TNC data set – this is abundance “>=1” and the two locations collected in 1998 by NPS surveyors are recorded in the same way. The survey method for the Whitney sensitive plants data set is unknown, it is count data with the population size between 1 to 3, dominantly “1”. Three different ways of indicating population numbers used by four different organizations makes these data too inconsistent for trend analysis or summary statistics.

Using a preliminary assessment survey method, the NPS collected data for 1998 and 2000 for the Valley of Fire bearpoppy population. Plant numbers were recorded as an abundance of “>=1”, at 21 locations in 1998 and 13 in 2000. The 2008 data are from the NPS ArcaMonitoring data set which generated counts ranging from 0 to 52 per plot for a total of 657 plants. This would appear to be a good source of data, but is not comparable with the other two years of data for this population.

Undated records, of limited value for trend detection, from several sources, constitute the remaining ~ 500 records in the Las Vegas Valley bearpoppy suite of data.

Las Vegas Valley buckwheat (*Eriogonum corymbosum* var. *nilesii*)

There are eight populations of buckwheat in the database, with data contributed by six sources. The Coyote Springs population was sampled in 2005, at 16 locations of which 14 are from the NHP obs_cent data set and two from NNHP. These are all count data, with numbers ranging from 1 to 8,170 and totaling 24,251. The observed_centroids data set includes detailed notes including, for 13 locations, the survey acreage, from which an estimate of abundance can be generated. This varies from 27 to 568 plants per acre, with a mean of 156 plants per acre. If consistently measured on a long-term basis, specific information like this would assist in determining plant status and trend. However there are three other observations for this population made in the same year,

where area was not recorded, so the value for abundance is inconclusive and should be used with extreme caution.

The Garden Spring population has data from two 1997 surveys, on the same day and same location conducted by NNHP_erconi and NHP observed-centroids. These are probably repeat data. Neither give a population size, both provide a qualitative abundance estimate “good” and “common” respectively. In 1999 the White Basin population was sampled in two locations and recorded in the same two NHP data sets, however this time one is a count of 12 and the other an abundance of ≥ 1 . A third population has data from one year only, in this case 2002 and Bitter Spring Valley, where a population of 42 was recorded on one sampling date, again in an NHP data set. Two populations, Lovell Wash and Toquop Wash, were sampled in 2005, one-time visits, counts of 100 and 10,000 respectively both reported in the NNHP erconi_eos data set. For this species this is five of the eight species for which only one year of data exists, and for which no trend analysis or summary statistics are possible.

The two remaining populations of the buckwheat, Southern Las Vegas Valley and Northern Las Vegas Valley, have four and seven years of data exist respectively. There are 60 records for the Southern Las Vegas Valley population, just one from 1970 (NNHP_erconi) with a population size of zero and abundance note “gone” from a location at UNLV. In 1982 (same source) there were 300 at the Patrick and Pecos intersection. For this population in 1998 there are 16 records, five of which recorded the plant as “extant” or “gone”. Whilst interesting, and not surprising, these urban location records do not permit numerical analysis.

Of the other 11 records for this population - from six different sources - two are for an abundance of “ ≥ 1 ” (BLM_sensitive_plants), two for abundance “common 26-50” (BLM ssplants) while the others provide a count, totaling 2,726, with age structure data provided but no survey area. The 2002 survey for the same population comprises 36 records from the BLM_sensitive_plants relative abundance data set reporting “rare 1-3” and “occasional 4-25”, and four from NHP observed_centroids_2006_11_20 which again provides qualitative data, for population size, using terms such as “17-77”. The mix of methods and data type for this population makes even trend analysis a marginally viable possibility.

The Northern Las Vegas Valley population has seven years of data and 752 records in the database. For 1998 there are three BLM data sets (updated_eis_nnhp1, updated_eis, and ssplants) the first two of which account for 21 records and are internally consistent in their presentation of data, expressed as a count for population size, whilst the third (ssplants) provides 71 qualitative records all but four of which are abundance “common (26-50)”. The other four are “occasional (4-25)”. There are two other sources for this population in 1998 (erconi_eos_200709 and observed_centroids). The former provides count or absence and street intersection locations, and the latter provides counts with maturity stage and floristic association. There are two records for 1999 for this population, from two different sources with two different methods.

In 2000 the format of the BLM ssplants data collection is different, and is expressed as an abundance of “>=1”, with 157 records from 4 survey dates. These are very likely GPS data. There are two observed_centroid count data points with notes saying “265+ plants counted” and another record from the same source with an abundance of “>=1”. These data are not suitable for summary statistics.

The Northern Las Vegas Valley population 2001 data are all from the BLM ssplants source and are in the “>=1” format, but the 2002 records also from ssplants are presented in the same way as in 1998 – “occasional (4-25)”. There are only 12 records for 2002 in comparison to the 67 for 1998, negating the possibility of a trend plot comparing these two years of relative data. The eight records for 2004 are in an observed_centroids format, with counts ranging from 1 to 134 and totaling 312 - accompanied by location notes. There are only four records for 2005, from two sources – but they both come in count format – providing a population size of 1,098. The variability in number of records and methods used results in a wide range of plant numbers for this buckwheat population – which is not related to management or land use change. Deriving summary statistics for trend detection from such varied data is not a useful or meaningful exercise.

White-margined beardtongue (*Penstemon albomarginatus*)

There are seven populations of this species, comprising 5,443 records in the database. Except for one record, all data are from the TNC rare plants data set, are internally consistent and constitute abundance data of “>=1”. The one anomalous record is for Jean Dry Lake in 2003. It is a BLM (data for DCP) with a note “collect for Kew” – Kew Gardens perhaps! There is no population or sample method information and it may not be appropriate to include this record in the database.

There is one record for the Clark County population, which is undated. The North of Ash Meadows and Roach Lake populations are each represented by one year, 1997, with at least one plant at 130 and 139 locations respectively. Roach Lake also has eight undated records. Ivanpah Valley and Jean Lake both have undated records (one and three respectively) plus records for 1994 and 1997, however the number of locations for which data were recorded varies tremendously. For Ivanpah Valley it is eight in 1994 and 1,947 in 1997; for Jean Lake 110 in 1994 and 1,080 in 1997. These are all “>=1” records which rather ambiguous for statistical analysis.

The Hidden Valley population has records for three years, 1994, 1996, and 1997 – from 1,695, 158 and 158 locations respectively. The only analysis possible for data relating to this species is the cautious statement that the plant numbers seem unchanged from 1996 to 1997 for the Hidden Valley population - although this is based on the ambiguous “=1” recording format. Despite the consistent methodology, this ambiguity for the two other multi-year populations does not permit meaningful trend detection analysis.

Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)

The DCP provided DRI with data for 18 populations of the milkvetch, all of which have some undated records, but seven of which have only undated records – Bark Bay, Lime Cove, Logandale, Mud Wash, The Meadows and Town Wash. Undated records mean that a trend analysis or summary statistics are not meaningful. There are also 139 records where no population name is recorded, and no coordinates.

Seven years of sampling were reported for the Sandy Cove population, resulting in 224 records in the database. Rather unusually, all the sampling was conducted by one agency, the NPS (363_ASGE_97to06obs), all locations are counts – but there is no other pertinent information. Sampling occurred at five locations in 1998, with a total population of 129 plants. Fifty locations in 2000 yielded a total of 1,477 plants with counts ranging from 1 to 158. There were 38 locations sampled in 2001 with a grand total of 3,038 plants counted, in numbers ranging from 1 to 500. Only 14 counts were made in 2003, ranging between 1 to 51, for a total of 108 plants. In 2004 the population total was 982, from 49 locations with numbers ranging from 1 to 285. Seventy one counts, ranging from 1 to 2,274 for a total of 8,081 constitute the 2005 results, whilst 2006 has only five locations listed totaling 69 plants with counts ranging from 0 to 4. The data for the Sandy Cove milkvetch population are summarized in Table 5.

In view of the similarity in methods, seven years of data are included in Table 5. Sampling effort was used to normalize data, so “normalized abundance” is therefore the product of dividing the bird count by the number of observations.

There is too much variability and uncertainty in the data for the Sandy Cove milkvetch population to make the generation of summary statistics a meaningful exercise, however cautious interpretation of a plot of relative trend in abundance, normalized around sample effort (Table 5) suggests that changes in this population may be strongly linked to external factors – such as precipitation – which are unrelated to management. If similar data were available on a long-term basis (20 plus years) it would be meaningful to do a regression analysis, which would provide information on species status.

Table 5. Abundance of the Sandy Cove population of threecorner milkvetch normalized by sample effort (plant count divided by number of observations)

Description of metric	1998	2000	2001	2003	2004	2005	2006
Plant count	129	1,477	3,038	108	982	8,081	69
Number of observations	5	50	38	14	49	71	5
Normalized abundance	25.80	29.54	79.95	7.71	20.04	113.82	13.80

Populations at Ebony Cove, Muddy River, Sand Hollow Wash, Weiser Wash and Clark County have records for one year, either 1995 or 1998. Data for Ebony Cove were collected by the National Park Service in 1998 and included in the NPS_3634_ASGE_97to06obs data set. The three dated records are in a count format,

and the population size totals 21. In contrast, 169 observations for the Muddy River population were recorded in 1995. These are TNC presence data, with an abundance of “>=1” and no other information. At the other extreme, Sand Hollow Wash has only one record, from 1995, this is also from TNC, abundance “>=1”. Data were also collected in 1995 from 25 locations at Weiser Wash – TNC again, “>=1” abundance. The data for these five populations are not suitable for trend analysis or summary statistics due to inconsistency and insufficient information.

Data for the California Wash population were collected at 24 locations in 1995 and 74 locations in 2001, all reported in the TNC data set, and all abundance “>=1”. As mentioned elsewhere in this report, although no sample methods are provided it is possible that the TNC data result from a GPS survey - which is expeditious, but does not provide the sort of data which can be used for population trend analysis. Mormon Mesa and Mud Lake populations were also sampled in 1995 and 2001, and Toquop Wash in 1995 and 2003 – all are reported in the TNC data set and the data are in the same format as the California Wash population.

Two entities report data for the Virgin River population, TNC (rare plants data set) in 1995 from five locations and the NPS (363_ASGE_97to06obs) in 2005 from four locations – not particularly close to the previous sampling. The NPS data are in count form, indicating a population of 38; and the TNC data are abundance “>=1”. The data for the five populations described in this paragraph and the one above are not suitable for trend analysis nor are they sufficiently consistent or informative for generation of summary statistics to be meaningful.

Summary

In summary, the data provided to DRI by the DCP for this analysis are a reflection of the diversity of data collection efforts targeting the 11 selected species in Clark County. It is not that there has been insufficient sampling to generate summary statistics for most of the species investigated – but that collection methods and the format in which data have been collected are so variable as to be incomparable over time. Each of these surveys was conducted to meet specific goals, and the fact that goals may change is reflected in the changes in methods and data format over time – even among data collection efforts by the same entity.

Formulation and implementation of species-specific science plans to standardize survey and data collection methodologies is highly recommended. In time, these plans will facilitate the generation of summary statistics concerning population status and trend for all covered species. Inter-agency cooperation to standardize these plans is greatly encouraged.

Until science plans specifying survey and data collection methods are developed for each species, and have been consistently operational for several years, it is unlikely that any meaningful measure of species’ population status and trend will be obtained – leaving managers powerless to evaluate the consequences of management decisions, and

the implementation of changes in policy or management activity designed to benefit species and their habitat.

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