Expert bioblitz on the Atwood Preserve in the Oasis Valley, Nevada
May 19-21, 2023
Final Report


Photo credit: Mike Swink

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I. Introduction and context of the Amargosa River watershed

The Amargosa River is a 180-mile long groundwater-fed river system in the eastern Mojave that crosses from Nevada into California. The Amargosa River does not flow above ground its entire length but is fed by a large groundwater system. This system contains a network of springs where the underlying geology pushes groundwater to the surface, and this water constitutes the flow of the river. The Amargosa's headwaters are located at the Atwood Preserve in Oasis Valley, there is a groundwater connection to Ash Meadows and wetlands in Shoshone and Tecopa. The river terminates in the Badwater Basin of Death Valley National Park. The region is the hottest and driest of North America, but the Amargosa River has some of the highest biodiversity and endemism on the continent. The high biodiversity stems from the geological history of the region and the extreme environment. During the Pleistocene, the climate was cooler, with higher precipitation and surface water periodically connected many of the rivers and lakes of the Mojave Desert. However, with episodic dry intervals and the drying climate during the Holocene, many species became isolated and adapted to small habitats. The wetlands became "islands" for species with short dispersal mechanisms.

The Nature Conservancy has worked in the Amargosa River for 50 years. The early work focused on the conservation of Ash Meadows, with work in the Oasis Valley beginning in the late-1980s with a focus of conservation on the endemic Amargosa toad (*Bufo nelsonii*). Great effort was placed in the conservation of the Amargosa toad and unique models of community and collaborative conservation were developed. Significant scientific efforts went into studying Amargosa toad populations and habitats and understanding how to manipulate and restore wetlands to enhance toad habitat. Toad habitat restoration also included large-scale tamarisk (*Tamarix* spp.) removal throughout the Oasis Valley, and by 2019 the largest stand of tamarisk had been removed. Currently, the only remaining large stand of tamarisk within Oasis Valley occurs near the water treatment plant. Since TNC's time working in the Oasis Valley, the Conservancy has acquired three large properties: Torrance Ranch (1999), Parker Ranch (2000), and Atwood Preserve (2019); and several smaller parcels. Despite efforts from the conservation community in Oasis Valley, the area faces many threats including climate change, mining, renewable energy development and infrastructure, and non-native species.

The Atwood Preserve is a 905-acre working cattle ranch situated at the headwaters of the Amargosa River in Oasis Valley. The Preserve is located at the transition of the Great Basin Ecoregion and the Mojave Desert Ecoregion, and was acquired by The Nature Conservancy in 2019, along with the approximately 280,000-acre grazing allotment, which surrounds the Preserve and comprises the Bureau of Land Management (BLM) lands in the area. The Preserve has springs, wetlands, riparian areas, uplands, stabilized dunes, and other features. Several springs have been modified to hold water in ponds and much of the area covered by wet meadows has been ditched for irrigation to enhance livestock forage. The expert bioblitz will provide important data on which species occur on the Preserve and where those species occur. These data will provide valuable input for management decisions.

II. What is an expert bioblitz?

An expert bioblitz gathers taxonomic experts from many fields of biology to catalogue the species in a specific location over a brief and specified period of time, in this case a 48-hour period. Many bioblitzes are used for outreach and citizen science, however the bioblitz at the

Atwood Preserve, and others organized by TNC, have focused on gathering taxonomic experts that can be rapidly deployed to gather important data relevant to conservation needs. The participants are considered "experts" because they are professionals that work for state agencies, environmental consulting firms, NGOs, natural history museums, botanical gardens, colleges and universities, etc. Further, gathering a diverse group of experts allows for intensive networking and collaboration among participants (Parker et al. 2018). An expert bioblitz is a hotspot of interdisciplinary ideas that can lead to better science on the property that is surveyed. From hereafter in this document, we will refer to an expert bioblitz as a "bioblitz" for simplicity.

Prior to this bioblitz, The Nature Conservancy operated two other bioblitzes in the Amargosa River, one in Chicago Valley in 2016 and one in the Shoshone/Tecopa/Amargosa Canyon area in 2017. This 2023 bioblitz at the Atwood Preserve is the first to occur in Nevada and the Oasis Valley. Past bioblitzes have been important for gathering valuable data that were later used for acquisitions by TNC, and the results of these events have been provided to land management entities for use and for incorporation into federal management plans, such as the Amargosa Wild and Scenic River Plan.

III. Goals for the bioblitz

The goals of this bioblitz were to catalogue the biodiversity on the Atwood Preserve. Biological sampling and collecting were not allowed on the Atwood Preserve (formerly named the 7J Ranch and Coffer Ranch) until 2017 because of landowner concerns. Since The Nature Conservancy acquired the Preserve in 2019, there have been many ideas for managing the Preserve. However, staff felt there were knowledge gaps on the biodiversity and location of species. Data gathered during the bioblitz will greatly enhance and supplement TNC's knowledge of which species occur on the Preserve and where those species are located, enabling better management of the property.

IV. Participants

Participants were invited by organizers S. Parker, M. Rader, or M. Clifford based on personal knowledge of their taxonomic skillset and expertise in the region.

List of Participants

Name	**Affiliation**	**Expertise**
Anita Antoninka	Northern Arizona University	Soil Biological Crusts
Chris Hass*	Retired	Auditory Monitoring (primarily birds)
Corey Lange*	Bureau of Land Management	Spring snails
Daniel Bautista	College of Southern Nevada	Small mammals, Reptiles
Douglas Merkler	Retired	Soils
Emmanuel Herrera	College of Southern Nevada	Small mammals, Reptiles
Estella Hernandez	Natural History Museum of Los Angeles County	Insects
Janet Kempf	Natural History Museum of Los Angeles County	Spiders
Joy England	California Botanic Garden	Plants

Laura Cunningham	Western Watersheds	Plants, Birds
Lois Merkler	College of Southern Nevada	Small mammals, Reptiles
Lydia Bailey	Northern Arizona University	Soil Biological Crusts
Makenna Magdos	College of Southern Nevada	Small mammals, Reptiles
Maria Jesus	California Botanic Garden	Plants
Matthew Flores	Nevada Department of Wildlife	Small mammals, Reptiles, and Amphibians
Matthew Rader	TNC Nevada	Conservation
Michael Clifford	TNC Nevada	Conservation
Mike Swink	SWCA Environmental Consultants	Reptiles, Amphibians, Birds, Bats
Naomi Fraga	California Botanic Garden	Plants
Peri Lee Pipkin	California Botanic Garden	Plants
Sophie Parker	TNC California	Conservation
Vivian Sam	BEC Environmental, Inc.	Insects

*denotes that participant conducted at least some surveys before or after the official expert bioblitz weekend.

V. Methods

a. Organization of the bioblitz

The bioblitz was organized by Sophie Parker, Matt Rader, and Michael Clifford. This was the first bioblitz organized by TNC in Nevada, and the first organized collaboratively by California and Nevada Chapter staff. Three previous TNC bioblitzes have been completed in California (Tehachapi in 2015, Chicago Valley in 2016, and Amargosa Canyon in 2017) organized by Sophie Parker and colleagues.

b. Bioblitz logistics

Participants arrived Friday, May 19, 2023 in the early afternoon and most stayed until the afternoon of Sunday, May 21, 2023. An organizational meeting was held at 2:00 pm PDT in the barn at the Atwood Preserve, where participants introduced themselves and their expertise to the group. Team leaders were chosen for each expertise to better organize each group and reduce redundancy in sampling and driving, and plans were developed for sampling during the bioblitz. Most groups either installed instruments or began sampling Friday evening. Most participants either camped at the main ranch house at the Atwood Preserve, stayed in the bunkhouse, or camped at the Colson Ponds at the Preserve. Due to the large group size, Port-o-potties were stationed at the main ranch house and near Colson Pond.

c. Data Collection

i. Arthropods

Several methods were used to sample for arthropods at the Atwood Preserve during the Bioblitz in May 2023. Malaise traps were installed at three sites: one site in the meadow area at the entrance to the Preserve and two traps at Colson Pond. Three pitfall traps were placed near the Malaise traps at Colson Pond. All traps were deployed from Friday afternoon until Sunday at noon, except for 2 Malaise traps placed on Saturday. During this time period, several areas were sampled by hand collecting using sweep nets: the meadow areas along the entrance to the

Preserve, around all the buildings, including the equipment stored on site, the areas around the parking lot at Colson Pond and around the pond itself. In addition, nighttime surveys were conducted along the road through the sand dunes enroute to Colson Pond and along the entrance driveway to the Preserve. Collected specimens were transported to the Natural History Museum of Los Angeles County for processing and identification.

ii. Bats

Acoustic bat detectors were deployed at three sites within the Atwood Preserve (Table 1). At each site, a SM4BAT FS (Wildlife Acoustics) full-spectrum detector and SMM-U1 ultrasonic microphone were deployed to collect bat vocalizations. Each microphone was attached to an extendable aluminum pole and elevated at least 3 meters above the ground surface. Detectors were calibrated to optimize low-intensity acoustic recordings of both target species and record within their respective frequency ranges. Detectors were placed adjacent to potential bat attractant features such as water features and natural corridors, whenever present. Each detector was programmed to operate nightly for 1 to 2 detector-nights (defined as the period from 30 minutes before sunset to 30 minutes after sunrise).

Table 1. Bat Acoustic Survey Schedule and Locations

Location	**Survey Point Identification**	**Land Ownership**	**Deployment Date (2023)**	**Retrieval Date (2023)**	**Detector-Nights**	**Microphone Height (m)**
Bunkhouse Hill	7J1	TNC	5/19	5/21	2	3
Southern Boundary	7J2	TNC	5/19	5/21	2	5.6
Colson Pond	7J3	TNC	5/20	5/21	1	3

Michael Swink identified acoustic recordings of bat species through a combination of bat classification software and manual vetting. An experienced bat biologist performed batch processing, including noise filtering and automated bat call classification, of the recorded dataset. A total of 891 acoustic files were recorded during acoustic bat surveys. These data were batch processed using SonoBat version 4.4.5 bat call analysis software, which resulted in the removal of noise (non-bat) files and the identification of 793 potential bat files. A subset of files identified by the SonoBat automated classifiers as bat calls were manually reviewed and identified to species or a user-defined category. A minimum of one file / species / location / night was manually reviewed and labeled. Files that were not carried forward for analysis included relatively lower quality files that were either not manually reviewed, or not identified to species by the SonoBat classifier. Due to various factors, including environmental noise, echo, and non-bat wildlife recordings, a subset of manually reviewed files were not identifiable to species. A total of 122 bat echolocation files were manually identified to species using multiple reference materials, including acoustic bat identification keys (Szewczak 2017, 2018; Tyburec 2019), guides (Reichert et al. 2018), and vouchered reference recordings provided by SonoBat.

iii. Birds

Avian surveyors, including Mike Swink, Laura Cunningham, and Chris Hass performed opportunistic, meandering transects through various habitat types known to support breeding, foraging, and roosting, activities for multiple avian species. Surveyors identified birds to species through visual and/or aural cues. Surveys were focused around dawn and dusk to optimize detection probability during periods when many bird species were most active.

Two locations were passively sampled with acoustic monitoring devices for birds and frogs. The first location was at Colson Ponds from 1600 h on May 18, 2023 to 1030 h on May 20, 2023. A Songmeter Mini (Wildlife Acoustics) was used, with a sampling rate of 44.1 kHz at 16 bits. The recorder was set to record for 1 minute every 10 minutes throughout the entire period, resulting in 256 recordings. At the second location, near the Coffer Ponds, professional recording gear was used to obtain overnight recordings on May 18-19, 2023, with the recorder running continuously overnight from 1920 h to 0717 h in the morning, for a total of almost 12 h. The recorder was set at a sampling rate of 48 kHz at 24 bits.

Red-tailed hawk in flight carrying a mourning dove. Photo credit: Mike Swink

iv. Herpetafauna

Reptiles were surveyed by Lois Merkler, Matt Flores, Mike Swink, Makenna Magdos, Emmanuel Herrera, and Daniel Bautista by driving at night for observation along roads and by collection using capture nooses. Two individuals drove roads after sunset, while five individuals captured reptiles with nooses. Daytime reptile captures occurred in late morning and before daily peak temperature.

v. Plants

Two days of botanical surveys were conducted on May 19 and May 20, 2023 at the Atwood Preserve. The botanical team was composed of Naomi Fraga, Maria Jesus, Joy England, and Peri Lee Pipkin from the California Botanic Garden. The team first performed a cursory survey, driving from south the north along the main road on the property to identify areas with the most plants flowering to maximize survey efforts. In the field, a GPS-enabled smart-phone device assisted with data collection and map visualization. Applications such as iNaturalist were used to record observations of plant taxa and Gaia GPS was used to record survey tracks. Herbarium specimens were collected to verify identification of plant species. Provisional plant identifications were made on iNaturalist. Herbarium vouchers were collected to support plant identification, specimens were deposited at the herbarium at California Botanic Garden with duplicates being distributed to University of Nevada-Reno (UNR). The team standardized names using iNaturalist (2023).

vi. Small mammals

In late-afternoon and evening of May 19 and May 20, the small mammal survey led by Lois Merkler set 30 Sherman live traps in each transect (with one exception), set generically perpendicular to the road. Each transect was established by marking a beginning waypoint and then following a bearing, setting a trap every ~25 feet. Transects were placed in different habitats including stabilized sand dunes, saltbrush north of Colson Ponds, wet meadow of southern meadows, and riparian area adjacent to Colson Pond. The transect in the riparian area adjacent to Colson Pond only had 10 traps due to poor, weedy habitat in the adjacent disturbed field – all other transects had 30 traps. All traps were checked at sunrise. Trapped animals were identified to species. Sex and approximate age (adult vs juvenile) were determined, and each animal was marked with a sharpie so that recaptures could be identified in subsequent trapping. Animals were released at trap locations. All traps were picked up when checked Sunday morning, May 21st.

vii. Soil crust

Biological soil crusts (biocrusts) are the community of lichens, mosses, cyanobacteria and more which knit together the soil surface in arid landscapes. Biocrusts stabilize soil from wind and water erosion, influence hydrology, and have complex relationships with vascular plants. Biocrust communities are influenced by aspect and soil type, texture and parent material. To survey the Preserve, Anita Antoninka and Lydia Bailey first identified the distinct landforms and soil types within the Preserve, including 1) the sand dunes 2) the lowlands/wetlands and 3) the rocky uplands. They then walked through each of these areas, ensuring that they traversed multiple aspects and slopes within each, and searched for biological soil crust organisms. They collected lichen and moss voucher specimens for further identification.

VI. Results

There were 23 participants in the expert bioblitz. Their expertise covered many taxa including, insects and spiders, birds, plants, reptiles, bats and small mammals, and biological soil crusts. Participants observed and identified 264 species during the bioblitz that were uploaded to iNaturalist. Plants comprised the group with the most species (162) observed (Table 2).

Table 2. Counts of species observed during the bioblitz.

Taxa	**Number**
Fish	1
Amphibian	2
Birds	49
Fungi	2
Insects	25
Mammals	16
Plants	162
Reptiles	7


Group photo of most participants. Photo credit: Peter Castagnetti

VII. Challenges

There were several challenges to holding this expert bioblitz and include: **1)** scheduling the bioblitz so that the maximum number of species could be observed and accurately identified, given varied species phenology. This bioblitz occurred in late May, which is an appropriate time to survey for most taxa, particularly migrating and breeding birds. However, wetland plants would be more appropriately surveyed later in the summer when the majority are flowering. More insects may have been observed later in the summer as well. And **2)** getting a critical mass of participants to attend the bioblitz. The Atwood Preserve is a 2-hour drive from Las Vegas, NV and approximately 4-6 hour drive from the Los Angeles area. It is challenging to schedule a weekend event for >20 people that is more than a 2-hour drive for nearly all of the participants.

One method to avoid these challenges would be to have a “rolling bioblitz” that allowed participants to visit the Atwood Preserve and conduct their surveys at the appropriate phenological time and during times that worked with their personal schedules. The downside of a rolling bioblitz could be access issues from TNC (e.g., lack of personnel available at the appropriate time), the personnel cost to TNC, and the community developed by the participants when attending the bioblitz. By having most participants at the Atwood Preserve together, it allowed participants to network with experts from other disciplines and provide guidance on other areas of the Preserve to survey.

A Merriam’s kangaroo rat being processed after capture. Photo credit: MaKenna Magdos

VIII. Cost and funding

While many individuals are happy to donate their *time* to participate in an expert bioblitz, travel costs can be considerable and a barrier to participation for some. Following the recommendations made by participants during the 2016 Chicago Valley Bio-Archaeo-Blitz (Parker et al. 2016), and the Amargosa River Expert BioBlitz (Parker et al. 2017), organizers secured funding from the TNC California Science Catalyst Fund (The Nature Conservancy 2022) to defray some costs for participants during the 2023 Atwood Preserve Expert BioBlitz. This helped incentivize participation, especially for participants with limited budgets and no access to research and travel funds.

The total expenses for this event borne by The Nature Conservancy, not including staff time by employees, amounted to $4,115.52. Given that 264 taxa were recorded during this effort, the return on investment for The Nature Conservancy in holding this event is high, at about $15.59 per taxon documented. A significant portion of the cost of holding this event was borne by participants. Several participants elected to self-fund all or part of their expenditures as part of their volunteer contribution to this event. For example, while some participants sought reimbursement for transportation costs, they did not seek reimbursement for meals. Of the 23 participants, 11 (47.8%) sought no compensation from TNC for the expenses they incurred.

All field time was donated to the Atwood Preserve Expert BioBlitz on a volunteer basis. Each participant contributed an estimated 16 hours of field time during the BioBlitz. Given that services provided by subject experts conducting surveys of this nature are typically valued at more than $50.00 per hour, and the event included 23 participants, this amounts to an estimated total of the equivalent of at least $18,400 in volunteer labor utilized during the Atwood Preserve BioBlitz. Time spent in transit to the event was not included as part of the calculation of time contributed by participants.

The total reimbursed by The Nature Conservancy for transportation was $2,712.91. The travel of 12 participants was subsidized by TNC, so the cost was $226.08 per participant. The distances traveled by this group were far, involving travel from Las Vegas and other cities in Nevada, the Los Angeles area, and Flagstaff, Arizona. Participants sought reimbursement for 3,127 vehicle miles traveled by the group, including for travel to and from the Atwood Preserve from their cities of origin, and repeated trips to/from the field site from each participant's place of lodging. It is important to note that an estimate of the true transportation costs for the group would be much higher than that reimbursed by TNC, as several participants who did not seek compensation traveled long distances to attend the event.

Food expenses were a significant cost at this event. The Nature Conservancy directly reimbursed $220.01 to cover the cost of meals and snacks for participants. The Nature Conservancy provided snacks and beverages free of charge to the group at a cost of $181.71. It is important to note that most participants bore some or all of their meal costs without seeking reimbursement.

The total reimbursed by The Nature Conservancy for lodging was $586.60. The majority of participants opted to camp for free at the Atwood Preserve, which helped defray lodging costs. The Nature Conservancy rented porta-potties at a total cost of $591.00 for this event.

This breakdown of estimated and actual costs does not include TNC staff time to organize and execute the event, time spent in the lab processing samples or analyzing data, report preparation, or any other preparatory or post-event activity. Including these items could easily add tens of thousands of dollars in additional costs.

Stabilized sand dunes between the upper and lower wet meadows. Photo credit: MaKenna Magdos

IX. Management Implications

The Oasis Valley surrounding the Atwood Preserve faces many threats including climate change, invasive species, gold mining, lithium mining, renewable energy development, transmission lines, and groundwater withdrawal. Despite all of the threats in the region, TNC still needs to manage the Preserve to maximize biodiversity. This expert bioblitz provides baseline information on which species occur, when they were recorded (e.g., phenology) on the Preserve, and their location. The species list and baseline data will be used to assist with the cattle grazing operation and determine where and when cattle grazing should avoid certain locations – and for future restorations and any type of spring maintenance projects.

Data collected from the expert bioblitz will also be provided to federal agencies, like the Bureau of Land Management, to provide greater insights into the biodiversity of the region when permitting mines and renewable energy projects and infrastructure. Furthermore, all development on federal lands in the Oasis Valley will be required to go through the National Environmental Protection Analysis (NEPA). The public comment period during the NEPA process will give TNC an opportunity to provide additional biological data to the Environmental Assessment or Environmental Impact Statement process, so that all species are being considered in the impact analysis.

X. Conclusions

The goal of the bioblitz was to collect a wide range of species occurrences on the Atwood Preserve, and coordinate the effort with a large contingent of experts. The Atwood Preserve (formerly 7J Ranch, and prior to that the Coffer Ranch) has historically been under-sampled by scientists due to landowner access issues, but the property is one of the most important conservation properties in the Oasis Valley. It has the largest wet meadows in Oasis Valley, includes the headwater springs, and is relatively well intact. Collecting data in a data devoid area that is facing so many pressures is critically important for understanding which species occur on the Preserve and which species may be at risk of declining due to outside development.

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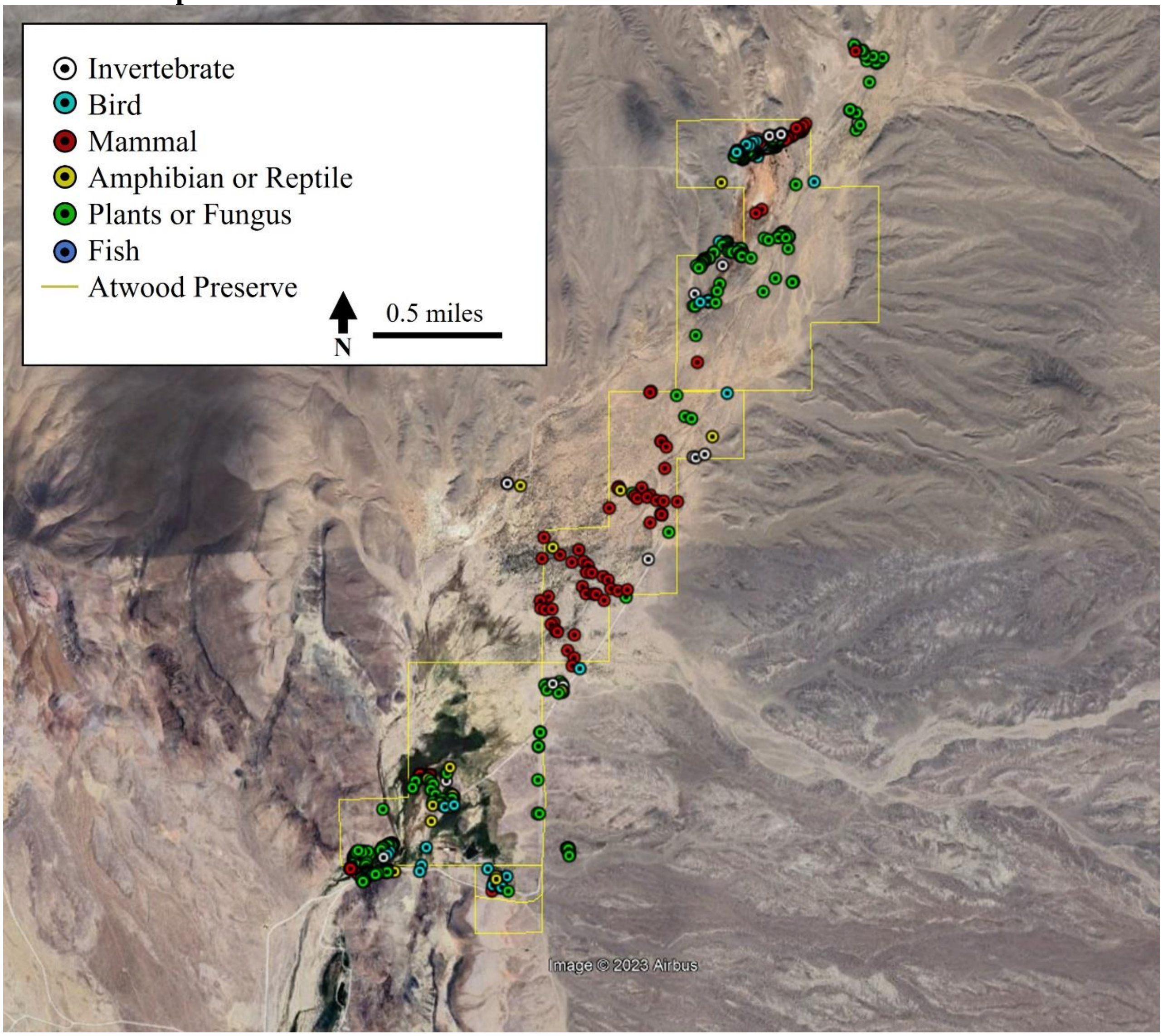
XII. Map



Map of the Atwood Preserve with location of species uploaded into iNaturalist.

XIII. Species list

Species	**Taxa**
Micropterus dolomieu	Fish
Lithobates catesbeianus	Amphibian
Pseudacris hypochondriaca	Amphibian
Accipiter cooperii	Bird
Actitis macularius	Bird
Agelaius phoeniceus	Bird
Anas platyrhynchos	Bird
Bombycilla cedrorum	Bird
Bubo virginianus	Bird
Buteo jamaicensis	Bird
Cardellina pusilla	Bird
Cathartes aura	Bird
Charadrius vociferus	Bird
Chondestes grammacus	Bird
Chordeiles acutipennis	Bird
Contopus sordidulus	Bird
Corvus corax	Bird
Empidonax wrightii	Bird
Falco mexicanus	Bird
Falco sparverius	Bird
Fulica americana	Bird
Gallinago delicata	Bird
Geococcyx californianus	Bird
Geothlypis trichas	Bird
Haemorhous mexicanus	Bird
Icteria virens	Bird
Icterus bullockii	Bird
Icterus parisorum	Bird
Mimus polyglottos	Bird
Molothrus ater	Bird
Myiarchus cinerascens	Bird
Oxyura jamaicensis	Bird
Phainopepla nitens	Bird
Phalaenoptilus nuttallii	Bird
Plegadis chihi	Bird
Podilymbus podiceps	Bird
Quiscalus mexicanus	Bird

Rallus limicola	Bird
Salpinctes obsoletus	Bird
Sayornis saya	Bird
Setophaga petechia	Bird
Streptopelia decaocto	Bird
Sturnella neglecta	Bird
Tringa melanoleuca	Bird
Tyrannus verticalis	Bird
Tyto alba	Bird
Vireo bellii	Bird
Vireo gilvus	Bird
Vireo plumbeus	Bird
Xanthocephalus xanthocephalus	Bird
Zenaida macroura	Bird
Zonotrichia leucophrys	Bird
Montagnea arenaria	Fungi
Podaxis pistillaris	Fungi
Acmaeodera	Insect
Anthophorula	Insect
Augochlorella pomoniella	Insect
Calliopsis puellae	Insect
Disonycha	Insect
Eristalis tenax	Insect
Euodynerus	Insect
Formicidae	Insect
Glyptoscelis	Insect
Gryllidea	Insect
Helophilus latifrons	Insect
Hippodamia convergens	Insect
Hyles lineata	Insect
Ischnura	Insect
Lepidoptera	Insect
Libellula saturata	Insect
Lordotus	Insect
Miscophus	Insect
Noctueliopsis	Insect
Noctuinae	Insect
Odonata	Insect
Pogonomyrmex	Insect

Trimerotropis pallidipennis	Insect
Vanessa cardui	Insect
Zygoptera	Insect
Ammospermophilus leucurus	Mammal
Bos taurus	Mammal
Chaetodipus formosus	Mammal
Dipodomys deserti	Mammal
Dipodomys merriami	Mammal
Dipodomys microps	Mammal
Equus asinus	Mammal
Euderma maculatum	Mammal
Lasiurus cinereus	Mammal
Myotis californicus	Mammal
Myotis ciliolabrum	Mammal
Onychomys torridus	Mammal
Parastrellus hesperus	Mammal
Peromyscus eremicus	Mammal
Peromyscus sonoriensis	Mammal
Tadarida brasiliensis	Mammal
Abroni turbinata	Plant
Acamptopappus shockleyi	Plant
Agrostis exarata	Plant
Aliciella leptomeria	Plant
Aliciella lottiae	Plant
Ambrosia acanthicarpa	Plant
Ambrosia dumosa	Plant
Ambrosia salsola	Plant
Amsinckia tessellata	Plant
Anemopsis californica	Plant
Angiospermae	Plant
Artemisia spinescens	Plant
Asclepias erosa	Plant
Astragalus layneae	Plant
Astragalus lentiginosus	Plant
Atriplex canescens	Plant
Atriplex confertifolia	Plant
Atriplex parryi	Plant
Atriplex polycarpa	Plant
Atriplex torreyi	Plant

Baileya pleniradiata	Plant
Bassia hyssopifolia	Plant
Berula erecta	Plant
Blitum nuttallianum	Plant
Bromus rubens	Plant
Bromus tectorum	Plant
Calochortus flexuosus	Plant
Calycoseris wrightii	Plant
Camissonia campestris campestris	Plant
Carex praegracilis	Plant
Castilleja chromosa	Plant
Caulanthus lasiophyllus	Plant
Chaenactis carphoclinia	Plant
Chaenactis macrantha	Plant
Chaenactis stevioides	Plant
Chorizanthe brevicornu	Plant
Chorizanthe rigida	Plant
Chylismia brevipes	Plant
Chylismia claviformis integrior	Plant
Cleomella brevipes	Plant
Crepis runcinata	Plant
Cryptantha nevadensis	Plant
Cylindropuntia echinocarpa	Plant
Cymopterus ripleyi saniculoides	Plant
Cynodon dactylon	Plant
Dasyochloa pulchella	Plant
Datura wrightii	Plant
Delphinium parishii	Plant
Descurainia pinnata	Plant
Descurainia sophia	Plant
Diplacus bigelovii cuspidatus	Plant
Distichlis spicata	Plant
Distichlis spicata stricta	Plant
Draba verna	Plant
Echinocereus engelmannii engelmannii	Plant
Elaeagnus angustifolia	Plant
Elymus elymoides	Plant
Encelia virginensis	Plant
Ephedra nevadensis	Plant

Eremothera boothii	Plant
Eremothera boothii desertorum	Plant
Eremothera refracta	Plant
Eriastrum wilcoxii	Plant
Ericameria cooperi	Plant
Ericameria nauseosa	Plant
Eriocoma hymenoides	Plant
Eriogonum fasciculatum	Plant
Eriogonum inflatum	Plant
Eriogonum maculatum	Plant
Eriogonum nidularium	Plant
Eriogonum pusillum	Plant
Eriogonum trichopes	Plant
Eriophyllum pringlei	Plant
Erodium cicutarium	Plant
Erythranthe guttata	Plant
Euphorbia albomarginata	Plant
Gilia cana	Plant
Gilia cana speciformis	Plant
Glyptopleura marginata	Plant
Grayia spinosa	Plant
Greeneocharis circumscissa	Plant
Halerpestes cymbalaria	Plant
Halogeton glomeratus	Plant
Heliotropium curassavicum	Plant
Hordeum brachyantherum	Plant
Hordeum jubatum	Plant
Hordeum murinum	Plant
Ipomopsis polycladon	Plant
Juncus mexicanus	Plant
Krascheninnikovia lanata	Plant
Lactuca serriola	Plant
Langloisia setosissima	Plant
Larrea tridentata	Plant
Lepidium fremontii	Plant
Lepidium latifolium	Plant
Leucosyris carnosa	Plant
Leymus cinereus	Plant
Leymus triticoides	Plant

Lolium arundinaceum	Plant
Lycium andersonii	Plant
Malacothrix coulteri	Plant
Malacothrix glabrata	Plant
Malacothrix sonchoides	Plant
Menodora spinescens	Plant
Mentzelia albicaulis	Plant
Mirabilis laevis	Plant
Mirabilis laevis retrorsa	Plant
Monoptilon bellioides	Plant
Muhlenbergia asperifolia	Plant
Nama demissa	Plant
Nama densa	Plant
Nasturtium officinale	Plant
Neokochia americana	Plant
Nitrophila occidentalis	Plant
Oenothera californica	Plant
Oenothera primiveris	Plant
Opuntia basilaris basilaris	Plant
Oxytheca perfoliata	Plant
Pappostipa speciosa	Plant
Paspalum distichum	Plant
Pectocarya setosa	Plant
Penstemon floridus	Plant
Phacelia distans	Plant
Phacelia fremontii	Plant
Plagiobothrys salsus	Plant
Poa secunda juncifolia	Plant
Polypogon monspeliensis	Plant
Populus fremontii	Plant
Prenanthella exigua	Plant
Psathyrotes annua	Plant
Psorothamnus polydenius	Plant
Puccinellia distans	Plant
Rafinesquia neomexicana	Plant
Salix gooddingii	Plant
Salvia columbariae	Plant
Sarcobatus vermiculatus	Plant
Schismus barbatus	Plant

Schoenoplectus acutus occidentalis	Plant
Schoenoplectus americanus	Plant
Schoenoplectus pungens	Plant
Sclerocactus polyancistrus	Plant
Sisymbrium irio	Plant
Sisyrinchium idahoense	Plant
Spergularia rubra	Plant
Sphaeralcea ambigua	Plant
Sporobolus airoides	Plant
Sporobolus cryptandrus	Plant
Stephanomeria pauciflora	Plant
Stutzia covillei	Plant
Stylocline micropoides	Plant
Suaeda nigra	Plant
Syntrichopappus fremontii	Plant
Tamarix ramosissima	Plant
Taraxacum officinale	Plant
Tetradymia axillaris	Plant
Tetradymia glabrata	Plant
Tiquilia plicata	Plant
Trifolium wormskioldii	Plant
Triglochin maritima	Plant
Xylorhiza tortifolia	Plant
Yucca brevifolia	Plant
Yucca brevifolia brevifolia	Plant
Arizona elegans	Reptile
Callisaurus draconoides	Reptile
Masticophis flagellum	Reptile
Phrynosoma platyrhinos	Reptile
Pituophis catenifer	Reptile
Sceloporus uniformis	Reptile
Uta stansburiana	Reptile