Boulder County Parks and Open Space
Wildlife Program Annual Report 2011

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Accomplishment of Stated Goals for 2011

1. Finalize our Indicator Species List.
    a. Utilize information already compiled by other land management agencies in our selection process.
    b. Ensure that the relationship between the Indicator Species List and the more comprehensive Species of Concern List is well-defined.

Results: We crafted conservation assessments and management recommendations for each of the following species: American marten, northern leopard frog, Abert's squirrel, Preble's meadow jumping mouse and dusky grouse. We started the review process (research compilation) on the following species: olive-sided flycatcher and bobolink. We have concurred that species to receive future review include: northern goshawk, grasshopper sparrow and 13-lined ground squirrel.

While some progress was made in relation to this goal in 2011, we do not consider it complete. Additionally, the relationship between the Boulder County Species of Concern list and our Indicator Species list was not formalized. We are continuously reviewing the Species of Concern list and attempting to define its origins and documentation. This list has been in existence for several years, and was crafted prior to electronic records. Therefore, our goal is to capture all information pertaining to the creation and rationale of this list, for documentation into the future.

2. Continue efforts to capture all data (historic and future) into appropriate database formats to ensure that our efforts in data collection are usable into the future for the guidance of management decisions.
    a. In 2011, our goal is to complete the Breeding Bird, Preble's Meadow Jumping Mouse, and Abert's Squirrel databases.

Results: In 2011, the Preble's Meadow Jumping Mouse dataset were reprioritized after assessment of the data revealed a need for further updating. Breeding Bird and Abert's Squirrel databases were initiated. A need to prioritize fish stocking records emerged, and a database component to house historical and current records was completed. In addition, metadata was completed for all major datasets previously transferred to the database (Raptors, Cameras, Scent Stations, and Fish Stocking).

Additionally, a database can now be developed for survey records (Northern goshawk, small owls) to be utilized alongside our Raptor data. Maintenance and updates to the database are ongoing to ensure data reflects current status.

Wildlife staff continuously explores and develops documents, reports, and criteria by examining research literature, internal and ex data sources. Our goal of identifying, qualifying, and consolidating wildlife data has illuminated the need to explore additional data storage hardware and software options that offer archive search capability.

- **Breeding Bird Survey Data**- The historic spreadsheets dating back to 2000 have been reformatted for inclusion into the comprehensive database. Spatial location of survey stations is current.
- **Fish Stocking**- This database contains all historic stocking information for our fisheries, and is complete. New seasonal or annual records will be added as needed.
- **Preble's Meadow Jumping Mouse**- Current data was evaluated by staff and more updated records are needed before consolidation to the database.
- **Abert's Squirrel-** Completed database components for Abert's Squirrel is congruent with monitoring transects within areas of forestry treated and untreated stands. Further refinement of the current database structure may occur as needed, to reflect additional data collection efforts.
- **Shrub Monitoring**- The final defined structure for the shrub monitoring database is complete after reviewing and testing an initial framework. Modifications are in process and first-year data is ready for entry.

3. Work in collaboration with other Parks and Open Space programs.
    a. Specifically, in 2011, work with Forestry and prioritize collaboration on treatment units scheduled for 2011.
    b. Assess all proposed treatment stands for wildlife resources.
    c. Review and respond to Internal Review Documents as requested by Forestry.

<u>Results</u>:

<u>a.</u> The wildlife department worked closely with the forestry department on many projects in 2011. To facilitate continuous collaboration, the senior wildlife biologist and the senior forestry supervisor met bi-monthly. These meeting were beneficial to both departments, as they ensured communication.

<u>b.</u> Wildlife staff spent considerable time assessing proposed forestry treatment units in 2011. These efforts are listed by property below:

<u>Heil Valley Ranch</u>: For proposed treatments at Heil Valley Ranch, staff spent considerable time assessing units in Project Area 5 (PA5) and Project Area 7 (PA7). Units assessed in PA5, included units 1, 2, 3, 5, 8, 9, 10 for a total of 316 acres assessed. Units assessed in PA7 included units 2 and 3 for a total of 50 acres assessed. Assessment of PA7 will continue in early 2012, and will include Units 4, 5 and 6. Staff conducted all assessments by walking parallel transects at a spacing 25 meters apart. We visually located nests (ex.: Cooper's hawk and Abert's squirrel), snags, and Abert's squirrel feeding sign, as well as wet areas and springs. We attempted to ensure continued wildlife use of the stands by excluding areas from treatment, based on known habitat requirements of indicator species. For instance, in the case of Abert's squirrels, we attempted to connect heavy feeding areas with nest sites, by flagging a travel corridor based on connecting canopy requirements.

All recommendations made by wildlife staff were discussed with forestry staff and agreements were incorporated into the unit prescriptions.

All on-the-ground flagging has been removed in treated units. This was accomplished by Youth Corps with Wildlife staff leadership.

Hall Ranch: Staff assessed stands within Project Area 4 (PA4), Unit 5, Stands 1, 2. Formalized recommendations were made, and incorporated into the stand prescriptions.

Wildlife staff was involved with the prescribed burn of PA4, Unit 4 (66 acres). We assessed the unit, plus conducted shrub transects in treatment vs. control comparisons. This area contains bitterbrush, which is unusual at the elevation of the area, and is an important forage species for ungulates. Using the results of our surveys, which will assist in assessing bitterbrush response, we will be better able to make future recommendations in areas containing bitterbrush.

In addition, we actively participated in the prescribed burn when it was implemented. The wildlife working group emphasizes that staff be red-carded in order to participate in prescribed burns, as well as wildland fire suppression. During implementation of the prescribed burn of PA4, unit 4, staff assisted by hosting researchers from the Rocky Mountain Research Station and the Rocky Mountain Geographic Science Center.

Reynolds Ranch: Staff conducted site visits to PA2, Unit 2, and provided recommendations. (Ex: retention of downed woody material). Staff also collaborated on building elk exclosures in the Reynolds Ranch area, to help accomplish the shared goal of aspen regeneration and enhancement.

Additionally, forestry and wildlife staff met with U.S. Forest Service personnel to discuss the adjoining USFS Forsythe Planning area, and provide our recommendations based on the larger context of how their future treatments may complement the work already accomplished by Boulder County.

Other collaborations: Wildlife staff will participate in the newly formed Prescribed Burn team created by Forestry. In addition, wildlife staff provided information towards the creation of the draft Forest Management Plan (FMP). Participation in this project will continue in 2012.

c. Records of communication are available via the Internal Review Documents for these areas.

Stand assessment at Heil Valley Ranch

4. Continue annual surveys to provide data to be utilized for input towards management decisions. Specifically, conduct breeding bird surveys at Betasso Preserve, Caribou Ranch, Heil Valley Ranch (Overland Burn) and Rock Creek Farm. Conduct northern goshawk surveys in areas of historical occupancy, as well as areas of suitable habitat, as possible. Utilize remote cameras to conduct inventories in habitat proposed for management action, such as Reynolds Ranch and the Hall II properties.

   Results:

   a. Breeding bird surveys were completed for each of the four properties above, and additionally for Reynolds Ranch, completing the second year of baseline data. Surveys in 2012 at Reynolds Ranch will provide the final baseline data of a three-year survey effort.
   b. Northern goshawk surveys were conducted at properties with historical occupancy (Caribou and Reynolds Ranch) as well as suitable habitat at BLM South and Meyers Gulch. Evidence of nesting was determined at BLM South with the discovery of a nest, and subsequent surveys may follow in 2012, as possible.
   c. Remote cameras were deployed at Reynolds Ranch to continue gaining data regarding wildlife use of the property towards management decisions relating to the management plan process.

5. Continue collaborations and partnerships with outside agencies including Colorado Parks and Wildlife (CPW), U.S. Forest Service (USFS), and City of Boulder Open Space and Mountain Parks (OSMP).
   a. Share data and methodologies with adjacent land managers in an effort towards wildlife resource management on a landscape scale.
   b. In 2011, prioritize the Spring Gulch project in collaboration with the USFS.

c. Additionally, prioritize developing shared waterfowl and raptor databases with OSMP. Develop a plan to ensure annual information on heronries is relayed to the CPW.

Results:

OSMP- In 2011, we completed a shared BCPOS-OSMP waterfowl database. The waterfowl database is accessed online, and enables wildlife volunteers from both agencies to enter monitoring data electronically, and staff to easily review, track, and create reports based on their data. To complement the waterfowl databases, BCPOS and OSMP recently initiated commencing the raptor database component of this project, for projected completing in spring of 2012. In addition to extending the use of an electronic database to raptor monitors, raptor nest data can readily be available to both agencies for management purposes.
Development of a plan to address heronries is currently being explored. Refinement of our current heronry data, and expansion of our data collection efforts is of interest and integral to future monitoring. In 2011, staff was unable to fully develop a program to address data collection and the sharing of annual information with CPW, however the initial framework is in development.

CPW- The wildlife staff worked with the Colorado Division of Parks and Wildlife throughout the year on several fronts. We coordinated and assisted them with research involving the Front Range Cougar Study, bats in mines, yellow perch, and a new deer-trapping device. Their aquatic researchers sampled fish and stream conditions in the St. Vrain on POS properties. Staff worked closely with the aquatic management biologist on our public fisheries (stocking and sampling; Ex. Photo of Northern pike transplanted, caught, and released in 2011). Staff worked diligently on a permit to relocate prairie dogs from the Lower Boulder Creek stream restoration project, as well as evaluating sites at Rabbit Mountain to receive them. Staff again participated in the annual St. Vrain bighorn population survey in November. And we worked on an everyday basis with all of the District Wildlife Managers.

USFS- Wildlife staff worked with the USFS to plan and complete the **Spring Gulch Habitat Enhancement** project (photo). Each agency shared time, money, and manpower to close over 1 mile of trail, rehabilitate the old trail tread, and build barrier fencing. The Inmate Work Crew from the Boulder County Sherriff's Office was also instrumental in transporting materials to the remote job sites. The 2 staffs also cooperated on aspen management, bluebird nest box monitoring, shared sensitive species information, and toured USFS timber units for upcoming planning.

Northern Pike-Lagerman Reservoir Spring Gulch Restoration Project

Goals 2012

1. Continue working towards the finalization and approval of our Indicator Species List. As part of this process, ensure that the relationship between the Indicator Species List and the more comprehensive Boulder County Species of Concern (SOC) List is well-defined. Document the origination of the SOC list, and formalize its update process.

2. Continue developing the Wildlife Geodatabase with the goal of capturing data (historic and future) into appropriate formats.
    a. Attempt to ensure that our efforts in data collection are usable into the future for the guidance of management decisions, by making the databases stable, easy to understand, and query.
    b. In 2012, our goal is to complete the Breeding Bird, Bobolink, Herpetile databases, and conclude development of Abert's Squirrel and Shrub Monitoring databases with metadata components.

3. Work in collaboration with other Parks and Open Space programs.
    a. Specifically, in 2012, work with our Agriculture department. Prioritize collaboration on input into Property Operating Plans, and the completion of approved Best Management Practices (BMPs) for Wildlife, as related to Agricultural practices.
    b. Continue close collaboration on assessing the status of prairie dog populations on agricultural properties.

4. Continue to implement field surveys in support of management planning, as well as establishing baseline information on species use of BCPOS properties. Continue in our efforts to investigate and improve on our survey methodologies. Specifically:

a. Develop a protocol for assessing small owl presence on our properties.
b. Develop methods for assessing invertebrate populations within BCPOS water bodies.
c. Determine the most currently accepted methods to implement breeding bird surveys.

5. Continue collaborations and partnerships with outside agencies including CPW, USFS, OSMP and universities. Share data and methodologies with adjacent land managers in an effort towards wildlife resource management on a landscape scale.
    a. Achieve the incorporation of OSMP's waterfowl monitors into the BCPOS-developed waterfowl online database.

6. Develop at least one additional long-term monitoring project using volunteers.
    a. Focus on the use of volunteers to implement sampling for aquatic insects and other bottom-dwelling invertebrate species.

In addition to the above listed goals and accomplishments, the wildlife department was fortunate to have been able to hire two new employees in 2011. The first is Mac Kobza, who filled the position of wildlife biologist, and the second is Michelle Durant, who has a newly created position of Volunteer Program Specialist-Wildlife.

Avian Program 2011

Raptors

Raptor nests were again monitored in 2011 for productivity. CPW volunteers and POS staff monitored bald eagle nests. Volunteers and POS staff monitored golden eagle, osprey, and prairie falcon nests. Volunteers (**9**) contributed **400** hours to this effort in 2011.

Bald Eagle Nest Monitoring

We continued to coordinate monitoring three bald eagles nests on POS property with the CPW. A new nesting attempt was observed at Western Mobile in 2011, and it has been determined that this new pair displaced the pair referred to as the "Braly" pair in past records. In 2011, this new pair (Western Mobile) successfully nested and fledged 3. In late 2011, it was determined that another new pair is attempting to nest near POS property south of Lagerman Reservoir. We will continue to monitor this pair.

2011 Results

Nest Location-Bald Eagles	**Number of Fledglings**
Wambsganss	2
Keyes North	2
Western Mobile	3
IMEL	New pair observed
Braly	Displaced by W. Mobile pair

Golden Eagle Nest Monitoring

Staff and volunteers monitored the five known golden eagle nest sites on BCPOS properties in 2011.

All 5 nests appeared to hatch young, however 3 nests failed during an unusually cold, wet spring. A possible nest site was identified at BLM South which staff will continue to monitor in 2012.

2011 Results

Nest Location-Golden Eagles	**Number of Fledglings**
Heil Valley Ranch	2
Heil Valley Ranch	Nest failed
Wyn/Forsberg	2
Meadow Park	Nest Failed
Rabbit Mountain	Nest Failed
BLM South	Unknown

Burrowing Owl Nest Monitoring

In 2011, three burrowing owl nests were located on one southern property, Rock Creek Farm.

2011 Results

Nest Locations-Burrowing Owls	**Number of Fledglings**
Rock Creek Farm	6
Rock Creek Farm	6
Rock Creek Farm	2

Osprey Nest Monitoring

Osprey nests at the Fairgrounds and Lagerman Reservoir were again monitored in 2011 by POS staff and volunteers. Additional observations of two nests located on separate Conservation Easements contributed to County data.

In late 2010, wildlife staff replaced, as well as relocated, an old nest platform at Lagerman Reservoir. Additionally, one was replaced at a Conservation Easement property on St. Vrain Road. Both new structures were utilized by returning ospreys in 2011.

2011 Results

Nest Location-Osprey	**Number of Fledglings**
Lagerman Reservoir	3
Fairgrounds	1
Conservation Easement	3
Conservation Easement	4

Prairie Falcon Nest Monitoring

Staff determined activity and observed prairie falcon nests in 2011. All nesting information was sent to the University of Colorado for inclusion into the annual cliff-nesting raptor report for the Front Range (golden eagles, prairie falcons and peregrine falcons.)

2011 Results

Nest Location-Prairie Falcon	**Number of Fledglings**
Walker Ranch-Castle Rock	Inactive
Hall Ranch	5
Heil Valley Ranch	3
Geer Canyon	Inactive
Steamboat Mountain	Inactive

Northern Goshawk Monitoring

In 2011, surveys for northern goshawks were conducted at Caribou Ranch and Reynolds Ranch. Two additional properties were surveyed, BLM South and the northeast parcel of Meyers Gulch. A late-season visit to the Peck Gulch nesting territory determined a second failure event. Surveys were completed by wildlife staff.

2011 Results

Caribou Ranch- Broadcast surveys were conducted at Caribou Ranch, however no detections were made. Of note, staff observed an unusual event of four Northern goshawks collectively soaring the ridgelines north and west of DeLonde meadow in early July.

Peck Gulch- The Peck Gulch nest was again active in 2011. Close coordination continues with the private landowner adjacent to this nest, and they alerted us again in July 2011 to atypical nesting events. Staff visited the site and found the remains of two nestlings aged at 30 days post-hatch. Site evidence and remains strongly indicated predation by Great-horned owl. A similar event took place in 2010.

Reynolds Ranch- The nesting territory discovered in 2009 was determined inactive in 2011. Broadcast surveys were conducted in alternate potential habitat, but no detections were made. Additional stands were surveyed for evidence of nesting but none was found.

Meyers Gulch- Dawn acoustical and broadcast surveys were conducted on the northeast parcel of Meyers Gulch, and in the surrounding Hawkins Gulch area in response to observed Northern goshawk winter use. Although survey records indicate no detection, two post-survey observations were made by staff.

BLM South- Broadcast surveys were conducted at BLM South. Evidence of nesting was discovered and staff will continue to monitor this site.

Additional Detections of Raptor Species

POS staff located or monitored several additional sites in 2011. At Reynolds Ranch, the site of an active nest of Sharp-shinned hawks was identified. At Heil Valley Ranch, a Cooper's hawk was observed on a former nest, but later appeared to abandon the location. At Hall Ranch, staff monitored a nesting pair of Long-eared owls in a former Cooper's hawk nest monitored in 2010. The nest was destroyed by high winds prior to fledging young. In addition, staff conducted an evening survey for Long-eared owls at Heil Valley Ranch in response to sightings. Wildlife staff recorded the occurrence of a calling Flammulated owl at Caribou Ranch.

2011 Breeding Bird Surveys

In 2011, breeding bird surveys were conducted on six properties. All point count stations were surveyed three times during the timeframe of June 1 through July 15. The 2009 Rocky Mountain Bird Observatory Point Transect Protocol was followed. Selection of properties to be surveyed was based on the need for initial baseline information, continuation of baseline/trend monitoring via long-term survey schedule or in response to future management activities.
Survey points were established and surveyed on Reynolds Ranch for its initial baseline breeding bird survey. 2011 was the second year of surveys which will span 3 years total. Meyer's Gulch was surveyed using volunteers, so now has a continuous dataset spanning 9 years. Betasso Preserve, Caribou Ranch, Rock Creek Farm, and the Overland Burn at Heil Valley Ranch were also surveyed in 2011; these properties were initially surveyed 2004-2006. In 2010, Hall Ranch was surveyed prior to a planned prescribed burn and post-treatment surveys were conducted in 2011.
All surveys, with the exception of Meyer's Gulch, were conducted by wildlife staff (permanent and seasonal), and resource protection staff.

Results
Results from these surveys, including species detected and relative abundance indices are on file and can be accessed via communication with wildlife staff at Parks and Open Space.

Bluebird Nest Box Project

In 2011, volunteers from both the BCNA and BCAS monitored 111 bluebird nest boxes. The box routes are located at Heil Valley Ranch, Betasso Preserve, Walker Ranch, and Bald Mountain as well as Shanahan Ridge and Eldorado on OSMP property. Additionally, USFS personnel again assisted with monitoring boxes on the Minnick property. As in previous years, all data are being shared with the Cornell Lab of Ornithology-The Birdhouse Network, which monitors nest box data nationwide.

Volunteers worked in pairs and visited their assigned nest box route approximately once per week. In total, **16** volunteers contributed **1,020** hours to this project between late April and early August.
Bluebird Nest Box Results for 2008-2011

Year (#Nest Boxes)	**2008 (89)**	**2009 (113)**	**2010 (106)**	**2011 (106)**
Species	Fledged	Fledged	Fledged	Fledged
Western Bluebird	238	262	96	182
Mountain Bluebird	95	67	59	68
Tree Swallow	20	7	12	10
Violet-green Swallow	20	27	9	21
Mountain Chickadee	7	8	10	19
White-breasted Nuthatch	12	0	5	37
Pygmy Nuthatch	23	10	11	0
House Wren	0	4	4	19
Total	**415**	**385**	**195**	**237**

An increase in nesting success was recorded in 2011, despite unfavorable weather conditions and suspected predation events similar to the 2010 nesting season.

Waterfowl Monitoring Project

The aquatic bird volunteers covered four major plains aquatic habitat areas; Braly/Western Mobile complex, Pella Ponds, Kenosha Ponds and Walden Ponds. Two volunteers were teamed up on each property to allow them to schedule their own monitoring days as necessary. All aquatic species seen during these visits, including wading birds and shorebirds, were also recorded. In total, **5** volunteers contributed **329** hours to this program in 2011.

Annual CPW Waterfowl Monitoring
Wildlife staff assisted CPW in 2011 with their winter waterfowl surveys. Winter surveys were conducted on Fairgrounds Lake/Cattail Pond, Lagerman Reservoir, Walden Ponds, Prince Lake 2, Western Mobile and Stearns Lake.

Mammals 2011

Prairie Dog Management

Relocation efforts

In 2011, staff consisting of plant ecologists, wildlife biologists, invasive weeds specialists and agricultural specialists initiated a relocation plan for prairie dogs to be removed from the Alexander Dawson property. The Lower Boulder Creek restoration project will necessitate the removal of a 13-acre prairie dog colony, and therefore, staff located a suitable area for the receiving of these individuals. An unoccupied colony at Rabbit Mountain has been selected as the receiving site, based on vegetation condition and the existence of prior burrow structure. After public scoping, and an on-site public meeting, a relocation permit application was submitted to the Colorado Department of Parks and Wildlife, and is currently under review. If the application is approved, staff will commence the relocation efforts starting in early July, 2012.

Removal of prairie dogs occurred on 10 properties in 2011. Seven of these properties are designated at No Prairie Dog (NPD), two are designated as Multiple Objective Area (MOA), and 1 is designated at Habitat Conservation Area (HCA). A total of 880 prairie dogs were trapped in 2011. Of these, 580 prairie dogs were contributed to the US Fish and Wildlife Service Black-footed Ferret Recovery Facility, and 300 were contributed to the Birds of Prey Foundation. Trapping occurred on the following properties: Mayhoffer, Rock Creek Farm, Leyner, IMEL, Keyes West, Keyes North, Bouzarelos, Cemex and Peck.

Lethal control occurred on 35 properties, 29 of which are designated as NPD, and 6 as MOA. Some of these properties were trapped first, as referenced above, then received lethal follow up. These properties are as follows: 66 Investments, Alexander Dawson, AHI, Barrett, Boulder County Land Venture, Becky, Bouzarelos, Leyner, Liley South, Lohr, Monarch, Peck, Rock

Creek Farm, Swanson, Bragg/Spangler, Burchfield, Colp, Doniphan, Dirks, Gage, IMEL, Imel (NW Pkwy), Jay Family, Johnson/Coen, Hirschfeld, Keller, Knopf, Keyes North, Keyes West, Leonard, Sisters, Suitts, Trillium, Wasson and Western Mobile.

We completed comprehensive mapping of colony extent. Acreage within each management category is listed in Table 1.

Table 1-Percent Occupancy of Designated Property Management Categories- 2011

	Property	2011	% Occupancy
	Total Acreage	Colonized Acres	
Classification	Acres	Acres	
HCA	**5389.43**	**418.43**	**7.76%**
MOA	**4808.34**	**766.07**	**15.93%**
NPD	**16602.92**	**371.95**	**2.24%**
NSH	**18480.21**	**60.57**	**0.33%**

Table 2- 2009-2011 Black-tailed Prairie Dog Colony Acres and Growth Rate

	2009	2010	2011	2010-2011	2010-2011
				Acreage Change	% Change
Classification	**Acres**	**Acres**	**Acres**	**Acres**	**% Change**
HCA	371.47	348.41	418.43	70.02	**20.09%**
MOA	784.07	685.62	766.07	80.45	**11.73%**
NPD	489.53	344.57	371.95	27.38	**7.95%**
NSH	45.00	33.20	60.57	27.37	**82.44%**
Total	**1,690.07**	**1,411.80**	**1,617.02**	**205.22**	**14.54%**

HCA = Habitat Conservation Area
MOA = Multiple Objective Area
NPD = No Prairie Dogs
NSH=Non-Suitable Habitat

Abert's Squirrel Monitoring

Abert's squirrels are on the Boulder County Species of Concern list and are one of our program's indicator species. They are also a USFS Management Indicator Species (MIS). One of our program's main objectives is gaining an understanding Abert's squirrel utilization of our properties located in the lower montane lifezone. To this end, wildlife staff initiated a new volunteer monitoring project for Abert's squirrel in 2010. In 2011 volunteers re-read 6 of 32 transects that either had or were scheduled for timber stand reductions. In total, **6** volunteers contributed **24** hours to this project in 2011. We will evaluate the data collected in 2012 with the

earlier data associated with timber operations to see if we can improve our management recommendations pertaining to forestry prescriptions.
We are also using Abert's squirrel as our test species for modeling habitat using GIS. Our GIS staff is building the model based on habitat characteristics that have been either measured on the ground, or gained via remote sensing, such as canopy cover and tree species. Our goal is to use this technology to determine levels of habitat suitability.

Remote Camera Surveys

Camera monitoring was again focused on collecting information at the Reynolds Ranch complex for the upcoming management planning process. The stations ran from mid-April to early-June and mid-August through October. The cameras detected deer, elk, bears with cubs, and tree-squirrels. One also detected turkeys, which we hadn't known were in the area.

Cameras were also used to monitor a spring, a meadow/trail at Caribou Ranch, an underpass along SH7 between Hall Ranch and the new Hall Ranch II purchase (photos below), and the Rabbit Mountain golden eagle closure area.

We upgraded and increased our camera inventory at the end of the year to allow us to capture photos with much higher confidence, and under poor conditions.

Camera location/setting for SH7 underpass west of Lyons (L) and collared cougar using it April 2011 (R).

Front Range Cougar Study
Boulder County Parks and Open Space continued to assist the Colorado Division of Parks and Wildlife with its Front Range Cougar Study. This project is in its fourth overall year (3 years + pilot study year). The study has followed 62 cougars within the study area (Front Range

foothills from Evergreen to Lyons), many of which use POS properties. Only 15-25 cats have been collared at any one time, due to movement, mortality, and technology failures. The project is spawning additional research on prey selection and availability, genetics, and population estimation. The large expanses of properties like Hall Ranch, Heil Valley Ranch, and Walker Ranch have allowed the Division to conduct their operations safely and relatively undisturbed, without disturbance to the visiting public. Project coordination and success has been greatly facilitated by the resident caretaker staff of the Resource Protection branch.

Front Range Bobcat Study

The Front Range bobcat study completed its second year in 2011. This study is coincident with the cougar study; a unique situation of an ongoing study of 2 different predator species using the same habitats/areas at the same time. This study will show the same kinds of things that the cougar study does: habitat use, home range size, movements, bobcat density, range overlap between males and females, proximity to developed areas, etc. - and how they relate to cougars using the exact same areas. The study emphasis areas contrast more rural, natural, undeveloped areas like Betasso Preserve, Hall Ranch, and Heil Valley Ranch verses more heavily developed/used areas like the mountain backdrop of Boulder. Twenty bobcats were collared in the study area and 40 trail cameras were placed in it for 14 months. The camera data and the radio-collar data will also allow the researcher to learn about the interactions of bobcats with other species that were captured on camera, by location and time of day.

Other large mammals/issues

The North Boulder elk herd and Caribou Ranch elk herd remain wary of people and are difficult to observe on BCPOS properties. We have no data to support statements regarding the success of the new night speed limit in reducing collisions along the northern stretch of US36 south of Lyons.

Moose were detected by incidental sightings, sign and remote cameras in 2011. Detections occurred in new areas where moose had not previously been documented, including Betasso Preserve, Spring Gulch, and Reynolds Ranch.

BCPOS staff again assisted CPW with their winter bighorn sheep count of the St. Vrain sheep herd in November. The POS observers were fortunate enough to view 28 individuals on their count, which represents at least half of the population estimate of the 2011 count.

Several fence removal projects occurred at Hall Ranch, Betasso Preserve, Forsberg, Rabbit Mountain, Caribou Ranch, and Walker Ranch utilizing volunteers, partner groups, and the Youth Corps. The barrier fence enforcing the seasonal closure at Lagerman Reservoir was improved to a 2-rail wooden fence and farm gate to improve compliance with the closure. Barrier fencing was also a big part of the Spring Gulch project with the US Forest Service.

Volunteers completed lopping the mountain mahogany in the second test unit at Rabbit Mountain. A different set of volunteers collected “before” data on that plot as well as reading two other transects. Staff completed transects inside and outside the controlled burn area at Hall Ranch to see what the impacts are in the long-term relative to productivity and survival. The

lopping data will be evaluated to see if the plant response is worthy of expanding lopping as an alternative treatment to prescribed fire to enhance and rejuvenate decadent or declining stands in the absence of fire (wild or prescribed).

Fish Program 2011

Events
The spring and fall fishing seasons at Wally Toevs pond were supported by nine stocking efforts. The aeration system was in place from the end of the spring stocking season throughout the winter. Even with them in place, stormy, cloudy weather and a rapid turnover event ended up killing fish (mostly small bluegill) in the fall. The aerators served to keep the rear portion of the pond open and fishable during a very mild winter.

The Senior Fish-off was held on April 29, 2011 at Walden Ponds. Three "Catfish Nights" were held at the Fairgrounds Lake (June 8, July 13, and August 10, 2011). A Junior-Senior Fishing Derby was planned for Walden Pond for October 15, but was precluded by poor conditions. Large fish (trout and catfish) were stocked in advance of both seasons and contributed to angler success and satisfaction. This was the most popular year for the catfish nights with almost 200 attendees for the 3 events! All programs were coordinated with CPW and co-staffed with a combination of POS Education-Outreach, Resource Protection, and the new Angler Host volunteers. They conducted educational displays and assisted at events such as the Catfish Nights or Fishing Derbies

Amenities
Wildlife staff completed and presented a case for a Fishing-is-Fun Grant from the Colorado Division of Parks and Wildlife, and was awarded $8,300 to enhance fishing opportunities at Walden Ponds Wildlife Habitat and Pella Crossing. Features will improve safety, access, and the angling experience at the Wally Toevs Pond and Duck Pond (Walden Ponds Wildlife Habitat) and at Webster Pond (Pella Crossing). Grounds staff was able to improve access to Heron Lake (Pella Crossing) by adding a graveled access trail, boat launch, and bellyboat put-in.

Staff and volunteers participated in more work projects that managed shade/habitat trees at Walden Ponds, ensuring protection from beavers.

Stocking and Sampling
Stocking occurred at Lagerman Reservoir (saugeye, pike), Fairgrounds Lake (catfish), Pella Crossing (catfish, smallmouth bass, largemouth bass), and Wally Toevs (rainbow trout, grass carp). Sampling occurred at Pella Crossing and Walden Ponds Wildlife Habitat. An annual coordination meeting and periodic check-in's with CPW served to introduce new staff, and to decide on sampling and stocking/transplanting locations, maximizing budget efforts across our system. Our fish stocking history database is built and updated periodically. It provides staff with easy access to historical and recent stocking information. We also began work on a flip-book of pond depths to assist anglers as well (will finish in early 2012).

Lower Boulder Creek Restoration
The long-awaited agreement to proceed was signed by Boulder County in 2011. The project stands ready to be approved and funded by the US Army Corps of Engineers/Congress. Wildlife staff is still monitoring conditions within the project area (fishery, New Zealand mudsnail, and a heronry) that could impact construction.

Amphibians 2011

Northern Leopard Frog
The Northern Leopard Frog (*Lithobates* (=Rana) *pipiens*) (NLF) underwent review by the US Fish and Wildlife Service to determine if protection under the Endangered Species Act (ESA) was warranted. On October 5, 2011, the USFWS published its decision that this species does not merit protection under the ESA. This decision was based on the determination that the eastern population of NLF is not distinct from the western population. As the eastern population is more numerous, it was decided that listing was not currently warranted.
http://www.fws.gov/policy/library/2011/2011-25498.html

However, this species has declined precipitously within Boulder County. It used to be quite common in Boulder County, but its decline has coincided with habitat loss and alteration, invasion by American bullfrogs and infectious diseases, such as that caused by chytrid fungus which is easily transferred between water bodies.

It is considered a sensitive species by USFS and BLM and CPW, and is on both the County's Species of Concern List, and is one of our program's selected indicator species.

In 2011, there were only four sites confirmed as breeding sites in all of Boulder County. These four locations occured generally in the least-disturbed, isolated, and largest acreages of grassland habitat. While these frogs require water bodies to breed, they forage and disperse terrestrially. Our large blocks of intact grasslands are providing a refuge for this species.

In 2011, BCPOS funded a small grant for a researcher to assess water bodies in Boulder County for NLF presence, as well as sample the invasive American bullfrog (*Lithobates catesbianus*) for the pathogen *Batrachochytrium dendrobatidis* (*Bd*), known as chytrid fungus . The researcher also attempted to determine if Western chorus frogs (*Pseduacris triseriata*) carry Bd, which may impact higher elevational areas than bullfrogs could typically access. Data from this study are currently being analyzed, and will help in assisting in management decisions on behalf of this species. (For more information, see page 20 of this document).

Management considerations for this species involve limiting impact to breeding sites. To protect one of the most consistent breeding sites located on BCPOS lands, we have planned, with our agricultural staff, a fencing project to restrict cattle and human access to this area.

As a program we are looking at providing protections for these frogs into the future, such as habitat restoration.

Volunteer Contributions 2011

Natural Resource Monitoring and Long-Term Monitoring Programs

The Wildlife program generated increased volunteer participation and hours within our volunteer program in 2011.

Program	2009 Vols	2009 Hours	2010 Vols	2010 Hours	**2011 Vols**	**2011 Hours**
Long-Term Monitoring	70	2,179	51	2,105	**94**	**2,464**
Natural Resource Monitors (WL projects only)	2	12	9	230	**10**	**40**
Totals	72	2,191	60	2,335	**104**	**2,504**

There were several different monitoring programs that took place in 2011. The following are brief descriptions of volunteer contributions.

Natural Resource Monitoring Programs-Wildlife-Related Projects

The natural resource monitoring program was initiated in 2009, in an attempt to incorporate long-term monitoring projects into the BCPOS overall volunteer program. The recruitment process is overseen by Education and Outreach staff, and the projects are then coordinated by wildlife staff. Wildlife staff developed two projects for this program and they are listed below.

Abert's Squirrel Monitors
Abert's squirrel monitors read 6 transects in the spring of 2011 at Heil Valley Ranch associated with either recent forestry activities or upcoming cutting. This program was initiated in an attempt to document squirrel presence at Heil Valley Ranch and further to assess their response to forest treatments. **Six volunteers contributed 24 hours to this project in 2011**.

Shrub Monitoring Program
The Shrub monitoring program was created to document shrub species baseline and condition at Rabbit Mountain and Hall Ranch. **Four volunteers contributed 16 hours to this program in 2011.**

Long-Term Monitoring Programs

These programs were initiated in the wildlife department. As wildlife monitoring is typically implemented to determine baseline, or trends over time, ongoing, long-term projects are a good fit for the needs of the wildlife department's progam of work.

Bluebird Program
The bluebird monitoring program is a partnership with Boulder County Audubon Society. The program was initiated in its current form in 2005, and we now monitor 111 boxes on BCPOS properties. The boxes are located at Heil Valley Ranch, Betasso Preserve, Walker Ranch and Bald Mountain. Additionally, we monitor two routes collaboratively with OSMP in the Shanahan Ridge and Eldorado areas. Plus, we share a route with the US Forest Service on the Minnick property north of Caribou Ranch Open Space. Volunteers typically work in pairs and monitor boxes approximately once a week during the breeding season, late April to early August. They record species and number of fledglings for each box used. Each route had up to 14 boxes and the project was successful due to dedicated volunteers, including outstanding volunteer project coordinators. **Sixteen volunteers contributed 1,020 hours to this program in 2011.**

Breeding Bird Surveys at Meyers Gulch
BCPOS has been recording information on birds on county open space properties since 1976. Historically, surveys included anecdotal observations during field visits and point counts. In the past decade however, we have adopted the Rocky Mountain Bird Observatory protocol for standardization of data collection. In 2011, **three volunteers completed the Meyers Gulch survey at Walker Ranch and contributed a total of 30** hours to the survey effort.

Burrowing Owl Monitoring Program
This program was initiated in 2008 by BCPOS. In 2009, a partnership arrangement was proposed to Boulder County Nature Association and Boulder County Audubon Society. Currently, this program represents a large-scale, comprehensive volunteer monitoring program for burrowing owls. The survey methodology developed by the Colorado Division of Wildlife is used, as it has high success in determining presence and absence of burrowing owls if repeated four times during the breeding season (April-mid August). **Fifty-five volunteers contributed 616 hours to this project in 2011.**

Barn Owl Monitoring
In 2011, volunteers monitored a pair of barn owls utilizing a structure on the AHI property, adjacent to Lagerman Reservoir. They documented behavior and nest success. In total, **two volunteers contributed 20 hours** to this effort.

Raptor Nest Monitors
Volunteers monitored cliff-nesting raptor nests from December through July. They observe the nests for at least two hours at a time and note behavior, number of nestlings, prey deliveries, and status. Gathering nesting data for raptors is important to developing long and short-term management decisions. **Ten raptor nest volunteers contributed 400 hours to the program** in 2011.

Waterfowl Program
Waterfowl volunteers monitored four wetland sites in 2011. They counted waterfowl species and numbers. In the past, the department used data from this program in property management plans (Walden Ponds Wildlife Habitat) and data collected in 2011 will be used to develop the Kenosha property management plan. In total, **eight volunteers contributed 329 hours** to this effort

Figure 1- Long-Term Wildlife Projects- Volunteer Hours

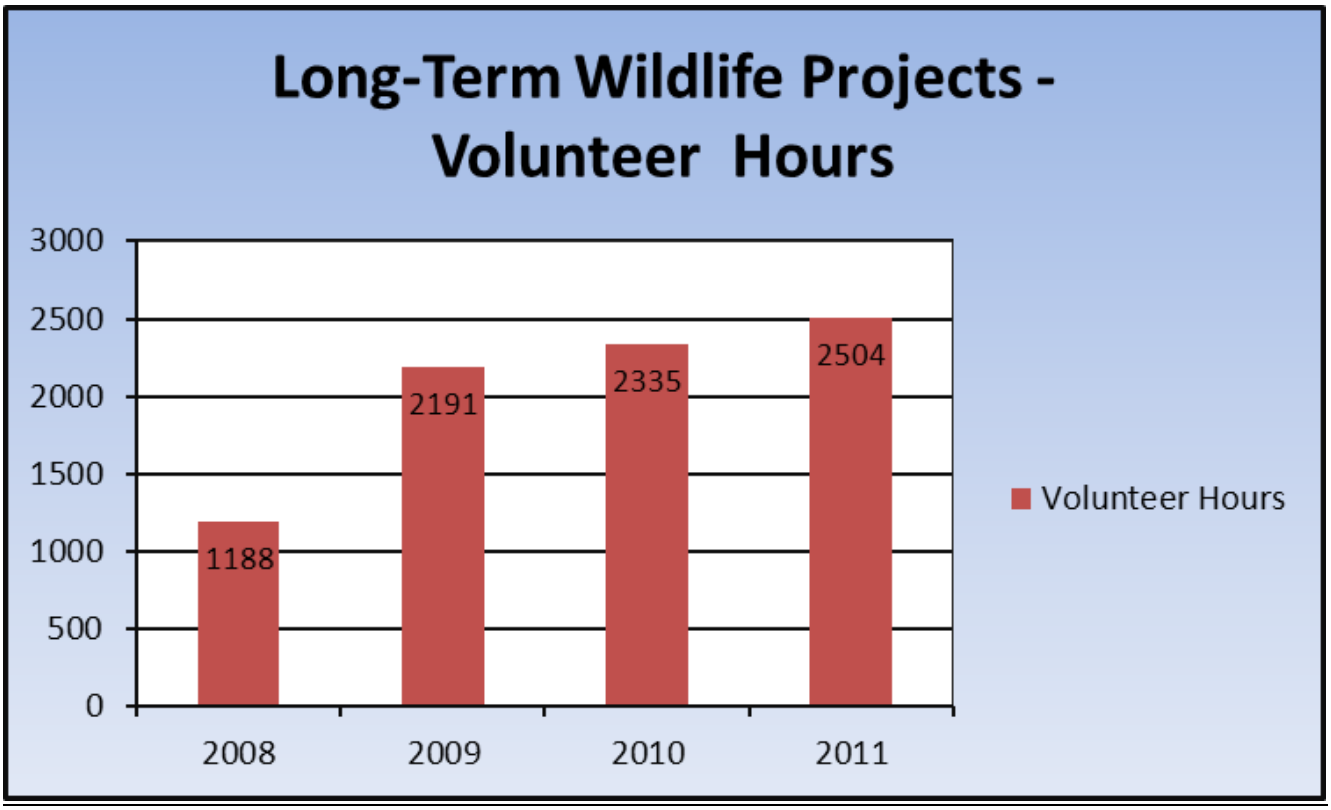


Table 3- Volunteer Contributions Per Program- 2011

PROJECT	Volunteers	Hours Contributed
Bluebird Nest Box Monitoring	16	1,050
Breeding Bird Surveys	3	30
Raptor Monitoring	10	400
Burrowing Owl Monitoring	55	616
Waterfowl Monitoring	8	329
Shrub Surveys	4	16
Abert's Squirrel Monitoring	6	24
Barn Owl Monitoring	2	20
Totals	**104**	**2,504**

One Day Projects

The wildlife program sponsored or cooperated on 13 one-day projects engaging **288** volunteers totaling **601** volunteer hours. Partner groups and organizations included Amgen, Naropa Institute, University of Colorado, Alexander Dawson School, Mothers Against Drunk Driving, and the Eldorado Canyon State Park staff. Staff picked up a new partner: Environment for the Americas, who donated $1,800 for habitat restoration at Walden Ponds. They will also participate in a 2012 volunteer project there as well. Volunteers removed approximately 8,000 feet of fence.

Table 4-One-Day Volunteer Events Wildlife-related 2011

Month	Property	Project	Volunteers	Volunteer Hours
March	Walker Ranch	Fence building	9	18
April	Walden Ponds	Tree caging	35	35
June	Stearns Lake	Trash removal	63	126
June	Hall Ranch	Fence removal	14	56
July	Caribou Ranch	Fence removal	12	48
August	Lagerman Reservoir	Fence building	12	48
September	Rabbit Mountain	Fence removal	5	20
October	Rabbit Mountain	Fence removal	7	28
October	Forsberg	Fence removal	11	44
October	Rabbit Mountain	Fence removal	9	45
October	Rabbit Mountain	Shrub lopping	8	48
October	Stearns Lake	Trash removal	21	63
October	Conservation Esmnt	Trash removal	22	22
			288	**601**

Planning and Coordination 2011

Management Plans

Annually, wildlife staff contributes to the development and completion of comprehensive management plans and policy documents as requested by Resource Planning. This work required extensive field work, site visits, meetings, document creation and review:

Wildlife staff provided input for the management planning below:

- Rock Creek Grasslands Management Plan
- Lagerman-Imel Management Plan
- Lower Boulder Creek Riparian Restoration Project
- Reynolds Ranch Management Plan
- Walker Ranch Management Plan

- Rabbit Mountain Management Plan
- Cropland Policy

Team Projects
Wildlife staff provided input for the projects below:

Two Creeks/Egg Farm Trail Alignment
Site plan work for Walden Management Plan implementation
Hessie Trailhead
Coalton Trailhead and trail re-route
XCEL's natural gas line replacement
US36 bikeway/regional trail
St. Vrain Greenway Regional Trail
Niwot Trail (USFWS/Preble's).

Acquisitions

Wildlife staff assisted with initial surveys and evaluations on several land transactions in 2011. This information helped to inform staff and the Parks and Open Space Advisory Committee of the wildlife habitat values and/or issues on proposed purchases. Important lands acquired in 2011 with significant wildlife values included: AHI, Hall Ranch II, and another installment of the Loukonen Dairy Farm purchase. The AHI purchase is adjacent to Lagerman Reservoir and has been folded into the Lagerman-Imel-AHI Management Plan process. The Hall Ranch II parcels are situated between Hall Ranch and Heil Valley Ranch, and contain valuable big game habitat and over 1 mile of St. Vrain Creek.

Oil and Gas Activity

There was a significant uptick in oil and gas lease activity within lands managed by Parks and Open Space. Staff participated in several of these processes, either by site visit or office discussion. Memoranda detailing concerns and best management practices were prepared for those that had wildlife issues, usually involving nesting raptors. Nearly 50 wells are proposed for work in 2012.

Small Grants and Non-funded Research 2011

Small Grants
In 2011, three wildlife-related proposals for small grant funding were approved and awarded to Jan Chu, Jesse Lewis (CSU) and Anna Peterson (CU). Below are the final report summaries. Both Jesse Lewis's and Anna Peterson's research is continuing in 2012, so full results are not yet available. The two summaries below denote this.
Jan Chu's report summarizes the final tally of species detected, as properties visited.
The complete reports are available at:
http://www.bouldercounty.org/live/environment/land/pages/posresearch.aspx

Distribution of an invasive species and an amphibian pathogen in the Front Range of Colorado

Anna C. Peterson, Master's Student, Department of Ecology and Evolutionary Biology
University of Colorado, Boulder

Project Status Summary:

The overarching goal of this study was to **understand the differing roles that Colorado amphibians may play in influencing dynamics of the amphibian pathogen *Batrachochytrium dendrobatidis*** (hereafter referred to as Bd) **in Front Range wetlands**.

I focused a large portion of my sampling on collecting Bd swabs from North American bullfrogs (*Lithobates catesbeianus*), in order to determine if this species is acting as a reservoir for the pathogen Bd in the Colorado Front Range.

Defining and identifying reservoirs of infection can be a challenge, as the literature lacks a clear consensus about what constitutes a disease reservoir. In the field portion of this project I sought to more accurately determine the role of bullfrogs as a reservoir. At all wetlands where bullfrogs were present, I collected swab samples to determine prevalence of the pathogen in bullfrog populations. Additionally, I collected samples from amphibians at wetlands with co-occurring populations of bullfrog and native amphibians as well as at wetlands where only native amphibians were present. The purpose was to determine if Bd prevalence is higher in native amphibian populations that co-occur with bullfrogs in comparison to those populations that are not found co-occurring with bullfrogs.

Previous research in Colorado has suggested that the Western Chorus frog (*Pseudacris triseriata*) may also act as a reservoir or transport vector for Bd (Johnson, per. comm.). In systems in California, members of the genus *Pseduacris* as well as salamanders in the genus *Ambystoma* are both hypothesized to be potential reservoirs for Bd due to their high prevalence of infection (Padgett-Flohr & Hopkins 2009). In my study I collected samples from *Pseudacris triseriata* and *Ambystoma tigrinum*, in order to help clarify prevalence of this pathogen in these other potential reservoir species.

Finally, Northern Leopard frogs (*Lithobates pipiens*) are known to be in decline in much across much of their range, including the Colorado Front Range (Johnson et al. 2011). Thus, I also sought to determine the presence of this species at all wetlands visited.

Accomplishments to date:

Over the course of the summer of 2011, I, along with two undergraduate assistants, visited 37 wetlands located on Boulder County Open Space property. Wetlands were sampled using a standardized technique. Upon arriving to each wetland, we conducted a visual encounter survey (VES), in which we walked the perimeter of each wetland and noted the presence of any amphibians and other vertebrate seen. We also kept a tally of all adult/metamorphic amphibians observed during the VES. Following the VES we conducted standardized dip-net sweeps.

Finally, we conducted 3 seine net sweeps 3-10 m in length (depending on wetland), to further verify the presence of larval amphibians. We identified all amphibians captured in the seine net and dip net to species, and then immediately released them back into the water.

Eight of the 37 wetlands that we visited were not present at the time of sampling (i.e. were dry-in grey on the attached maps). Of the remaining 29 wetlands, 24 had the presence of amphibians. I found Northern leopard frogs (*Lithobates pipiens*) at 3 of these wetlands, but breeding Northern leopard frog populations at only one wetland. Woodhouse's toads (*Bufo woodhousii*) were found at 6 wetlands, Western Chorus frogs (*Pseudacris triseriata*) were found at 10 wetlands, Tiger salamanders (*Ambystoma tigrinum*) were found at 6 wetlands, and North American bullfrogs (*Lithobates*

Seasonal Variation in Wildlife Community Dynamics in Relation to Urbanization and Human Activities on the Front Range

Jesse Lewis, PhD student, Department of Fish, Wildlife, and Conservation Biology
Colorado State University

Project Status Summary:

We present a report that updates the progress of our research supported through Boulder County Parks and Open Space (BCPOS). Without the support from the BCPOS grants program we would not have been able to accomplish our field efforts over the last 6 months and greatly appreciate your interest in our research.

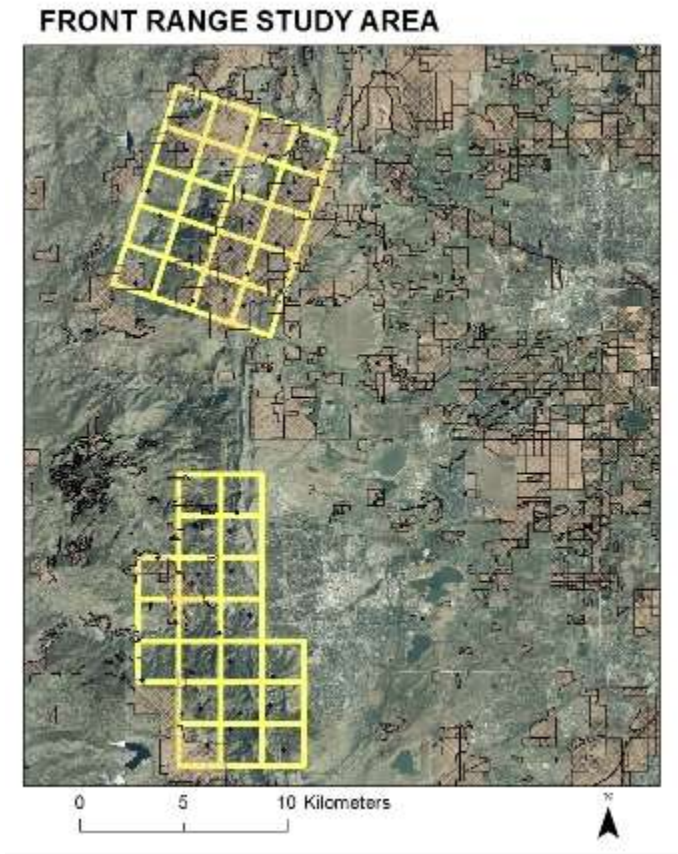
The overall objective of our research is to understand how urbanization and human activities influence the composition of the wildlife community and interactions among species adjacent to the urban-wildlife interface. Our work is focused on the interactions among bobcats, mountain lions, and domestic cats, as well as understanding the interactions of these focal species in the context of a much broader relationship with the wildlife community and landscape characteristics.
Our specific objectives include:

1. Understand which wildlife species are present along the Front Range and evaluate how urbanization and human activities influence the composition of the animal community.
2. Evaluate activity patterns of wildlife in relation to urbanization and human activity patterns.
3. Evaluate interactions of wildlife in relation to urbanization and other landscape characteristics.
4. Estimate the population size of bobcats in relation to urbanization.
5. Evaluate the seasonal variation (during fall, winter, spring, and summer) of species composition, activity patterns, interactions, and population density.

To accomplish the above objectives we have maintained a broad-scale grid of 40 Cuddeback motion-activated digital cameras, spaced approximately 2-km apart, across 2 areas that are characterized by varying degrees of urbanization. Our urban study area occurs west of Boulder

(dimensions approximately 6 x 14 km) and our non-urban study area occurs to the northwest of Boulder (dimensions 8 x 10 km; Figure 1). Our cameras operated across several BCPOS properties, including Heil Valley Ranch, Hall Ranch, Anne U White, Walker Ranch, and Betasso.

Figure 1:



From September 2010 to November 2011, we maintained 40 motion-activated cameras as described above. In September 2011, we hired a student at Colorado State University to assist in sorting the data collected from our cameras. She will continue to work on data sorting through December 2011 and is sorting photos from people trails. In addition, an undergraduate student enrolled in the Honors Undergraduate Research Scholars (HURS) Program at CSU began working on our project and will also assist in sorting photos through spring 2012.

Between mid-October and mid-November 2011, all motion-activated cameras were removed from the field. Over the past year, we have collected tens of thousands of photographs from our cameras. During this period of time, we obtained approximately 600 bobcat and 450 mountain lion photos. We obtained thousands of photographs of other wildlife species as well (see Appendix I for some wildlife photos obtained on BCPOS properties) and this data will be summarized in more detail shortly. Table 1 presents a summary of species detected on our grid of cameras.

Table 1

Bobcat
Mountain lion
Domestic cat
Black bear
Coyote
Gray fox
Red fox
Striped skunk
Spotted skunk
Mule deer
Elk
Moose
Bighorn sheep
Aberts squirrel
Rock squirrel
Pine squirrel
Chipmunk
Song birds (various)
Poorwill
Magpie
Raven
Great-horned owl
Mallard duck
Cottontail rabbit
Woodrat
Humans
Domestic dog
Horse
Cattle

Appendix I

Elk at Red Hill, Heil Valley Ranch

Black Bear at Marietta Canyon, Heil Valley Ranch

Mountain Lion at Arkansas Gulch Drainage, Betasso

Bobcat at Walker Ranch

Butterflies
A Continuing Study of Species and Populations In Boulder County Open Space Properties - 2011 Inventory and 2007-2011 Analyses
Jan R. Chu

<u>Summary of Inventories</u>:

Butterfly inventories continue to contribute substantial data to the Boulder County Open Space natural history records. Field inventories during 50 days clocked 133 research hours as compared with 84 in 2010. Of the recorded 201 Boulder County species, 118 were observed in 2011; with 123 during 2004-2011. We conducted walking surveys on each of the following seven properties, in 2011: Southeast Buffer (7 surveys); Anne U. White (10); Heil Valley - Geer Watershed (5), Heil - Plumely Canyon (7), Heil - North (4); Walker Ranch (4) Caribou Ranch and Mud Lake (4) Rabbit Mountain (3) and Steamboat Mountain (1).

Annual totals of butterfly Individuals per Research Hour (I/RH) were charted for five years. The calculated average for the five-years was 86 I/RH. The greatest numbers were in 2007 (112) with 2010 and 2011 (62 and 61 respectively) showing the lowest numbers. Common Ringlets were most numerous (94.2 I/RH) followed by Variegated Fritillaries (36.9 I/RH), Cabbage Whites (34.7 I/RH), Checkered Whites (10.9 I/RH) and Painted Ladies (9.1 I/RH).

Non-funded Research

Several wildlife-focused research projects were conducted on Boulder County Parks and Open Space properties in 2011. Projects included entomological inventories (for species such as moths,

dragonflies, damselflies, bumblebees, grasshoppers, and butterflies), work with bats (including CPW research on white-nose syndrome), and various bird monitoring studies, counts, and banding. Large mammal research was conducted (the aforementioned bobcat and cougar studies), as well as a CPW remote deer capture device.

All reports are available at:
http://www.bouldercounty.org/live/environment/land/pages/posresearch.aspx