

**Prairie Dog Working Group
June 2017 Recommendations Subgroup Proposals
Draft Version for Review by PDWG on September 11, 2017**

Recommendation #1: Create guidelines and criteria for prioritizing relocation/take sites on both public and private land to City property.

Priorities for relocation from public and private lands to City property are as follows:

- First priority is given to public or private properties upon which construction and/or development is imminent; prairie dogs are causing immediate damage to a public facility or utility infrastructure; there is an immediate threat to public safety; or prairie dogs have re-colonized an area where they had been lawfully removed, and relocation is part of a city manager approved plan to prevent re-colonization.
 - Imminent construction/development is defined in this context as demonstration to a high degree of probability that the land will be developed within 15 months.
 - If there are multiple sites within this category, projects on city property will be granted available receiving sites prior to projects on private property.
- Second priority is given to properties owned by city departments upon which development plans are approved or there are unmanageable conflicts with the existing or planned land use, or relocation has been directed by the city manager. This includes but is not limited to conflicts with irrigated agricultural use.
- Third priority is given to city owned properties that are designated for removal of prairie dogs and adjacent neighbor conflicts with prairie dogs are ongoing, resulting in sustained lethal control of prairie dogs on the private property portions of a colony.
- Fourth priority is given to properties where the landowner or city department's desired future use of the property conflicts with the presence of prairie dogs.

The city manager has full discretion make determinations of prioritization within the context of these guidelines.

(There is no supplemental information for Recommendation #1.)

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Recommendation #2: Create guidelines and criteria for prioritizing receiving sites on public lands within existing plans and develop recommendations for making receiving sites more feasible; develop recommendations for increasing landowner and stakeholder acceptance of the use of receiving sites.

Prioritization of receiving sites on OSMP managed land:

Following evaluation of colonies in PCAs and Grassland Preserves with Grassland Plan relocation criteria it may be necessary to prioritize efforts if more than one colony is available in any given year. As a result, criteria to prioritize (not to decide if a colony will be pursued for relocation, just which would be pursued first) between colonies are included below. These criteria can help staff determine which colonies, and in which order, they should pursue.

Prairie Dog Conservation Areas and Grassland Preserves -

1. Number of adjacent neighbors (directly adjacent to the property or colony)
 - a. Private property- agriculture (score 1 for each property)
 - b. Private property- residential (score 2 for each property)
 - c. Private property- other (score 1 for each property)
 - d. Other public land management Agencies (Federal) (score .5 for each property)
 - e. Other public land management Agencies (County) (score 0)
2. Documentation of previous issues or complaints related to prairie dogs on the site or adjacent property (Substantial = 2, Some = 1, None = 0)
3. Adjacency to urban or suburban neighborhoods where we have had prior experience with neighbor objection to prairie dog relocation (Substantial = 2, Some = 1, None = 0)
4. Sufficient vegetation to support prairie dogs

Additional criteria for Grassland Preserves in addition to above criteria -

1. Habitat suitability of colony (based on Grassland Plan Habitat suitability model)
 - a. 80-100% Good or Very Good = 0
 - b. 50-80% Good or Very Good = 1
 - c. Less than 50% = 2
2. Ease of access (Poor = 2, Fair = 1, Good = 0)
3. Existing infrastructure (None = 2, Some burrows = 1, Extensive = 0)
4. Other (rare plant communities, timing constraints due to sensitive wildlife, etc) = 1-2 depending on level of issue

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Higher scoring properties face higher challenges to obtaining a relocation permit and successfully implementing a relocation and thus would be ranked last in priority for pursuing a relocation permit as compared to other sites with fewer challenges.

Prioritization of receiving sites on other city managed land:

Areas on non-OSMP City properties that are identified for long-term protection will be considered for receiving sites on a case by case basis. These sites will provide generally for receiving relocated prairie dogs as described for PCAs, and generally following guidance contained within the administrative rule for prairie dog relocation, unless sensitive species are identified in the area, or other land use conflicts have arisen. Future evaluation of non-OSMP properties may lead to specific criteria being developed for these sites.

Strategies for increasing stakeholder and neighbor acceptance of relocation site use:

Develop and implement strategies for outreach to neighbors of PCAs (or Grassland Preserve colonies near neighbors) ahead of making decisions regarding pursuing relocation permits for a site.

Strategies could include -

- Planned consultative stakeholder engagement (at a minimum- potentially higher level engagement)
 - consultative stakeholder engagement means that staff will inform, listen to and acknowledge the concerns of related publics and will relay how the publics' input influenced decisions
- Stakeholders may be encouraged to provide suggestions on management ideas
- Proactive partnerships and education to build support for prairie dogs and prairie dog ecosystems within the community
- Resources (staffing, funding, contractors, etc) should be adequately planned and allocated by city departments to be able to undertake a robust outreach process with sufficient time to be completed before relocation decisions need to be made
- Decisions related to whether to pursue relocation to a site in a particular year will be based on assessment of neighbor support, likelihood of success and feasibility of agreed upon mitigation methods, relocation need and capacity to pursue a relocation to the site with associated mitigation

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Thorough engagement with stakeholders and neighbors should be initiated well in advance of the timeframe of decision to move forward with relocation to a site. As a result, it is possible that public engagement could lengthen the timeframe between identification of a site as a possible receiving location, and application to the state for a relocation permit.

Mitigation:

The mitigation required at each site will be unique depending on -

- Adjacent landowner viewpoints
- Topography
- Vegetation
- Layout of receiving site in relation to adjacent properties
- Size of relocation site
- History of prairie dog occupation patterns
- History of coexistence or conflict between adjacent landowners and prairie dogs
- Other site specific characteristics

Specific mitigation methods to be used will be decided along with adjacent landowners through consultative stakeholder engagement. However, options that may be considered include:

- Barriers
 - Vinyl, metal, wooden
 - Straw
 - Vegetative
 - Chicken wire
- Limiting size of relocation (fewer animals than site could ecologically accommodate)
- Marking prairie dogs and retrieving from private property if relocated prairie dogs move off the relocation site
- Plans with neighboring landowners to discourage prairie dog movement onto their property (landscaping, etc)
- Including prairie dogs from adjacent private properties in the relocation to provide them relief from prairie dog occupation

Strategies to increase availability of receiving sites in Grassland Preserves:

To decrease time required for unoccupied colonies to meet vegetation criteria, OSMP will work on site by site basis with tools such as seeding, other restoration, shifts to grazing, etc.

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Recommendation #2 – Supplemental Information

Current practices for prioritizing relocation sites:

Site evaluation OSMP managed land - Occupancy is evaluated in the fall when system wide mapping is completed. Colonies are included in further evaluation if they:

1. Are in a Grassland Preserve and the Grassland Preserve is at less than 10% occupancy
2. They are a Prairie Dog Conservation Area and are at low occupancy (no set threshold, but generally less than 50% occupied)

These colonies are then further evaluated. For PCAs, evaluation of numbers of adjacent neighbors, numbers of complaints received in the past related to prairie dogs, etc. are considered. Sites with fewer neighbors and fewer complaints are prioritized higher than ones for which there are more potential neighbor issues. For Grassland Preserves, initial assessment of vegetation (not quantitative), presence of wildlife closures (burrowing owl, bald eagle, etc) which might influence timing requirements for relocations, or other issues. For those colonies where the initial vegetation assessment suggests that the colony may pass the vegetation thresholds and other circumstances (access, etc) suggest that the site might be an appropriate relocation site, measurement of vegetation is undertaken using an established vegetation survey design. Vegetation surveys were designed to capture the full range of variability within a colony and is stratified by vegetation type. Surveys are done in summer (typically late July or early fall, when plant phenology is most appropriate for measurement). If the colony passes the thresholds, it is put on the list as a potential receiving site for the next summer (to allow time for planning, permitting, etc.)

Site evaluation on non-OSMP managed city land - The primary “other” (non-OSMP) city lands that have been suitable for prairie dog relocation are managed by Parks and Recreation (Parks) and include the Boulder Reservoir and Area III Planning Reserve (north of Jay Road and U.S. 36). Staff has explored the possibility of any other properties owned by the city that could be suitable for prairie dog relocation and the only other city owned property that was identified as a potential relocation site through this process is a two-acre parcel managed by the Public Works department at Foothills Parkway and Valmont road. This property is identified for Long-term protection in the Urban Wildlife Management plan. All three of these properties were occupied by prairie dogs in 2017.

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Prioritization of potential receiving sites:

As detailed above, a process of evaluating OSMP sites to see if they meet established criteria from the Grassland Ecosystem Management Plan is already in place. These evaluations provide sufficient data to determine if a site could serve as an appropriate receiving site. However, no formal process has existed for Parks and Recreation sites and no process exists to prioritize among potential sites to determine which sites would be used first, or if some sites would be pursued and others would not.

Until additional evaluations of Parks and Recreation or other city properties can be completed, areas that are identified for long-term protection will be considered for receiving sites on a case by case basis.

Strategies to increase availability of receiving sites in Grassland Preserves:

The two limiting factors to availability of receiving sites in Grassland Preserves is high occupancy levels of colonies, and time required for vegetation to recover, especially after long term occupation.

The Grassland Plan includes criteria that determine which sites can be considered for relocation. One of these criteria is the existence of previous prairie dog occupation. This specific criterion is included for two reasons.

1. Prairie dogs have been allowed to self-select habitat within grassland preserves for at least 20 years. During that time, nearly 11 years was a period of expanding populations. As a result, prairie dogs had the opportunity to select the habitat that best suits their needs. These patterns of occupation are assumed to represent high quality habitat as selected by the prairie dogs as an indicator of good locations for prairie dog colonies to be placed.
2. An attempt to balance the needs of conserving a variety of grassland habitat, including those with prairie dog occupation, as well as those without. By not expanding locations where prairie dog burrowing and grazing has been present, we better meet our needs to fulfill multiple Grassland Plan and OMSP preservation goals.

As a result, availability of relocation sites is tied directly to occupation levels. During times of low occupation (less than 10% of Grassland Preserve), opportunities exist for relocation. However, at times of high occupation (greater than 10% occupancy of Grassland Preserve), relocation of prairie dogs is inconsistent with the Grassland Plan conservation targets and

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viability measurements for prairie dog conservation, and meeting multiple goals for grassland conservation on a system-wide basis.

Improve condition of vegetation on Grassland Preserve Colonies to reduce time until relocation. To decrease time required for unoccupied colonies to meet vegetation criteria, OSMP will work on site by site basis to determine what steps can be taken to encourage recovery of the vegetation community to meet relocation criteria as determined in the Grassland Plan. What tools are appropriate will depend on site conditions, including plant communities present, length of prairie dog occupation, slope, soils, etc. Tools that might be used include:

- Seeding
- Changes in cattle grazing intensity or timing
- Other restoration techniques to be determined

Considerations with expanding receiving site availability:

Currently, low levels of occupation, and thus opportunities for relocation site availability are tied to periodic epizootic plague on our system. It should be noted that successful prevention of plague, as is being explored in current PDWG recommendations could lead to sustained occupancy in grassland preserves above thresholds that would allow for relocation, thus reducing the availability of receiving sites.

In addition to increasing availability of receiving sites through strategies described above to increase neighbor and stakeholder support or acceptance of relocations, funding and staff capacity increases will also be necessary to increase utilization of available receiving sites. Current staffing levels can support only 1-2 relocations per season (assuming that relocation contractors are used to do the actual relocation) based on the permitting, contracting, coordination and support needed for each project. If additional relocations are possible and desired, additional capacity and funding will be needed. Staff are committed to exploring all feasible options to supplement staff capacity and funding.

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Recommendation #3: On approved receiving sites, ensure that the number of prairie dogs to be relocated have adequate accommodations, utilizing existing or artificial burrows (including nest boxes) and taking into consideration existing native vegetation.

Within Prairie Dog Conservation Areas (PCAs), the main goal will be accommodation of prairie dogs during relocation. Thus, infrastructure will be installed as needed to accommodate the desired number of prairie dogs. This will include installation of artificial nest boxes as required to supplement existing natural burrows. PCAs are identified with Open Space and Mountain Parks (OSMP) managed city land.

On non-OSMP managed city land, that has been identified for long term prairie dog protection and approved for relocation, installation of infrastructure will be evaluated on a case-by-case basis, with the exception of areas where sensitive species are identified in the area, or other land use conflicts have arisen. Future evaluation of non-OSMP properties may lead to specific guidance for these sites.

Within Grassland Preserves, the goal of accommodating relocated prairie dogs will be balanced with preservation of intact native plant communities.

- Within relocation areas of non-native vegetation, or where the soil has been previously tilled or disturbed, nest boxes will be installed to supplement natural burrows to accommodate the desired number of prairie dogs.
- Within areas of intact native vegetation that have not been tilled or previously disturbed, nest box installation will be further evaluated to ensure balance of prairie dog relocation goals with preservation of best opportunity grassland areas. (See supporting information for discussion of options.)
- Within areas of rare plant communities (communities or species ranked by Colorado Natural Heritage Program as S1, S2 or S3) or directly adjacent to these communities if the associated disturbance is deemed to present a threat to conservation of the community, artificial nest boxes will not be installed.

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Recommendation #3 – Supplemental Information

Prairie dog relocation methodology:

In prairie dog relocations a variety of potential methods exist for accommodating prairie dogs on receiving sites. Based on information collected from relocators, and prairie dog relocation literature, these include:

- Natural burrows with an intact entrance and tunnel open to at least 36 inches and at least 4 inches in width
- Natural burrows with an intact entrance and tunnel open to less than 36 inches and at least 4 inches in width that has been further opened with hand tools (auger or shovel) to be at least 36 inches deep
- Constructed burrows installed with heavy equipment. These include a tunnel structure (usually corrugated, flexible piping) and an artificial below ground chamber (may be plastic, wood) which is buried at least 3 feet below the surface. The chamber connects to the tubing which is installed to provide access to the surface in one or two locations.
- Augered holes that are constructed entirely by machinery (auger) and consist of an angled hole approximately 4-6 inches in diameter reaching at least 36 inches below the surface and not corresponding to the location of an existing burrow or burrow mound
- Release of prairie dog onto sites without any underground infrastructure- with or without a retention pen/cage (we are unaware of any relocators using this method and thus do not have information related to retention, but assume it to be low). It will not be discussed further due to lack of information.

In addition to these underground accommodations, many relocators also use above ground cages (caps/retention pens) to protect the released prairie dogs from predation and restrict their ability to disperse from the site for a few days after release. Later stages of relocation may not include use of these cages once prairie dogs are established on the site and later captures are released.

Success of methodologies varies. Based on responses from relocators, experience by the City and published literature, success (as measured by retention of prairie dogs after release) is generally highest in natural burrows (either intact or re-opened), followed by artificial nest boxes, and success is lowest in augered holes. The degree of success of each of these methods

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depends on site specific conditions and how success is measured. It appears that availability of additional natural burrows (either partially intact or filled in, but still present- the prairie dogs can find them) helps to ensure retention of relocated prairie dogs on the release colony. In some cases, prairie dogs may not remain in the provided infrastructure (natural burrows, nest boxes or augered holes), but will remain on site by re-opening previously occupied burrows or constructing new burrows. Measures of success vary from # prairie dogs remaining in the specific area of release, # prairie dogs remaining in the release site and surrounding colony area and # of prairie dogs remaining in the release site, colony area and surrounding landscape.

Balancing City Goals:

On Open Space and Mountain Parks properties, the City of Boulder preserves approximately 25,000 acres of grassland habitat. This area encompasses agricultural landscapes (irrigated hayfields, row crops), native grasslands, and plains riparian and wetland areas. Within this area, the Grassland Ecosystem Management Plan defined 8 conservation targets, including Black-tailed Prairie Dogs and their associated species. As part of planning for management and conservation of prairie dogs, areas where prairie dogs were consistent with management goals of the property were identified. Within these, Prairie Dog Conservation Areas and Grassland Preserves were included as sites where prairie dog relocations could occur, if relocation criteria were met. Prairie Dog Conservation Areas are properties where potential conflicts between prairie dog occupancy and management of other OSMP charter goals are minimal (no ag, no rare plant communities, etc). Grassland Preserves represent the best opportunity on OSMP lands to preserve large, intact grassland habitats with dynamic prairie dog colonies embedded in a larger landscape mosaic made up of high quality native plant communities, prairie dog towns and areas without prairie dogs present. Because Grassland Preserves represent that best opportunity to meet conservation goals for a variety of resources, balancing the needs of each conservation target is necessary to ensure conservation of the full suite of native grassland ecosystems.

Within grassland preserves, many prairie dog colonies exist in areas of high quality native grassland vegetation. Many of these areas represent the last remaining areas of untilled native grassland on OSMP. Areas of prairie that were not previously tilled for agriculture represent the most intact, resilient native plant communities. Areas where the soil has been tilled or experienced other anthropogenic disturbance, native prairie grass sod is disrupted, creating communities easily invaded by non-native weeds and where native grasses are less resilient to grazing from either prairie dogs or cattle. Because tilling has converted large areas of grassland

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in the Boulder valley and across the Great Plains, areas of untilled or undisturbed grassland habitat are considered to be best opportunities for conservation on OSMP. Grassland preserves represent the largest blocks of habitat containing these intact grasslands. Prairie dog occupation is consistent with maintaining and conserving these grassland communities. Grassland Preserves are areas where prairie dog populations at reasonable occupancy levels (10-26% as defined in the Grassland Plan) can function in their role as a keystone species, shifting occupancy through time and space in a way that maintains and enhances the intact grassland mosaic of these large habitat blocks. Intact native plant communities have evolved with this type of prairie dog occupancy and with grazing by prairie dogs and do not show the level of degradation, soil loss, etc often seen on more fragmented, tilled and disturbed sites with prairie dogs.

When prairie dogs are relocated to Grassland Preserves, the relocation criteria ensure that plant communities are sufficiently resilient and healthy to support the prairie dogs in a robust and intact plant community.

In prairie dog relocations, a variety of anthropogenic disturbances are introduced to the colony. Extensive access by vehicles can create impacts to plant communities. In addition, installation of additional infrastructure to accommodate the prairie dogs can impact native plant communities. Techniques vary in their level of disturbance with use of natural burrows or burrows re-opened with hand tools creating the least disturbance. Installation of augered burrows with small equipment (skid steer) creates larger areas of soil and vegetation disturbance and installation of artificial nest boxes with heavy equipment creates larger areas of soil disturbance and removal of native vegetation. In an effort to meet conservation goals related to black-tailed prairie dogs and native plant communities, OSMP strives to accommodate prairie dog relocation to the largest degree possible while balancing impacts to native plant communities associated with relocation.

City relocations:

OSMP Receiving Sites –

Based on the information gathered from relocators and the literature, the City of Boulder will define adequate accommodation to mean: sufficient burrows are available for the number of prairie dogs to be relocated. Burrows will be taken to mean natural burrows or artificially installed burrows (nest boxes). This is based on currently available methods. Future

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emergence of new techniques for constructing burrows or accommodating relocated animals should be considered and explored. The City of Boulder will continue to work with relocation professionals to explore new and innovative ways to accomplish successful relocations, especially where new techniques can provide successful accommodation while limiting ground and vegetation disturbance. In most cases, augered burrows will not be included (except as needed to provide supplemental starter burrows- not to be used for release of animals).

If augered burrows are going to be used, it will only be in consultation with the relocation contractor and be based on an expectation of success (feedback from one relocater and experience on a previous city relocation suggested that in some limited circumstances, augered burrows may be successful based on soil type, number of burrows in the surrounding area, etc).

Within Prairie Dog Conservation Areas, the main goal will be accommodation of prairie dogs during relocation. Thus, infrastructure will be installed as needed to accommodate the desired number of prairie dogs as defined by the City and outreach to surrounding landowners. This will include installation of artificial nest boxes as required to supplement existing natural burrows.

Within Grassland Preserves, the goal of accommodating relocated prairie dogs will be balanced with preservation of intact native plant communities.

- Within relocation areas of non-native vegetation, or where the soil has been previously tilled or disturbed, nest boxes will be installed to supplement natural burrows to accommodate the desired number of prairie dogs.
- Within areas of intact native vegetation that have not been tilled or previously disturbed, nest box installation will be further evaluated to ensure balance of prairie dog relocation goals with preservation of best opportunity grassland areas. In these cases, options might include:
 - clustering nest boxes in areas of lower quality vegetation or in areas with easier access that avoids high quality communities
 - reduction in the number of prairie dogs to be relocated to reduce the need for supplemental nest boxes
 - exploration of options to maintain integrity of natural burrows following a reduction in occupation that may lead to the site being a suitable receiving site in the future. This may include:

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- Installation of plastic tubing or other contraption to maintain the integrity of the burrow
- Periodic evaluation of conditions and use of hand-tools to maintain the integrity of the burrows
- Other feasible options to be developed
 - completion of a “risk analysis” with an outside 3rd party (contractor) to evaluate the impact and significance of nest box installation in these areas
- Within areas of rare plant communities (communities or species ranked by Colorado Natural Heritage Program as S1, S2 or S3) or directly adjacent to these communities if the associated disturbance is deemed to present a threat to conservation of the community, artificial nest boxes will not be installed.
 - Within these areas, OSMP will explore options to maintain integrity of natural burrows following a drop-in occupation that may lead to the site being a suitable receiving site in the future. This may include:
 - Installation of plastic tubing or other contraption to maintain the integrity of the burrow
 - Periodic evaluation of conditions and use of hand-tools to maintain the integrity of the burrows
 - Other feasible options to be developed

Parks and Recreation and other non-OSMP City Property Receiving Sites -

On non-OSMP managed city land, that has been identified for long term prairie dog protection and approved for relocation, installation of infrastructure will be evaluated on a case-by-case basis, except for areas where sensitive species are identified in the area, or other land use conflicts have arisen. Future evaluation of non-OSMP properties may lead to specific guidance for these sites.

Recommendation #4: Define successful prairie dog relocation; this includes continual evaluation of new or different relocation methods, ongoing opportunities for stakeholder engagement, and short-term, mid-term and long-term evaluation of success.

Successful Prairie Dog Relocation Criteria:

In general, prairie dog relocations will be considered successful when best management practices (included in supplemental material) are followed and there is evidence of one or more of the following:

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- a stable population or positive population growth (through reproduction or annual recruitment),
- colony expansion,
- suitable vegetation to support the population, and
- presence of other wildlife such as:
 - commensal species (defined in the OSMP Grassland Ecosystem Management Plan also known as the GMAP) and
 - predators

Caveats: Relocations could still be considered generally successful if these conditions are not fully met, but these criteria outline the desired outcome and when not met should indicate that adaptation may be required. If goals are not met, then it should be determined if there were controllable factors that could be altered to increase success or if this is typical. Thresholds should be further developed as research information becomes available. This includes researching typical relocation success rates immediately following relocation and average survival rates over longer periods of time.

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Recommendation #4 – Supplemental Information

General Information:

The City of Boulder is one of many agencies in the front range that performs prairie dog relocations. We consulted with two local prairie dog relocation companies in addition to reading other local government agency plans, specifically the [City of Fort Collins Wildlife Management Guidelines](#) and [Boulder County's Prairie Dog Habitat Element of the Grassland & Shrubland Management Policy](#). These plans integrate how to perform a relocation along with what success looks like. This document is based more upon what success looks like.

The general principles used to guide development of this recommendation are that best intentions, and continued reevaluation are necessary. The goal of each prairie dog relocation should be:

- to exercise clear, situationally adaptive decision-making regarding relocation practices,
- to perform planned, consultative stakeholder engagement* to inform decisions,
- to evaluate the immediate and far-reaching outcomes of selected practices,
- to ensure relocations are conducted in a way that is humane,
- to mitigate a conflict with existing land uses or management,
- to support prairie dog colonies in suitable protected areas,
- to evaluate disease risks and prophylactic measures,
- to comply with all related federal, state and local laws, rules, regulations and guidelines,
- to minimize disturbance to the land,
- to discourage prairie dog recolonization (a plan must be in place if, for some reason, all the prairie dogs cannot be removed from the take site),
- to plan for fiscally responsible projects, and
- to articulate a plan which defines success for the take and release sites.

**Consultative stakeholder engagement means that staff will, at a minimum, inform, listen to and acknowledge the concerns of related publics and will relay how the publics' input influenced decisions. Stakeholders may be encouraged to provide suggestions on management ideas.*

The implementation of these goals looks at success of the project overall. The success of the relocation itself is a piece of the project.

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Evaluations should allow for typical dispersal, natural mortality factors (infanticide, predation and the inability to survive the winter) and uncontrollable environmental factors such as drought. Success ratings should take into account the location and season. For example, criteria on presence of bird species should be adjusted for urbanized areas (page 124 GMAP). Similarly, spring relocations would be expected to have much higher rates of mortality than relocations in the fall. Mortality from enzootic disease outbreaks should be considered for evaluation of success but different considerations should be given for those that are native/natural versus those that are not such as plague. Preventative measures should be further evaluated.

An adaptive management approach should be taken. Adaptive management generally refers to an ongoing process of:

- assessing conditions,
- developing a plan based on assumptions of ecosystem functions and objectives,
- implementing a plan,
- monitoring the changes,
- evaluating the results, and
- adjusting actions accordingly.

These processes will require planning by staff and allocating of resources well in advance of relocations. Resources (staff, funding, etc.) will need to be adequately planned and allocated by city departments to be able to implement and evaluate practices including providing contingencies for special circumstances. The responsibility for monitoring will be negotiated between the city and contractors on a case-by-case basis.

This framework of criteria and processes is often currently followed by staff. The guidance in this document is intended to increase consistency and transparency.

Other factors to consider include the successful ability for the relocated colony to coexist with the new, human neighbors for the first 2 years. Included in this, if barriers of any type were utilized, their effectiveness should be evaluated. Additionally, efficacy of burrow types can be evaluated by monitoring burrow use for the different types (existing but collapsed, existing and suitable, artificial nest boxes, augered holes, etc). This will help to determine how to increase success rates in the future.

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An evaluation worksheet or tool to measure the effectiveness of practices selected would be beneficial. Once this document is complete the clear and defined procedural steps (from beginning to end) for how the city, as one organization, handles relocations should be made available online in a concise manner that might be illustrated by a flow-diagram w/contact information provided at each step.

The proposed approach is intended to balance overall ecosystem health *and* sustainability of prairie dogs and other natural values. Evaluations will be utilized to inform the adaptive management process.

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Recommendation #5: Collaboratively prepare, with Colorado Parks and Wildlife, a research proposal for US Department of Agriculture approval for the use of the sylvatic plague vaccine (SPV) on the southern grasslands in 2018 and beyond.

The City of Boulder plans to complete a research proposal for use of the sylvatic plague vaccine, in collaboration with Colorado Parks and Wildlife by December 31, 2017. A final draft will be complete and ready to be submitted by Feb, 2018 (or by deadline set by CPW or USDA for application to receive vaccine for application in 2018).

- Full study design for contribution to plague vaccine research with CPW
- Scope of study
- Budget
- Schedule for pilot project

Plague management goal: maintain sufficient prairie dog populations in Grassland Preserves to meet Grassland Ecosystem Management Plan defined viability measures designed to ensure conservation of Black-tailed Prairie Dogs and their associates species on Open Space and Mountain Parks Lands.

2018 Pilot Project:

In 2018, apply to receive sufficient SPV vaccine to vaccinate all currently occupied acres in the Southern Grassland Preserve (60.25 acres in 2016- will be updated with 2017 numbers when available). Refrain from coupling the application of delta dust with SPV vaccine delivery due to concerns over secondary effects to native species within Grassland Preserves (which represent best opportunity conservation areas for all grassland species, not just prairie dogs). Apply vaccine per recommended doses and application techniques in collaboration with the Colorado Parks and Wildlife Department. Monitor success of the vaccine through periodic monitoring for plague (techniques and frequency to be determined with CPW researchers). Explore possibility of partnering with Boulder County in study design to compare their use of SPV and Delta Dust with application of SPV only.

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Recommendation #5 - Supplemental Information

Preliminary conversations have been had with CPW staff and are reflected in the information on preliminary pilot study framework below. Additional, more focused conversations with CPW, feedback from the Prairie dog working group or City Council may influence this framework, planned timeline or implementation.

Staff will provide updates to the Prairie Dog Working Group and consult on any necessary discussion points as appropriate in development of the plan specifics.

Future beyond 2018 in Southern Grasslands:

Following completion of the 2018 pilot project in Southern Grasslands, results will be evaluated, and a feasibility study (success, cost, resources required, etc) will be completed to inform plague management plans for Southern Grasslands.

Overall Framework- Future beyond 2018 system-wide:

Following collection of data on success of the program in Southern Grasslands, plans will be completed for other grassland preserves on OSMP or other long-term protection areas on other City properties, including Parks and Recreation properties. These plans will take into account any lessons learned in Southern Grasslands, and the system-wide goals for prairie dog conservation as included in the Grassland Ecosystem Management Plan and any other relevant city plans.

Considerations:

If acres occupied reach and are maintained at $\geq 10\%$ within a Grassland Preserve, then relocation receiving sites will no longer be available in that Grassland Preserve.

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Appendix

Additional Content to Consider for Recommendation #2

Criteria for good indicators (from The Nature Conservancy 2007) should be measurable, precise & consistent, specific, sensitive, timely, technically feasible, cost effective, and publicly relevant. The following criteria should be evaluated on a short-term (6 month), mid-term (12 month) and long-term (24 month) basis. **Evidence of these criteria may be evaluated in the following manner depending upon the level of evaluation needed to properly evaluate each term:**

- A stable population or positive population growth
 - Performing visual surveys to determine the number and density of prairie dogs while taking into account the possibility that they may have moved outside of the original release site and adjusting to not count preexisting colonies.
 - Perform a count of the entire colony and compare to number of prairie dogs relocated there.
 - Use a map and ground markers to delineate the original release area and ensure that the numbers counted within that area are separate from the overall count. This will allow you to determine if the density in the original area has also been altered or if the released animals have expanded or dispersed.
 - Noting estimated age class (adult, juvenile, pup) and comparing that to animals released will aid in determining reproduction versus recruitment.
 - Counts should be performed and compared to number of moved animals. Adjustments should be made for natural mortality factors depending upon the timeframe.
- Colony expansion
 - Map the extent of the release. Remap the area post relocation. This will allow you to better track expansion versus dispersal as prairie dogs will respond to food availability and other habitat conditions over time and may expand or contract their colonies accordingly and may move across the landscape to forage or find new colony sites.
 - Count the number of active burrow mounds within the original and, if pertinent, expanded colony. (More work needs to be done to determine expectations.)
 - Colony expansion and populations counts should be evaluated together to determine densities and how that may affect evaluations.
- Suitable vegetation to support the population

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- Set up random transects or plots over the relocation site that provide an adequate representation of the entire area (needs defined) and perform an inventory of species present and density of vegetation while noting plants known to be edible to prairie dogs.
- Base your determination of suitable vegetation to support the population upon the CPW criteria which is used to evaluate sites for relocation potential.
- Presence of other wildlife
 - Performing scientific wildlife surveys pre and post relocation that would evaluate the presence of typical commensal and predatory species and changes in their population.

The following charts assign a rating for these factors based upon the short, mid and long-term evaluations. All ratings will be evaluated for potential areas of improvement but Subpar designations should indicate that changes are needed.

6 Month Evaluation – General Observations Sufficient					
Rating	Population/Counts	Colony Expansion	Vegetation	Wildlife	General Criteria Met (where applicable)
Very Good	Increase in number of pdogs through reproduction and/or recruitment	Significant increase in active acreage and/or active burrows	Stable and suitable cover and/or better (new native species found, an increase in cover or diversity)	Good criterion met and an increase in commensal and/or predator species diversity or number	>80% Yes answers
Good	Stable with evidence of reproduction if timing appropriate	Retention in area - utilization of provided burrows with some evidence of creation of new burrows	Stable and suitable cover available to sustain the population	Stable and evidence of interaction of species – use of burrows or of prairie dogs as food	61-80% Yes answers
Par	Stable - no significant net loss beyond expected factors	Stable – no significant net gain or loss beyond expected factors – may include movement of active area	Stable – no significant net loss beyond expected factors	Stable = continued presence - no significant net gain or loss of number or diversity beyond expected factors	40-60% Yes answers
Subpar	Decrease outside of expected factors	Decrease outside of expected factors	Decrease outside of expected factors	Decrease outside of expected factors	<40% Yes answers

*Marginal and significant will need to be defined for each criterion.

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12 Month Evaluation – Full Scientific Evaluations Required

Rating	Population/Counts	Colony Expansion	Vegetation	Wildlife	General Criteria Met (where applicable)
Very Good	Increase in number of pdogs through reproduction and/or recruitment - Evidence of typical reproduction rates - consistent with similar colonies	Significant increase in active acreage and/or active burrows	Suitable cover with no significant net loss of diversity and/or better (new native species found, an increase in cover or diversity)	Good criterion met and an increase in commensal and/or predator species diversity or number (2 or more)	>80% Yes answers
Good	At least a marginal increase in numbers through reproduction	Marginal increase	Suitable cover available to sustain the population	Par criterion met and an increase in commensal and/or predator species diversity or number (at least one)	61-80% Yes answers
Par	Stable – no net loss beyond expected factors	Stable – no significant net gain or loss beyond expected factors – may include movement of active area	Typical vegetation changes for an active colony which may include a marginal decrease in ground cover especially as burrows are constructed.	Stable and evidence of interaction of species – use of burrows or of prairie dogs as food	40-60% Yes answers
Subpar	Decrease outside of expected factors	Decrease outside of expected factors	Decrease outside of expected factors	Decrease outside of expected factors	<40% Yes answers

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24 Month Evaluation – Rapid Assessment* Rechecks Sufficient					
Rating	Population/Counts	Colony Expansion	Vegetation	Wildlife	General Criteria Met (where applicable)
Very Good	Higher than average reproduction or recruitment	Significant increase in active acreage	Suitable cover with no significant net loss of diversity and/or better (new native species found, an increase in cover or diversity)	Good criterion met but with both commensal and predator species and with an increase in number and diversity	>80% Yes answers
Good	Increase in number of pdogs through reproduction and/or recruitment - Evidence of typical reproduction rates - consistent with similar colonies	Increase in active acreage and/or active burrows	Suitable cover available to sustain the population	Par criterion met and an increase in commensal and predator species diversity or number (2 or more)	61-80% Yes answers
Par	At least a marginal increase in numbers through reproduction	Marginal increase in size or an increase in density	Typical vegetation changes for an active prairie dog colony	Evidence of interaction of species and an increase in commensal and/or predator species diversity or number (at least one)	40-60% Yes answers
Subpar	No increase or a decrease outside of expected factors	No increase in size or density or a decrease outside of expected factors	Decrease in cover or diversity outside of expected factors	No evidence of interaction of species or a decrease outside of expected factors	<40% Yes answers

*Rapid Assessment will generally include annual mapping but for other categories may utilize techniques where a portion of the site is evaluated and the information is extrapolated out for the remainder of the colony so long as the portions are representative of the whole.

Additional Supplemental Information to Consider:

This plan will need to take into consideration varying situations as best management practices are often site/case specific. BMP's that may be included are outlined below. "Yes" answers indicate success:

1. Was the relocation done in compliance with all related federal, state and local laws, rules, regulations, guidelines and protocols regarding trespass, wildlife, transport, pesticides, etc.?
2. Were assessments performed utilizing recent data on numbers, acreage, etc.?
3. Were only humane practices utilized?
4. Unless performing experiments or research, were practices commonly known to be successful (with preference given in order of most to least successful) utilized?
5. Were practices prioritized based upon the safety of the relocators?
6. Were known negative influences minimized and mitigated as much as possible within existing policies/practices?

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7. Was relocation performed into best opportunity areas prior to less suitable habitats?
 - a. This includes utilizing areas with less conflict potential first, areas where prairie dog communities can function without the threat of development or extermination due to conflicts with competing land uses, areas designated for prairie dog conservation. An example is the GMAP designations (box at right)
8. Was disturbance to the land minimized and mitigated?
9. Were proactive measures taken to mitigate issues (mowing, feeding, acclimation cages, etc.)?
10. Was the project performed in a fiscally responsible manner?
11. Are removal sites being maintained in a manner to discourage ongoing issues?
 - a. Where appropriate, was management performed at the release site to discourage recolonization?
 - b. Is monitoring being performed?
12. Is an attempt being made to keep coterries together?
13. Is there a sufficient number of prairie dogs already at the site or being relocated to the site to establish a viable population?
14. Is monitoring, evaluation and adaptive management occurring by staff and/or by being included in the scope of work for the contractor?
15. Were our goals accomplished?

GMAP Category	Management Focus
Grassland Preserve	Conservation of prairie dogs and their associated species in large and ecologically diverse grassland habitat blocks.
Multiple Objective Areas	Conservation of prairie dogs and their associated species is one of multiple management objectives.
Prairie Dog Conservation Areas	Conservation of the prairie dog is the primary management objective; associated species managed opportunistically.

If success data consistent with our practices is not available then staff is encouraged to gather data to perform this research. Factors to consider include the successful ability for the relocated colony to coexist with the new, human neighbors for the first 2 years. Included in this, if barriers of any type were utilized, their effectiveness should be evaluated. Additionally, efficacy of burrow types can be evaluated by monitoring burrow use for the different types (existing but collapsed, existing and suitable, artificial nest boxes, augered holes, etc). This will help to determine how to increase success rates in the future. Other potential items for future consideration would include setting goals within the relocation criteria. For example, striving for evidence of retention of at least 50% of the relocated prairie dogs at or near the release site for at least 2 years. And if multiple occurrences of plague die off of relocation sites occur within the first year after only allowing one year of rest before placing prairie dogs there, then evaluations should be done to determine why and practices should be reevaluated. Consistency is important in

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evaluations. And as this practice is implemented, evaluations and criterion should be more thoroughly defined.

An evaluation worksheet or tool to measure the effectiveness of practices selected would be beneficial. Once this document is complete the clear and defined procedural steps (from beginning to end) for how the city, as one organization, handles relocations should be made available online in a concise manner that might be illustrated by a flow-diagram w/contact information provided at each step.

The proposed approach is intended to balance overall ecosystem health *and* sustainability of prairie dogs and other natural values. Evaluations will be utilized to inform the adaptive management process.

Staff will utilize this document for all relocations to city managed land. They will build these evaluations into their workplans. They will coordinate internally and with stakeholders to evaluate the process and criteria on a regular basis following the adaptive management protocol.

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