Appendix 5: Process for Evaluating Conservation Connection Widths

By Ray Sperger, Ecologist[2]

The following corridor widths were developed as a reference source that may be used as part of determining ecological connectivity within the Basin at various scales and are provided as recommendations not standards or guidelines. Future review or peer review of these recommendations may be appropriate as land use changes occur. The corridor widths are based on flight distance from the literature for species of wildlife that would or could be using these corridors. The flight distances were multiplied by two since disturbance from people could come from either side of the corridor. A 10% "safety" factor was added to derive the guideline corridor widths to insure that the corridor would support movement and limit disturbance of the targeted species. Additionally, scaled drawings were used to look at the influences of terrain and possible berms to screen development from wildlife. The corridor width calculations for areas with topographic relief were derived from scaled drawing of typical cross sections of various parts of the basin. The topographic criteria are listed at the bottom of the corridor width spreadsheet. Corridor widths for areas with topographic relief or with berms were calculated for the Neighborhood Corridor, and then the Community Corridor and Regional Corridors were scaled up from that reference. Neighborhood corridor guidelines are for areas where development generally dominates the landscape and generally would not be considered as ecologically important as community or regional corridors. These corridors represent a system of connectivity within the urban wildlife interface and act to facilitate movement as well as to serves as a filter that will generally limit certain species of wildlife.

The width of the corridor is one of several factors that influence the movement of wildlife through a corridor. Each corridor should be looked at on its own merits and in context with the surrounding landscape. Other factors that contribute to the connectivity of a corridor include the length of the corridor, the habitat quality within the corridor the particular species, the dispersal mechanism and abilities of the species moving through the corridor, the biotic and abiotic factors affecting the motivation to move (i.e. heavy snows tin the foothills could force movement on to the adjacent plains).

The following generalizations can be made about corridors or habitat linkages.
The main function of corridors is to connect larger blocks of habitat or core areas.
The habitat connectivity that is provided by the corridor is impacted by the following:

[2] The conservation connection widths recommended as part of this study were developed by Raymond H. Sperger, Ecologist, using the following sources: Department of Environmental Conservation, New South Wales (2004); San Diego County (2000); Nelson, Scott (2005); Hellmund Associates (1998); Sperger and Chew (1995); Sperger and Chew (2002); Knight and Gutzwiller (1995).

1. Corridor Width – wider is always better.
2. Corridor Length – shorter is better
3. Habitat Quality – native vegetation, some topographic relief, and habitat structure is better for most species.
4. Negative edge effects – the development or land use adjacent to the corridor including light and noise pollution, domestic animals (especially those that go unrestrained into the open space), availability of trash, which adds in the overabundance of mesopredator populations reduce the effectiveness of the corridor.
5. Bottleneck - areas where the corridor narrows so much that it doesn't facilitate wildlife movement (or plant dispersal) by many species.
6. The movement and dispersal capabilities of the species in question that need to move through the corridor.

These factors act as a filter to the species that are in the vicinity, allowing some to easily move through and acting as a barrier to others.

As discussed above, the functionality of conservation connections is based on the width and length of the connection, habitat quality within the connection, length of bottlenecks, and movement capabilities of the species. The following is one approach recommended for determining the widths needed to adequately provide for functioning conservation connections: 1) determine the key species associated with the type of connections (e.g. neighborhood, local or regional); 2) determine the flight distance for the key species; and 3) determine desired connection width based upon habitat type and flight distances.

Neighborhood conservation connections are designed to allow for:

- The passage of neighborhood species, some community species and some regional (especially at night)
- Feeding habitat for neighborhood and some local species.

Local conservation connections are designed to allow for:

- The passage of neighborhood, community and many regional (especially at night) species
- Feeding and breeding habitat for neighborhood species and some local species

Regional conservation connections are designed to allow for:

- The passage of neighborhood, community and regional species
- Feeding and breeding habitat for neighborhood and local species
- Feeding habitat for some regional species

The WHST identified the following species as key indicator species within each of the conservation connection categories. The flight distances for each of these species was determined to help define the recommended widths of conservation corridors within different habitat types.

Key Neighborhood Species	Flight Distance (ft)
Mule Deer	656
American Kestrel	246
Meadowlark (nesting success)	328

Community Species	Flight Distance (ft)
Mule Deer	820
Ferruginous Hawk	459

Regional Species	Flight Distance (ft)
Deer	1082
Elk (use	656
Elk (low use areas)	1312
Golden Eagle	984

Riparian Woodland Conservation Connections
Recommended Protection Width Guidelines

Riparian Woodland Conservation Connections Surrounded by Grasslands	Neighborhood Connections (width in ft)				Community Connections (width in ft)				Regional Connections (width in ft)		
	Single story house	*Two story*			*Minimum*	*High Quality*			*Minimum*	*High Quality*	
Without Berms	**Key Mammal Passage**		**Am. Kestrel**		**Key Mammal Passage**		**Ferruginous Hawk**		**Key Mammal Passage**		**Golden Eagle**
With No Topographic Relief	962	1203	541		1203	1587	1010		1587	2094	1804
With Minor Topographic Relief **	353	647	541		647	853	1010		853	1126	2165
With Significant Topographic Relief ***	113	207	541		207	273	1010		273	360	2165
With Berms (constructed in disturbed areas only)											
With No Topographic Relief	533	1067	541		1067	1407	1010		1407	1857	2165
With Minor Topographic Relief **	93	180	541		180	238	1010		238	313	2165
With Significant Topographic Relief ***	67	113	541		113	150	1010		150	197	2165

⅄ Based upon a relatively moderate prairie site with slopes of 5-7 percent of grass and mix of trees and shrubs cover in the riparian corridor. Corridor connectivity is based on the width of the corridor, habitat quality, length of corridor, length of bottlenecks, and movement capabilities of species.

Calculated distance based on no visual detections of a single 5' tall undulate in the bottom of the topographical feature.

** Minor Topographical Relief = 6 feet deep with 3:1 to 4:1 side slopes. Shallow and gradual, like some of the features in the CBCN.

*** Significant topographical relief = 10' deep and 1.5;1 side slopes. Deep and steep, characteristic of some Chatfield Basin features.

Grassland Conservation Connections
Recommended Protection Width Guidelines

Grassland	Neighborhood Connections (width in ft)				Community Connections (width in ft)				Regional Connections (width in ft)		
	Single story house	*Two story*			*Minimum*	*High Quality*			*Minimum*	*High Quality*	
Without Berms	**Key Mammal Passage**		**Am. Kestrel**		**Key Mammal Passage**		**Ferruginous Hawk**		**Key Mammal Passage**		**Golden Eagle**
With No Topographic Relief	1443	1804	541		1804	2380	1010		2380	3141	2165
With Minor Topographic Relief **	530	970	541		970	1280	1010		1280	1689	2165
With Significant Topographic Relief ***	170	310	541		310	409	1010		409	540	2165
With Berms (constructed in disturbed areas only)											
With No Topographic Relief	800	1600	541		1600	2111	1010		2111	2786	2165
With Minor Topographic Relief **	140	270	541		270	356	1010		356	470	2165
With Significant Topographic Relief ***	100	170	541		170	224	1010		224	296	2165

⅄ Based on relatively flat prairie site with slopes of 5 percent and limited shrub cover. Corridor connectivity is based on the width of the corridor, habitat quality, length of corridor, length of bottlenecks, and movement capabilities of species.

Calculated distance based on no visual detections of a single 5' tall undulate in the bottom of the topographical feature.

** Minor Topographical Relief = ' dep with 3:1 to 4:1 side slopes. Shallow and gradual, like some of the features in the CBCN.

*** Significant topographical relief = 10' deep and 1.5;1 side slopes. Deep and steep, characteristic of some Chatfield Basin features.

Prairie Foothills Shrub Complex Conservation Connections
Recommended Protection Width Guidelines

Prairie Foothills Shrub Complex	**Neighborhood Connections (width in ft)**				**Community Connections (width in ft)**				**Regional Connections (width in ft)**		
	Single story house	*Two story*			*Minimum*	*High Quality*			*Minimum*	*High Quality*	
Without Berms	**Key Mammal Passage**		**Am. Kestrel**		**Key Mammal Passage**		**Ferruginous Hawk**		**Key Mammal Passage**		**Golden Eagle**
With No Topographic Relief	722	902	541		902	1190	1010		1190	1570	2165
With Minor Topographic Relief **	265	485	541		485	640	1010		640	844	2165
With Significant Topographic Relief ***	85	155	541		155	205	1010		205	270	2165
With Berms (constructed in disturbed areas only)											
With No Topographic Relief	400	800	541		800	1056	1010		1056	1393	2165
With Minor Topographic Relief **	70	135	541		135	178	1010		178	235	2165
With Significant Topographic Relief ***	50	85	541		85	112	1010		112	148	2165

Corridor connectivity is based on the width of the corridor, habitat quality, length of corridor, length of bottlenecks, and movement capabilities of species.

Calculated distance based on no visual detections of a single 5' tall undulate in the bottom of the topographical feature.

** Minor Topographical Relief = 6 feet deep with 3:1 to 4:1 side slopes. Shallow and gradual, like some of the features in the CBCN.

*** Significant topographical relief = 10' deep and 1.5;1 side slopes. Deep and steep, characteristic of some Chatfield Basin features.

Shrubland Conservation Connections
Recommended Protection Width Guidelines

Shrubland	**Neighborhood Connections (width in ft)**				**Community Connections (width in ft)**				**Regional Connections (width in ft)**		
	Single story house	*Two story*			*Minimum*	*High Quality*			*Minimum*	*High Quality*	
Without Berms	**Key Mammal Passage**		**Am. Kestrel**		**Key Mammal Passage**		**Ferruginous Hawk**		**Key Mammal Passage**		**Golden Eagle**
With No Topographic Relief	481	601	541		601	793	1010		793	1047	2165
With Minor Topographic Relief **	177	323	541		323	427	1010		427	563	2165
With Significant Topographic Relief ***	57	103	541		103	136	1010		136	180	2165
With Berms (constructed in disturbed areas only)											
With No Topographic Relief	267	533	541		533	704	1010		704	929	2165
With Minor Topographic Relief **	47	90	541		90	119	1010		119	157	2165
With Significant Topographic Relief ***	33	57	541		57	75	1010		75	99	2165

- Based on rolling site with slopes of 5 – 15 percent and with significant shrub cover, especially shrub oak.

Corridor connectivity is based on the width of the corridor, habitat quality, length of corridor, length of bottlenecks, and movement capabilities of species.

Calculated distance based on no visual detections of a single 5' tall undulate in the bottom of the topographical feature.

** Minor Topographical Relief = 6 feet deep with 3:1 to 4:1 side slopes. Shallow and gradual, like some of the features in the CBCN.

*** Significant topographical relief = 10' deep and 1.5;1 side slopes. Deep and steep, characteristic of some Chatfield Basin features.