

## Chapter 2 – The Wild Connections Methodology

*“The last word in ignorance is the man who says of an animal or plant:  
‘What good is it?’ To keep every cog and wheel  
is the first precaution of intelligent tinkering.”*

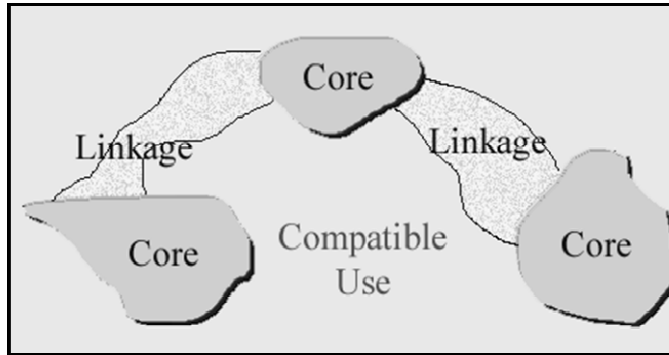
– Aldo Leopold (1972)

### Components of the Core Reserve System

The core reserve and linkage network model was promoted by Noss (1983), Harris (1984), and many others, who looked at conservation opportunities from a landscape or regional perspective and emphasized the need for animals to move between reserves or other areas of favorable habitat. If functionally connected, a system of reserves may be united into a whole that is greater than the sum of its parts. Although no single reserve may be able to support a long-term ecologically effective population of a species with large area requirements, such as grizzly bear or grey wolf, reserves linked by corridors or other avenues of movement may do so (Noss and Harris, 1986). Thus, whereas individual reserves are unlikely to encompass ecosystems replete with all native species, a well-connected network of reserves has a better chance of doing so (Noss and Cooperrider, 1994).

The reserve design is comprised of protected core reserves, which are large wild areas that are interconnected by linkages, which are habitats that allow for species dispersal and migration. Core areas are surrounded by compatible use areas, which accommodate medium and high-impact recreation, extraction and other human-oriented uses that are managed according to the conservation goals.

Figure 2.1: Core – Linkage Model



### The Three-Track Approach to Network Design

Scientists have developed basic generalizations to consider when creating a network of cores and connecting habitat. They are useful in deciding size and configuration of optimal wildlands network units. Noss and Cooperrider (1994) summarize as follows:

- Species well distributed across their native range are less susceptible to extinction than species confined to small portions of their range.
- Large blocks of habitat, containing large populations of ecologically important species are superior to small blocks of habitat containing small populations.
- Blocks of habitat close together are better than blocks far apart.
- Habitat in contiguous or connected blocks is better than fragmented habitat.
- Interconnected blocks of habitat are better than isolated blocks, and dispersing individuals travel more easily through habitat resembling that preferred by the species in question.
- Blocks of habitat that are roadless or otherwise less accessible to humans are superior to roaded and accessible habitat blocks.

The Wild Connections Planning team utilized the *Three-Track Approach* to inform our network design. Combining the three tracks of ecosystem representation, inclusion of special elements, and protection of habitat for focal species offers a comprehensive approach toward conservation planning (Soulé and Terborgh, 1999).

### 1) Ecosystem Representation

Representing various ecosystem or cover types in protected areas in proportion to their occurrence across the larger landscape provides a coarse filter approach to ensuring adequate protected habitat for wildlife and plant species. The Nature Conservancy estimates that 85% to 90% of all species in a region can be protected by protecting representative samples of natural communities, although this hypothesis is as yet untested (Noss and Cooperrider, 1994). In addition, this approach is economically efficient when it comes to collecting data: “Broader vegetation schemes serve as a surrogate for data on each individual species within a given scheme, and these vegetation patterns are easier to map. In many cases such data already exist...” (Miller 2003). While vegetation is never a substitute for actual data on animal species, it may be the best information available when field studies are not available.

However, most existing protected areas do not include proportionate representation. In the Southern Rockies Ecoregion, for example, approximately 70% of the protected lands in National Parks and Wilderness Areas are above 10,000 feet, while low and the mid-elevation ecosystem types, such as grasslands and shrublands which support a high number of vertebrate species, are not sufficiently represented in protected areas (SREP, 2000). Species that depend on low and mid-elevation habitats commonly have little protected habitat.

Similarly, for the Pike-San Isabel, the present configuration of protected areas does not adequately represent all ecosystem types when compared with the whole of the forest. Table 2.1 shows the percent of various cover types across the forest in comparison with their representation in Wilderness and Research Natural Areas (RNA), the two most protective management designations.

**Table 2.1: Protected Cover Types within the Pike-San Isabel**

Ecosystem or Cover Type	Acres within the Pike-San Isabel	% of Pike-San Isabel	Acres Protected by Wilderness / RNA Designation	% of protected area
Shrubland and Cottonwood	114,500	5.1%	30,800	7.2%
Piñon-Juniper Woodland	61,100	2.7%	4,900	1.1%
Ponderosa Pine Forest	363,200	16.3%	7,600	1.8%
Douglas-Fir Forest	447,400	20.0%	36,600	8.6%
Lodgepole Pine Forest	206,600	9.3%	37,800	8.9%
Aspen Forest	180,800	8.1%	36,300	8.5%
Grassland	222,200	9.9%	50,800	11.9%
Limber Pine & Bristlecone Pine Forests	74,900	3.4%	14,800	3.5%
Engelmann Spruce/Blue Spruce/Subalpine Fir	395,700	17.7%	138,300	32.4%
Barren Lands/Exposed Rock	159,800	7.2%	68,400	16.0%
Open Water	7,200	0.3%	300	0.1%
TOTAL	2,233,400	100.0%	426,600	100.0%

Sources: PSI RIS Vegetation/Cover Type Analysis October 1998; Wilderness Boundaries from Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, June 2005; Research Natural Area (RNA) Boundaries from Center for Native Ecosystems, 2002. Notes: Acreages are rounded to nearest 100.

Relative to the total forest vegetation, high elevation vegetation types (barren lands, exposed rock and spruce-fir forests) together make up almost 25% of the total Pike-San Isabel. But those same cover types make up 48% of the vegetation protected as Wilderness or RNAs. Ponderosa pine is substantially under-represented, at less than 2% protected within Wilderness or RNAs, leaving ponderosa pine dependent species at more risk.

These statistics clearly show the bias toward high elevation ecosystems in protected areas of the Pike-San Isabel. To remedy this imbalance, the Wild Connections Plan includes almost all wilderness quality underrepresented vegetation types within roadless areas in the most protective designations, especially Wilderness.

## 2) Special Elements

Protecting areas based solely on ecosystem representation may not sufficiently ensure protection of rare species and unique ecosystems, also known as special elements. Therefore, a fine filter approach targets specifically identified special element locations for protection.

### a) Species and Natural Communities

The biodiversity represented in rare species on the Pike-San Isabel includes nearly 1,000 documented occurrences of 148 different amphibians, birds, fish, mammals, insects, mollusks, natural communities and plants (CNHP, 2005). UASPP captured this biodiversity by using the following elements to evaluate the appropriate level of protection when deciding on management scenarios:

- Biological hotspots and general biodiversity are represented by Potential Conservation Areas (CNHP), Research Natural Areas, Areas of Critical Environmental Concern (BLM lands only), Colorado Natural Areas, Audubon’s Important Bird Areas, and The Nature Conservancy Preserves and their Conservation Blueprint areas of high and moderately high conservation value (The Nature Conservancy, 2001).
- Important wildlife areas such as calving and lambing areas.
- Selected natural communities (extreme rich fens and various riparian and wetlands communities), animal species of state rank 1 (which includes federally listed species), and state rank 2 that are candidate species and are tracked by CNHP in the Pike San Isabel (CNHP, 2005) shown in Table 2.2.

We limited our use of special elements to those within the Pike-San Isabel National Forest and the BLM lands in the Arkansas canyon. The many other special elements found on state or private lands are thus outside the purview of this document.

**Table 2.2: Animal Species as Special Elements**

Group	Common name	Scientific Name	ESA Status	Colorado Protected Status	Global Rank	State Rank	Federal Sensitive
Amphibians	Boreal Toad	<i>Bufo boreas pop. 1</i>	Candidate	Endangered	G4, T1, Q	S1	USFS
Insects	Pawnee Montane Skipper	<i>Hesperia leonardus montana</i>	Threatened	--	G4, T1	S1	--
Mammals	Common Hog-nosed Skunk	<i>Conepatus leuconotus</i>	--	--	G4	S1	USFS
Mammals	Lynx	<i>Lynx canadensis</i>	Threatened	Endangered	G5	S1	--

Group	Common name	Scientific Name	ESA Status	Colorado Protected Status	Global Rank	State Rank	Federal Sensitive
Mammals	Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	Threatened	Threatened	G5, T2	S1	--
Mammals	Wolverine	<i>Gulo gulo</i>	--	Endangered	G4	S1	USFS
Birds	American White Pelican	<i>Pelecanus erythrorhynchos</i>	--	--	G3	S1B	BLM
Birds	Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	--	--	G4, T3	S1B	BLM
Birds	Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened	G5	S1B S3N	--
Birds	Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Threatened	Threatened	G3T3	S1B SUN	--
Fish	Greenback cutthroat trout*	<i>Oncorhynchus clarki stomias</i>	Threatened	Threatened	G4, T2, T3	S2	--
Mammals	Townsend's Big-Eared Bat <i>Subsp</i>	<i>Plecotus townsendii pallescens</i>	--	Candidate	G4, T4	S2	BLM USFS
Birds	American Peregrine Falcon	<i>Falco peregrinus anatum</i>	--	Candidate	G4, T3	S2B	USFS
Birds	Mountain Plover	<i>Charadrius montanus</i>	--	Candidate	G2	S2B	BLM USFS

\* Also a focal species

### **b) Roadless Areas**

Roadless areas are *the most important special element* used in the development of this Wild Connections Conservation Plan. As roads severely fragment habitat and have many associated adverse ecological impacts, protecting remaining roadless areas is a major component in Wild Connections. Roadless areas are less accessible for intensive human activities and offer some of the best opportunities for conservation and restoration on the Pike-San Isabel National Forest.

Scale, both spatial and temporal, must be considered in conservation projects. The preservation or restoration of native species, especially wide ranging animals, and natural disturbance regimes requires quality habitat over large areas and a time frame of hundreds or more years. Scott et al. discuss the question of scale and conclude “The job of conserving biodiversity requires broadening the scope of temporal and spatial considerations beyond the traditional focus of resource management. If the goal is preservation of existing biota and its long-term evolutionary potential, this broad-scale, long term framework is absolutely essential” (Scott et al., 1999). Thus the large roadless areas of wilderness quality, as well as smaller areas contiguous with existing Wilderness, are the backbone of the Wild Connections Conservation Plan.

UASPP inventoried more than 100 roadless areas on Pike-San Isabel, BLM, or state land over the past ten years to supplement and expand the agency data from the RARE II and the Roadless Area Conservation Rule. “Roadless area” in this context refers to the UASPP citizen inventories, which in general found the actual roadless boundary to be larger than either the RARE II or Roadless Area Conservation Rule boundaries (UASPP, 2005). In addition, there are nine designated Wildernesses,

some of which extend into adjacent forests. Table 2.3 shows a breakdown of Pike-San Isabel Roadless Areas by size. The substantial body of research cited earlier reveals a tremendous potential for preventing further fragmentation and loss of habitat by protecting these areas.

**Table 2.3: Roadless Areas on the Pike-San Isabel National Forest**

Type	Number	Size Range (acres)	Total Acres
Roadless areas - very large	4	30,000 to 67,000	180,200
Roadless areas - large	19	15,000 to 30,000	364,000
Roadless areas - small	37	5,000 to 15,000	343,200
Roadless areas - very small	26	Less than 5,000	79,600
<b>Total outside Wilderness</b>	<b>86</b>		967,000
Wilderness	9	19,000 to 253,300*	445,600
<b>Total RA and Wilderness</b>	<b>95</b>		1,412,600

Notes: Acres for roadless areas may include private inholdings.

\* Acres for Wilderness includes designated, not proposed, land in the Pike-San Isabel National Forests only.

Specific recommendations have been made for roadless areas that are of wilderness quality and meet the USFS criteria for capability, availability, and suitability. Given the conservation potential and value of roadless areas, Wild Connections recommends:

- 1) adding contiguous roadless areas to existing Wilderness areas to protect larger blocks of habitat;
- 2) designating roadless areas between existing Wildernesses as Wilderness to increase the amount of protected land and minimize distances between blocks of protected habitat;
- 3) designating lower-elevation roadless areas as Wilderness to protect additional and more productive native ecosystem types.

More details on these areas are found in the complex narratives, Chapter 5.

### **c) Connectivity and Special Wildlife Areas**

In spite of large areas of wild, unroaded land on the Pike and San Isabel National Forest, none of the roadless areas are individually large enough or encompass enough variety of habitats to serve as stand-alone refuges for larger wide-ranging species. Therefore, maintaining suitable connectivity between large core areas is required to allow animals to disperse from their natal areas, migrate between adjacent areas, and move seasonally among various areas used for birthing, summer, and winter ranges. Where large core areas are not contiguous or closely adjacent, the WCCP proposes connecting habitat to facilitate wildlife movement.

### **3) Focal Species**

The third component of the three-track framework addresses the habitat needs of focal species. The requirements of focal species for survival and ecological effectiveness represent factors that are important to maintaining ecologically healthy conditions (Miller et al., 1998). These requirements were used to identify, configure and protect wildland reserves.

Focal species represent various roles in the ecosystem:

- **Ecologically interactive species, keystone and foundation species**, enrich ecosystem function in various interactions, such as predation, competition, mutualism, and habitat modification (Menge et al. 1994, Power et al. 1996, Jeo et al. 2000 and Soulé et al., 2005). Either keystone species or foundation species have a disproportionate influence beyond their

numbers. For example, some keystone species, such as the beaver, shape ecosystems into a mosaic of habitats that provide for greater diversity (Naiman et al., 1988).

Large predators are important to maintain ecosystem structure, diversity and resilience through the top-down effects of their predation (SREP, 2003, Soulé et al. 2005). Soulé et al. observe that current conservation laws, including the Endangered Species Act, generally deal with individual species in isolation from the larger interrelationships of interactive species. They propose that “that population densities of strongly interactive species must not be permitted to fall below thresholds for ecological effectiveness, and that the geographic ranges of such species should be as large as possible” (Id.).

- **Umbrella species** are those whose diverse habitat needs represent the needs of many other species. An example of an umbrella species on the Pike-San Isabel is the black bear whose optimum terrain includes subalpine coniferous forests, subalpine aspen forests, upper and lower montane closed coniferous forests, and adjacent shrublands and grasslands (SREP, 2003).
- **Indicator species** are “tightly linked to specific biological elements, processes, or qualities, and are sensitive to ecological changes” (SREP, 2003). Thus, they serve as indicators of ecosystem health and early warning systems of environmental shifts (Id.). The greenback cutthroat trout (*Oncorhynchus clarki stomias*) is an example of an indicator species for the Pike-San Isabel as they are closely tied to high quality cold mountain streams.
- **Wilderness quality species** often have large home territories, with a preference for wild areas, and/or are especially sensitive to human activity or persecution. Black bear, lynx, and bighorn sheep fulfill this role.
- **Flagship species** are charismatic animals that serve a valid ecosystem function but are also important for directing public attention toward the need for conservation. Lynx are a good example of a flagship species.

Top-level carnivores are particularly important to use as focal species for conservation because they are generally highly interactive and their far-ranging and diverse habitat needs often encompass those of numerous other species. In addition, large predators have fundamental roles in sustaining the natural balance of ecosystems via “top-down regulation” (Soulé and Terborgh, 1999, Miller et al., 2001). Many studies have shown that ecosystems are incomplete in both form and function without large predators (Soulé and Noss, 1998, Terborgh et al., 1999, Estes et al., 2001, Miller et al., 2001). For example, without natural predators like the wolf, ungulate numbers in some areas have increased until they cause significant damage to vegetation (Rocky Mountain Elk Foundation 2005, Berger et al., 2001). This imbalance often results in negative impacts on other species; for example, an overabundance of elk is detrimental to cottonwood and willow growth which in turn affects beavers (Ripple and Beschta, 2003, Ripple and Larson, 2000).

Wild Connections has selected large carnivores such as the lynx and gray wolf as focal species because of their potential role in maintaining ecological integrity in the Pike-San Isabel, as well as representing the requirements of numerous species for survival. We are also interested in mountain lion and bobcat for their predatory function and beaver and prairie dogs for their keystone roles, but have not done any analysis of these species.

### **WCCP Focal Species Selection and Analysis**

The following were selected as focal species. Unless otherwise noted, the descriptions draw heavily on the *Southern Rockies Wildlands Network Vision* focal species accounts (SREP, 2003). Their application to the WCCP utilized data and modeling from the Colorado Division of Wildlife, the *Southern Rockies Wildlands Network Vision* (SREP, 2003) and *Linking Colorado’s Landscapes*

species modeling and expert workshops (SREP, 2005). See Tables 2.4 and 2.5 for specific data sources.

- 1. Bighorn sheep (*Ovis canadensis*)** are wilderness quality and flagship species that were used to identify wilderness areas and connectivity between lambing areas and summer and winter ranges. They prefer steep-sloped, rugged terrain and high-visibility habitats dominated by grasses and low shrubs. Escape terrain of slopes between 25-85 degrees with rock outcroppings is optimal. They are prey for large carnivores, including mountain lion, bears and wolves. Bighorn are susceptible to domestic sheep diseases which mandates domestic sheep grazing restrictions. There is only moderate dispersal to non-occupied habitat patches, and migration is seasonal between several different ranges. As occupants of rugged mountain terrain who are mostly intolerant of human activities, they are charismatic indicators of wild habitat.
- 2. Black bear (*Ursus americanus*)** is both a wilderness quality and umbrella species that was used to identify large wild areas of closed forest and woodland habitat in the WCCP. Black bears are common and widely distributed in subalpine coniferous forests, subalpine aspen forests, upper and lower montane closed coniferous forests, and adjacent shrublands and grasslands. They require large areas of suitable habitat and safe, densely forested linkages. Other important habitat needs include: hard or soft mast foods in fall, adequate spring and summer feeding areas, movement corridors, winter denning habitat, and escape cover. Usually solitary, they hibernate from mid-October to April. Ranges are large, with home ranges up to 24 km<sup>2</sup>, and when long range movements are factored in, they may move over 3,000 km<sup>2</sup>. Dispersal and migration needs are relatively minimal except for seasonal movements for food sources. They generally avoid roads and are wary of human beings.
- 3. Canada lynx (*Lynx canadensis*)** serves as a wilderness quality, umbrella and flagship focal species. Requiring large expanses of high-elevation boreal forest, they identify good wilderness quality land in higher elevations and exhibit the top down predation dynamic for the WCCP. Although there is little historical data for lynx in the Pike-San Isabel, there is current data that attest to significant denning and winter forage habitat, connecting linkage areas (USDA Forest Service 2004, SREP, 2005), as well as the presence of dispersing animals from the reintroduction in the San Juan mountains. Satellite locations from 43 different lynx are found across the Pike-San Isabel, with notable clusters near Guanella Pass, in the northern Mosquito Range, along the Sawatch Range, and around Spanish Peaks (Shenk, 2005). Ideal habitat is old growth in which natural disturbance regimes have resulted in continuous forest stands of varying ages with low topographic relief. Late successional/old growth forests provide denning sites and hiding cover, along with habitat for a very important secondary prey species, red squirrel, while early successional areas support high prey densities and foraging areas for their chief prey of snowshoe hare. They require connectivity for dispersal for meta-population health and may move long distances if prey is scarce. Roads and snowmobile routes provide easy winter access for competing carnivores such as coyotes.
- 4. Gray wolf (*Canis lupus*)** is a strongly interactive keystone, umbrella and flagship focal species, currently extirpated throughout Colorado. Wolves were used in the WCCP to ensure that the best habitat for future recolonization or reintroduction of this species is protected. The vitally important predator role of wolves in maintaining a healthy balance of prey species and regulating the top-down cascade of effects through trophic levels is well established in the literature. The most cogent recent studies from Yellowstone National Park attest to the change in behavior of elk and coyotes in response to wolves, and the resulting regeneration of willows and cottonwoods (formerly overgrazed by elk) which has allowed the return of beavers (Ripple and Beschta, 2003).

While the gray wolf is not currently present in the Pike-San Isabel, it may return naturally in the future, and portions of the San Isabel have been identified as secondary habitat and connecting habitat between prime reintroduction sites for wolves in western Colorado and northern New Mexico. Wolves require large areas for population persistence, and must exist in sufficient numbers over time to exert their ecological function of top-down regulation. Primarily dependent on ungulate prey, such as elk and deer, their return will help restore and maintain a healthy balance between prey and predator species. Their large range requirements and ability to travel long distances is attested to by the radio-collared Yellowstone wolf killed on I-70 near Idaho Springs, Colorado, in 2004, hundreds of miles from where it was known to reside. In addition, the core refuges for wolves in southern Colorado are smaller than those of the greater Yellowstone ecosystem, so maintaining connectivity among them is particularly critical (Carroll et al., 2003). The Colorado Division of Wildlife is facilitating a wolf working group to establish a plan for these various contingencies. Future wolf populations, whether in the Pike-San Isabel or elsewhere, will contribute to a larger meta-population from the Northern Rockies to the southwest forest of Arizona and New Mexico.

5. **Greenback cutthroat trout** (*Oncorhynchus clarki stomias*) a habitat quality indicator and flagship species, was used in the WCCP to identify remaining high quality streams. The greenback cutthroat trout was declared the State Fish of Colorado in 1994. Once widespread in the Arkansas and South Platte watershed, populations are now reduced to where only 0.7% of the historical range is occupied by strong or conservation populations. Furthermore, 75% of those populations are found within roadless areas, indicating the importance of roadless areas for the survival of these native trout (Western Native Trout Campaign, 2001). Optimum habitat is cold, well oxygenated waters; stable temperature regime; a pool to riffle ratio of 1:1; some areas of deep, low-velocity water; rocky substrate free of fine sediments, and well-vegetated stream banks. This high water quality is most readily found away from roads and their associated impacts. Greenback cutthroats are vulnerable to human uses which degrade water quality, such as livestock grazing, roads, water diversion, mineral development, and timber harvest as well as unregulated angling. Non-native stocking has been a particular issue, resulting in hybridization and competition with introduced rainbow, brown and brook trout, and possible introduction of whirling disease.
6. **Mule deer** (*Odocoileus hemionus*) are also an umbrella for other species and were used to identify general wildlife habitat connectivity between winter and summer concentration areas and ranges, as well as problem areas such as road crossings. They are a prey base for large predators. Common across the Pike-San Isabel in suitable habitat, they prefer open areas for feeding on a great variety of food sources such as leaves, twigs, lower branches of trees, and various grasses, and forested or shrubby areas for hiding cover and thermal protection. In Colorado, chronic wasting disease may be spreading into deer herds.
7. **Pronghorn** (*Antilocapra americana*) are a flagship species. Pronghorn are found in intermountain valley shrub and grassland habitats, as well as more broadly on the eastern plains. Although not a forest species, the pronghorn were used to identify wildlife habitat and connectivity across the broader area of the two watersheds. Grassland habitats provide good forage, and pronghorn seem to thrive on sub-climax rangelands maintained by fire and seasonal grazing by elk. It is not unusual to see elk and pronghorn in adjacent groups in the winter in the Wet Mountain valley. While they are constantly on the move, their overall movements are seasonal, varying with weather and rangeland conditions, and they do not migrate over long distances if there is sufficient quality forage. They too are a prey species for large carnivores, such as mountain lions, and depend on eyesight and speed to escape predators. They are

particularly vulnerable to fences, which they will not jump, to dense vegetation which impedes their line of view, and to human encroachments.

8. **Rocky Mountain elk** (*Cervus elaphus*) are an umbrella for many other species found in both forested and non-forested areas. Elk were used to identify general wildlife habitat of low road density; connectivity between calving grounds, winter and summer ranges; and areas of special concern such as road crossings. Prior to the 1800s, elk ranged from southern Arizona and New Mexico to mid Alberta and British Columbia. By 1900 in Colorado, they were nearly hunted out, later to be restored with elk from Wyoming. By 2002, the population was estimated to be approximately 300,000, and in some areas, for example Rocky Mountain National Park, it is at or above carrying capacity. Optimum habitat conditions include a landscape integrity represented by low road densities, with secure, sun-exposed low-elevation wintering areas, and a variety of ecological zones and vegetation types. Forage consists of grass, woody plants and forbs. Low hanging aspen braches are clipped off from below and trunks show teeth marks as the animals feed on the bark in hard winters. They are a prey species for bears, mountain lions, coyotes and wolves

## **Rewilding, A Complementary Approach**

Protection of biodiversity has always been a primary concern for conservation. More recently the complementary goal of rewilding has become an important part of large scale conservation strategies (Soulé and Noss., 1998, Foreman, 2004). The key features of rewilding are:

- large, strictly protected core reserves
- connectivity
- keystone species

Soulé and Noss go on to discuss the scientific arguments that support rewilding and justify emphasis on large predators as keystone species:

First the structure, resilience, and diversity of ecosystems are often maintained by “top-down” ecological (trophic) interactions that are initiated by top predators. Second, wide-ranging predators usually require large cores of protected landscape for secure foraging, seasonal movements, and other needs; they justify bigness. Third, connectivity is also required because core reserves are typically not large enough in most regions; they must be linked to insure long-term viability of wide-ranging species (Soulé and Noss, 1998).

Rewilding is described by Foreman as a “landmark for the wilderness conservation movement as well as for those primarily concerned with protecting biological diversity. Soulé and others have crafted the *scientific basis* for the need to protect and restore big wilderness-area complexes” (Foreman, 2004).

Application of a rewilding strategy will vary depending on the remaining natural lands or lands that can be restored to a more natural condition. The Pike-San Isabel has extensive areas that fit this definition, and has habitat suitable for lynx, bears, mountain lions, and secondary habitat for wolves.

## **Data Sources Used in Designing the Wild Connections Conservation Plan**

Information from a variety of sources was used to create the Wild Connections Conservation Plan. UASPP’s roadless area inventories, regional workshops, and expert reviews provided essential field knowledge and citizen input in the development of this conservation plan.

In addition to the information compiled from these experts and citizens, Table 2.4 lists data sources as they relate to the three-track approach, and Table 2.5 lists these data sources relative to each of the management themes. Taken together, these data sources defined the need for the various forest uses and activities, and guided the Wild Connections team in determining boundaries for the management themes.

**Table 2.4: Data Sources Used Respective to the Three-track Approach**

Track	Data Layer	Source
Ecosystem Representation	Colorado GAP vegetation Pike-San Isabel RIS Vegetation Elevation	Colorado GAP Project USDA Forest Service October 1998 USGS National Elevation Dataset
Special Elements	Roadless Areas	Roadless Area Inventory - UASPP
	Biodiversity hotspots: Potential Conservation Areas Research Natural Areas Areas of Critical Environmental Concern Colorado Natural Areas Important Bird Areas The Nature Conservancy Preserves and Conservation Blueprint	CNHP USFS, CNE BLM CNAP Audubon Society TNC
	Rare, threatened and endangered species and communities, including State critically imperiled (S1) ranked, ESA listed, Forest Service and BLM sensitive species.	CNHP
	Wildlife linkages and important sites for wildlife: known and modeled movement linkage, lambing, calving, fawning, etc.)	CDOW species data SREP Linking Colorado's Landscapes 2005
Focal Species	Greenback cutthroat trout	CDOW, SREP 2005, Western Trout Native Trout Campaign 2001
	Canada lynx	USFS 2004, SREP 2003 and 2005, CDOW.
	Gray wolf	SREP 2003 and 2005
	Black bear	CDOW, SREP 2003 and 2005
	Bighorn sheep	CDOW, SREP 2005
	Mule deer	CDOW
	Pronghorn	CDOW, SREP 2003 and 2005
	Rocky Mountain elk	CDOW, SREP 2003 and 2005

*CDOW refers to the Colorado Division of Wildlife data available on the Natural Diversity Information Source web site.*

*SREP 2003 refers to the Southern Rockies Ecosystem Project's "Wildlands Vision," Miller et al, 2003*

*SREP 2005 refers to the Southern Rockies Ecosystem Project's "Linking Colorado Landscapes," SREP, 2005*

**Table 2.5: Data Sources Used Respective to Each Management Theme**

Management Theme	Data Layer	Source
1.1 – Existing Wilderness	CO Wilderness	NDIS
1.2 – Recommended Wilderness	Roadless Areas Wildlife data	Roadless Area Inventory (UASPP) CDOW, SREP 2003 and 2005
1.3 – Core Reserve	Roadless Areas Wildlife data	Roadless Area Inventory (UASPP) CDOW, SREP 2003 and 2005
2.1 – Research Natural Areas: Existing and Proposed	Existing USFS, Pike-San Isabel long and short list Citizens' recommendations	USFS CNE
2.2 – Experimental Forests	Current designated Experimental Forests	Pike-San Isabel LRMP (84).
2.3 – Eligible Wild, Scenic and Recreational Rivers	River corridor with eligible segments	Supplemental Wild and Scenic River Study Report and Draft Legislative EIS. USDA Forest Service 1999

*Wild Connections Conservation Plan for the Pike & San Isabel National Forests*

Management Theme	Data Layer	Source
2.4 – Special Areas: Minimal or Interpretive Use	Existing USFS, Pike-San Isabel long and short list Citizens’ recommendations	USFS CNE
3.1– Quiet Use Areas	Roadless Areas Routes – low density  Elk, deer, bighorn sheep, pronghorn movements, lynx habitat Elk, bighorn sheep, black bear, wolf, lynx modeling/expert opinion	Roadless Area Inventory (UASPP) + Pike-San Isabel routes (UASPP & USFS) Wildlife movement data CDOW, SREP 2005 USFS 2004
3.2 – Connectivity Areas	Roadless Areas Routes – medium density  Elk, deer, bighorn sheep, pronghorn movements, lynx habitat Elk, bighorn sheep, black bear, wolf, lynx modeling/expert opinion	Roadless Area Inventory (UASPP) + Pike-San Isabel routes (UASPP & USFS) Wildlife movement data CDOW, SREP 2005 USFS 2004
4.1 – Motorized Recreation Areas	Current heavy use areas	USFS travel routes, ROS, Pike-San Isabel LRMP (84). Roadless Area Inventory (UASPP)
4.2 – Scenic Byways	Current designated byways	<a href="http://www.coloradobyways.org/Main.cfm">http://www.coloradobyways.org/Main.cfm</a>
5.1 – Active Management for Wildlife Habitat	Wildlife data Routes – medium to high density	CDOW Roadless Area Inventory (UASPP) + Pike-San Isabel routes (UASPP & USFS)
5.2 – Active Management for Human Needs	Wildlife data Routes – medium to high density	CDOW Roadless Area Inventory (UASPP) + Pike-San Isabel routes (UASPP & USFS)
8.1 – Ski Based Resorts	Existing ski area developments	USFS -Pike-San Isabel LRMP (84).
8.2 – Permanently Developed Recreation Areas	Major campgrounds adjacent to water bodies	USFS -Pike-San Isabel LRMP (84).
9.1 – Non-Forest Service Recommended for Wilderness	Roadless Areas Wilderness Study Areas	Roadless Area Inventory (UASPP) BLM
9.2 – Significant Non-Forest Service Biological Areas	Land ownership State Wildlife Areas	NDIS NDIS
9.3 – Non-Forest Service Connectivity Areas	Roadless Areas Routes – medium density  Elk, deer, bighorn sheep, pronghorn movements, lynx habitat Elk, bighorn sheep, black bear, wolf, lynx modeling/expert opinion	Roadless Area Inventory (UASPP) + Pike-San Isabel routes (UASPP & USFS) Wildlife movement data CDOW, SREP 2005 USFS 2004

*CDOW refers to the Colorado Division of Wildlife data available on the Natural Diversity Information Source web site.*

*SREP 2003 refers to the Southern Rockies Ecosystem Project’s “Wildlands Vision,” Miller et al, 2003*

*SREP 2005 refers to the Southern Rockies Ecosystem Project’s “Linking Colorado Landscapes,” SREP, 2005*

*< This Page Intentionally Left Blank >*