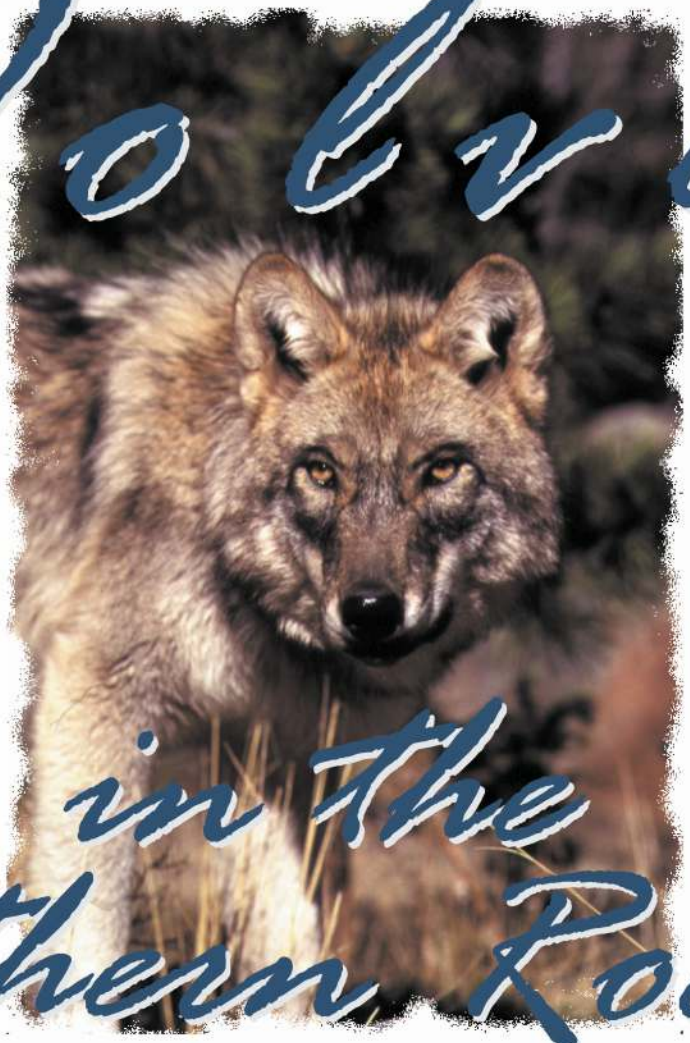
Wolves in the Southern Rockies



REPORT FROM THE POPULATION AND HABITAT VIABILITY ANALYSIS WORKSHOP

VERMEJO, NEW MEXICO
8-11 AUGUST 2000

TURNER ENDANGERED SPECIES FUND

DEFENDERS OF WILDLIFE

Southern Rockies Carnivore Restoration Project
SINAPU

Wolves in the Southern Rockies

A Population & Habitat Viability Assessment (PHVA)

A Collaborative Workshop:

Defenders of Wildlife
Turner Endangered Species Fund
The Conservation Breeding Specialist Group (SSC/IUCN)

A contribution of the IUCN/SSC Conservation Breeding Specialist Group.

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Phillips, M., N. Fascione, P. Miller and O. Byers. 2000. *Wolves in the Southern Rockies. A Population and Habitat Viability Assessment*: *Final Report*. IUCN/SSC Conservation Breeding Specialist Group: Apple Valley, MN.

Additional copies of *Wolves in the Southern Rockies. A Population and Habitat Viability Assessment*: *Final Report* can be ordered through the IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124.

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Executive Summary

Introduction

Successful federal wolf recovery programs for the western United States have increased the number of wolves in this vast region from none just a few years ago to more than 300 today. With the impending U.S. Fish and Wildlife Service proposal to reclassify wolves throughout the country, as well as the on-going restoration projects in the northern Rockies and Southwest, the time was deemed right to begin addressing the question of wolf recovery in the Southern Rocky Mountains Ecoregion, an area between these two recovery areas that stretches from south-central Wyoming though western Colorado to northern New Mexico. A coalition of groups, called the Southern Rockies Wolf Restoration Project, formed in February, 2000 to advance wolf recovery in the region. However, for successful recovery to ever occur it is essential to include a broader representation of stakeholders in public discussions. The Population and Habitat Viability Assessment (PHVA) workshop, held at the Vermejo Park ranch in northeastern New Mexico August 8th-11th, 2000, provided an opportunity to do just that by bringing together scientists, landowners, wildlife agency personnel, conservationists, and other interested parties.

To ensure a successful workshop, the Turner Endangered Species Fund and Defenders of Wildlife invited the Conservation Breeding Specialist Group (CBSG) to serve as a neutral workshop facilitator and organizer. CBSG is a member of the Species Survival Commission of the IUCN - World Conservation Union, and for more than a decade has been developing, testing, and applying a series of science-based tools and processes to assist species management decision-making. One tool CBSG employs is use of neutral facilitators to moderate small working group sessions, as the success of the workshop is based on the cooperative process of dialogue, group meetings, and detailed modeling of alternative species and/or habitat management scenarios. The CBSG team was led by Dr. Onnie Byers facilitating the overall process. Participants and invitees are listed in the report.

It is important to note that participation in the PHVA did not imply support for wolf recovery but was rather an opportunity for people to share their views and expertise on relevant biological and sociological issues. The objectives of the workshop were to create an opportunity for scientists, state agencies, and interested stakeholders to meet and share ideas; be a forum to discuss the implications of wolf restoration to the region; and use modeling to identify potential habitat for wolves and illuminate factors for wolf recovery such as prey and road density.

The PHVA Process

Effective conservation action is best built upon critical examination and use of available biological information, but also very much depends upon the actions of humans living within the range of the threatened species. Motivation for organising and participating in a PHVA comes from fear of loss as well as a hope for the recovery of a particular species.

At the beginning of each PHVA workshop, there is agreement among the participants that the general desired outcome is to maintain a viable population(s) of the species. In the case of the PHVA for wolves in the Southern Rockies, the goal was to determine the potential for recovery of wolves in the Southern Rockies Ecoregion. By way of introduction, each participant was asked to provide a statement on his or her expectations for the workshop (these statements can be found in Appendix II of this report). Nearly universal among the participants was their interest in learning about the issues related to wolf restoration in the Southern Rockies Ecoregion and sharing information relevant to the deliberations to take place over the next 3 days. Learning and sharing of information is at the heart of the PHVA workshop process which takes an in-depth look at the species' life history, population history, status, and dynamics, and assesses the threats that may put the species at risk.

One crucial by-product of a PHVA workshop is that an enormous amount of information can be gathered and considered that, to date, has not been published. This information can be from many sources; the contributions of all people with a stake in the future of the species are considered. Information contributed by hunters, trappers, park managers, scientists, and field biologists all carry equal importance.

To obtain the entire picture concerning a species, all the information that can be gathered is discussed by the workshop participants with the aim of first reaching agreement on the state of current information. These data then are incorporated into computer simulation models to determine: (1) potential for successful recovery under current conditions; (2) those factors that make recovery of the species problematic; and (3) which factors, if changed or manipulated, may have the greatest effect on improving the prospects for recovery. In essence, these computer-modelling activities provide a neutral way to examine the current situation and what needs to be changed if a decision is made to proceed with recovery of wolves in the Southern Rockies Ecoregion.

Complimentary to the modelling process is a communication process, or deliberation, that takes place during a PHVA. Workshop participants work together to identify the key issues affecting the conservation of the species. During the PHVA process, participants work in small groups to discuss key identified issues. Each working group produces a report on their topic, which is included in the PHVA document resulting from the meeting. A successful PHVA workshop depends on determining an outcome where all participants, coming to the workshop with different interests and needs, "win" in developing a management strategy for the species in question. Local solutions take priority. Workshop report recommendations are developed by, and are the property of, the local participants.

At the beginning of the workshop, the participants worked together in plenary to identify the major impacts affecting the potential for recovery of wolves in the southern Rockies. Using the technique of mind mapping, these issues were identified and themed into three main topics, which then became the focus of the working groups: Biological Aspects of Restoration, Legal, Political and Policy Aspects and Human Dimensions.

Each working group was asked to:

- Examine the list of impacts affecting the potential for recovery of wolves in the southern Rockies as they fell out under each working group topic, and expand upon that list, if needed.
- Identify and amplify the most important issues.
- Developed recommendations and strategies to address the key issues.
- Specify the action steps necessary to implement each of the recommendations.

Each group presented the results of their work in daily plenary sessions to make sure that everyone had an opportunity to contribute to the work of the other groups and to assure that issues were carefully reviewed and discussed by all workshop participants. The majority of the recommendations coming from the workshop were accepted by all participants, thus representing a consensus. Those that could not agree with the recommendations and actions of the group were offered the option of writing dissenting opinion pieces. Working group reports can be found in sections 3-5 of this document.

Working Group Conclusions and Recommendations

Biological Aspects of Restoration

This group was charged with the task of identifying and addressing the biological issues surrounding gray wolf recovery in the Southern Rockies Ecoregion. In addition to a host of other important topics, the group focused on three primary issues to accomplish this task: the need for an ecological justification for wolf recovery in the region, the identification of appropriate animal stocks for initiating recovery, and the development of demographic and landscape-level models of wolf population viability as a means to prioritize alternative recovery sites.

Intact ecological systems are characterized by the diverse species that inhabit them and the ecological functions and processes that link species to their environment (e.g., fire, predator-prey relationships). Wolves are important apex predators whose presence would help restore top-down regulation of food chains and reduce unnatural levels of use of vegetation. Accordingly, the reintroduction of wolves into the Southern Rockies Ecoregion would enhance the ecological health of the region. Thus, biological considerations provide ample justification for reintroducing wolves into the SRE. In addition, there was considerable discussion among group members concerning which subspecies is most ecologically and genetically suited to the region. Is the Mexican gray wolf (*Canis lupus baileyi*) best suited to the region, or should wolves from more northerly regions be used to stock the Southern Rockies? Experts on molecular taxonomy, population genetics, and wolf ecology at the workshop recognized the SRE was likely an historic

zone of gradation between the two forms. Consequently, they drafted a statement recommending that both types of wolves be used to establish healthy populations that would, over time, naturally mix to reform this zone of gradation similar to that found historically in gray wolves from south to north in this region. (Several experts, who were invited to the workshop but unable to attend, were asked to review and comment on this statement. Their comments can be found in Appendix IV of this report.)

Finally, a subgroup of population biologists worked toward developing a computer modeling tool that would provide insight for identifying the most favorable areas for wolf reintroduction within the SRE. While unable to provide a complete picture of site prioritization during the three days of the workshop, the group provided much-needed information to the larger body of participants on the structure of a comprehensive risk assessment tool that would accomplish this task.

The Biological Aspects Working Group, with considerable input from other workshop participants, recommends that, if a decision is made to reintroduce wolves into the southern Rockies, the most appropriate initial source is *C l. baileyi*. A detailed rationale for this recommendation is included in the Working Group report found in Section 3 of this document. In addition, the following restoration goals were identified:

1. Establish a viable population of *Canis lupus* in the Southern Rockies Ecoregion (SRE) by introducing *Canis lupus baileyi* to the southern portion of the SRE and *Canis lupus occidentalis* to the northern part of the SRE.
2. Restore free-ranging and well-connected gray wolf populations to their ecological role in suitable habitats throughout the SRE.
3. Wolf reintroduction efforts must focus on both restoration of the natural environment and meeting human needs, while reducing the potential for one to seriously encroach upon the other (*Dave Parsons 1995, Spain*).

The modeling subgroup of the Biological Aspects Working Group identified one overarching goal which was to provide insight for identifying the most favorable areas for wolf reintroduction within the SRE. The group accomplished this goal in that they provided a method comparing potential reintroduction sites. However, the recommendation was made that the *Southern Rockies Wolf Restoration Project* provide resources and funding to complete this analysis.

Legal, Political and Policy Aspects

The first goal identified by the Legal, Political and Policy Aspects Working Group was to encourage federal and state agencies to realign policy to foster wolf recovery in the southern Rockies and implementation of recovery if Service planning concludes that such action is appropriate. They concluded that the most viable route for realizing this objective is to modify the proposed reclassification rule to include either a southern Rockies DPS or by reconfiguring the proposed southwestern DPS to include all of Colorado, Utah, Arizona, New Mexico, and that portion of Texas delimited by the current proposal

Recognizing that wolf recovery is a fundamentally political issue, the second goal the working group identified was to empower a constituency to build political support or acceptance that will enable recovery of wolves in the southern Rockies. Strategies designed to achieve this goal include:

- develop approach for engaging rural and urban populations in discussions about wolf recovery in the southern Rockies
- develop approaches for integrating tribal lands, resources, and support for wolf recovery in the southern Rockies
- develop comprehensive campaign for demonstrating local, regional, and national support for wolf recovery in the southern Rockies
- develop campaign for alerting key elected officials and local and regional operatives (including good guys) to the specific needs for modifying the reclassification rule to include serious consideration of wolf recovery in the southern Rockies
- develop a sense of public perception of wolf recovery in the region
- develop effort to expose key formal and informal decision makers to information about the successes and reality of wolf recovery

Human Dimensions and Economics

The Human Dimensions and Economics Working Group addressed issues regarding the concerns, interests, and educational needs of the interested/affected public with regard to wolf restoration. The diverse backgrounds of the working group members contributed greatly to the thoughtful discussion and resulting recommendations surrounding these issues. The group recognized that a lot of attention is typically focused on the biological aspects of wolf reintroduction, but that reconciling divergent human values and attitudes may be the most difficult challenge to wolf recovery. Of particular importance to the group was the need for a more concerted and sustained effort to communicate clearly and consistently with the public regarding plans to restore wolves and the implementation of those plans. The overarching philosophy of this communication is the need for mutual learning and teaching among all affected parties. Further, communication skills for all officials dealing with interested/affected parties must be honed to address the emotional needs of the people with whom they interface. Economic impacts as well as perceived risks to lifestyle and safety must be addressed. Finally, the recent experiences of other wolf recovery programs formed the basis of some innovative ideas regarding incentives for landowners and livestock operators to act as stewards for wolves. The Human Dimensions and Economics Working Group developed a set of goals that are listed below. The working group report (See Section 5 of this document) contains specific action steps designed to achieve these goals.

Education and Information Sharing

Education needs to be a two-way process of mutual learning and teaching.

Education should be based on the best available information. Declarative statements that prove to be untrue build distrust and cause the loss of credibility.

Recognize and respect that there are diverse viewpoints, and seek common interests and shared goals (e.g., wolf advocates should work with livestock producers to minimize or mitigate negative impacts of wolf reintroduction).

Relationship-Building and Cooperation

Ensure a format where all affected parties can be heard.

Ensure that people feel that their concerns are being taken seriously (feel validated rather than patronized).

Involve local people in planning, implementation and monitoring whenever possible.

Improve interpersonal relationships and build trust between managers and affected individuals.

Use an understandable (non-technical) format when communicating information to affected parties.

Mitigation

Emphasize proactive measures to reduce losses through incentives, and use reactive programs (such as compensation and wolf control/manipulation) when needed. It may be more economical and successful in the long-term to invest in proactive efforts as much as possible.

Expand compensation for individuals willing to work with wolf recovery efforts (e.g., through tolerance and willing to make changes in husbandry to accommodate the presence of wolves). Paid fair (true) compensation for costs associated with wolves.

Reform public lands grazing policy to promote flexibility in using proactive methods to reduce wolf depredation on livestock and promote successful wolf recovery.

Reduce risk of loss of hunting opportunities by hunters.

Dispel myths about wolf behavior and the risk that they pose to humans. Address and alleviate the concerns of people that wolves will attack them.

Avoid habituation of wolves to humans, which will reduce the likelihood of attack. Wolves generally have a low tolerance of humans, but habituated wolves are much more likely to come into conflict with humans and are the primary source of negative interactions.

Recognize and respond to the emotional impacts of a traumatic encounter with wolves or the loss of a pet/special animal.

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SECTION 2

Workshop Invitation and Invitation List

Wolves in the Southern Rockies
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SECTION 4

Biological Aspects Working Group Report

Biological Aspects of Wolf Recovery in the Southern Rockies Ecosystem Working Group Report

INTRODUCTION – REASON FOR GATHERING & ISSUES IDENTIFIED

> *Complete objectivity about one's own work is a little much to expect from a human being, even a scientist, but it is not too much to expect from one's colleagues.*
> Efron, 1986

Our charge is to address the biological aspects of gray wolf reintroduction to the Southern Rockies Ecoregion, hereafter referred to the SRE. Specifically, we reviewed the following:

A. Pre-reintroduction/Reintroduction Phase
   Ecological Rationale for wolf restoration to the SRE
   Most appropriate means for recovery (e.g., mechanics, techniques)
   Modeling demographic viability
   Wolf conflicts (e.g., humans, livestock)
   Population/Community/Landscape effects
   Time frame for beginning recovery (e.g., urgency of need, when to begin?)

B. Monitoring
   Techniques for evaluating population size and distribution
   Develop, refine models for application elsewhere
   How should success be evaluated?
   Land use changes (e.g., identify projected changes, model effect of changes on wolves)

BIOLOGICAL JUSTIFICATION OF WOLF RESTORATION IN THE SOUTHERN ROCKIES ECOREGION

> *To keep every cog and wheel is the first precaution of intelligent tinkering.*
> Aldo Leopold

Intact ecological systems are characterized by the diverse species that inhabit them and the ecological functions and processes that link species to their environment (e.g., fire, predator-prey relationships). Ecosystems may continue to exist long after species have been lost and natural relationships have been altered or destroyed. However, most conservation scientists believe such impoverished systems are at risk and do not typify healthy environments. Although the point can be overstated, we believe the presence of a self-sustaining population of gray wolves is indicative of the healthiest ecosystems. Wolves are important apex predators whose presence would help restore top-down regulation of food chains and reduce unnatural levels of use of vegetation by ungulates and other prey species. Accordingly, the reintroduction of wolves into the Southern Rockies Ecoregion would enhance the ecological health of the region. Thus, biological considerations provide ample justification for reintroducing wolves into the SRE.

RESTORATION GOALS

1. Establish a viable population of *Canis lupus* (grey wolf) in the Southern Rockies Ecoregion (SRE) by introducing *Canis lupus baileyi* (Mexican wolf) to the southern portion of the SRE and *Canis lupus occidentalis* to the northern part of the SRE.
2. Restore free-ranging and well-connected gray wolf populations to their ecological role in suitable habitats throughout the SRE.
3. Wolf reintroduction efforts must focus on both restoration of the natural environment and meeting human needs, while reducing the potential for one to seriously encroach upon the other (*Dave Parsons 1995, Spain*).

BIOLOGICAL TIMEFRAME

The SRE is experiencing unprecedented human population growth and related development throughout the ecoregion. While much of the existing fabric of public lands will likely remain available, private lands are being developed at an unprecedented rate that will inevitably lead to ongoing and significant degradation of the landscape. Therefore there is an urgency to restore wolves to the ecoregion as soon as possible.

Activities on private and public land that can lead to general landscape degradation include (SREP 2000):

- Recreation (e.g., snowmobiling)
- Logging
- Mining
- Oil & gas
- Development – impacts to adjacent public lands.
- Roads
- Invasive Exotics
- Loss
- Alienation
- Displacement
- Fragmentation

> *God put the wolves here. The government took them away. Whose side are you on?*
> Gus Buder III, 2000

The public lands are protected as potential core areas through their ownership. However, the biological contribution of each segment of public land varies according to different management and protected status, and proximity to private lands. Continuing degradation of the landscape, including the habitat value of public lands is occurring due to rapid development of private lands and the indirect effects on both public and private lands in the SRM. The projected development of many private lands is detailed in SREP (2000). Such development creates an urgency to prepare the current and future human inhabitants and wolves for co-habitation of the ecoregion. This could lead to important changes in people and land management.

There are many private lands that could qualify as core habitat or high quality buffers. However, those properties are being changed to higher impact conditions. In conclusion we have identified an urgency that is created by diminishing opportunities for successful wolf reintroduction. Those opportunities are decreasing at an unprecedented rate.

We realize that there may be non-scientific reasons that create urgencies (e.g., political or social reasons). Other groups should deal with these issues.

[Write the specific actions in response to the above paragraphs.]

WOLF RESTORATION ISSUES ADDRESSED

> *The validity of an argument does not guarantee the truth of its conclusion.*
> Copi, 1954

A. Which Wolves are Appropriate Reintroduction Stocks for the Southern Rockies Ecoregion?

The Mexican gray wolf has been traditionally defined as a subspecies *(Canis lupus baileyi*) of the gray wolf that inhabited the American southwest and adjacent Mexico. Nowak (1995) recognized *C. l. baileyi* as inhabiting southeastern Arizona, southern New Mexico and western Texas with a range bounded to the north by *C.l. nubilus*. To accommodate other taxonomic treatments and the dispersal behavior of wolves, the Mexican Wolf Recovery Team extended Nowak's depiction of the range for *C. l. baileyi* 200 miles northward (Parsons 1996). However, recent genetic evidence suggests that the genetic diversity of wolves is better characterized as a pattern of differentiation with distance rather than being delimited by subspecific geographic boundaries (Forbes and Boyd, 1997). Consequently, gray wolves that inhabited the southern Rocky Mountains were likely close genetic relatives of the Mexican wolves that historically inhabited nearby areas of New Mexico and Arizona.

For several reasons, the Mexican wolf is the most appropriate wolf to use as a reintroduction source to the southern Rocky Mountains. First, the habitats and prey base in the southern Rockies are ecologically similar to both that existing in the northern historic range of the Mexican wolf and the present range of the reintroduced population. Second, the Mexican wolf is the closest geographic source of wolves to southern portions of the SRM ecoregion (although 6 of 7 founders of all known Mexican wolves are from Mexico and the 7th is from extreme southern Arizona). Third, the Mexican wolf is the most endangered subspecies of gray wolf and would therefore greatly benefit from this additional reintroduction area.

Two other potential sources of wolves for reintroduction exist. One potential source is *C. l. occidentalis*, now established in Wyoming (although the source of this population is from Canada). These wolves may be an appropriate source stock for the northern part of the southern Rocky Mountains. However, these wolves are not nearly as endangered as Mexican wolves and their source is quite distant from the southern parts of southern Rocky Mountains. The other potential source is *C. l. nubilis* which is well established in Minnesota. Although this subspecies formerly inhabited the southern Rocky Mountains (Nowak, 1995), these wolves are an inappropriate reintroduction source for three reasons: the Minnesota populations are

geographically quite distant from the Rocky Mountains, they may have ancestry from other canids (Roy et al., 1994; Wilson et al., in press), and they are ecologically divergent from wolves that historically inhabited the southern Rocky Mountains (e.g., Mech and Frenzel, 1971).

For the above reasons, we believe that the most appropriate initial source of wolves for reintroduction into the southern Rocky Mountains is *C l. baileyi*. The first priority should be the establishment of this critically endangered subspecies in the southern part of this ecoregion. The second priority should be establishment of *C. l. occidentalis* into the more northern part of this region. Eventually, a clinical genetic differentiation from *C l. baileyi* in the south to *C. l. occidentalis* in the north, with a transition zone area in the southern Rockies Mountains, would be established. This would serve to provide a genetic gradation similar to that found ancestrally in gray wolves from south to north in this region.

B. Preparing For, Monitoring, And Evaluating Recovery

Specific predictive modeling objectives

- Assess the inherent capability of the region to support wolves;
- Identify and quantify the areal extent of key habitats (i.e., habitats most important for wolves);
- Identify landscape linkages that connect key habitat patches;
- Assess changes in key habitats, landscape linkages, and the surrounding landscape that have or might occur over time as the result of natural disturbance regimes (e.g., fire, natural succession);
- Assess changes in key habitats, landscape linkages, and the surrounding landscape that have or might occur over time as the result of human caused disturbances (e.g., physical structures, activities);
- Assess the effect of human-induced habitat fragmentation using the following indicators;
  - changes in the distance between patches of important habitats (proximity),
  - changes in the number of isolated habitat patches (i.e., the number of fragments)
  - changes in the size of important habitat patches (area)
  - changes in relative position of important habitat patches (juxtaposition, dispersion),
  - changes in shape of important habitat patches (geometry)
  - changes in quality of the landscape matrix that separates habitat patches
- Quantify the past, current, and future effectiveness of key habitats and linkages (i.e., inherent capability minus effects of human use)
- Assess the quality and security of travel routes that connect important habitats (connectors);
- Identify safe travel opportunities between important habitats. This includes identification of latitudinal and elevational travel opportunities that might occur in response to seasonal change;
- Identify opportunities to assure dispersal and population exchanges, which can potentially counteract the isolating effects of regional fragmentation.

Techniques for Monitoring Population Size and Distribution: Recommendations

Radio collaring

- All released animals should be radio collared;
- Frequent monitoring at minimum of once weekly; increase frequency during denning, of newly released animals, of dispersers and of wolves near conflict areas.
- Data need to be feed into GIS for monitoring home range and movements.

DNA monitoring with most appropriate technique

- All released wolves are DNA fingerprinted before release;
- As opportunity presents itself, DNA fingerprint wolves born in the wild;
- Bank DNA samples for future reference;
- Track individuals through scat/hair DNA sampling.

Monitoring wolf-prey interactions

PAUL'S TEXT GOES HERE

Objective: monitor changes of prey demographics, distribution and abundance on selected sample prey populations.

Techniques:

- Herd composition counts
- Radio telemetry
- Wolf scat analysis for DNA and content (hair, etc.)
- Emphasize sample populations with long-term data
- Account for factors other than wolves that contribute to prey population changes; relate this to local and landscape change monitoring.

Note: Must consider protocols for and/or impacts of disease monitoring, pre-release monitoring of canids in the area, e.g., chronic wasting disease

How to Evaluate Results?

Set the benchmarks with the expectation for success.

1. Frequent field team meetings; begin early on.

2. Annual project review
   - Internal and/or external review
   - Compare benchmark predictions
   - Evaluate effectiveness of techniques used, e.g., supplemental feeding, timing of release, length of time in pens, etc..
   - Evaluate wolf survival/mortality, reproductive success, population size, distribution.

3. Three-year intensive program evaluation (go/no go emphasis)
   - With external reviewers
   - Same measure as one year review
   - Determine need for new or different techniques (assess and adapt)
   - Determine date of next intensive evaluation
   - Use risk-assessment models such as "Patch" to determine timing for next intensive evaluation.

The development of a monitoring protocol must explicitly include discussions on the make-up and effectiveness of a wolf field crew as well as a review body responsible for suggesting appropriate modifications to the crew. In other words, the whole process is iterative and adaptive.

C. Wolf Conflicts

Proactive approaches

General Education

- Synthesis of wolf biology literature from diverse sources (e.g., incl range science) and make it readily available to public (e.g., Internet, publications, etc.)
- Urban./suburban education – assure that the information is scientifically accurate.

Hunting

- Notification during hunting season that wolves are in the area
- Wolves vs. coyote shooting/hunting – require legal mechanism for monitoring effects
- Hunter education

Livestock Husbandry

- Change livestock type where feasible (e.g., bison)
- Use incentives to allow wolves on private property (e.g, public lands access, ESA flexibility, share scientific knowledge upfront)
- Create ongoing research program to measure impacts on landowners (specific to So. Rockies)
- Need good data on all predator species, re: livestock depredation, i.e., what is the current level of depredation? (quantify to generate baseline data)
- Carcass management
- Research additional suggested preventative measures (e.g., fences, dogs), specific to SRE
- Publish findings and make available through journals and newsletters e.g., esp. range science and livestock industry circles)
- Get livestock industry involved in more self regulation of wolves
- Transfer of grazing "rights" – modeled after transfer of development rights
- Information exchange program from ranchers that are practicing predator-friendly ranching.

Modeling

- Model potential denning sites
- ID conflict areas thru modeling

Criteria for Wolf Control

- Must be reassuring to the public
- Must create reporting mechanisms
- Must have predetermined control protocols (e.g., killing or moving)

What constitutes a problem wolf? (Real or perceived threats to humans/property)

- Depredating or threatening to livestock
- Repeats habits
- Habituation (need to educate people about ways to prevent/avoid this problem)
- Diseased
- Urban wolves

Related issues (problems for wolves):

- Wanderers (e.g., to other suitable habitat)
- Drastic habitat changes

Many of the proactive measures listed above will also be reactive. Moreover, it is important to specify that all of the measures listed above will also need to be adaptive as new information becomes available.

D. Population, Biological Community, Ecosystem, And Landscape Changes

Changes in Populations

Wolf/prey interactions (all prey)

- Elk,* deer,* bighorn,* beaver, turkey, bison, black bear, pronghorn, grouse (T&E - Gunnison), small mammals
  *most heavily impacted (restructuring of herds)

Potential competitive interactions

- Canids, ursids, felids, mustelids, possibly large predatory birds

Actions ***for above include: ranking the likelihood of influence to individual species, model, monitor, research (what types of interactions?)***

Hybridization/gene flow

- Inbreeding
- Coyotes
- Dogs
- Mexican/gray (refer to statement earlier in this report)

Actions: augmentation, maximum number/genetically diverse founding population, monitoring/collection (useful technique for inbreeding and hybridization)

Changes in Biological Communities

- Loss of overall biomass (loss of biomass in larger species)
- Dampening population oscillations in ungulates
- Increased selection/improved fitness of prey species
- Relative increase in smaller prey species (due to less competition, less meso-predators)
- Decrease in other large predators, mesopredators (overall decrease, some individual spp. could increase)
- Biodiversity increase (in patterns and abundance)

- Benefits to scavengers
- Increased stability (redundancy increased), resistance, and resilience
- Changes in food web

Changes in Ecosystems
- Move closer to within range of natural variability
- More variability
- Vegetation change
- Changes in energy flow, hydrology
- Increased system stability, resistance, and resilience

Changes in Landscapes
- Same changes as above taking case at broader scales
- Occurring over multiple spatial and temporal scales
- Presence of wolves will alter landscape parameters

Actions for the above
Identify predicted versus known changes
Model, monitor changes

E. Demographic and Landscape Modeling of Wolf Restoration in the Southern Rockies Ecoregion

> *There are three rules for creating a model. Unfortunately, nobody knows what they are.*
> JWH and W. Somerset Maughan

First goal: Provide insight for identifying the most favorable areas for wolf reintroduction within the SRE.

Accomplishments of this meeting: Provide a method for achieving this goal.

Generalized Model Descriptions

1. Random walk model
   - *Focus*: local population dynamics
   - *Data requirements*: modest
   - *Model structure*: simple

We employed a population viability analysis that has been used to assess the viability of numerous endangered species and small populations including the whooping crane, California condor, Yellowstone grizzly bear and many others (Dennis et al. 1991; Foley 1994). This method also emphasizes an important, but often overlooked component of population viability, namely annual fluctuation in population size (FPS). For example, it is possible for an isolated population with a positive average growth to exhibit high levels of extinction risk, if FPS is too great. Any complete assessment of population viability must consider the impact of FPS. In addition, this method provides an independent means of evaluating the results obtained from *VORTEX*.

This analysis begins by making the assumption that the study population is isolated from other wolf populations. Although technically incorrect, an analysis based on this assumption reveals what could happen if the study population became isolated. Presumably, if the population were viable it should have reasonably low extinction risk even if isolated from other populations.

This population viability model is based on a simple, yet robust, mathematical expression of population dynamics:

$$N_{t+1} = N_t R_t,$$

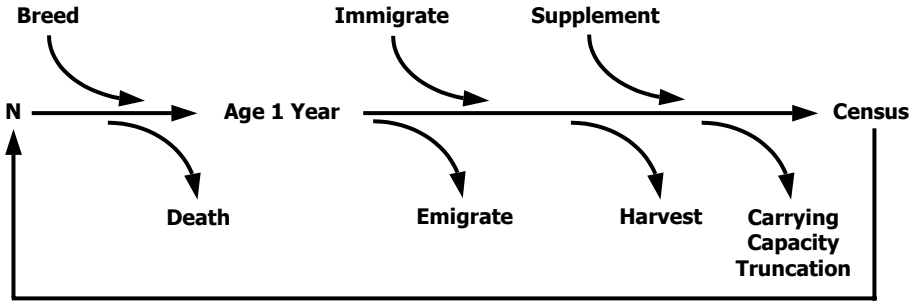
where N_t is the population size or density in year t and R_t is the annual finite rate of population increase. If R_t is, on average, greater than one, the population grows; and, if R_t is, on average, less than one the population tends to decline. Because the statistical properties of R_t are complex, it is difficult to assess whether R_t tends to be greater than or less than one. The acceptable approach for circumventing these statistical difficulties is to consider the log-transformed population dynamics. Therefore, let the natural logarithm of N_t (i.e., $\ln[N_t]$) be denoted as n_t. By following the algebraic rules for manipulating logarithms, the dynamics of the above equation are equivalently expressed as: $n_{t+1} = n_t + r_t$, where r_t is properly modeled as a normally distributed random variable with mean μ and variance σ^2. If maximum population density or carrying capacity (K) and current population size (N_0) are specified, the mean time to extinction (MTE) can be predicted according to Equation 8 of Foley (1994:126). We use this equation to explore the effect of FPS on the MTE of an isolated population with demographic parameters comparable to that of the study population. In this model, FPS is characterized by σ^2. As σ^2 increases, so does FPS.

2. *VORTEX*
   - *Focus:* local scale & meta-population dynamics
   - *Data requirements*: complex
   - *Model structure*: complex

The *VORTEX* computer program is a simulation of the effects of deterministic forces as well as demographic, environmental and genetic stochastic events on wildlife populations. It is an attempt to model many of the extinction vortices that can threaten persistence of small populations (hence, its name). *VORTEX* models population dynamics as discrete, sequential events that occur according to probabilities that are random variables following user-specified distributions. *VORTEX* simulates a population by stepping through a series of events that describe an annual cycle of a typical sexually reproducing, diploid organism: mate selection, reproduction, mortality, increment of age by one year, migration among populations, removals, supplementation, and then truncation (if necessary) to the carrying capacity. Although *VORTEX* simulates life events on an annual cycle, a user could model "years" that are other than 12 months duration. The simulation of the population is iterated many times to generate the distribution of fates that the population might experience.

VORTEX is an individual-based model. That is, it creates a representation of each animal in its memory and follows the fate of the animal through each year of its lifetime. *VORTEX* keeps track of the sex, age, and parentage of each animal. Demographic events (birth, sex determination, mating, dispersal, and death) are modeled by determining for each animal in each year of the simulation whether any of the events occur. (See figure below.)

VORTEX Simulation Model Timeline



Events listed above the timeline increase N, while events listed below the timeline decrease N.

VORTEX requires a lot of population-specific data. For example, the user must specify the amount of annual variation in each demographic rate caused by fluctuations in the environment. In addition, the frequency of each type of identified catastrophe (drought, flood, epidemic disease) and the effects of the catastrophes on survival and reproduction can be specified if desired. Rates of migration (dispersal) between each pair of local populations must be specified. Because *VORTEX* requires specification of many biological parameters, it is not necessarily a good model for the examination of population dynamics that would result from a more generalized life history. It is most usefully applied to the analysis of a specific population in a specific environment.

Demographic rates are described as constants specified by the user. Although this is the way the program is most commonly and easily used, *VORTEX* does provide the capability

to specify most demographic rates as functions of time, population density, specific characteristics of individuals, or other parameters.

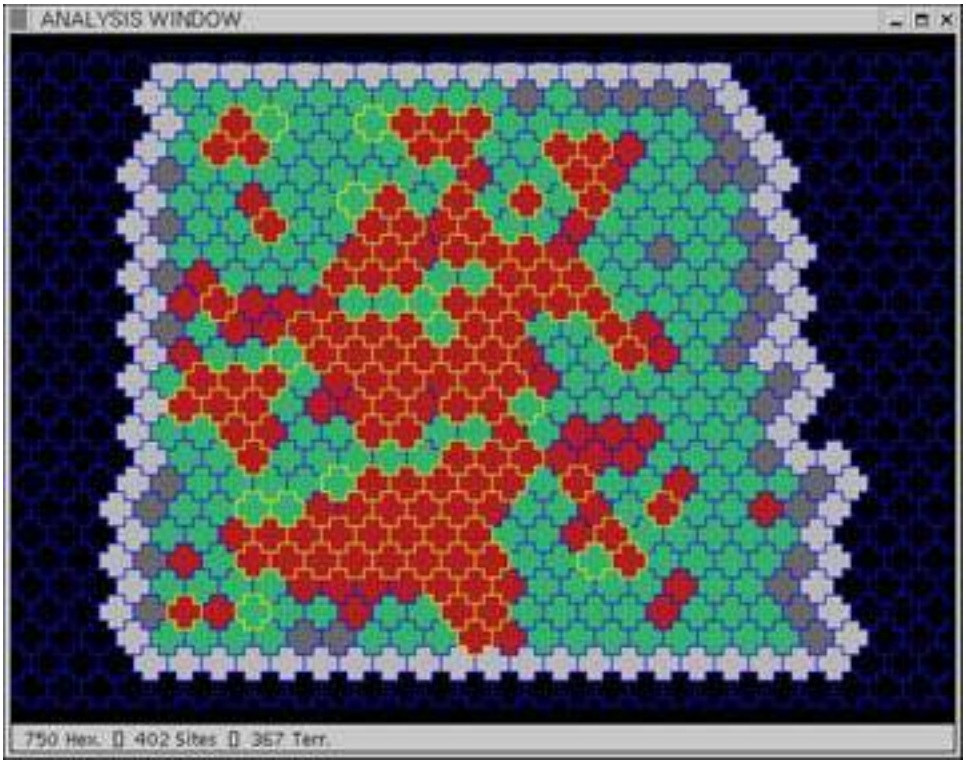
3. *PATCH* (*in development*)
   - *Focus:* landscape level dynamics
   - *Data requirements*: complex
   - *Model structure*: complex

   Large carnivores such as the gray wolf may be particularly sensitive to landscape configuration because of their low population densities and large area requirements. Because regional-scale dynamics characterize population processes in these species, regional-scale predictive habitat models can be useful management tools for prioritizing restoration efforts. One approach to predicting regional habitat suitability involves combining GIS data on different components of habitat suitability, which in the case of the wolf might include spatial data on the level of prey availability and human-associated mortality risk (Martin et al. 2000 and this volume). These can be termed static habitat models as they provide a snapshot of habitat quality and potential population distribution. A second approach, exemplified by VORTEX and other non-spatial viability models, is to use summary information on habitat characteristics to predict carrying capacity and other habitat-related parameters (Lacy 1993 and this volume). This information in then combined with demographic and genetic data to predict viability over time, i.e. in a dynamic model.

   Combining both spatial habitat information and demography data in a dynamic model produces what is termed a spatially-explicit population model (SEPM). Here we apply a SEPM model called PATCH (Schumaker 1998) that has been adapted to account for wolf social structure and pack dynamics (Carroll et al. in prep.). This model can be used to evaluate area and connectivity factors that influence the probability that a patch of suitable habitat will remain occupied by a species over time, and can help predict long-term viability, source-sink behavior, and dispersal. PATCH links the survival and fecundity of individual animals to the GIS data on mortality risk and habitat productivity measured at the location of their pack territory. The model tracks the demographics of the population through time as individuals are born, disperse and die, predicting population size, time to extinction, and migration and recolonization rates. Figure 1 shows territory distribution across the analysis area (Colorado portion of the southern Rockies ecoregion). Red areas are occupied at the particular year shown, while green areas are vacant pack territories.

   <u>Limitations of the PATCH analysis</u>
   Spatially-explicit individual-based models are often sensitive to errors in poorly-known parameters such as dispersal rate. Although the output of the SEPM must therefore be subject to extensive sensitivity analysis, it provides qualitative insights into factors, such as variance in population size, that are difficult to explore using static spatial models. However, static habitat models and non-spatial demographic viability models will often be useful in providing robust results especially when data on species' demography and habitat associations are limited.

Figure 1. PATCH simulation display for Colorado wolf viability analysis.



4. Wolf-specific model of population viability (*in development*)
   - *Focus:* local scale & meta-population dynamics
   - *Data requirements & model structure*: well-tailored to current knowledge of wolves

Viability Modeling Approach

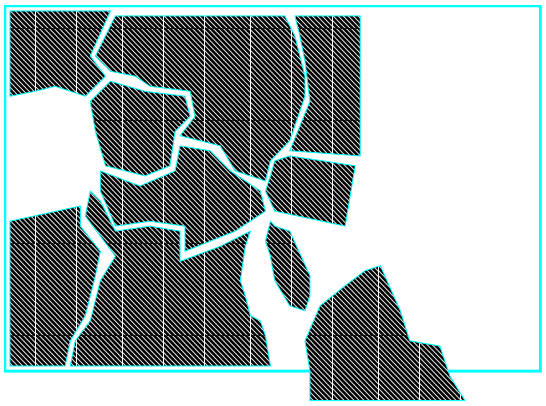
A. Divide SRE into subregions based on centers of potential wolf habitat.
B. Predict the viability of a reintroduced wolf population within each these subregion.
C. Rank the regions from most favorable to least favorable.

A. Division of SRE into subregions

Subdivision based on:
- Empirical habitat models (GIS models)
- Modified by expert knowledge of local regions

Criteria for potential wolf habitat:
- Prey abundance and availability
- Land ownership
- Road density
- Topography
- And others…

Figure 2. Schematic example of subregion designation within the state of Colorado.

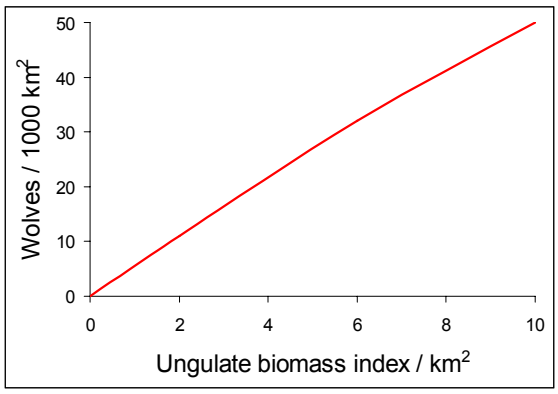


B. Prediction of the viability of a reintroduced wolf population within each subregion.

General approach: predict wolf viability based primarily on ungulate abundance.
Procedure:

1. Calculate ungulate (e.g., elk and deer) abundance in each subregion.
2. Convert abundance to an ungulate biomass density (deer-equivalents per unit area)
3. Convert ungulate biomass density to wolf density (see Figure 3 below)

Figure 3. Schematic representation of the relationship between the density of ungulate biomass and wolf density, taken from Fuller (1989).



4. Convert wolf density to wolf carrying capacity (*K*) within each subregion. Carrying capacity is the predicted maximum number of wolves that can be supported.
5. Predict wolf population viability within each subregion based on *K* (and other aspects of wolf demography)

Habitat data used in the analysis
GIS information on habitat attributes was graciously provided by Bill Martin and the Southern Rockies Ecosystem Project. Data acquisition is currently complete for the Colorado portion of the Southern Rockies Ecoregion and is in the final stages for adjacent

portions of New Mexico and Wyoming. Incorporation of this additional data would obviously provide more accurate predictions concerning reintroductions initiated at Vermejo Park Ranch, which lies primarily in New Mexico and has been suggested by some individuals as a potential reintroduction site.

GIS data layers used in the PATCH analysis include those used to measure potential fecundity as based on prey availability:

1) Summer ungulate prey density (kg meat/km^2)
2) Winter ungulate prey density (kg meat/km^2)
3) Slope

Average annual prey density was derived as an average of seasonal prey availability. More complex metrics that weight winter prey availability more heavily may be warranted, although it appears from sensitivity analyses that use of winter prey data in place of an annual average does not greatly affect results. Slope was used as an inverse measure of prey accessibility to wolves, which tend to avoid rugged terrain (Carroll et al. in review).

Road density was used as a surrogate for potential mortality risk. Future analyses might incorporate additional information on human population density (e.g., as in Merrill et al. 1999 and Carroll et al. 2001). Potential future mortality risk was assessed assuming a 50% proportional increase in road mileage outside of protected areas and inventoried roadless areas. This approximates an annual increase of 2% to 2020 or 1% to 2038. Future analyses would benefit from more complex models to predict future development trends (e.g., Theobold 2000).

Description of PATCH runs

The options used in the PATCH model were as follows:

1) Territory size: 500 km^2. This includes interstitial areas, and therefore is larger than would be average pack territory as measured by a home range estimator (e.g., adaptive kernel and minimum convex polygon).
2) Dispersal behavior incorporated knowledge of optimal habitats (see Schumaker 1998) and medium site fidelity. Maximum dispersal distance was 5 home range diameters (~60 km). Dispersal distance in PATCH does not show the long-tailed distribution seen in real wolf populations, so maximum dispersal distance should be set as closer to mean dispersal distance in PATCH than in real populations.
3) The Leslie matrix took the form shown below in optimal habitat (Table 1). This is based on wolf demography data from other regions (e.g., Ballard 1987, Fuller 1989). Because PATCH scales demographic rates to habitat quality, most territories will have survival and fecundity rates lower than those shown here. Note fecundity is reported as female pups per pack. Minimum adult fecundity was 1.15 and minimum adult survival was 0.38.
4) One hundred replicate simulations were each run for 100 years for each of the scenarios. Initial population size was varied between 11 or 20 breeding pairs released from Vermejo Park Ranch. Habitat quality was varied from current condition to that of the year 2020, and area was varied from the entire Colorado portion of the ecoregion to southern Colorado only. Resulting data produced by PATCH included

population size over time, ending distribution for wolf packs, and source/sink characteristics of occupied habitat (Table 2).

Table 1. Demographic matrix used in PATCH model runs. Age refers to age of individuals in years. Numbers in row 2 indicate annual female fecundity rates, while those below the table diagonal indicate annual survival rates.

Age	0	1	2	3	4	5	6	7	8	9
	0	0	2.0	2.8	2.8	2.8	2.8	2.8	2.8	1.0
0	0.4									
1		0.75								
2			0.80							
3				0.80						
4					0.80					
5						0.80				
6							0.80			
7								0.80		
8									0.60	
9										0.40

Table 2. Example of the calculations used to conduct analysis to identify favorable subregions for wolf reintroduction into the Southern Rockies Ecoregion.

								3 metrics of viability		
								Local Scale	Landscape scale	Meso-scale
								Random walk	Patch	Vortex
	Region	area (km2)	number of elk	number of deer	Ungulate index per km2	wolf/ 1000km2	wolf K	Prob of extinction (100 years) -- local populations	Relative Proportion of time a patch is vacant	Prob of extinction (100 years) -- metapop'n
	A	1830	1,551	18,838	14.53	19.06	35	40%	77%	87%
	B	5607	4,837	10,785	6.24	8.83	49	34%	86%	78%
	C	7785	3,278	20,275	4.71	6.94	54	34%	84%	76%
	D	10990	8,399	27,466	6.32	8.93	98	23%	93%	51%
	E	18809	20,385	55,238	8.36	11.44	215	14%	67%	26%
	F	9322	26,620	80,829	22.95	29.44	274	11%	3%	24%
	G	21854	29,384	68,087	9.84	13.27	290	12%	0%	20%
	H	7935	46,199	18,192	31.40	39.86	316	11%	no data	21%
	I	22009	33,786	70,940	10.90	14.58	321	13%	49%	20%
	J	30030	40,563	65,399	8.93	12.15	365	9%	30%	18%
	TOTALS:	**136,171**	**215,002**	**436,049**			**2,018**			

The PATCH simulations showed the following results (Table 3) when initial population and habitat configuration were varied (i.e. scenarios A – E below) as part of a proposed larger sensitivity analysis:

Table 3. Results of PATCH simulations of wolf reintroduction to southern Rockies. Probabilities of population survival are presented for a 100-year timeframe.

Scenario	Breeding pairs released	Habitat quality as of year	P(Survival)
A	11	2000	0.45
B	20	2000	0.92
C	11	2020	0.17
D	20	2020	0.56
E	20	2000 (So. CO only)	0.84

Population trajectories for scenarios B and C are shown in figure 4. PATCH is currently being revised due to some inaccuracies in how it records the number of pups and yearlings, so figures should be used for comparative purposes and do not give the exact population size. The predicted distribution of wolf packs under scenario B is shown in figure 5. Darker green indicates a higher probability of occupation of an area by wolves. Distribution of demographic sources and sinks under scenario B is shown in figure 6. Green areas are sources and red areas are sinks, with darker colors indicating stronger sources or sinks. Note that the strength of source or sink behavior depends not only on habitat quality but on adjacent areas. An area of moderate mortality risk that is adjacent to a strong source of dispersers will appear as a stronger sink than a more developed area that has high mortality risk but few dispersing wolves. Gray areas are not occupied or are outside the analysis area. Roadless and protected areas are outlined in blue. County lines are shown in black for reference.

Figure 4. Population trajectories for wolves reintroduced from Vermejo area under scenario B (left figure) - 20 breeding pairs under current landscape conditions, and scenario C (right figure) - 11 breeding pairs under future landscape conditions.

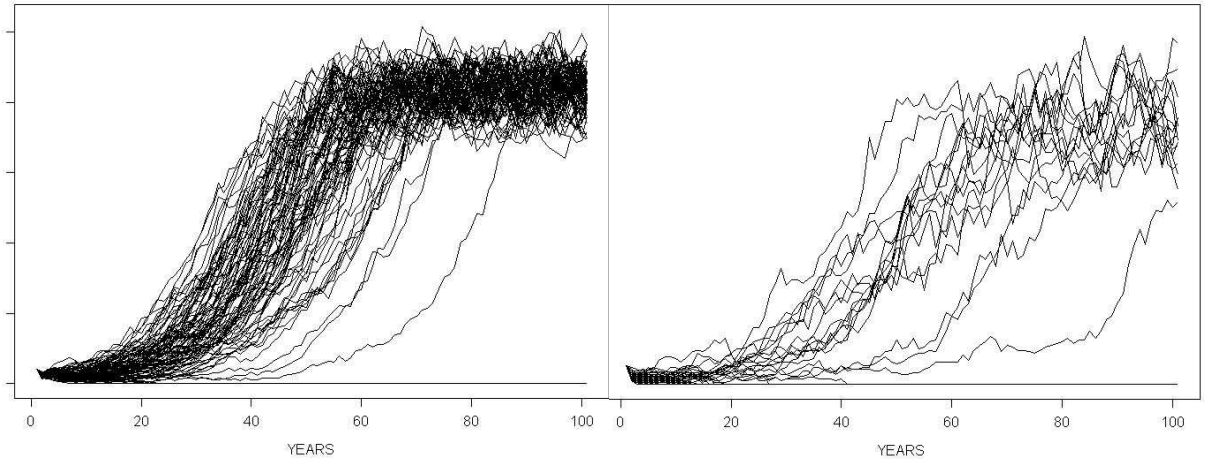


Figure 5. Predicted distribution at year 100 of wolf packs in west/central Colorado under reintroduction scenario B. Darker green areas have higher probability of occupation by wolves. Blue lines outline roadless areas.

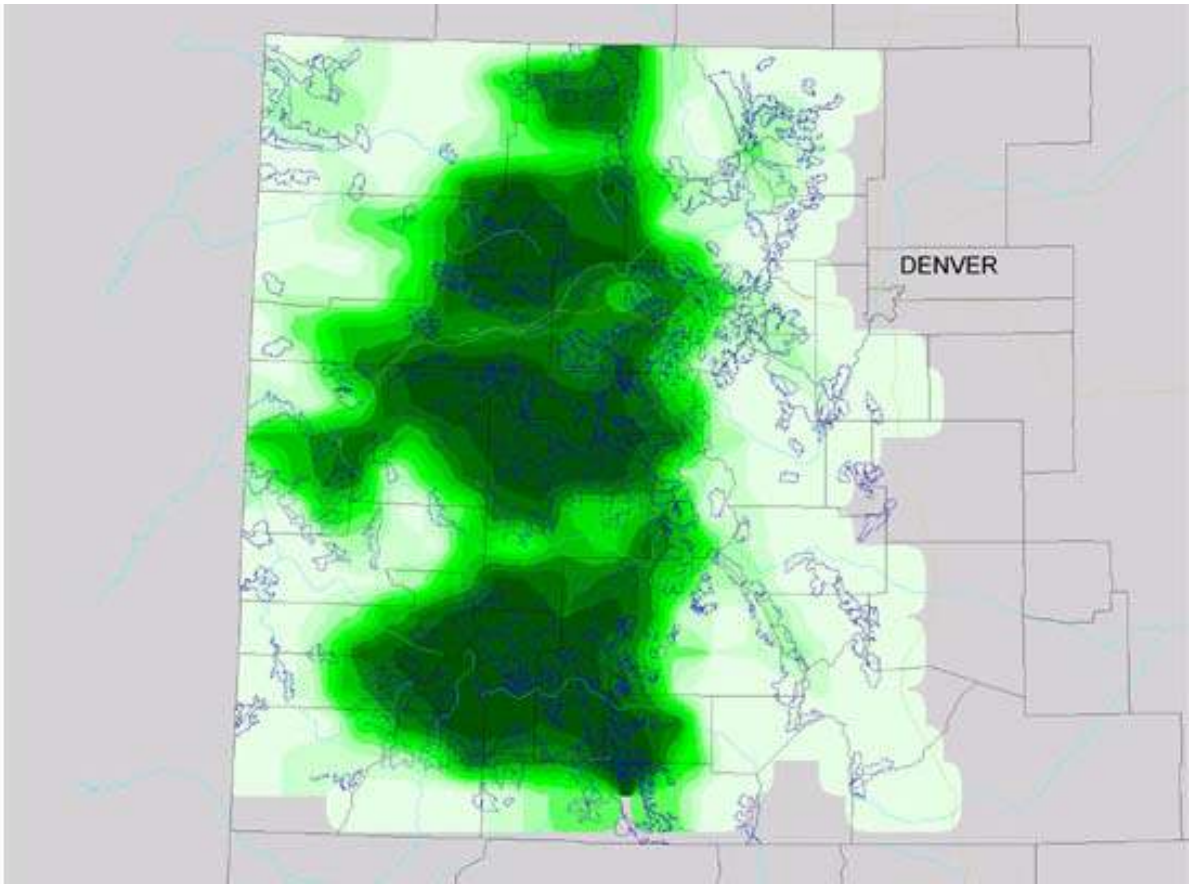
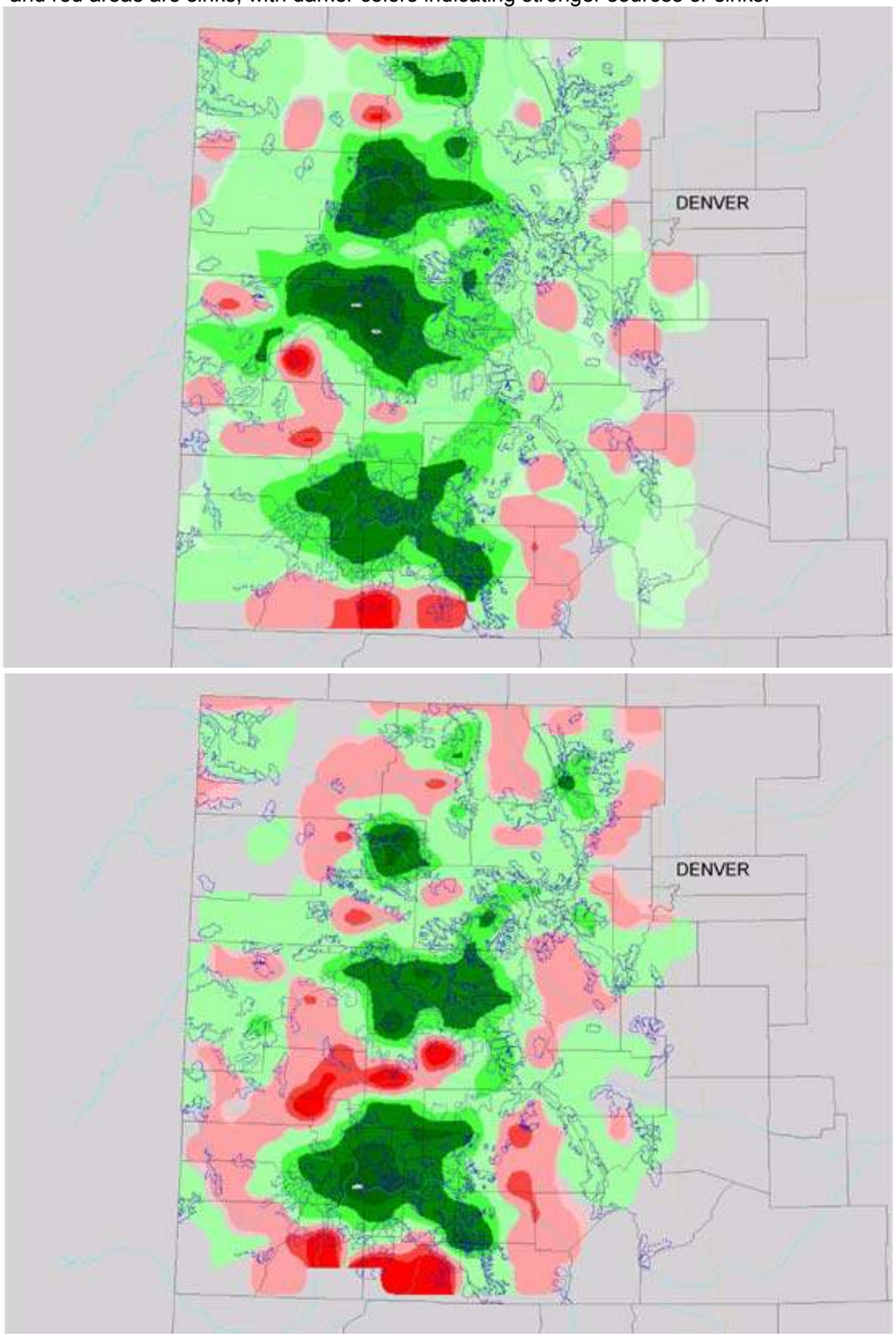


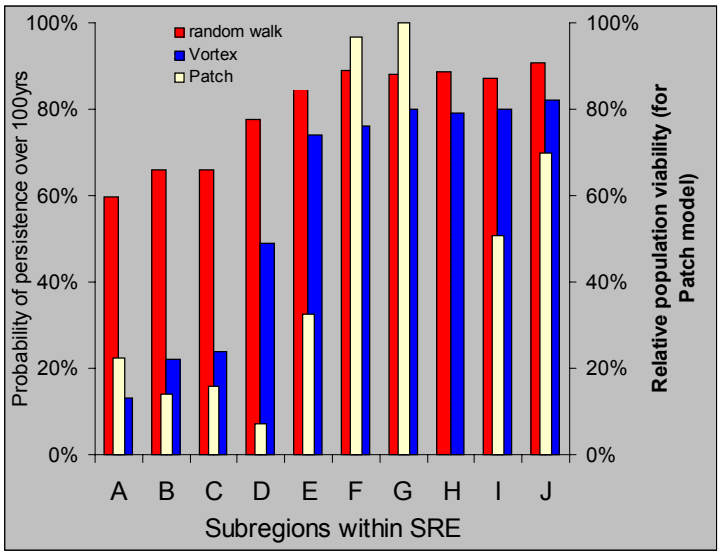
Figure 6. Distribution of demographic sources and sinks for wolves under reintroduction scenarios B [current habitat] (top) and D [potential future habitat]. Green areas are sources and red areas are sinks, with darker colors indicating stronger sources or sinks.



C. Rank the subregions according to viability

We also used the results of modeling to rank the favorability of subregions for recovering wolves (Figure 7).

Figure 7. Hypothetical example of how subregions may be rank-ordered in terms of favorable sites for wolf reintroduction.



Discussion of PATCH Model Results

The PATCH analyses described in this report were performed in the context of a three-day workshop and therefore does not incorporate the sensitivity analyses that would be necessary before the conclusions would be robust enough to be usable in conservation planning. Conclusions as described here should be seen only as suggestive as to the critical factors that potentially affect wolf viability in the region and therefore need to be evaluated before reintroduction occurs.

A full analysis would necessarily include evaluation of the sensitivity of the results to error in:

1) GIS data on habitat attributes
2) Demographic rates (fecundity, mortality) attributed to varying levels of the habitat attributes
3) Structure of the Leslie matrix
4) Mean pack territory size
5) Site fidelity
6) Search (dispersal) behavior
7) Maximum dispersal distance
8) Initial population size
9) Effects of environmental stochasticity

Sensitivity analysis of items 1 and 2 is facilitated by comparison with wolf distribution and

habitat quality in areas with extant populations such as the northern Rockies (Carroll et al. in prep.).

Although regional-scale viability analyses are a critical component of planning for reintroduction, the accuracy of regional habitat models such as these is limited by our imprecise knowledge of underlying species-habitat relationships at this scale. Although the models shown here are unlikely to provide quantitatively accurate predictions of the future size of wolf populations, they are nonetheless useful tools for qualitative comparisons between regions. The models provide a structure for considering restoration potential, in that they form testable hypotheses that can be refined in an adaptive management context based on new field research, improved modeling techniques, and data from successful and unsuccessful restoration efforts and natural recolonization events. Dynamic models such as PATCH allow us to examine long-term viability requirements for these species, which may differ from short-term requirements for occupation of habitat.

Wolves, along with many other large carnivores, have high area requirements, with thousands of km^2 required to support a viable metapopulation (Noss et al. 1996). The social structure of the wolf may make limits on habitat area even more important (Woodruffe and Ginsberg 1999), and may help explain why the wolf was the one of the first of the large carnivores to be extirpated from Colorado. However, its exceptionally high vagility also makes restoration of the wolf more probable.

The map of predicted wolf distribution (e.g. Figure 5), when compared to that shown in a static habitat suitability model (e.g., Martin et al. 2000), shows broad areas of overlap in portions of the central Rockies where large roadless areas occur. This is because both static and dynamic models appropriately emphasize the importance of mortality risk in limiting wolf distribution. Although wolves may be more demographically resilient than some large carnivores, adult survival is still of overriding importance. Differences between static and dynamic models are also evident. Predicted occupancy in some areas adjacent to large source populations is higher in the PATCH results than in the static model, as wolves there are predicted to benefit from a demographic rescue effect. In contrast, small and isolated areas of predicted suitable habitat shown in the static model (e.g., the Greater Sand Dunes) are rarely occupied in the dynamic model.

Although the model did not incorporate habitat data for New Mexico, the analysis does provide some information about designing reintroduction strategies for this area. In many aspects, Vermejo Park Ranch represents a highly favorable reintroduction site due to its large size (238,000 hectares), restricted access to humans, and high prey density. However, under the assumptions used in this preliminary PATCH analysis, long-term viability of wolves in Colorado is dependent on wolves occupying three major refugia composed of large groups of roadless public lands: the greater San Juans, Central Rockies (Maroon Bells), and Flattops (for a description of the geographic features of the Central Rockies Ecoregion see The State of the Southern Rockies Ecosystem Report which can be downloaded at http://csf.colorado.edu/srep). The strong dependence of metapopulation persistence on wolves inhabiting the three roadless refugia is linked to model assumptions concerning relative mortality risk in different habitats. These assumptions are probably

appropriate given what is known about wolf demography in other areas, but should be evaluated through sensitivity analyses.

Wolves dispersing from Vermejo will be able to reach these three areas but will likely suffer higher mortality risk in transit. In order for wolves to have a high probability of rapidly colonizing these areas in sufficient number to establish a viable population, a relatively intensive recovery effort will be necessary. This is suggested by the large increase in viability predictions for a reintroduction effort based on 20 rather than 11 breeding pairs (Table 3). This difference becomes greater as human development trends further isolate source habitat during the next 20 years. In comparing figures 4a (20 pairs released under current conditions) and 4b (11 pairs released in 2020), we can see that most extinctions in both scenarios occur in the initial colonization phase, but an earlier release of more animals insures that the population quickly attains and persists at high population levels. Encouragingly, viability is high even if only one of the three refugia, for example the greater San Juans, is occupied (Table 3). Although some connectivity with peripheral populations is lost in future landscape scenarios, the wolf metapopulation as a whole remains relatively connected and viable once it becomes established. However, the predicted increase in sink habitats in critical linkage zones such as the Gunnison valley (figure 6) highlights the need for proactive conservation planning through public lands management, habitat acquisition, and conservation easement programs. The Flattops subpopulation, for example, although having the highest prey availability of the three areas, has the smallest area and shows a marked decrease in source habitat under future scenarios. Although our results suggest a high potential for successful restoration of wolves in the southern Rockies, current development trends may foreclose options for restoration unless steps are taken soon to initiate restoration planning and protect critical habitat.

Some Important Factors (soon to be but) Not Yet Incorporated

Methodological

1) More thorough approach to defining subregions
   Approach: Work with local game managers

2) More thorough understanding of data quality for ungulate abundance among subregions
   Approach: Work with local game managers

3) The influence of wolf social structure on population dynamics
   Approach: Complete the development of a wolf-specific population model.

Future Uses of This Modeling Approach

1) Examine effect of migration among subregions/subpopulations on wolf viability.

2) Examine effect of isolation on wolf viability within each subregion.

3) Examine how viability differs in systems dominated by one versus two prey species

4) Effect of rates of habitat change on long-term wolf viability.

Conclusion of Viability Modeling Efforts

First Goal: Provide insight for identifying the most favorable areas for wolf reintroduction within the SRE.

Accomplishments: Provide a method for achieving this goal.
Recommendation: *Southern Rockies Wolf Restoration Project* should provide resources and funding to complete this analysis.

Working Group Members: Gus Buder III, Carlos Carroll, Phil Hedrick, Brian Kelly, Bill Martin, Chris Pague, Paul Paquet, Dave Parsons, Benjamin Romero, Vernon Sharp, Doug Shinneman, Peter Siminski, Larry Temple, John Vucetich, Bob Wayne, Phil Miller, (Facilitator)

Literature Cited

Ballard, W. B., J. S. Whitman, and C. L. Gardner. 1987. Ecology of an exploited wolf population in south-central Alaska. Wildlife Monographs 98:1-54.

Carroll, C., R. F. Noss, and P. C. Paquet. 2001. Carnivores as focal species for conservation planning in the Rocky Mountain region. Ecological Applications.

Carroll, C., R. F. Noss, N. H. Schumaker, and P. C. Paquet. In review. An evaluation of the biological feasibility of restoring wolf, wolverine, and grizzly bear to Oregon and California. In D. Maehr et al., eds. Large mammal restoration. Island Press, Washington, DC.

Carroll, C., R. F. Noss, N. H. Schumaker, and P. C. Paquet. In prep. Predicting viability of carnivore focal species in the Rocky Mountain region.

Dennis, B., P.L. Mulholland, and J.M. Scott. 1991. Estimation of growth and extinction parameters for endangered species. Ecological Monographs 61:115-142.

Foley, P. 1994. Predicting extinction times for environmental stochasticity and carrying capacity. Conservation Biology 8:124-137.

Forbes, S. H., and Boyd, D. K. 1997. Genetic structure and migration in native and reintroduced Rocky Mountain wolf populations. Conservation Biology. 11: 1226-1234.

Fuller, T. K. 1989. Population dynamics of wolves in north-central Minnesota. Wildlife Monographs 105:1-41.

Lacy, R. C. 1993. VORTEX: a computer simulation model for population viability analysis. Wildlife Research 20:45-65.

Martin, W. W., A. Jones, and R. Edward. 2000.Wolf recovery in the southern Rockies of Colorado: an initial habitat suitability analysis. In review.

Mech, L. D, and L. D. Frenzel, Jr. (eds). 1971. Ecological studies of the timer wolf in northeastern Minnesota. U.S. Department of Agriculture, Forest Service Research Paper NC-52. 62 pp.

Merrill, T., D. J. Mattson, R. G. Wright, and H. B. Quigley. 1999. Defining landscapes suitable for restoration of grizzly bears (*Ursus arctos*) in Idaho. Biological Conservation 87:231-248.

Noss, R.F., H. B. Quigley, M. G. Hornocker, T. Merrill, and P. C. Paquet. 1996. Conservation biology and carnivore conservation in the Rocky Mountains. Conservation Biology 10:949-63.

Nowak, R. M. 1995. Another look at wolf taxonomy. Pages 375-397 in L. N. Carbyn, S. H. Fritts, and D. R. Seip, eds. Ecology and conservation of wolves in a changing world. Canadian Circumploar

Institute, Edmonton, Alberta. Occasional Publication No. 35. 642 pp.

Parsons, D. 1996. Case study: the Mexican wolf. New Mexico Journal of Science. 36:101-123.

Roy, M.S., E. Geffen, D. Smith, E. A. Ostrander, and R. K. Wayne. 1994. Patterns of differentiation and hybridization in North american wolf-like canids. MOI Biological Evolution 2:553-570.

Schumaker, N. H. 1998. A user's guide to the PATCH model. EPA/600/R-98/135. U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon.

Theobold, D. M. 2000. Fragmentation by inholdings and exurban development. In Knight, R. L., et al. eds. Forest fragmentation in the southern Rocky Mountains. Univ. Press of Colorado, Niwot, CO.

Wilson, P.J., S. Grewal, I.D. Lawford, J.N.M. Heal, A.G. Granacki, D. Pennock, J.B. Theberge, M.T. Theberge, D.R. Voigt, W. Waddell, R.E. Chambers, P.C. Paquet, G. Goulet, D. Cluff and B.N. White. In press. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology.

Woodruffe, R., and J. R. Ginsberg. 1998. Edge effects and the extinction of populations inside protected areas. Science 280:2126-2128.

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SECTION 5

Policy Working Group Report

Legal, Political and Policy Aspects Working Group Report

These aspects are of immediate and critical importance to wolf recovery in the southern Rockies and were considered extensively.

The group identified five categories of issues for discussion.

1. Statutory and Bureaucratic
2. Politics
3. Responsibilities and Assignments
4. Strategic Planning
5. Impacts to Natural Resource Policies

STATUTORY AND BUREAUCRATIC

Statutory and bureaucratic issues set the policy framework that govern federal and state actions toward wolf recovery and received the greatest attention.

Background

The United States Fish and Wildlife Service (USFWS, also referred to in this document as FWS or the Service) has never advocated wolf recovery in the southern Rockies because the original Endangered Species Act (ESA) listing was based on taxonomic considerations that did not include consideration of the historical occupation of the southern Rockies by wolves. Moreover, state bureaucracies have not been philosophically aligned with wolf recovery and have not advocated the idea. This complexion probably continues to characterize the bureaucracies today. Wolf recovery has been and will remain dependent upon the intimate involvement of the USFWS.

Specific legislation, laws, policies, and litigation are relevant to wolf recovery in the southern Rockies and include the ESA, the proposed FWS draft reclassification rule (which describes the current status of wolves and future recovery actions), the National Forest Management Act (NFMA). We recognize that the ESA is the overarching stimulus for engaging federal and state agencies in wolf recovery. It is unlikely that the ESA will change in the near future. Moreover, we recognize that a change to the executive branch of the federal government has great potential to effect policy and the future of wolf recovery in the southern Rockies and possibly the ESA.

Goal

The group's goal was to encourage federal and state agencies to realign policy to foster wolf recovery planning in the southern Rockies and to implement recovery if planning concludes that such action is appropriate.

Strategies

We determined that the proposed reclassification rule needs to be modified to meet the goal. We identified two possible strategies for administering wolf recovery in the west that properly integrates the southern Rockies in the national plan. Specifically we recommend that the Service either:

1. establish a southern Rockies Distinct Population Segment (DPS)[1] and designate wolves as threatened, or
2. enlarge the southwestern DPS and designate wolves outside the experimental area as threatened, provided that the reclassification is accompanied by a recovery plan for Mexican wolves that includes expanded recovery objectives.

Another strategy we considered called for modifying the recovery goals for the western DPS to include breeding pairs in the southern Rockies. We concluded that this was a less desirable strategy because of the extended period of time required to implement activities to establish such pairs. During this period, delisting would be delayed, greatly frustrating Montana, Wyoming, and Idaho. Certainly Montana, Wyoming, and Idaho will express great frustration with having to "wait" on other areas in the western DPS to "catch up" before delisting can be effected. The August 19, 1997 memorandum of understanding signed by the Governors of these states clearly indicate their desire for the Service to delist wolves in the northern Rockies in a timely fashion.

We also considered litigation as a strategy for reaching the stated goal. We recognize that litigation has advanced wolf recovery in other regions of the U.S. We further recognize that such action might be necessary if the efforts mentioned above fail to integrate the southern Rockies into the national wolf recovery effort. Litigation was, however, identified as the least preferable strategy because it would likely be divisive, expensive and require an extended timeline.

We concluded that the most viable route for realizing our objective is to modify the proposed reclassification rule to include either a southern Rockies DPS or by reconfiguring the proposed southwestern DPS to include all of Colorado, Utah, Arizona, New Mexico, and that portion of Texas delimited by the current proposal. Both a southern Rockies DPS or an expanded southwestern DPS would comply with the vertebrate population policy criteria of discreteness, significance, and listing as threatened or endangered. Moreover, the proposed wolf restoration strategy for the Southern Rocky Mountains (SRM) Ecoregion would create a genetically unique deme (see "Which Wolves are Appropriate Reintroduction Stocks for the Southern Rockies Ecoregion" on page 27 of this document) of wolves in the SRM Ecoregion that exhibits genetic

[1] "Vertebrate Population Policy" guides the Services in recognizing DPSs that satisfy the definition of species under the Act. To be recognized as a DPS, a group of vertebrate animals must satisfy tests of discreteness and significance, as well as qualify for the status (that is, threatened or endangered) assigned to it. To be considered discrete, a group of vertebrate animals must be delimited by physical, physiological, ecological, or behavioral barriers or by an international governmental boundary that coincides with differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms. A population does not have to be completely isolated from other populations of the parent taxon in order to be considered discrete. The significance of a potential DPS is assessed in light of its importance to the taxon to which it belongs. Evidence of significance includes, but is not limited to, the use of an unusual or unique ecological setting: a marked difference in genetic characteristics; or the occupancy of an area that, if devoid of the species, would result in a significant gap in the range of the taxon. If a group of vertebrate animals is determined to be both discrete and significant, its status can then be judged as would that of any species; that is, if it satisfies the Act's definition of "endangered" or "threatened", it can be accorded the appropriate protective legal status under the Act as a DPS. Although the policy does not allow State or other intra-national governmental boundaries to be used in determining the discreteness of a potential DPS, a State boundary may be used as a boundary of convenience when it incidentally separates two DPSs that are judged to be discrete on other grounds." Proposed Rule to Reclassify and Remove the Gray Wolf...Federal Register/Vol. 65. No. 135.

gradation similar to that found ancestrally in gray wolves in the SRM Ecoregion. This adds to the significance of integrating the southern Rockies into the national wolf recovery scheme.

Both strategies generate many benefits over the proposed rule including:
1. a simplification of recovery in the western DPS,
2. facilitation of recovery in the southern Rocky Mountains ecoregion,
3. facilitation of recovery of *baileyi*,
4. an improved consistency in federal policy governing wolf recovery, and
5. restoration of wolves to an existing and significant gap in species' historic range which Service studies indicate could support 1,000 wolves.

We also identified secondary strategies for integrating the southern Rockies in the national wolf recovery scheme. We concluded that these strategies are not currently timely. For sake of completeness they are listed below.

1. Engaging the Forest Service (FS) to effect wolf recovery via NFMA. We recognize that section 7(a)(1) of the ESA probably has a greater affect on FS policy than NFMA. USFS has not comprehensively assessed the potential to recover wolves anywhere in the U.S. including the southern Rockies. Efforts have taken place to alert the FS of the need to include wolves and wolf recovery in the forest management planning process. Assigning wolf recovery objectives to the southern Rockies would trigger identification of *Canis lupus* as a management indicator species (MIS) for the FS. This would ensure that the FS considered the species in appropriate planning processes.

2. Engaging other federal agencies to effect wolf recovery via internal policies. Other federal agencies should be required by more than ESA compliance to include consideration of wolf recovery in appropriate planning processes. Assigning wolf recovery objectives to the southern Rockies would trigger identification of *Canis lupus* as an important species for other federal agencies managing land in the southern Rockies.

Actions

Actions for effecting two strategies must be implemented by November 13 (the deadline for commenting on the draft rule). Conservation organizations present at the PHVA (Defenders of Wildlife, Turner Endangered Species Fund, National Wildlife Federation, Sierra Club and Sinapu) have agreed to be responsible for implementing the following action items:

1. Establish southern Rockies DPS or expand southwestern DPS
   - respond to draft rule by emphasizing the creation of a southern Rockies DPS or by expanding the proposed southwestern DPS [comments should emphasize that habitat suitability (isolation from human persecution and abundance of prey) is high, public lands are extensive, public support is keen, there is a need to revise the Mexican wolf recovery plan and that the southern Rockies can greatly advance recovery of the subspecies, that the proposed rule presents inconsistencies by excluding the southern Rockies when reasons for including the northeast are applicable to the southern Rockies]
   - prompt the public to submit written comments that support #1 above by:

- developing target audiences and contact target audiences (e.g. develop education effort with Denver Zoo, Denver Museum, Universities, etc.)
- supplying a template for submitting reviews (develop a core message for southern Rockies that is clear, concise and includes reference to habitat suitability, public support, and great potential to advance recovery of Mexican wolves)
- providing appropriate information for submitting reviews
- generating targeted editorials that support #1 above

2. engage professional organizations to submit comments that supports #1
3. engage targeted elected officials to submit comments that supports #1
4. visit with key agency personnel.

POLITICS

Wolf restoration is politics. Wolf recovery on a national level is very different than at the state and regional level.

a) Approaches for working with local, state, regional, national, tribal leaders will vary.
b) Affected region is not restricted to the biological definition of the Southern Rockies Ecoregion. Colorado, Southern WY, Northern NM, Utah and Northern AZ are likely areas which will be affected.
c) Public attitude survey (Manfredo, et al 1994) belies the stereotype that there is greater support for wolves in urban areas than in rural areas.
d) Ultimately, the American public decides on wolf recovery in the southern Rockies
e) Tribes are unique. Being sovereign nations, they can do what they want. Tribal land is an open question.
f) The state and local governments have land and fiscal resources limitations. There is no political will at the state and local levels.

Goal

To empower a constituency to build political support or acceptance that will enable recovery of wolves in the southern Rockies. We are mindful of Abraham's Lincoln observation: "Public sentiment is everything. Without it nothing can succeed, with it nothing can fail."

Strategies

- develop approach for engaging rural and urban populations in discussions about wolf recovery in the southern Rockies
  - -Town meetings—in target rural area
  - -Presentations as regular meetings of conservation organizations
  - -Media campaign for urban areas—newspapers, billboard, etc
  - -Ongoing presentation effort at zoos, museums, universities, etc.
- develop approaches for integrating tribal lands, resources, and support for wolf recovery in the southern Rockies
  - -Meetings with tribal leaders to inform them of issues
  - -Develop management and funding plans
  - -Establish protocols (the playing field)
  - -"Enable" tribes to participate in lobby process

- develop comprehensive campaign for demonstrating local, regional, and national support for wolf recovery in the southern Rockies
    -Convene meeting of conservation groups to develop strategies
    -Submit grant proposals to enable this effort
- develop campaign for alerting key elected officials and local and regional operatives to the specific needs for modifying the reclassification rule to include serious consideration of wolf recovery in the southern Rockies
    -One-on-one meetings
    -Regular update of information/status
    -Field trips, etc.
- develop a sense of public perception of wolf recovery in the region
    -Seek a neutral party to conduct a new attitudinal survey
- develop effort to expose key formal and informal decision makers to information about the successes and reality of wolf recovery
    -Include them where appropriate

RESPONSIBILITIES AND ASSIGNMENTS, STRATEGIC PLANNING, AND IMPACTS TO NATURAL RESOURCE POLICIES

Issues 3 – 5, Responsibilities and Assignments, Strategic Planning and Impacts to Natural Resource Policies, were not considered in detail by this group because they are less urgent than 1 and 2 and are familiar to most parties involved with wolf recovery, or are addressed elsewhere.

Responsibility and assignments: The development of a recovery plan will include:

a) Why wolves here?
b) What is the decision making process?
c) Recovery objectives

Strategic Planning: It is the administrative backdrop against which recovery will be affected. Strategic plan could act as a defacto recovery plan.

a) A good strategic plan will answer what needs to be done and how including what roles are assigned, and identification of recovery objectives.
b) Strategic planning involves trying to anticipate, plan and foresee issues. Learning from the past both mistakes and successes. This needs to be conducted on the over all policy level.
c) What's the best way to get it done?
d) The strategic plan would include: Vision, mission, objectives, stakeholder id, goals/objectives, stakeholder participation, etc as well as an operational plan.
e) Strategic planning would include a list of administrative processes that would be exercised to achieve recovery, (e.g. NEPA, EIS)

Impacts to Natural Resource Policies: Management policies may or may not need to be changed but the issues must be addressed.

a) Public (FS & Bureau of Land Management, State), tribal, and private policy on range management will be affected. Note: One participant expressed concern about the need to work to create flexibility in grazing allotment rules to allow proactive management responses to the presence of wolves.
b) Must assess and address potential impacts to agency policies like road closures, coyote control (M44); Assess impacts to ADC activities, agency travel plans (road closures, trails, etc.) mining, grazing, recreational harvests of ungulates, non consumptive recreational activities (wildlife viewing and snow mobiling), forestry, etc.
c) throughout the west we expect that wolf/ungulate relations will be a topic of great concern and consideration

Note: We acknowledge that there is a flip-side to the purpose/use of all the above strategies, i.e., you can use them to promote or oppose the reintroduction of wolves to the Southern Rockies.

Working group members: Craig Miller, Mike Phillips, Brian Kelly, Steve Torbit, Joanna Lackey, Ed Bangs, Wally Murphy, Tina Arapkiles, David Vackar, and Nina Fascione (facilitator).

Literature Cited

Manfredo, M. J., A. D. Bright, J. Pate, and G. Tischbein. 1994. Colorado residents attitudes and perceptions toward reintroductions of the gray wolf (*Canis lupus*) into Colorado. Human Dimensions in Natural Resources Unit, Colorado State University, Report No. 21. 99 pp.

DISSENTING OPINION BY DAVID R. PARSONS

In reference to strategies outlined in the STATUTORY AND BUREAUCRATIC section of this working group report:

I believe that a designation of "threatened" for either the SRM DPS or an enlarged SW DPS is inappropriate and inconsistent with requirements of the Endangered Species Act (i.e., listing decisions shall be made "solely on the basis of the best scientific and commercial data available"). Further, the Act defines an endangered species as any species that is "in danger of extinction throughout all or a significant portion of it's range" and a threatened species as any species which is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of it's range." In the case of a SRM DPS, clearly a population of zero better meets the definition of endangered rather than threatened. The promotion of threatened status merely to attain management flexibility available under that status is inappropriate and violates the "best science" standard of the Endangered Species Act. If management flexibility is desired, it can be obtained legally under section 10 (j) of the Act. In the case of an enlarged SW DPS, the U. S. Fish and Wildlife Service's proposed rule retains endangered status for the Mexican wolf, which would be changed to threatened by the workshop recommendation. Since only 23 Mexican wolves are known to exist in the wild and no threshold population level for downlisting to threatened has been established for the Mexican wolf and no

wolves currently exist in the SRM, I fail to see how this recommendation can be portrayed as "science-based."

Furthermore, it is my opinion that the recommendation of an expanded SW DPS to include the southern Rocky Mountain region is inappropriate under the provisions of the U. S. Fish and Wildlife Service's policy on the establishment of Distinct Population Segments.

Note: I was in intermittent participant to this group, but absent when this section was discussed and drafted.

Wolves in the Southern Rockies

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SECTION 6

Human Dimensions and Economics Working Group Report

Human Dimensions and Economics Working Group Report

The Human Dimensions and Economics Working Group was tasked with addressing issues regarding the concerns, interests, and educational needs of the interested/affected public with regard to the potential recovery of wolves in the Southern Rockies. The working group was fortunate to be composed of a diverse set of perspectives and expertise, represented by members of the livestock industry (including a ranching family that worked with the Mexican wolf recovery program in Arizona), land conservation organizations, government officials and wolf advocates. Issues addressed by the group included effects to lifestyles, effects to land management activities, and economic concerns of wolf recovery. These concerns can be addressed through improved relationships, improved communications, changes in the way "we do business", and equitable mitigation practices. Wolf recovery in the Southern Rockies is still under consideration, and potential recovery areas and management strategies are not yet determined. However, the recommendations of the working group should be applicable to most wolf recovery scenarios in the Southern Rockies.

On one level, all citizens have an interest in the debate over wolf restoration. On another level, there are certain critical individuals who might be affected by wolf recovery, especially private landowners that ranch or utilize their land to profit from hunting. Others with a proximal interest include federal and state agencies, tribal governments, local governments (county and city), conservation organizations, recreation groups (e.g., hunters, off-road vehicle users), scientific community, chambers of commerce/local businesses, non-elected community leaders (community attitude influencers), and youth organizations. We also recognize that media influence is crucial, but the media is not a true 'stakeholder' in wolf recovery. The location of the recovery area (on public vs. private land) may influence to some extent who the affected parties are.

Ranchers and local landowners sometimes feel that their level of interest (their stake) is minimized because they lack specific biological knowledge about wolves. However, these people often have longevity on the land and have a heavy economic commitment. One approach to assessing an individual's level of 'stake' in the issue is to consider their knowledge, level of emotional investment, level of economic investment, and longevity in the area. Such factors may affect how an individual may view his or her vested interest in wolf recovery.

Human Concerns with Wolf Reintroduction

A lot of attention has been focused on the biological aspects of wolf reintroduction, but the social aspects are also extremely important. In fact, reconciling divergent human values and attitudes may be the most difficult challenge to wolf recovery.

Presented below is a list of potential impacts that may or may not occur with wolf reintroduction. Some of these impacts may be highly unlikely, but there is a perception that they could pose a threat. We recognize that even the most unlikely occurrence needs to be addressed, because to the individual experiencing this fear, it is real.

Specific concerns focus both on the potential outcomes of wolf reintroduction and also on the process of planning and implementation itself. The means by which we go about reintroducing wolves may be just as important as the results of reintroduction.

Identified Concerns with the Planning and Implementation Process

1. Not being listened to (e.g., rancher viewpoint: "You scientists are paid to go to meetings, but we're not. It costs us money to be here because we're not home working on the ranch. And then we give the meeting our full effort, only to be told that the feds will listen to our input, but then do whatever they want. Why should we even come? Our efforts won't change things for us. In five years, I bet if you look at how things have happened, our input won't have changed a thing.").
2. Some affected parties not being involved from the beginning.
3. No emotional buy-in by all affected parties (e.g., no common or shared goal).
4. Rapid turnover of biological staff and government people. It is difficult to build relationships with transitory staff, and recently transferred biologists do not have their feet on that particular acre long enough to have credibility or site-specific experience.
5. Concerns not being validated, even discounted (e.g., resident: "I'm worried that the wolves will eat my kids." Scientist response: "Scientific evidence suggests that hardly ever happens.").
6. Lack of information being provided to all interested groups. Partners fear intentional withholding of information. Do we have all the information that the biologists have? Are you telling us the whole story?
7. Communications are often not understandable to stakeholders (e.g., too technical).
8. Holding meetings as a formality after plans have been finalized ("Don't patronize me by asking my opinion when you have already made a decision.").
9. Both biologists and ranchers tend to be people that would rather be out working with animals in the field; therefore, both may lack some of the 'people skills' necessary to work together effectively.
10. Pace of action is too fast: biologists are responsive to agency deadlines and court-ordered schedules, whereas relationships and trust take time to build. Sometimes the fastest route between two points is not the most direct.

Identified Concerns with Reintroduction of Wolves

When wolves occur in areas also used by humans, we recognize that there is potential for both benefits from and conflicts with the activities of wolves. Different people or groups may interpret the same impact as positive or as negative. For example, there is a potential that wolves may reduce elk numbers or shift locations of herds. Hunters may find this to be a negative effect, while people interested in limiting elk browsing in riparian zones may view this as a benefit. Below we have identified activity types and some examples of real or perceived impacts of wolves.

1. Recreational practices: Interference with activities involving hunting and companion dogs; perceived threats to human safety; perception that big game hunting opportunities will be diminished; wolves may be shot because they are mistaken for coyotes; threat of road and area closures; increased potential for wolf-based ecotourism; successful recovery of wolves may lead to eventual opportunities for trophy hunting of wolves.

2. Livestock husbandry practices: Wolf actions may elicit changes in cattle management practices that could result in better range condition; direct loss of livestock due to depredation; area closure may cause additional restrictions on grazing allotments; indirect livestock losses such as reduced weaning weights and conception rates of livestock due to harassment by wolves; changes in husbandry practices may be required; tighter enforcement of allotment and forestry management plans; wolves could chase livestock into vacant allotments and cause a trespass; some ranchers derive income from fee hunting, and wolves may reduce the potential for that income; conversely, some research suggests that wolf predation could result in more robust game animals that are more valued by hunters, and thus has more economic value to the rancher; new agriculture venues (predator-friendly meat: 'No wolves were harmed in the production of this steak.'); increased amount of volunteer labor available for ranchers involved in wolf recovery.

   Indirect benefits include better media and public attention to wolf-friendly practices. This could lead to improved public perception of ranching, and perhaps retention of public land leases and protection of agricultural lands against development. However, there could be a backlash against non-predator-friendly operations, which could then cause a retaliatory backlash against the predator-friendly ranchers.

3. Local residents: Perceived threat to human safety; threat to pets; potential impact on real estate value (may be either positive or negative); enhancement of human spiritual health through presence of wolves; economic benefits of ecotourism and related activities.

4. Forestry practices: Road closures, area restrictions, and protecting large intact roadless areas with good corridors for movement may cause modification of forestry practices. This could affect timber sales and impact the economy of local communities. On the other hand, it could provide improved connectivity for the movement of wildlife and increase the viability of otherwise isolated populations for many species.

5. Environmentalists and conservationists: Restoration of a keystone species may have resounding effects throughout the system, such as improved ecosystem health; promote persistence of prey populations in an evolutionary context through selection; potential to enhance connectivity of existing wolf populations and associated ecosystems; potential improvement of riparian areas and other habitat when overabundant prey are controlled by wolves; creation of 'living laboratories'; promote preservation of natural areas and deter 'urban sprawl'. Questions include: do we really understand what wolves will do in today's ecosystems?; are we restoring "native" wolves, or just an ecological surrogate?; by reintroducing wolves, are we causing problems for other listed species, such as reducing available funds and resources for other conservation efforts?; do wolves directly or indirectly impact other key species?

6. Animal rights groups: Better for wolves to control ungulate populations than for humans to continue hunting them; use of leghold traps in wolf programs; stress associated with relocation of 'problem' wolves; lethal control of 'problem' wolves.

7. Predator control activities: Presence of wolves may limit predator control options and efforts on other species in order to reduce the potential for take of wolves.

8. Tribal sovereignty: Tribes are sovereign nations and must be dealt with as such; differential acceptance between parties on contiguous lands; BUT regulations are sometimes forced upon tribes without consent. Wolf recovery efforts present a catalyst for improving relationships with tribal members. Potential for loss of tribal hunting opportunities provided through treaties.

9. Transportation: Wolf mortalities caused by collisions.

10. Oil, gas and mining: Vehicle collisions; disturbance to prey and wolves; temporary restriction of access and operations on public lands.

11. Cultural and spiritual significance: Wildness and wolves are important to the spiritual health of some people; preservation of more wild natural areas as a consequence of wolf protection efforts; some local communities traditionally utilize historic land grant areas for hunting and gathering activities, and road or area closures could affect that.

12. State wildlife agencies: Loss of hunting license revenue by state wildlife agencies; regulation and reduction in numbers of overabundant prey populations.

The potential impacts of wolf reintroduction outlined above illustrate many of the potential human/wolf conflicts and perceived threats as well as many of the potential benefits of adding wolves to the landscape. When considering the 'pros' and 'cons' of wolf recovery, one should include not only direct impacts (such as loss of livestock to wolf depredation) but also second- and third-order effects (such as improvement of riparian areas through control of prey populations, leading to cleaner water). There are likely to be many ecological benefits to wolf recovery through restoration of a 'healthy, intact and functioning ecosystem' (also see the **Biological Aspects Working Group Report**); on the other hand, there will certainly be economic costs for the implementation of any recovery program and associated mitigation costs. Individuals with different viewpoints and attitudes may weigh these potential impacts differently.

Education and Information Sharing

Wolf recovery involves a broad range of individuals that, in turn, represent a diversity of perspectives and attitudes toward this issue. Some individuals already value wolves and support wolf reintroduction; some may be unsure about whether they would accept wolf reintroduction; and some may never support any level of wolf recovery or expansion. Lack of continuing dialog to discuss divergent views serves to polarize different factions and may jeopardize wolf recovery throughout several areas of the country.

In order for wolf recovery to be successful, it is important to have a continuing two-way process of teaching and learning among all concerned parties. This includes local people, politicians, government agencies, conservation organizations, wildlife managers, the general public, and everyone that is concerned with wolf recovery. Participants with divergent views should act

both as teachers and learners so that information flows in both directions. This allows everyone to benefit from the knowledge and experience of others and may lead to a better understanding of different perspectives and the identification of 'common ground'. Two-way information sharing allows everyone to feel that his or her knowledge is valued and considered.

Up-to-date information should be incorporated into ongoing educational programs. There is a real lack of understanding of wolf behavior and biology among many people, particularly those that have never lived with wolves. Myths and misinformation still abound, and unfortunately, many of these are used by people to develop their values and attitudes toward wolves. These inaccuracies need to be addressed by education efforts. Another issue that should be addressed is the relationship among wolf subspecies and the implications for the recovery of both Mexican and gray wolves.

Part of education involves why we should have wolves. The addition of wolves to an area can be beneficial in many ways (see **Human Concerns** section above). Benefits may be environmental/ecological, economic, and aesthetic. As a large and controversial predator, wolves also provide a great educational opportunity for students to observe and discuss a host of issues from predator/prey relationships to divergent values regarding wildlife.

It is critical that education and information sharing be ongoing, especially with people in and adjacent to the recovery area. Sometimes people need to share information, sometimes they need an audience, and sometimes they need emotional support. This may help to alleviate the stress and complications involved with wolf recovery for many people.

The diversity of human values must be considered and shared, and a broad teaching effort will be needed to impact attitudes. People with divergent views need to share them, have them heard, and have their points incorporated into management plans.

Below are recommended goals and actions outlined by the working group with respect to education and information-sharing.

GOAL: Education needs to be a two-way process of mutual learning and teaching.

Action: Develop a format(s) to allow the two-way flow of information and learning. The process should be not be perceived as one-way lectures by biologists and managers to local people, but should promote the sharing of information among all individuals involved.

GOAL: Education should be based on the best available information. Declarative statements that prove to be untrue build distrust and cause the loss of credibility.

Action: Avoid overgeneralizations and using information out of context.

Action: Monitor wolf recovery efforts to obtain and communicate accurate and up-to-date information to all concerned parties.

Action: Continue scientific inquiry to obtain critical missing information (e.g., why do wolves harass some domestic dogs and not others).

Action: Identify and correct misinformation and myths. This includes not only general perceptions of wolf behavior but also inaccurate reporting of specific events as purported wolf 'attacks'.

Action: Identify and document where information came from before accepting an idea as fact. Track down the origin of potential 'myths' to determine if they have any factual basis.

Action: Education and learning needs to be a continuing process, beginning in the planning stages of wolf recovery and continuing through implementation and monitoring. All affected parties should be kept abreast of current information and status of the recovery process.

GOAL: Recognize and respect that there are diverse viewpoints, and seek common interests and shared goals (e.g., wolf advocates should work with livestock producers to minimize or mitigate negative impacts of wolf reintroduction).

Action: Tailor education activities and information to fit the audience with different viewpoints and levels of knowledge (e.g., eliminate jargon and acronyms).

Action: Make every effort to involve landowners, livestock producers and other affected parties in the monitoring and science process. This promotes respect and a vested interest in the program and may make it harder for an individual to shoot a wolf that has an individual identity.

Relationship-Building and Cooperation

The wolf is a very biologically robust species, and as some of the other working groups have demonstrated, the reestablishment of wolves into the Southern Rockies appears to be biologically feasible. Ultimately, however, the cooperation of the local people will be necessary if wolf recovery is to succeed. Cooperation, in turn, can be promoted through the development of strong interpersonal relationships between biologists/managers and the local residents most affected by the recovery efforts.

Good working relationships go beyond education and information-sharing, although they serve as a good foundation. Individuals want their concerns to be heard, considered and incorporated into management practices whenever possible. This means that it is important to develop good relationships and work cooperatively from the very beginning of the process.

The challenge is how to implement and maintain good cooperation. This includes who to include and how to develop relationships with them. When the number of individuals involved in a step in the process is limited (such as during a roundtable meeting), representatives from concerned and special interest groups may be invited based upon their knowledge, experience

and relative authority (i.e., individuals who are in a position to make decisions within their represented group). It is important, however, to provide everyone with a mechanism through which his or her opinions can be conveyed and considered.

Presented below are several goals and actions recommended by the working group to promote cooperative working relationships involved in wolf recovery.

GOAL: Ensure a format where all affected parties can be heard.

Action: Use neutral, skilled facilitators at meetings (especially large meetings). This would promote constructive dialogue in the presence of strong opposing viewpoints. Biologists or government employees are not perceived as neutral and often have no facilitation training, which may serve to antagonize extreme points of view and result in less successful meetings.

Action: Schedule meetings (e.g., time, location, etc.) so that all affected parties are able to attend (e.g., ranchers are generally unable to attend day-time meetings but may be able to attend those held in the evening).

Action: Provide one or more mechanisms through which everyone can be heard. One strategy used by a wolf advisory group was to present an issue at one meeting and then allow the representatives to take the issue to their constituencies to get their input, and finally to bring their opinions back to the next meeting for discussion.

Action: Involve representatives from all critical affected parties in the process from the beginning, and continue involvement as the program progresses.

GOAL: Ensure that people feel that their fears and concerns are being taken seriously (feel validated rather than patronized).

Action: Provide training in interpersonal and communication skills to members of the recovery team; work with a social psychologist; and/or include a social psychologist on the recovery planning team.

Action: Ask for points of clarification. Ask them to help solve the problem. Ask them to provide information. Why do you feel that way? (e.g., the perception that elk populations will decline because of wolves). Consider emotional concerns as well as economic concerns. Determine what is their real concern and address it.

GOAL: Involve local people in planning, implementation and monitoring whenever possible.

Action: Involve people in understanding the issue and solving the problem (e.g., have hunters/outfitters assist in monitoring the elk population). This will promote more 'buy-in' and sense of a common goal. In Manitoba, wolf depredation claims are investigated by a biologist, insurance agent and ranching representative. The rancher is often the 'toughest' in terms of awarding compensation.

Action: Consider the pace of action. Biologists often need to be responsive to agency deadlines and court-ordered schedules, but they should remember that changes in attitudes and viewpoints may take time. Strong beliefs and value systems are resistant to change

GOAL: Improve interpersonal relationships and build trust between managers and affected individuals.

Action: Use more personal one-on-one meetings with concerned individuals in place of large, impersonal town meetings (the 'kitchen table' method is often much more effective than the 'round table' strategy). When the Mexican wolf recovery program contracted out to determine how people wanted to be informed, the results suggested that they strongly disliked public town meetings. One wolf advisory group chose to begin each meeting with a meal, providing an opportunity to build personal relationships and reduce tension, and then proceeded to the discussion at hand.

Action: Strive for longevity in agency staff that must interface with affected public to promote the development of long-term relationships.

Action: Consider using a larger field crew in the recovery team to lessen the intensity of the job and avoid 'burn-out'.

GOAL: Use an understandable (non-technical) format when communicating information to affected parties.

Action: Eliminate (or at least define) jargon, acronyms and other overly technical language in reports and presentations to the diverse group of affected parties.

Mitigation

Mitigation is the alleviation or lessening of impacts of wolf recovery to affected individuals. Some view mitigation in the narrow sense, which may be taken to mean addressing only direct economic losses such as the loss of livestock due to wolf depredation. Others approach mitigation from a broader perspective, including efforts to reduce the risk of loss (proactive efforts) and the reduction of the emotional/traumatic impacts as well as economic impacts of

wolf recovery. All perceived threats should be addressed, regardless of their probability of occurring, as they are viewed as legitimate concerns by the individual.
The reestablishment of wolves can affect a broad range of individuals and businesses (see **Human Concerns with Wolf Reintroduction** above). The working group concentrated on three main impacted groups of individuals: livestock producers; hunters; and individuals who perceive a threat to themselves and/or their pets. These individuals were believed to have the ability to suffer the greatest impacts and perceived risks to living with wolves.
Often those individuals that will live closest to wolves and feel the impact of their presence are the same individuals that may not initially be supportive of wolf recovery. Education programs that provide accurate information and dispel myths may help to alleviate perceived threats, but often some risks are real, particularly the threat of economic loss. Mitigation can act as a 'safety net' or insurance policy against these threats, reducing the burden of risk and therefore fear. By alleviating the risk factor, it is more likely that local individuals will buy into the program and be willing to participate.

There are a diversity of views and philosophies regarding who should 'pay the bill' for mitigation. Some believe that if the citizens of the United States want to recover wolves, the citizens should pay for economic losses sustained by individuals. Others view that livestock producers and similar affected individuals are operating a business. Since few other businesses are compensated for losses due to environmental conditions, costs associated with wolves (particularly on public land) should be considered as normal business losses and should not be compensated. A more intermediate view between these extremes is that those individuals that support wolf recovery should pay for economic losses associated with recovery. The current compensation fund coordinated by Defenders of Wildlife (DOW) operates in this manner, such that wolf advocates fund the compensation program. This is a voluntary contribution that is currently sponsored by only a portion of wolf proponents. To date this method has been sufficient to provide all needed compensation costs, but the long-term sustainability and sufficiency of this fund is not guaranteed.

Many of the following recommendations involve expansion of incentive and compensation programs, some of which are or have been offered by DOW. At the workshop, DOW indicated a willingness to be flexible and to modify and expand its programs. The Turner Endangered Species Fund also indicated a willingness to assist in providing compensation funds if wolves are reintroduced into the Southern Rockies.

Some of these recommendations may not be realistic or sustainable on a long-term basis, but they may be necessary at least in the short-term if wolf recovery is to be accepted and successful.

LIVESTOCK PRODUCERS

Ranchers and other livestock producers perhaps bear the highest risk of economic loss in wolf recovery. Mitigation efforts should be aimed to reduce both direct and perceived losses. Such losses can be catastrophic to small ranchers/landowners, whereas they may have relatively less effect on large operations.

An observation was made that, in the past, predator losses were considered a normal and accepted risk. Ranchers not only had a different perception of the issue but also a different set of skills to address the problem. "We're relearning what my grandfather knew about living with wolves and grizzlies. He knew livestock handling skills compatible with big predators. People back then knew how to live with wildness. In the past, predators were more accepted and we knew how to deal with them. Now we're going to have to learn over again what my grandfather knew." Changes in the landscape and with livestock production may also necessitate the development of additional strategies for living with wolves and other predators.
A general concern is that government and compensation programs tend to reward the lowest common denominator with regard to livestock management. Those individuals that do not follow good husbandry practices may put their livestock at greater risk and may be more likely to lose livestock to wolves. This may offer little incentive for ranchers to use proactive measures to reduce the threat of depredation (which are also costly) and may jeopardize long-term wolf recovery efforts. Also, anytime that ranchers take money from the government (even in the form of compensation), they may suffer negative public reaction. Although compensation programs for direct losses are important, it would be beneficial to increase efforts to be proactive to avoid losses to the greatest degree possible. This would also serve to reward good husbandry practices rather than poor ones.

GOAL: Emphasize proactive measures to reduce losses through incentives, and use reactive programs (such as compensation and wolf control/manipulation) only when needed. It may be more economical and successful in the long-term to invest in proactive efforts as much as possible.

Action: Provide increased incentives for landowners that use proactive/good husbandry practices (see the Biological Aspects Working Group Report for more information on recommended husbandry practices).

Action: Make sure that information on available incentive and compensation programs is made available to everyone concerned.

Action: Encourage experienced ranchers to share effective livestock management techniques with other ranchers (e.g., herding techniques). Provide educational clinics to ranchers on how to effectively handle livestock in wolf country.

Action: Promote cooperation among landowners to make management more flexible, efficient and economical. For example, the costs of a herder to stay with the cattle might be shared among adjacent ranches.

Action: Provide options for alternative grazing lands for ranchers under heavy threat of wolf depredation. Grass banks or vacant allotments could be used to remove cattle from areas with high wolf use (current public land permit policies may make this option difficult).

Action: Hire someone to communicate with and update landowners regarding wolf location and activities on a regular basis (e.g., regular updates are provided by the Nez Perce tribal biologists to livestock owners regarding wolf activity and locations in Central Idaho).

GOAL: Expand compensation for individuals willing to work with wolf recovery efforts (e.g., through tolerance and willing to make changes in husbandry to accommodate the presence of wolves). Pay fair (true) compensation for costs associated with wolves.

Action: Determine the actual cost to livestock owners of having wolves on the land (this will vary by year and among operations).

Action: Compensate rancher/landowner for added management costs associated with working with wolves (e.g. 'wolf easements' within wolf recovery zones). This can be thought of as 'growing wolves' as a second crop. For example, at one time Defenders of Wildlife compensated landowners that had active denning sites on their land. Similar incentives are also paid through the red wolf recovery program.

Action: Compensate for specific costs, such as costs associated with reduced conception rates due to cattle having to be moved during breeding season, cost of physically moving cattle out of wolf areas, cost of supplemental feed when cattle are moved from rangeland back to home ranch to avoid wolves, and cost of herders. Defenders of Wildlife already compensates for some of these costs, such as hiring herdsmen, fencing and supplemental feeding.

Action: Determine the fair cost to compensate owners for direct livestock loss. This may not necessarily be the same as the fair market price for the meat, depending upon the individual animal. For example, compensation may need to be higher for animals with greater breeding potential or valuable genetic lines.

Action: Promote mechanisms by which additional staffing/volunteers may be available for people 'growing wolves'. For example, some wolf advocates are willing to volunteer their labor to predator-friendly ranchers in wolf recovery areas. This idea could be promoted to attract volunteers.

GOAL: Reform public lands grazing policy to promote flexibility in using proactive methods to reduce wolf depredation on livestock and promote successful wolf recovery.

Action: Make vacant allotments available to ranchers to replace allotments made unsuitable by wolf threat (provided that the ecological condition of the allotment is not imperiled). Relocation of cattle, however, may incur other costs, such as transportation costs, risk of disease, and the need for the cattle to learn the landscape.

Action: Modify current regulations so that ranchers have the flexibility to move cattle to avoid wolf conflict and return to the allotment when wolves move on. Current Forest Service regulations state that once cattle are moved out of an allotment, they cannot re-enter, regardless of the amount of time spent in the allotment.

RECREATION HUNTERS AND OUTFITTERS

Hunting of elk and other prey species is a treasured recreational opportunity for some, a necessary activity for putting food on the table, or an important economic activity for outfitters or those who sell hunting rights to their land. Since hunting opportunities are seldom guaranteed and success depends on a number of factors, it is difficult to determine if declines in success are attributable to the presence of wolves. Outfitters fear the decline in availability of 'trophy' individuals and the associated loss of revenue, while recreational hunters may be concerned with the potential reduction in the number of hunting permits issued and resulting loss of hunting opportunities.

The potential impacts of wolf reintroduction on ungulate populations can be diverse and variable, depending upon factors such as the number and abundance of prey species and the interaction with other predator species already present. In areas with an overabundance of ungulates, habitat quality may be enhanced (through relaxation of grazing/browsing pressure), herds may become more sustainable, and animal fitness may be improved. Observations from the reintroduction of wolves to Yellowstone National Park suggest that wolves primarily target cow elk, posing little competition for 'trophy bulls'. This may be desirable in areas such as New Mexico, as indicated by the New Mexico Game and Fish, where the reduction of elk herds is desired. In Canada wolves have been shown to promote the increase in 'trophy bulls' with large antler racks (due to selection against bulls with small racks). Therefore, it is likely that in some instances the presence of wolves may pose little threat to trophy hunters and may even have a positive effect. Overall, the reintroduction of wolves into an ecosystem is likely to have long-term and large-scale positive effects, but short-term and local impacts may be negative in some areas.

Individuals who have concerns or perceive that there is a threat want to make sure that their concern is taken seriously. One way to address this is to develop contingency plans to deal with the situation if it materializes. This would let people know that their concern was heard and addressed, whether or not it is likely to occur. Methods to address hunters' concerns, however, are difficult to identify.

There was a substantial discussion of the perception of lost hunting opportunities due to wolf reintroduction and the means to compensate for this. However, factors other than wolves also impact game numbers and hunting success rate. Therefore, observed reduction in hunting opportunities may or may not be related to the presence of wolves. For this reason, several working group members believed that we should not go down the road of mitigation in this situation.

After serious consideration, the working group recommended the following actions to address potential concerns of hunters.

GOAL: Reduce risk of loss of hunting opportunities by hunters.

Action: Pursue a possible incentive program for managing for wolves on hunting lands.

Action: Provide state wildlife agencies and the public with information about location and impact of wolves on game species within individual game management units.

Action: Consider monitoring the impact of the suite of predators on prey populations (site-specific) to evaluate whether wolves are causing declines in prey species in the area.

Action: If in time, there appears to be negative effects on prey populations and hunting opportunities, then consider methods to address reduction in hunting opportunities.

Action: Need to investigate the implications for Native American hunting rights guaranteed through treaties.
Action: Communicate past experience with wolves and hunting regarding negative impacts to treaty rights from other Native American experiences (e.g., from the Nez Perce and tribes in Minnesota).

THREATS TO HUMANS AND PETS

Real and perceived threats to pets and to human life must be addressed, as they can be a great source of resistance to wolf recovery. From tales of *Little Red Riding Hood* and *The Three Little Pigs* to the pioneers' efforts to 'tame the West' and eliminate predators viewed as competitors, wolves have been represented through much of American history as an animal to be feared. Concern for the safety of our children and our pets is a deeply emotional issue, not an economic one, but it is an issue that must be addressed if wolf recovery is to succeed.

GOAL: Dispel myths about wolf behavior and the risk that they pose to humans. Address and alleviate the concerns of people that they will be attacked by wolves.

Action: Implement massive public education programs regarding human-wolf interactions in an understanding and conversational manner rather than a cold scientific manner.

Action: Distribute informative videos on wolf behavior to local residents prior to wolf reintroduction planning and implementation.

Acton: Work with the media to develop informative programs (e.g., public service spots or a weekly wolf information program) for release prior to and during wolf reintroduction. Provide information for balanced views (e.g., how to respond if you see a wolf).

Action: Develop a positive relationship with the media to facilitate the dissemination of accurate information rather than sensationalism.

GOAL: Avoid habituation of wolves to humans, which will reduce the likelihood of attack. Wolves generally have a low tolerance of humans, but habituated wolves are much more likely to come into conflict with humans and are the primary source of negative interactions.

Action: Implement massive public education efforts with a dual focus: how (and why) to avoid producing 'problem' wolves through habituation to humans (e.g., do not feed wolves, do not leave food or garbage unattended in campsites or around residences in active wolf areas, etc.); and how to react if you encounter a 'bold' wolf or feel threatened by a wolf.

Action: Post relevant wolf information at trailheads (e.g., alert people to wolves in area, advise them to keep dogs close and instruct on how to react when encountering a wolf, etc.).

Action: Restrict access to certain active wolf areas (such as is done with grizzly bears). Prohibiting dogs from active wolf areas, especially during breeding season, might also be considered.

Action: Use wild-born wolves for reintroduction efforts when possible, as captive-born individuals are likely to be more tolerant of humans. Use aversive conditioning on captive-born wolves prior to release so that they associate humans with negative consequences and will be more likely to avoid humans.

GOAL: Recognize and respond to the emotional impacts of a traumatic encounter with wolves or the loss of a pet/special animal.

Action: Have trained personnel (such as a member of the recovery team field crew or a counselor on contract) available to respond to such incidents, who can acknowledge and discuss the experience. This not only validates their experience and provides support, it also indicates that the federal agencies are serious about addressing the fear and the emotional aspects of wolf recovery. It also provides an opportunity for education regarding why it may have occurred and how to prevent further incidents.

Summary

To promote the success of future wolf recovery efforts, greater effort should be focused on reconciling divergent human values and attitudes toward this high profile and highly controversial species. Early and continuing communication and the development of ongoing relationships among individuals and organizations impacted by wolf recovery programs will be critical. Diverse perspectives should be respected, and both measurable economic losses and perceived threats should be acknowledged and addressed. Perhaps like no other creature, the wolf evokes strong emotions in a great number of people. This species is able to adapt to a variety of biological conditions and possesses the ability to expand its population rapidly. Its ability to co-exist with humans and our ability to co-exist with the wolf may be the ultimate key to successful recovery.

Working Group Members: Jim Baker, Mike Ballew, Tom Compton, Rob Edward, Cathy Gorman, Valerie Guardia, Jan Holder, Will Holder, Craig Miller, Linda Poole, Kathy Traylor-Holzer (facilitator).

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APPENDIX I

List of Participants

Wolves in the Southern Rockies
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APPENDIX II

Participants' Goals for the Workshop

Participants' Goals for the PHVA Workshop

- To contribute to a serious and comprehensive discussion concerning wolf recovery in the Southern Rocky Mountains Ecosystem.
- To be of use to the group in formulating direction for the re-establishment of the Southern Rockies Mountains wolf.
- I am a representative of the Colorado Cattlemen Association and am here to find out what is going on.
- To increase the level of understanding amongst all stakeholders, and to elicit a clear understanding of the issues facing a restoration effort.
- To identify and evaluate approaches to restoration in the Southern Rockies and to invite full participation from all affected stakeholders from the beginning of plan development.
- To understand the opportunities and limitations to wolves in the Southern Rockies.
- To devise an outline of a plan to introduce Mexican wolves/gray wolves to the Rockies acceptable to the wide diversity of interests represented by this group.
- To learn about interest groups and their positions on wolf recovery in the Southern Rocky Mountains and how that fits into national wolf recovery efforts.
- To leave the workshop with a clearer understanding of what my organization can do to aid in the restoration of wolves to the Southern Rockies.
- To gain an understanding of the process in place.
- To facilitate dialogue and to learn more from stakeholder groups what the various issues/concerns are in regards to wolf restoration in Southern Rockies and have discussions with scientists regarding biological implications.
- To provide whatever information I can regarding the demographic aspects of wolf recovery in the Southern Rockies.
- To define a research agenda for identifying barriers to carnivore viability in the Southern Rocky Mountains.
- To gain a better understanding of the potential (both biological and social) of the Southern Rockies to sustain a wolf population(s), and how this can aid Mexican wolf recovery.
- To catalyze a strategy for restoration of gray wolves to the Southern Rockies, coordinated with other restoration efforts in the western United States.
- To learn from the scientific expertise in the room; to contribute whenever I can; and to develop relationships with folks who will be actively involved in restoring wolves to the Southern Rockies in order to build trust and respect.
- To learn more from others at this meeting in order to improve my analysis of the biodiversity of the Southern Rockies.
- To learn how we can develop a strategy for successful restoration of wolves in the Southern Rockies.
- To develop a scientifically credible assessment of the proposed wolf reintroduction project that identifies the positive aspects of the plan and also indicates areas of the plan that need to be further researched.

- To learn more about the decisions governing the wolf reintroduction and possible reclassification, both for an understanding of how Arizona's program has worked and to try to help future Arizona efforts from an on-the-ground standpoint as well as the efforts in other states.
- To better understand the complexities of restoring "unpopular" wildlife species at the scale of vast landscapes. How can we restore biodiversity while maintaining cultural diversity and traditional lifestyles?
- To examine an historical and evolutionary perspective to reintroduction and long-term survival of wolves.
- To learn as much as I possibly can about this project.
- To learn more on the ecology and restoration efforts that will either make or break reintroduction efforts.
- To learn more about the feasibility and methods of restoring wolves to the Southern Rockies, and to assess how realistic proposed strategies may be.
- To facilitate tribal participation in the recovery of wolves in the Southern Rockies; in a broader context, to facilitate tribal participation in similar efforts by TESF, Defenders, CBSG, etc.; and to share the experience and knowledge of the Nez Perce Tribe who are key players in wolf recovery in Central Idaho.
- To contribute knowledge/experience gained from directing the Mexican Wolf Recovery Program for nine years, and to learn more about issues related to wolf restoration in the Southern Rockies.

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APPENDIX III

Workshop Presentations

A Brief History of Wolf Extirpation & Restoration In the Southern Rockies

By Rob Edward, Program Director, Sinapu

The effort to exterminate wolves in the Southern Rockies culminated in the killing of the region's last wild wolf in 1945, in the South San Juan Mountains near the Colorado New Mexico border. That event marked the end of a 70-year campaign to eradicate wolves from the region—a campaign that saw the federal government marshal a wartime budget and staff on behalf of the livestock industry. Notably, wolves had been wiped-out of Yellowstone National Park nearly twenty years before the last wolf in the Southern Rockies was killed.

Almost five decades later, in 1991, a small grassroots group formed to advocate for the restoration of wolves to Colorado and the rest of the Southern Rockies. That group—named "Sinapu", after the Ute word for "wolves"—quickly gained public support for the idea. In 1992, Congressman David Skaggs of Colorado successfully sponsored an Interior Department appropriations bill that directed the U.S. Fish & Wildlife Service (FWS) to spend $50,000 to determine the feasibility of restoring wolves to Colorado and to determine the level of public support for the idea.

The FWS contracted with Dr. Larry Bennet, a researcher at the University of Wyoming at Laramie to conduct the biological feasibility assessment and with Dr. Mike Manfredo at Colorado State University to conduct the public opinion survey. After a rocky start during which Sinapu filed a formal appeal with the Department of Interior over the study's methodology, the team moved on to conduct a thorough assessment of the capacity of the seven national forests on Colorado's Western Slope to sustain a population of wolves.

In the summer of 1994, the FWS released the findings of the biological feasibility study[2]—an event that would forever change the terms and tenor of the debate over wolves in the region. In sum, Dr. Bennett concluded that Colorado had room for over one thousand wolves (1,128 to be exact), although a likely population would number about 800 wolves. Given that the FWS had previously discounted the Southern Rockies with regard to wolves, the report made clear that the region was indeed "wolf country."

Following on the heels of the biological report, the public opinion survey[3] added fuel to the fire. Though hardly the bombshell the biological feasibility report proved to be, the public opinion survey indicated that public support for wolf restoration was as robust as the land's capacity to support wolves. According to the report, 71% of Colorado residents supported reintroducing wolves. Delving deeper, the survey looked specifically at the rural population of Colorado's Western Slope (where wolves would roam), discovering that support for wolf restoration stood at an amazing 65%.

In short, the FWS now faced a dilemma: the study unequivocally pegged the Southern Rockies as wolf country, and that put the agency in the uncomfortable position of having to respond to a call for wolf restoration. The fact that wolf restoration remained a political hot potato made the Southern Rockies study even more unsavory—and gave the agency a reason to stall further effort toward recovery.

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[2] Bennett, Larry E. 1994. *Colorado Gray Wolf Recovery: A Biological Feasibility Study. Final Report – 31 March 1994.* U.S. Fish & Wildlife Service, in cooperation with University of Wyoming Fish & Wildlife Cooperative Research Unit.

[3] Manfredo, Michael and Bright, Alan. 1994. *Colorado Residents' Attitudes and Perceptions Toward Reintroduction of the Gray Wolf (Canis lupus) into Colorado.* U.S. Fish & Wildlife Service, in cooperation with Colorado State University, Human Dimensions in Natural Resources Unit.

Putting Wolf Country on the Map

Not content to allow the apathy of the government to stall further progress, in 1996 Sinapu and the Southern Rockies Ecosystem Project initiated a comprehensive analysis of the biological capacity of the region to support wolves. The project moved an order of magnitude beyond the 1994 FWS feasibility study, utilizing sophisticated GIS computer mapping techniques determine the best remaining places for wolves. Unlike the FWS study, this analysis would actually graphically predict the areas that would support wolves.

The entire project centered on creating computer-based maps utilizing several different "layers " of data, both alone and in combination with each other. The data layers included: wild ungulate density and distribution; road density; land ownership status; and protected/roadless areas. We determined these elements to be the most important to the long-term survival of wolves in the region. However, the present study identifies the most important remaining habitat for wolves, based upon three highly important factors:

- ***Meat availability (as represented by prey density/ distribution);***
- ***Habitat security (as represented by both road density and protected/roadless area status);***
- ***Ease of land/species management (as represented by land ownership, because public lands usually involve less troublesome land/species management decisions. Notably, some private land did ultimately make it into the final "composite" map, simply because it had both high prey density and low road density).***

We combined the three factors listed above to yield the final map. The Final Composite Score map (Map 1) reflects a combination of all of the data layers, with certain properties of each layer being "weighted" greater than others.

A Meaty Bottom-Line

One of the initial challenges for the research team was how to display certain data as if seen through the eyes of a wolf, especially data regarding the spatial distribution and density of the region 's wild ungulates (elk, deer, and pronghorn antelope). Data from the Colorado Division of Wildlife indicated general herd numbers within specific "game management units," or "GMUs " as game managers call them. The trick was to represent those raw numbers as actual "meat value " across the landscape.

The team decided to utilize a mathematical model that would calculate the total weight of a herd within any particular GMU, allowing for a weight differential between males and females, and then mathematically "strip " the herd of the weight of hide and bone. The resulting value represented the actual weight of raw meat within the herd. The model utilized one square kilometer grid cells to display these values on the map; in a fit of wry humor, the team dubbed these the "meat maps."

One aspect of the "meat availability analysis" that stands out immediately is the dramatic change in distribution of wild ungulates from season to season. The two maps illustrating meat availability (Maps 2 & 3) portray what hunters and game managers have known intuitively for years. During the summer, big game herds spend their time grazing in the higher elevation areas, drifting into the river bottoms and valleys in late fall, then waiting to return to the high country in the spring. These maps, however, go well beyond intuition, indicating exactly where the elk, deer, and pronghorn congregate—and the density of those congregations.

The team chose to use a graduated scale to depict different levels of food value (represented as kilograms of meat/square kilometer). As the map delineates, nearly the entire region has at least 68 kilograms of meat per square kilometer during the summer months, with four very large regions sporting concentrations greater than 500 kilograms of meat per square kilometer. Three of these “meaty ” regions lie in the central and northern part of Colorado’s Western Slope, almost exclusively on public land, and the fourth lies on private lands east of the South San Juan Mountains and the Rio Grand National Forest in southern Colorado.

The picture changes dramatically as we move into winter, with all of the ungulate populations becoming less dispersed as they migrate to the lower elevations. Notable on this map, the large concentrations of ungulates present during the summer months directly north of the Interstate 70 corridor (generally on and surrounding the Flat Tops wilderness), migrate mainly west, onto the lower elevation lands owned predominantly by private interests. Similarly, the large summer concentration found just south of the Interstate 70 corridor (on the Grand Mesa), disperse down to private lands along the interstate, as well as into the Roaring Fork Valley (El Jebel, Aspen, Carbondale) and onto Forest Service lands to the south of the Grand Mesa.

Safe Spaces

On par with the need for abundant meat, the need for secure habitat presents more complex problems, tied directly to land management decisions, politics, and the ethics of those who venture into wilderness. Although some wolf biologists would argue that wolves could live in areas riddled with roads and two-track trails, mortality figures for wolves living in such areas are unacceptably high, whereas the wolves of Yellowstone and central Idaho (areas with very low road density) have suffered far fewer human-caused deaths.

A logical explanation for this phenomenon is that roads and trails that provide access to vehicles increase the opportunity for poaching and the risk of vehicular collision. Thus, the research team chose to include both road density and protected/roadless area status as important factors to delineate wolf country.

The map depicting road density within Colorado’s portion of the ecoregion (Map 4) includes 7,943 square miles of roadless areas on Forest Service and Bureau of Land Management properties. Map 5 gives a different perspective, illustrating a combination of roadless areas (red) and those areas protected by state and federal laws against road building —areas encompassing a total of 8,325 square miles. This view highlights the roadless and protected areas on public lands that may be important to wolf restoration. Notably, many of the wilderness areas are high elevation (above tree line)—a fact attributable to Congress’ historical refusal to designate more forested and other low elevation areas as wilderness. Hopefully, this trend will shift toward protecting the more biologically diverse lowlands, although doing so requires the political courage to defy special interest groups and industry lobbyists.

The final step in creating an honest picture of wolf country manifests when all three factors (food availability, habitat security, and land ownership status) receive “weighted ” values, and are then combined to reveal a composite score. The Final Composite Score map (Map 1) represents the culmination of this groundbreaking, volunteer-driven project. More importantly, it depicts a huge landscape still capable of supporting wolves. Over 20,910 square miles—or 30 percent of the Southern Rockies ecoregion within Colorado—fall within the top two score classes on the map (41-70 points).

Turning Some Heads

Clearly, the Southern Rockies has a significant capacity to support wolves; we believe that the first phase of this mapping study demonstrated that fact. However, these maps must find their way into deliberations of wildlife and land managers—and into the dreams of citizens. Further, they must translate into political discussion and policy development.

In 1998, the Sinapu/SREP mapping report piqued the interest of Mike Phillips of the Turner Endangered Species Fund (TESF). Soon after, Mike contracted with SREP and Sinapu to extend the GIS mapping

analysis to include northwest New Mexico, including the 588,000 Vermejo Park Ranch near Raton, NM. The results of that study appear elsewhere in this report. Notably, the capacity of the region to support wolves appeared so favorable that Sinapu and TESF moved forward with a regional campaign for wolf restoration.

At the invitation of Sinapu, the Sierra Club and TESF, regional and national conservation groups met in February of 2000 to launch a new joint initiative aimed at restoring wolves to the Southern Rockies. By the time the dust settled at the two-day meeting, the group had christened the Southern Rockies Wolf Restoration Project (SRWRP)—complete with a steering committee and a draft strategic plan.[4]

In sum, the effort to restore wolves to the hunting grounds of their ancestors has gained tremendous momentum in the past decade. Today, the nexus of scientific research and grassroots advocacy portend a bright future for wolves in the Southern Rockies. In the coming months and years, much remains to be done to ensure that wolves remain a priority of the U.S. Fish & Wildlife Service, and that politics do not reverse the rising tide. The elk, the deer, and the aspen all ache for the return of the top dog. The pack draws nigh.

[4] Member groups as of October 1, 2000: Turner Endangered Species Fund; Sierra Club; National Wildlife Federation; Defenders of Wildlife; Center for Biodiversity; Sinapu; San Juan Citizens Alliance; New Mexico Wilderness Alliance; Sky Island Alliance; Audubon of New Mexico; The Wildlands Project; The Wilderness Society; Animal Protection of New Mexico; the Western Wildlife Conservancy; and, the Wild Utah Project.

Restoring Mexican wolves to the Southern Rockies: Why Not?

A presentation by Mike Phillips (Executive Director, Turner Endangered Species Fund, P.O. Box 190, Gallatin Gateway, MT 59730)

In the U.S. gray wolf populations are distributed over about 3% of the species' historic range and are represented by about 3,000 animals (Ferris et al. 1999). Clearly, most of the historic range is unoccupied. Nonetheless the size and distribution of wolf populations represent a marked improvement of the conservation status of the species in the continental U.S.

Due to the improved status, the U. S. Fish and Wildlife Service (USFWS) recently released a national strategy that attempts to define the future direction for wolf recovery efforts (USFWS 2000). The Service's approach is built around the concept of "Distinct Population Segments" (DPS) of which they recognize 4: northeastern, western Great Lakes, western, and southwestern. Today I will concentrate on the southwestern DPS which was roughly defined according to the Service's sense of the "probable historic range" for Mexican wolves (*Canis lupus baileyi)*. While I recognize the importance of restoring imperiled species to appropriate areas within historic ranges, I worry that the Service's thinking concerning *baileyi* is unnecessarily limited in scope and needlessly relegates recovery to a landscape that may well not possess the habitat and prey populations necessary for recovering Mexican wolves.

Specifically, today will present information that hopefully will prompt you to endorse the position that it is appropriate to reintroduce Mexican wolves into the southern portion of the southern Rocky Mountains ecosystem if an Environmental Impact Statement shows the area to be suitable for wolf recovery.

While the current Mexican wolf reintroduction effort is progressing much work remains to be done to ensure a future for the species. Much of the area where the reintroductions are occurring is grazed by cattle for most of each year. Wolf-livestock conflicts have occurred repeatedly prompting Service to return many animals to captivity. While I expect the existing project to eventually result in the restoration of a persistent population, much work will remain after that to recover the species. While no recovery objectives currently exist for the Mexican wolf, the recovery team is revising the recovery plan and is inclined to consider recovery as the restoration of a metapopulation of at least three self-sustaining demes each including about 10 breeding pairs that would include about 100 wolves. As was first articulated in the northern Rocky Mountain wolf recovery plan (USFWS 1987), which also sets recovery as the restoration of three demes, such an objective is minimally acceptable from a ecological and long-range perspective. In part such a recovery objective was embraced in the northern Rockies because of the presence of extant populations in Canada. Such cannot be said for *baileyi* as there does not appear to be any functional wolf population in Mexico. Indeed, as a member of the Mexican wolf recovery team I'm inclined to lobby for a minimum of 5 demes so that total population size approaches 500.

Regardless of whether three demes or five demes is settled on as the recovery objective, it is clear that additional reintroduction sites besides the Blue Range Wolf Recovery Area (where releases are taking place) will be needed to recovery the Mexican wolf, and none of the sites

previously considered, offer the same potential as the southern portion of the southern Rockies. I am absolutely convinced that recovery of Mexican wolves, along with myriad other conservation activities, would be greatly advanced if a reintroduction involving *baileyi* was initiated in the region.

As you consider the appropriateness of the southern portion of the southern Rockies for Mexican wolves, note that currently the Service opposes the idea because of the belief that the area lies outside the historic range of the subspecies. This is, of course, consistent with proposed boundary for the southwestern DPS. I am befuddled by this opposition for many reasons.

Historically, taxonomists recognized many subspecies of gray wolves and over the years the issue of wolf taxonomy has been a topic characterized by dissenting opinions, intense debate, and changing sensibilities (Nowak 1995). A vivid example of this involves the red wolf. Initially some experts argued that the species was North America's ancestral wolf, while others argued it was a subspecies of gray wolf, while others yet argued that it was a hybrid resulting from gray wolf x coyote interbreedings. In light of recent work, that was discussed in great detail yesterday, the debate now shifts to the possibility that red wolves and gray wolves that inhabit Algonquin Park are one in the same, collectively comprising the remnant of the eastern wolf that is worthy of subspecific if not specific recognition. The controversy surrounding the origin and status of the red wolf clearly illustrates that taxonomy is fluid discipline that, despite its rigorous and logical sidebars, is subject to change as new techniques, investigations, and conservation issues improve our understanding of natural patterns and the importance of ensuring their persistence.

Originally it was thought that the southwest was a region where 5 subspecies converged: *C. l. baileyi, mogollonensis, monstabilis, nublilus,* and *youngi*. In 1983 a study considered skull morphometrics and recommended that *mogollonensis* and *monstabilis* be lumped with *baileyi*, effectively extending the historic range of *baileyi* by hundreds of miles to the north (Bogan Mehlhop 1983). This recommendation was endorsed by the U.S. Fish and Wildlife Service and served as an important backdrop for the approved recovery plan (USFWS 1982).

In 1995 Ron Nowak proposed a new wolf taxonomy that collapsed many of the previously recognized subspecific categories. Ron proposed that *Canis rufus* be recognized as a valid taxon along with 5 subspecies of *Canis lupus*, of which *Canis lupus baileyi* was one. In contrast to the 1983 study, Nowak lumped m*ogollonensis*, and *monstrabilis* not with *baileyi* but rather with *Canis lupus nubilus*, another of his gray wolf subspecies (Nowak 1995).

In 1996 the Service revised the probable historic range map for Mexican wolves. The map now includes most of Mexico, southwestern Texas, southeastern Arizona, and most of New Mexico. This range was determined by taking Nowak's core area for the *baileyi* and integrating a 320-km (200 mile) dispersal radius to define the outer limits (U.S. Fish and Wildlife Service 1996, Parsons 1996).

If the Service had maintained a consistent position regarding their 1983 endorsement of the recommendation that *mogollonensis* and *monstrabilis* be considered part of the *baileyi* clade,

then the 320 km (200 mile) dispersal radius would have extended the northern boundary into southern Colorado.

When considering the original distribution of subspecies it is important to note that in reality the boundaries between ranges are zones of integradation where genetic mixing occurs. Distinct lines on a map are human constructs that assist us in organizing the world we see around us. They mean nothing to the species in question (Forbes and Boyd 1997).

Clearly the width of these zones relate to the ability of a species to disperse, and for wolves this ability is quite keen. Wolves routinely travel great distances. Researchers in Minnesota documented one wolf dispersing 880 km (Fritts 1983). Without doubt, historically the zones of intergradation between wolf subspecies were hundreds of km wide. Because of this great mobility, selection of a 320 km radius for determining *baileyi's* historic range was arbitrary. One could have justifiably used a radius of 480 km (300 miles), 640 KM (400 miles), or even 880 km (550 miles).

Because of great mobility, it's certain that some Mexican wolves dispersed into areas north of the supposed probable historic range. Such movement would have resulted in some Mexican wolves inhabiting the southern Rocky Mountains. It's also likely that the northern wolf moved south into the Mexican wolf's supposed range. Accordingly, it seems almost certain that the southern portion of the southern Rockies was a transition zone where northern and southern wolves met. It is quite interesting that researchers who conducted an intensive assessment of a portion of the *baileyi's* nuclear genome reported that they were unable to eliminate the possibility of a northern gray wolf ancestry for some of the animals that founded the Mexican wolf captive breeding program (Garcia-Moreno et al. 1996). If you embrace the idea that the southern portion of the southern Rockies was a transition zone for northern and southern gray wolves, then it follows logically that the area is appropriate for reintroducing Mexican wolves.

Further complicating the issue of probable historic ranges for subspecies, and possibly rendering moot any concerns about involving *C. l. baileyi* in a southern Rockies reintroduction, is the 1978 decision by the Service to base wolf recovery on the species level rather than the subspecies level (Nowak 1978). Indeed the DPS paradigm and Nowak's (1995) taxonomic scheme is based on the fact that gray wolves vary little over large landscapes.

Considering the boundaries of baileyi's probable historic range has great conservation implications. Estimation of probable historic ranges has direct bearing on reintroduction programs promulgated under section 10(j) of the ESA (i.e. the xn designation). Regulations for implementing section 10(j) state that: "the Secretary may designate as an experimental population a population of endangered species that has been or will be released into suitable habitat within its **probable historic range** [50CFR 17.81(a)]. The Service could be challenged legally if it could be demonstrated that reintroductions under section 10(j) were being undertaken outside a subspecies' probable historic range.

Fortunately,

1. given the somewhat contradictory opinions concerning the Mexican wolf's historic range,
2. given the arbitrary nature of criteria used to estimate the probable historic range,
3. given the likelihood that the southern portion of the southern Rockies was a transition zone inhabited by at least a few Mexican wolves ,
4. given the Service' 1978 policy that directs that wolf recovery be effected at the species level, and
5. given the room afforded the Service by the term "probable" and the agency's great discretionary authority,

It seems that the Service is justified in officially recognizing the southern portion of the southern Rockies as an appropriate reintroduction area for Mexican wolves and integrating such recognition into the recovery program.

That brings me to a discussion about the suitability of the southern Rockies for gray wolves. As I showed earlier the gray wolf population is distributed over about 3% of the species' historic range and is represented by about 3,000 animals (Ferris et al. 1999). Clearly, most of the historic range is unoccupied. Most noticeably, wolves are still absent from the southern Rocky Mountains. This area comprises about 16 million ha (40 million ac or 62,500 sq. miles) and includes portions of Wyoming, Colorado, Utah, New Mexico, and Arizona (SREP 2000a).

Two studies of the Colorado portion of the region revealed about 5 million ha (12 million acres or 20,000 sq miles) of habitats that were ideal for gray wolves because of the presence of robust populations of native ungulates and extensive land holdings by the U.S. Forest Service and Bureau of Land Management where wolf-human problems should be minimal and manageable (Bennett 1994, Martin et al. 2000). The studies concluded that Colorado could alone support 1,000 or more wolves. A public opinion poll of Colorado residents revealed majority support for restoring wolves to the state (Manfredo et al. 1994).

The appropriateness of the southern Rockies for wolves is appreciated by the conservation community and recently the Southern Rockies Wolf Restoration Project was launched as a coalition of 14 organizations dedicated to restoring wolves to the region.

The prospects of recovering wolves to the southern Rockies received a boost in 1997 when media executive R.E. Turner purchased the 235,000 ha (588,000 acre or 918 miles sq. or 2,350 km sq) Vermejo Park Ranch in northern New Mexico and southern Colorado. If Yellowstone's is heaven on earth for wolves, then Vermejo is the pearly gates.

The Turner Endangered Species Fund in collaboration with Sinapu and the Southern Rockies Ecosystem Project recently completed a study of landscape features that are important to wolf recovery for Vermejo Park Ranch (VPR) and surrounding areas that collectively comprised 760,000 ha (1.9 million acres or 3,000 mi sq or 7400 km sq). The area in unique because it is mostly defined by the Carson National Forest and several large tracts of private land (> 12,000 ha or 30,000 acres) that are managed for conservation purposes. The most notable tract of private land is the 235,000 ha (or 588,000 acre) Vermejo Park ranch which we estimate, based solely on ungulate biomass could alone support 94 wolves (SREP 2000b).

VPR is

- is five times larger than Isle Royale, which has supported a wolf population since the late 1940s.
- supports 7,500 elk and 2,500 mule deer.
- free of cattle and sheep
- intensively monitored and access is strictly controlled which greatly reduces poaching of wildlife
- ecologically very similar to the area where Mexican wolves are currently being reintroduced

To reiterate, modeling based on ungulate biomass indicates that Vermejo Park ranch alone could support 94 wolves. If you consider the 760,000 ha area over which we conducted the GIS assessment the ungulate biomass model indicates that over 200 wolves could be supported.

Currently the TESF and the Southern Rockies Wolf Restoration Project are developing a proposal to reintroduce wolves to Vermejo as part of a campaign to promote wolf recovery in the southern Rockies. We believe that Vermejo could serve as a nidus or birthing place for wolves that disperse to other appropriate areas throughout the region. Large tracts of public land in Colorado, for example the Rio Grande and San Juan National Forests are within 240 km (150 miles) of the Ranch, well within the dispersal distance of gray wolves. Recently Dave Mech and I did an overflight of the area to survey the landscape that a dispersing wolf would encounter as it traveled from VPR to public land in southern Colorado. The flight convinced us that wolves could routinely make the trip.

It's easy to imagine that Vermejo could serve as the "Yellowstone" of the southern Rockies: home to a carefully protected population of wolves that produces dispersers that settle appropriate habitats of distant areas in the southern Rockies.

Moreover, a successful Vermejo wolf reintroduction project could greatly facilitate acceptance of wolf recovery by other private landowners. Such acceptance could facilitate efforts to recover gray wolves in the northeastern U.S., a region dominated by private land. Additionally, there are several strategic tracts of private land in the southwest that could advance recovery of the Mexican wolf. Moreover, successfully restoring wolves to Vermejo could promote other efforts to conserve other imperiled species on private land across the U.S. Overall, it seems that a Vermejo wolf project could be mighty magic for conservation of biodiversity on private land.

Closer to home, I think a VPR project that involved *baileyi* could greatly increase the odds of success for other Mexican wolf reintroduction projects. By emphasizing the translocation of Mexican wolves from Vermejo to other reintroduction sites, one could effectively minimize the reliance of these reintroductions on naive captive stock. In effect I imagine VPR serving as a site where captive-born adult Mexican wolves would gain experience in the wild and produce wild-born pups wolves, and then be translocated to other reintroduction projects thus greatly enhancing their success. Vermejo could serve to totally divorce the Mexican wolf recovery program from using captive stock in reintroduction efforts. Work with wolves elsewhere and countless other species clearly indicates that reintroduction effort are most certain if wild animals are used rather than captive animals (Griffith et al. 1989, Kleiman 1989)

Once other reintroduction projects did not need either experienced adults or wild-born pup, then translocations from Vermejo could be terminated and work carried out to ensure restoration of a self-sustaining population to the ranch. Once *baileyi* was firmly established, theTESF would support the reintroduction of *nubilus*, at the ranch or perhaps to areas north of Vermejo, to ensure the potential for dispersers from each subspecies to breed and effectively restore the original genetic mix to the region.

I think this scenario represents a logical, cost-effective, and certain approach for recovering Mexican wolves and for restoring gray wolves to the southern Rocky Mountains ecosystem. Once that's accomplished we will have made great strides toward restoring a wolf population that is continuous from Canada to Mexico. Clearly reintroducing Mexican wolves to VPR is a cornerstone in the puzzle of wolf recovery throughout the Rocky Mountain west. Accordingly, the soon to-be-released national plan and the revised recovery plan for Mexican wolves should be developed to advance the idea.

We recognize that we may never receive authority to reintroduce Mexican wolves to Vermejo as a means of recovering wolves to southern Rockies. So, because of our strong desire to assist with recovery of Mexican wolves and because we are absolutely convinced that Vermejo is a most appropriate site for *baileyi*, we have submitted a proposal to the USFWS that calls for the Fund to develop a wolf experience center that would promote Mexican wolf recovery by:

1. providing captive-born adults opportunities to enhance behaviors related to hunting native prey, denning, pup-rearing, interacting with conspecifics and other wildlife species, and avoiding humans;
2. allowing some adults to produce pups in the wild that could be involved in reintroduction efforts;
3. providing the Service an opportunity to "preview" the survival skills of animals being considered for reintroduction, and
4. providing an opportunity to develop population estimation techniques based on genetic sample collected passively (e.g. hair snags).

If the above objectives were realized the TESF would consider broadening the facility's mission to include research to reduce conflicts between wolves and livestock.

The center is proposed for the core area of Vermejo Park Ranch, which encompasses some 85,000 ha (about 200,000 acres). Any wolf that left the core area would be captured and returned. There would be no allowance for wolves to inhabit areas outside Vermejo's core.

It should be noted that this idea differs from a full-blown reintroduction effort to recover gray wolves in the southern Rockies in two distinct ways.

1. Wolves would not be allowed to inhabit areas outside VPR.
2. Once the Service determined that there was no need for experienced wolves, then the center would be shut down.

There are many benefits to the facility as it would:

1. increase the certainty, cost-effectiveness, and stakeholder acceptance of Mexican wolf recovery;
2. probably provide valuable information to Federal, State, and Tribal gray wolf managers nationally;
3. instruct other efforts to recover imperiled species via reintroduction of captive-born animals;
4. serve as a vivid example for future public/private efforts for conserving biological diversity with an emphasis on private land.

Currently the USFWS is supportive of the idea of developing the experience center. Logic tells me that if VPR (i.e. the southern portion of the southern Rockies) is appropriate for Mexican wolves to experience the sites and sounds of freedom before being translocated and permanently released elsewhere, then the southern Rockies should be viewed as appropriate for reintroduction of Mexican wolves as part of an effort to restore wolves to the southern Rockies.

Literature Cited

Bennett, L. E. 1994. Colorado gray wolves recovery: a biological feasibility study. University of Wyoming Fish and Widlife Cooperative Research Unit, Laramie, WY. 318 pp.

Bogan, M. A., and P. Mehlhop. 1983. Systematic relationships of gray wolves (*Canis lupus*) in southwestern North America. Occasional Papers of the Museum of Southwestern Biology No. 1. 21 pp.

Ferris, B., M. Shaffer, N. Fascione, H. Pellet, and M. Senatore. 1999. Places for wolves: a blueprint for restoration and long-term recovery in the lower 48 states. Defenders of Wildlife, Washington, D.C. 31pp.

Forbes, S. H., and D. K. Boyd. 1997. Genetic structure and migration in native and reintroduced Rocky Mountain wolf populations. Conservation Biology. 11:1226-1234.

Fritts, S. H. 1983. A record dispersal by a wolf from Minnesota. Journal Mammalogy. 64:166-67.

Garcia-Moreno, J., M. D. Matocq, M. S. Roy, E. Geffen, and R. K. Wayne. 1996. Relationships and genetic purity of the endangered Mexican wolf based on analysis of microsatellite loci. Conservation Biology, 10:376-389.

Griffith, B., J. M. Scott, J. W. Carpenter, and C. Reed. 1989. Translocation as a species conservation tool: status and strategy. Science. 345:447-480.

Kleiman, D. G. 1989. Reintroduction of captive mammals for conservation. BioScience. 39:152-161.

Martin, W. W., A. Jones, and R. Edward. 2000.Wolf recovery in the southern Rockies of Colorado: an initial habitat suitability analysis. In review.

Manfredo, M. J., A. D. Bright, J. Pate, and G. Tischbein. 1994. Colorado residents attitudes and perceptions toward reintroductions of the gray wolf (*Canis lupus*) into Colorado. Human Dimensions in Natural Resources Unit, Colorado State University, Report No. 21. 99 pp.

Nowak, R. M. 1978. Reclassification of the gray wolves in the United States and Mexico, with determination of critical habitat in Michigan and Minnesota. Federal Register. 43:9607-9615.

------. 1995. Another look at wolf taxonomy. Pages 375-397 in L. N. Carbyn, S. H. Fritts, and D. R. Seip, eds. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Edmonton, Alberta, Occasional Publication No. 35. 642 pp.

Parsons, D. 1996. Case Study: the Mexican wolf. New Mexico Journal of Science. 36:101-123.

Southern Rockies Ecosystem Project (SREP). 2000a. The state of the Southern Rockies Ecoregion. Southern Rockies Ecosystem Project, Nederland, CO. 137 pp.
------. 2000b. Summary of base data and landscape variables for wolf habitat suitability in the Vermejo Park Ranch and surrounding areas. A report to the Turner Endangered Species Fund, Gallatin Gateway, MT. 37 pp + figures.
U.S. Fish and Wildlife Service. 1982. Mexican wolf recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM. 103 pp.
------. 1987,. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Helena, MT. 119 pp.
------. 1996. The reintroduction of the Mexican wolf within its historic range in the United States. Final Environmental Impact Statement. U.S. Fish and Wildlife Service, Albuquerque, NM.
------. 2000. Proposal to reclassify and remove the gray wolf from the list of endangered and threatened wildlife in portions of the conterminous United States. Federal Register. 65: 43450-43496.

Wolves in the Southern Rockies

A Population & Habitat Viability Assessment

FINAL REPORT

APPENDIX IV

Minority Viewpoint

Minority Viewpoint
On
Wolf Recovery in the Southern Rocky Mountain Ecosystem

Prepared by:

Vernon Sharpe, Past President, Colorado Cattlemen's Assn.
Tom Compton, (Ph.D.-Zoology) President, Colorado Cattlemen's Assn.

We wish to commend the Wolf Recovery Workshop initiators, Turner Endangered Species Fund, Defenders of Wildlife, and the Conservation Breeding Specialist Group, for developing and implementing a process to bring together divergent viewpoints in order to assess the potential for successful reintroduction of wolves into the Southern Rocky Mountain Ecoregion. We are especially appreciative of the opportunity to present an opinion from the livestock industry. We cannot, however, speak for the entire industry so this opinion only represents two Colorado ranchers.

The document resulting from this workshop and authored by an impressive array of highly qualified scientists and other conservationists will no doubt suggest that there is a high probability for successful reintroduction of wolves into the southern Rockies. However, we are not convinced of a demonstrated need to do so at this time. There are two basic reasons for our opposition:

1. We believe that the introduction is driven by the faulty assumption that the presence of the wolf is necessary for healthy ecosystem function. We would suggest that any healthy ecosystem has the capability of adapting to the constant change under which it exists. Constant perturbation is the norm for an ecological system and, in fact, systems are dependent upon these perturbations for proper functioning. Whether wildfire, disease, or the constant ebb and flow of predator/prey populations, ecological systems possess the inherent capacity to evolve with environmental fluctuation. As one component of the system wanes others quickly fill the void.

   We believe that the current suite of larger predators including the mountain lion, black bear, coyote, lynx and humans can be effectively managed to appropriately contain prey species within carrying capacities. This may require some shift in our current sport hunting philosophies but it is certainly within our capabilities.

2. We continue to remain concerned over the high potential for conflict with wolf/human interactions. Particularly problematic are interactions between wolf populations and domestic livestock populations. It is our understanding that where other wolf reintroduction efforts have and are being done, the ranching community has, for the most part, not been totally satisfied with the resolutions of the conflicts. For example, the simple reimbursement of current market value for an animal lost to wolves does not take into consideration the loss

of reproductive capacities from a well developed gene pool or the economic loss experienced by the necessity of having to relocate an entire herd as the result of denning activity by wolves. Some of these issues are addressed in the Human Dimensions section of the Workshop Report.

The potential for serious conflict between dogs, whether kept for sport hunting or as family pets, must be considered. This is particularly true in the southern Rockies where humans, engaged in recreational activities on federal lands have demonstrated a marked proclivity for having dogs as companion animals.

Based upon these two areas of concern, we remain opposed to the reintroduction of wolves into the Southern Rocky Mountain Ecoregion. We wonder whether or not the effort needed to address the potential problems associated with reintroduction is sound public policy especially in light of the questionable "need" for this particular predator in this ecosystem.

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Non-participating Expert Commentary

To: Participants, Southern Rockies Wolf Recovery PHVA

From: Ron Nowak, 2101 Greenwich St. Falls Church, Virginia 22043

Subject: Endorsement of statement on appropriate wolf for southern Rockies

At the request of Mike Phillips, I am providing this endorsement for the statement "Which Wolves are Appropriate Reintroduction Stocks for the Southern Rocky Mountains?"

I agree with the statement's position that "the Mexican wolf (Canis lupus baileyi) would be the most appropriate wolf to use as a reintroduction source to the southern Rocky Mountains." I also agree that such a reintroduction, in the southern part of this ecoregion, would be a high priority action. An appropriate wolf for reintroduction in the northern part of this ecoregion might best be a topic for future discussion.

I do favor continued usage of the name C. lupus baileyi, as well as certain other recognized subspecific names for North American gray wolves. It would be premature to definitively accept alternative suggestions based on the sometimes contradictory genetic methodologies.

I would be glad to provide any further information or explanation that may be needed. Please feel free to contact me at any time.

Ronald M. Nowak
703-237-6676
ron4nowak@cs.com

U.S. Fish and Wildlife Service
Division of Federal Aid
P.O. Box 25486
Denver, CO 80225

24 August 2000

Participants, Southern Rockies Wolf Recovery PHVA:

At the request of Mike Phillips, I have reviewed the document Which wolves are appropriate reintroduction stocks for the Southern Rocky Mountains? I agree with the conclusion presented in the paper and the rationale for arriving at that conclusion. If reintroduction should occur in southern Colorado or northern New Mexico, it seems fairly clear that *baileyi* would be the most appropriate reintroduction stock from both a genetic and an ecological perspective.

I am uncertain about the statement which reads, "The second priority should be establishment of *C. l. occidentals* into the more northern part of this region." I would want to hear and think more about which subspecies or genetic background would be most appropriate stock for northern and central Colorado.

Please note that my opinions do not reflect any official position of the U.S. Fish and Wildlife Service, only my individual thinking about this matter.

Sincerely,

Steve Fritts

Steven H. Fritts, Ph.D.

cc: Mike Phillips

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IUCN Policy Guidelines