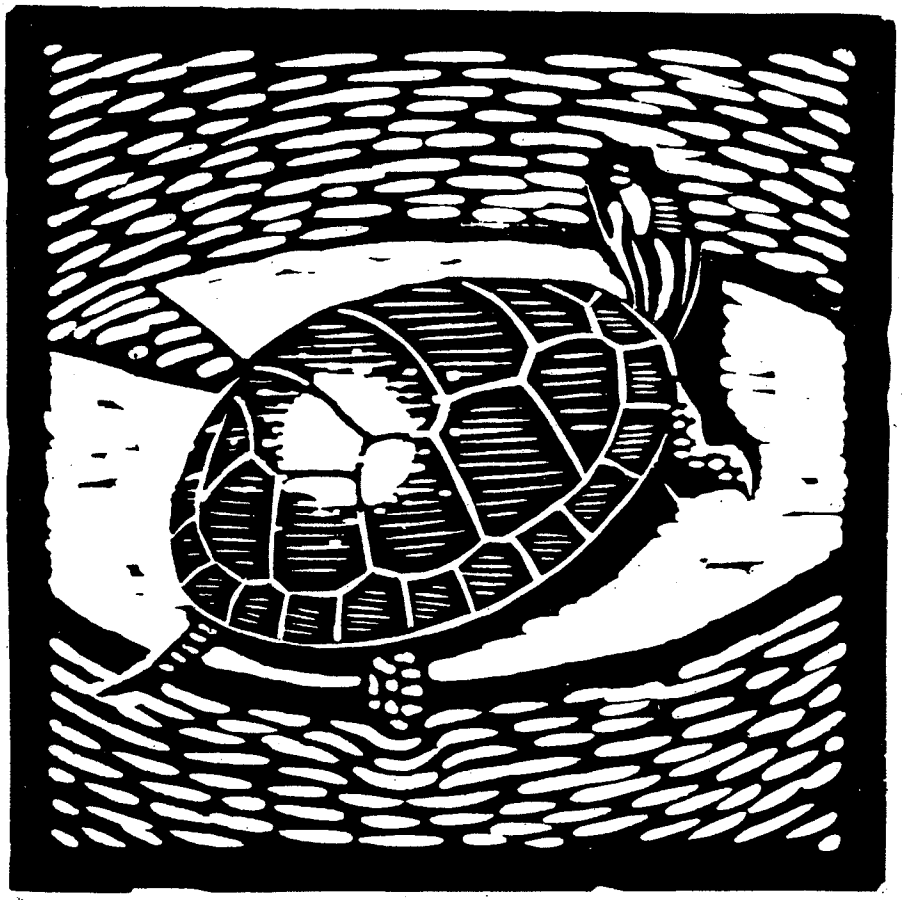
Wild EARTH
Special Issue

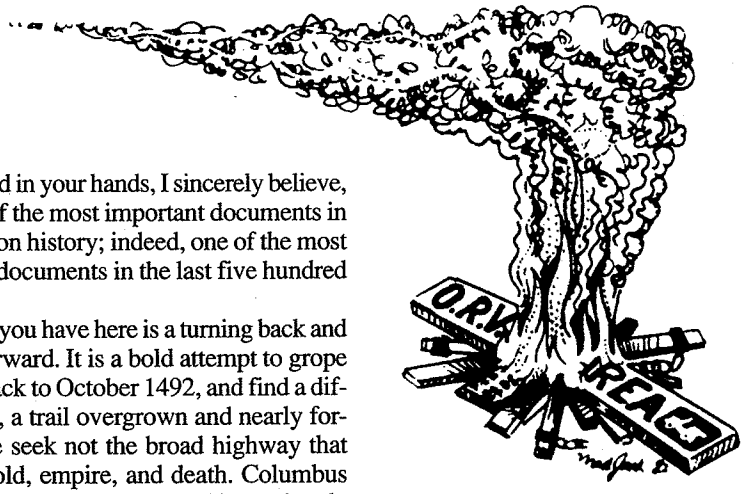


The Wildlands Project

Plotting A North American Wilderness Recovery Strategy

$6.00

Around The Campfire



You hold in your hands, I sincerely believe, one of the most important documents in conservation history; indeed, one of the most important documents in the last five hundred years.

What you have here is a turning back and a going forward. It is a bold attempt to grope our way back to October 1492, and find a different trail, a trail overgrown and nearly forgotten. We seek not the broad highway that leads to gold, empire, and death. Columbus and the hard men who followed have already found that yellow brick road.

What we seek is a path that leads to beauty, abundance, wholeness, and wildness. We look for the big outside instead of empire, we seek wolf tracks instead of gold, we crave life rather than death.

What you have in your hands is a special issue of *Wild Earth* magazine focusing on The Wildlands Project (North American Wilderness Recovery Project). The ideas here are a rare confluence of the passion of those who love wild things and the scientific rationality of those who study wild things. The Wildlands Project is a coming together of grass-roots conservation activists and conservation biologists in a time of crisis.

We cannot sit idly by as biological diversity is ravaged on Earth. This magazine is the foundation of our active vision of how to protect and perpetuate native species and systems in North America. It tells how we put conservation biology into effect.

Please read the Mission Statement of The Wildlands Project first, and then read Dr. Michael Soulé's introduction to the project. The centerpiece of this issue is Dr. Reed Noss's detailed model for Wilderness Recovery Plans—core wildernesses surrounded by buffer zones and connected by corridors. I add some practical points to Noss's model for activists, and a brief overview of the North American Wilderness Recovery Project.

Gary Snyder, perhaps the deepest thinker of this generation, offers his thoughts on how we can live our lives in harmony with this wild vision, and how we can advance on a watershed level.

Several specific proposals for restoring wilderness are also presented. They are building blocks for the continent-wide network; they are also meant to spark discussion on how we should proceed.

Finally, several pieces by John Davis, Rod Mondt, and Dave Johns explain who *Wild Earth* and The Wildlands Project are, and what you can do to help.

Because the North American Wilderness Recovery Project is unprecedented, audacious, and visionary, it is not fully formed. The authors included here do not march in lockstep to the beat of a single drum. Life on Earth is diverse, and diverse approaches are presented in this special issue of *Wild Earth*. As John Davis points out in his introduction to the proposal section of this issue, these plans are tentative and unfinished. Read them in that light.

Similarly, do not be discouraged from becoming involved with The Wildlands Project and its cooperating groups because you fear all the work has been done. We are just beginning. While regional Wilderness Recovery Networks should evolve in har-

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WILD EARTH

The Wildlands Project

Special Issue

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On the cover: *Turtle* woodcut by Patrick Dengate.

mony with Reed Noss's model, I am sure that the model will change subtly as it is applied throughout the extraordinary variety of natural ecosystems and human social systems in North America. Just as in wild Nature, we will see the dynamic of *co*-evolution between the theoretical model and the on-the-ground application of it in the art and science of specific regional Wilderness Recovery Networks.

Your input as a lover of things natural is needed at all levels of The Wildlands Project.

✣

Since we hope to transform the conservation movement as well as the debate over "natural resources," we are trying to achieve the widest possible distribution of this issue of *Wild Earth*. A number of cooperating groups are sending it to their members. There may be some unavoidable duplication in distribution. If you receive two or three copies of this special issue, please share them with others. If you would like more copies, contact Rod Mondt at The Wildlands Project. If you have access to a mailing list and would like to send this *Wild Earth* to your group, contact Rod. (See Clearinghouse article in this issue.) We are distributing 75,000 copies of this special issue.

In addition to the many people who have worked on this Wildlands Project issue of *Wild Earth,* we thank Doug Tompkins of the Ira Hiti Foundation for Deep Ecology, who provided a grant for printing and distribution. We deeply appreciate Doug's support and leadership.

We now need to reach out to other friends and supporters for help over the coming year. If what you read in the following pages tingles your spine like the distant howl of a wolf pack, send The Wildlands Project your contribution so we can work together to make our shared vision a shared reality. Please send your checks to:

The Wildlands Project
PO Box 5365
Tucson, AZ 85703
(2721 W. Calle Carapan, 85745)

We at The Wildlands Project are tired of campaigning for a mere slowing of the rate of destruction of natural diversity; we will no longer accept the status quo. What we seek is nothing less than the full flowering of the natural biological diversity of North America. We welcome all those who share this audacious vision and passion.

—Dave Foreman
Wolf Pond, Five Ponds Wilderness Area
Adirondack State Park

Western Azalea (Rhododendron occidentale) *by Robin Peterson*

THE WILDLANDS PROJECT MISSION STATEMENT

OUR MISSION

The mission of The Wildlands Project is to help protect and restore the ecological richness and native biodiversity of North America through the establishment of a connected system of reserves.

As a new millennium begins, society approaches a watershed for wildlife and wilderness. The environment of North America is at risk and an audacious plan is needed for its survival and recovery. Healing the land means reconnecting its parts so that vital flows can be renewed. The land has given much to us; now it is time to give something back—to begin to allow nature to come out of hiding and to restore the links that will sustain both wilderness and the spirit of future human generations.

The idea is simple. To stem the disappearance of wildlife and wilderness we must allow the recovery of whole ecosystems and landscapes in every region of North America. Allowing these systems to recover requires a long-term master plan.

A feature of this design is that it rests on the spirit of social responsibility that has built so many great institutions in the past. Jobs will be created, not lost; land will be given freely, not taken.

OUR VISION

Our vision is simple: we live for the day when Grizzlies in Chihuahua have an unbroken connection to Grizzlies in Alaska; when Gray Wolf populations are continuous from New Mexico to Greenland; when vast unbroken forests and flowing plains again thrive and support pre-Columbian populations of plants and animals; when humans dwell with respect, harmony, and affection for the land; when we come to live no longer as strangers and aliens on this continent.

Our vision is continental: from Panama and the Caribbean to Alaska and Greenland, from the Arctic to the continental shelves, we seek to bring together conservationists, ecologists, indigenous peoples, and others to protect and restore evolutionary processes and biodiversity. We seek to assist other conservation organizations, and to develop cooperative relationships with activists and grassroots groups everywhere who are committed to these goals.

THE PROBLEM

We are called to our task by the failure of existing Wilderness, Parks, and Wildlife Refuges to adequately protect life in North America. While these areas preserve landscapes of spectacular scenery and areas ideally suited to non-mechanized forms of recreation, they are too small, too isolated, and represent too few types of ecosystems to perpetuate the biodiversity of the continent. Despite the establishment of Parks and other reserves from Canada to Central America, true wilderness and wilderness-dependent species are in precipitous decline:

√ Large predators like the Grizzly Bear, Gray Wolf, Wolverine, Puma, Jaguar, Green Sea Turtle, and American Crocodile have been exterminated from most of their pre-Columbian range and are imperiled in much of their remaining habitat. Populations of many songbirds are crashing and waterfowl and shorebird populations are reaching new lows.

√ Native forests have been extensively cleared, leaving only scattered remnants of most forest types. Even extensive forest types, such as Boreal Forest, face imminent destruction in many areas.

√ Tall Grass and Short Grass Prairies, once the habitat of the most spectacular large mammal concentrations on the continent, have been almost entirely destroyed or domesticated.

THE MEANING OF WILDERNESS

The failure of reserves to prevent the losses just mentioned rests in large part with their historic purpose and design: to protect scenery and recreation or to create outdoor zoos. The Wildlands Project, in contrast, calls for reserves established to protect wild habitat, biodiversity, ecological integrity, ecological services, and evolutionary processes—that is, vast interconnected areas of true wilderness. We reject the notion that wilderness is merely remote, scenic terrain suitable for backpacking. Rather, we see wilderness as the home for unfettered life, free from industrial human intervention.

Wilderness means:

•Extensive areas of native vegetation in various successional stages off-limits to human exploitation. We recognize that most of Earth has been colonized by humans only in the last several thousand years.

•Viable, self-reproducing, genetically diverse populations of all native plant and animal species, including large predators. Diversity at the genetic, species, ecosystem, and landscape levels is fundamental to the integrity of nature.

•Vast landscapes without roads, dams, motorized vehicles, powerlines, overflights, or other artifacts of civilization, where evolutionary and ecological processes that represent four billion years of Earth wisdom can continue. Such wilderness is absolutely essential to the comprehensive maintenance of biodiversity. It is not a solution to every ecological problem, but without it the planet will sink further into biological poverty.

THE WILDERNESS PROPOSAL: CORE RESERVES, CORRIDORS, BUFFERS, AND RESTORATION

We are committed to a proposal based on the requirements of all native species to flourish within the ebb and flow of ecological processes, rather than within the constraints of what industrial civilization is content to leave alone. Present reserves—Parks, Wildernesses, Refuges—exist as discrete islands of nature in a sea of human modified landscapes. Building upon those natural areas, we seek to develop a system of large, wild core reserves where biodiversity and ecological processes dominate.

Core reserves would be linked by biological corridors to allow for the natural dispersal of wide-ranging species, for genetic exchange between populations, and for migration of organisms in response to climate change.

Buffers would be established around core reserves and corridors to protect their integrity from disruptive human activities. Only human activity compatible with protection of the core reserves and corridors would be allowed. Buffers would also be managed to restore ecological health, extirpated species, and natural disturbance regimes. Intensive human activity associated with civilization—agriculture, industrial production, urban centers—could continue outside the buffers.

Implementation of such a system would take place over many decades. Existing natural areas should be protected immediately. Other areas, already degraded, will be identified and restoration undertaken.

The Wildlands Project sets a new agenda for the conservation movement. For the first time a proposal based on the needs of all life, rather than just human life, will be clearly enunciated. Both conservationists and those who would reduce nature to resources will have to confront the reality of what is required for a healthy, viable, and diverse North America. Citizens, activists, and policy makers will be able to confront the real choices because the choices will be on the agenda. It will no longer be possible to operate in a business-as-usual manner and ignore what is at stake.

The Wildlands Project will also inspire the development of indigenous proposals for other continents.

WHO ARE WE AND WHAT DO WE DO?

The Wildlands Project is a non-profit publicly supported organization based in Tucson, Arizona. We are a group of conservation biologists and biodiversity activists from across the continent.

We work in cooperation with independent grass-roots organizations throughout the continent to develop proposals for each bioregion. These organizations include Preserve Appalachian Wilderness, Alliance for the Wild Rockies, Greater Ecosystem Alliance, Sky Island Alliance, Klamath Forest Alliance, Finger Lakes Wild, Coast Range Association (Oregon), and many others. Development of regional Wilderness proposals is based upon principles of conservation biology. Draft proposals are developed through discussions and conferences that bring together regional activists, conservation biologists and other scientists, and conservation groups across the spectrum of the movement. The Wildlands Project supports this process through funding, networking, and offering technical expertise.

We undertake and encourage research on appropriate human activities in buffers, reintroduction of extirpated species, design of connecting corridors (especially through areas with significant human obstacles), overcoming fragmentation and achieving habitat connectivity, genetic diversity, population viability, and control of exotic species.

As proposals are developed we will publish the results in pamphlet form, in *Wild Earth,* and in other conservation publications to reach a wide audience. Videos, slide shows, and academic articles will be produced and traveling exhibits will be organized to educate the public about the proposals. When proposals for all bioregions of the continent have been completed, a book and compendium of maps will be produced, as well as updated videos and related materials.

In short, our job is to educate the public, the environmental movement, government agencies, the academic community, and others about the importance of biodiversity and what is necessary to protect it.

The Wildlands Project welcomes the participation and support of all persons and organizations interested in these issues.

—Prepared by Dave Foreman, John Davis, David Johns, Reed Noss, and Michael Soulé.

PROYECTO DE TIERRAS SILVESTRES DECLARACION DE MISION

Traducido por María Quintana

NUESTRA MISION

La misión del Proyecto de Tierras Silvestres es la protección y la restauración de la riqueza ecológica y diversidad biológica indígena de Norteamérica a través del establecimiento y promoción de un sistema de reservas conectadas.

Al comenzar un nuevo milenio, la sociedad se aproxima a un momento crítico para la fauna y la inmensidad. El medio ambiente de Norteamérica está en riesgo y se necesita un plan audaz para lograr su supervivencia y recuperación. Sanar a la tierra significa reconectar sus partes para que los flujos vitales puedan ser renovados. La tierra nos ha dado mucho; ahora es hora de devolverle algo—de empezar a permitir que la naturaleza salga de su escondite y de restaurar los enlaces que sostendrán tanto a la inmensidad como al espíritu de futuras generaciones humanas.

La idea is simple: para detener la desaparición de la fauna y la inmensidad, tenemos que permitir la recuperación de ecosistemas y paisajes enteros en cada región de Norteamérica. Dejar que estos sistemas se recuperen requiere un plan maestro a largo plazo.

Una característica de este diseño es que se basa sobre el espíritu de responsabilidad social que ha levantado a tantas grandes instituciones en el pasado. Trabajos serán creados, no perdidos; terrenos serán dados libremente, no quitados.

NUESTRA VISION

Nuestra visión es sencilla: vivimos para el día cuando los Osos Pardos de Chihuahua tengan una conección ininterrumpida a los Osos Pardos de Alaska; cuando las colonias de Lobo Gris continuen desde Nuevo México hasta Groenlandia; cuando vastos bosques ininterrumpidos y extensos llanos vuelvan a prosperar y mantener abundantes colonias de plantas y animales precolombinos; cuando los humanos vivan con respeto, afecto, y en harmonía con la Tierra; cuando veamos a la naturaleza libre como nuestro verdadero hogar y dejemos de vivir como estrangeros en este continente.

Nuestra visión es continental: desde Panamá y el Caribe a Alaska y Groenlandia, desde el Artico hasta las repizas continentales, tratamos de unir a conservacionistas, ecologistas, gentes indígenas, y otras personas para proteger y restaurar a los procesos evolucionarios y la biodiversidad. Tratamos de asistir a otras organizaciones conservacionistas, y de desarrollar relaciones cooperativas con activistas y grupos de origen popular en todas partes que esten comprometidos a estas metas.

EL PROBLEMA

Nos llama a esta labor el fracaso de las existentes áreas silvestres, parques, y refugios de fauna en proteger adecuadamente a la vida en Norteamérica. Aunque estas áreas preservan paisajes de vistas espectaculares y áreas idealmente adaptadas a formas de recreo no mecanizadas, son demasiado pequeñas, demasiado aisladas, y representan muy pocos tipos de ecosistemas para poder perpetuar la biodiversidad del continente. A pesar del establecimiento de parques y otras reservas desde el Canadá a Centroamérica, la inmensidad y las especies que dependen de ella están declinando precipitadamente.

Predatores grandes como el Oso Pardo, Lobo Gris, Carcayú, Puma, Jaguar, Kawama Verde, y Cocodrilo Americano han sido exterminados de la majoría de su recorrido precolombino, y están en peligro en grán parte de la habitación que les permanece. Las colonias de muchos pájaros cantores están fracasando y las colonias de aves acuáticas y aves marinas están alcanzando puntos muy bajos.

Los bosques nativos han sido extensivamente desmontados, dejando solo remanentes dispersos de la majoría de los tipos de bosques. Aún los tipos de bosques que todavía son extensos, tal como el bosque boreal, enfrentan la inminente destrucción en muchas áreas.

Las praderas de yerbas altas y las praderas de yerbas cortas, una vez la habitación de las más espectaculares concentraciones de mamíferos grandes en el continente, han sido casi totalmente destruidas o domesticadas.

EL SIGNIFICADO DE LA INMENSIDAD

El fracaso de las reservas en prevenir las pérdidas mencionadas anteriormente es debido en grán parte a su propósito y diseño histórico: proteger las vistas y la recreación, o crear zoológicos en las abiertas. El Proyecto de Tierras Silvestres, en contraste, demanda el establecimiento de reservas para proteger la habitación, la biodiversidad, la integridad ecológica, los servicios ecológicos, y los procesos evolucionarios—es decir, vastas áreas interconectadas de terreno yermo. Rechazamos la noción que la inmensidad es solamente terreno escénico y remoto apropiado para escursiones de mochila. Mas bién, vemos a la inmensidad como el hogar de la vida desencadenada, libre de la intervención de la humanidad industrial.

La inmensidad significa:

-Extensas áreas de vegetación indígena en varias etapas de sucesión cerradas a la explotación por los humanos. Reconocemos que la mayoría de la Tierra ha sido colonizada por los humanos en solamente los últimos

cuantos miles de años.

-Colonias viables, autoreproductivas, y geneticamente diversas de todas las especies indígenas de plantas y animales, incluyendo predatores grandes. Diversidad al nivel genético, de especies, de ecosistema, y de paisaje es fundamental para la integridad de la naturaleza.

-Vastos paisajes sin carreteras, represas, vehículos motorizados, líneas de alto voltaje, vuelos de aviones, u otros artefactos de la civilización, donde los procesos evolucionarios y ecológicos que representan cuatro billones de años de la sabiduría de la Tierra puedan continuar. Tal inmensidad es absolutamente esencial al mantenimiento comprensivo de la biodiversidad. No es una solución para todos los problemas ecológicos, pero sin ella el planeta se hundirá más profundamente en la pobreza biológica.

LA PROPUESTA DE INMENSIDAD; RESERVAS CENTRALES, CORREDORES, ZONAS AISLADORAS, Y RESTAURACION

Estamos comprometidos a una propuesta basada en los requerimientos de todas las especies indígenas para prosperar dentro del flujo de los procesos ecológicos, en vez de dentro de lòs constreñimientos de lo que a la civilización industrial le place dejar en paz. Las reservas actuales—los parques, las áreas silvestres, los refugios de fauna—existen como discretas islas de naturaleza en un mar de paisajes modificados por los humanos. Edificando sobre esas áreas naturales, deseamos desarrollar un sistema de grandes, silvestres reservas centrales donde la biodiversidad y los procesos ecológicos dominen.

Las reservas centrales serían conectadas por corredores biológicos para hacer posible la dispersión natural de las especies de recorrido extenso, el intercambio genético entre colonias, y la migración de organismos en respuesta al cambio del clima.

Zonas aisladoras serían establecidas alrededor de las reservas y corredores para proteger su integridad contra las actividades humanas disruptivas. Solamente serían permitidas las actividades humanas compatibles con la protección de las reservas centrales y los corredores. Las zonas aisladoras también serían dirigidas para restaurar la salud ecológica, las especies extirpadas, y régimenes naturales de disturbio. Las intensas actividades humanas asociadas con la civilización—la agricultura, la producción industrial, los centros urbanos—podrían continuar fuera de las zonas aisladoras.

La implementación de tal sistema tomaría lugar a través de muchas décadas. Las existentes áreas naturales deben de ser protegidas inmediatamente. Otras áreas, que ya han sido degradadas, serán identificadas y se emprenderá su restauración.

El Proyecto de Tierras Silvestres establece una nueva agenda para el movimiento conservacionista. Por primera vez, una propuesta basada en las necesidades de todas las formas de vida, en vez de solamente las de la vida humana, será claramente articulada. Tanto los conservacionistas y ellos que reducerían a la naturaleza a meros recursos, tendrán que enfrentar la realidad de lo que es requerido para una saludable, viable, y diversa Norteamérica. Los ciudadanos, activistas, y los que formulan la política podrán enfrentar las verdaderas alternativas porque ellas estarán en la agenda. No nos será posible seguirnos conduciendo como de costumbre e ignorar lo que está en la balanza.

El Proyecto de Tierras Silvestres también inspirará el desarrollo de propuestas indígenas para otros continentes.

QUIENES SOMOS Y QUE HACEMOS

El Proyecto de Tierras Silvestres es una organización que no proporciona ni busca provecho, apoyada por el público, y basada en Tucson, Arizona. Somos un grupo de biologistas de conservación y activistas a favor de la biodiversidad de a través del continente.

Trabajamos en cooperación con organizaciones independientes de origen popular a través del continente para desarrollar propuestas para cada bioregión. Estas organizaciones incluyen: Preserven los Montes Apalaches (Preserve Appalachian Wilderness), Alianza para los Montes Rocosos (Alliance for Wild Rockies), Alianza de Grandes Ecosistemas (Greater Ecosystem Alliance), Alianza para las Islas de Cielo (Sky Island Alliance), Alianza para el Bosque Klamath (Klamath Forest Alliance), Lagos del Norte del Estado de Nueva York Silvestres (Finger Lakes Wild), Asociación de la Cordillera Costal de Oregón (Oregon Coast Range Association), y muchas otras. El desarrollo de propuestas de inmensidad para cada bioregión está basado en los principios de la biología de conservación. Borradores de las propuestas se desarrollan a través de discusiones y conferencias que reunen a activistas regionales, biologistas de conservación, y otros científicos y grupos ecologistas a través del espectro del movimiento. Apoyamos a este proceso con fondos, intercomunicación, y la oferta de conocimientos técnicos.

Emprendemos investigaciones de las actividades humanas que son apropiadas en las zonas aisladoras, la reintroducción de especies extirpadas, el diseno de los corredores conectadores (especialmente a través de áreas con significativos obstáculos humanos), como vencer la fragmentación y alcanzar la conectividad de la habitación, la diversidad biológica, la viabilidad de las colonias, el control de las especies exóticas, y otros problemas.

Al ser desarrolladas las propuestas, publicaremos los resultados en forma de pamfletos y en la revista *Wild Earth* (Tierra Silvestre) y otras publicaciones para alcanzar a una audiencia extensa. Videocintas, transparencias, y artículos académicos serán producidos y exhibiciones viajantes serán organizadas para educar al público acerca de las propuestas. Cuando se hayan completado propuestas para todas las bioregiones del continente, un libro y compendio de mapas serán producidos, así como videocintas y relacionados materiales puestos al día.

En breve, nuestra labor es educar al público, el movimiento ecologista, las agencias del gobierno, la comunidad académica, y otros acerca de la importancia de la biodiversidad y lo que es necesario para protegerla.

El Proyecto de Tierras Silvestres recibe con gusto la participación y apoyo de todas las personas y organizaciones interesadas en estos problemas.

—Preparado por Dave Foreman, David Johns, Michael Soulé, Reed Noss, y John Davis.

A Vision For The Meantime

by Michael Soulé

As our species balloons by a billion every decade or so, and as the population in the United States strides toward a half billion by 2150, it gets harder to be sanguine about wildlands and the return of wolverines, grizzlies, wolves and mountain lions. Rational people have abandoned the goal of stopping human expansion within the next few decades; now we foresee a century or more of growth in numbers of people in the tropics, perhaps 50 years of growth in the United States. If there is hope for nature, it must rest on the assumption that this binge of reproduction will be a transient blip on the graph rather than a surge to a plateau of permanent planetary obesity. A premise of this "blip theory" is that the 20th century population explosion will be followed by a slow implosion in the late 21st and 22nd centuries.

In the meantime, what should we be doing about wildlands and big creatures in North America? The "meantime" will be an interval of increasing human population and possible habitat loss; yet it is full of possibilities. The meantime must be an era for militant defense of what remains and for laying the foundation for a massive transformation of the American landscape. The meantime will require a long-term vision, a 22nd century vision, as Arne Naess has said.

The key is thinking BIG, both in space and time.

Talk of decades, let alone centuries, distresses many people, especially young ones. But we must not indulge in illusory quick fixes. An instantaneous ecological metamorphosis in North America is impossible because the continent is now too disrupted and fragmented. The isolated mountain ranges of the Southwest and our island parks and wilderness areas are too small and too poached today to sustain viable populations of big predators.

Repair—restoring and reconnecting the land—will take time; it will require the dedication of thousands of bioregional activists. Cattle and sheep grazing in many of the federal lands will have to be reduced or curtailed. Road building in major sections of National Forests and BLM lands will have to cease, and many existing logging roads will have to be closed. In the lowlands some eroding and degraded croplands now used to produce feed for livestock (in the US, livestock consume about 70% of grain production) will have to be converted to other uses. It is no simple matter to repair the ravages of centuries.

The two tools for this historic project are both radical: they are the expedients of land-use planning on *spatial* and *temporal* scales never attempted before. The key is thinking BIG, both in space and time. Can this be done during hard economic times, and when the human population of many regions of the country is growing at rates rivaling those in tropical nations? Can wilderness recovery and biodiversity protection be achieved without raiding the public treasury and without creating too much

resistance from powerful "wise use" enemies of the land? Yes, if we begin now.

Land-use planning has to occur at the regional level, and it must be participatory. The restoration of the wildlands network will depend on the knowledge of people intimate with the mountains, canyons, forests, coves, rivers and creeks. Such planning will not work without grass-roots education and empowerment. Over time, each regional planning group will develop a map-based program for their bioregion. Later, representatives of the bioregional groups will meet and integrate their plans into a national, then continental strategy.

Who will pay for the forfeited profits from mining, grazing, logging, and other uses of river, meadow, woods? The answer lies in the second tool—appropriate time scale. In most cases no one will have to pay if our time scale is appropriate to the challenge.

For instance, say you own a cattle ranch that sits astride a valley that forms a natural link between two massifs in Montana, and that is vital for a link in the system. And say that I, a stranger, show up one day and ask you to donate your ranch to a conservancy or to the state. At first you would probably think me a fool. At worst you would feel attacked, especially if I said that there would be a bill introduced into the legislature that would declare your land to be critical habitat, thus justifying its condemnation. But if you had been a partner in an open planning process, you might be more disposed to the conservation objectives of the program, if not the means of realizing it. And it might make a big difference if I told you that I wasn't asking you to give up ranching on your land, but to consider leaving it to a conservancy after the death of your children, by which time cattle ranching in Montana would probably not be economic. Besides, there might be tax benefits.

Or, say you were the supervisor of a National Forest in South Carolina, and a section of the forest that you planned to clearcut, against the recommendations of local conservationists, was an ideal site for a roadless corridor needed for the movement of black bear and panthers between a park and a wilderness area. And say that I approached you with the following argument. First, I would admit that the corridor didn't have to be covered with old growth forest—a second growth forest would function perfectly well. Second, I would try to persuade the local conservationists that the sacrifice of this particular patch of old growth was worth the long-term vesting of the section to the regional system of wildlife recovery. Whether I could quickly convince all parties of the wisdom of the transaction might be questioned, but I can afford to wait, because the biologists tell me that the bears and panthers won't need the corridor for 40 or 50 years.

Some readers will ask why we should adopt such a politics of patience. The answer is *fear*—fear on the part of those folks who believe they will lose their jobs as loggers or miners, have to abandon their way of life as ranchers, professional guides or commercial fishermen, and be forced to move from the region where their families have been living for generations. And as we all have learned, fear translates into potent political opposition.

Maybe our task as conservationists is to remove the fear from people who see themselves threatened by attacks on their occupations, their livelihood, their world view, and their property. The first step is to admit that much of their fear is born of impatience—*our* impatience. After all, 100 years is less than 1/10,000 of the lifetime of the average vertebrate species. The goal should be staying the course, not setting a speed record.

The paradox is that we must also hurry—hurry to plan the system and the strategy. Endangered species and landscapes are at stake, and some protective actions cannot wait. On the other hand, some pieces and parts can wait, as long as the plan is well conceived and is being implemented systematically. In other words, The Wildlands Project will require wisdom as well as hard work, patience as well as dedication.

To whom do we go for this wisdom on how to draw the detailed maps and how to establish priorities and coordinate tactics? Who knows what is precious and how much time is left? The oracles are the fishes of the river, the fishers of the forest, and articulate toads. Our naturalists and conservation biologists can help us translate their utterances. Our spokespersons, fund-raisers, and grass-roots organizers will show us how to implement their sage advice.

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This essay is based on the introduction to *Ghost Bears: Exploring the Biodiversity Crisis* by R. Edward Grumbine, published by Island Press. An excerpt from *Ghost Bears* appears in the winter issue of *Wild Earth.*

woodland petroglyphs *woodcut by Patrick Dengate*

WE Role in the Wildlands

(The Role of *Wild Earth* in The Wildlands Project)

Roughly stated, the relationship between *Wild Earth* and The Wildlands Project is organic. *Wild Earth* and The Wildlands Project are both part of the greater body that Dave Foreman has termed the New Conservation Movement, with The Wildlands Project perhaps analogous to the heart and *Wild Earth* acting as a vocal chord.

Wild Earth is an independent publication serving biocentric wildland groups, including The Wildlands Project and the groups involved in the Project. *Wild Earth* will serve as an inter-regional voice for The Wildlands Project. Numerous group newsletters (e.g., Preserve Appalachian Wilderness's *PAW Journal*, Greater Ecosystem Alliance's *Northwest Conservation News & Priorities*, Alliance for the Wild Rockies's *Networker*) will cover Wildlands work at a regional level; *Wild Earth* will connect the regions, take a continental and cross-continental perspective, provide a vulture's-eye view.... *WE* will run Wildlands Project proposals as they are developed, in addition to providing articles on successful wilderness protection strategies, natural history essays, conservation biology teachings, musings on deep ecology, ideas for reversing the human population explosion, and warnings of threats to wild areas.

More abstractly, *Wild Earth's* role in The Wildlands Project will be to constantly remind the various wilderness groups that the core-buffer-corridor proposals they are developing are merely emergency plans to slow the loss of biodiversity over the short term. *Wild Earth* writers and editors will continually challenge wildland proponents to design and implement ever more expansive reserve plans.

The Wildlands Project is a long-term campaign. Wilderness recovery must start now but continue indefinitely—expanding wilderness until the matrix, not just the nexus, is wild.

Ultimately, if we are serious about saving the full range of biodiversity and evolutionary processes, we cannot accept sacrifice zones. Though we may never be sure, it is reasonable to assume that every modern humanized landscape comes at the cost of unique genes, populations, races, subspecies, species, microclimates, microhabitats, animal paths, or natural disturbances. We do not know whether a development will expropriate a favorite sunning spot of a pair of snakes, say, or a needed roosting and feeding area for a flock of songbirds.

One of the most profound observations of conservation biologist Reed Noss is also one of his least scientific: "We really don't know what the hell we're doing"; meaning, we don't know what endemic genes, populations, species, or processes we may eliminate whenever we develop an area. Endemicity may be everywhere. *Wild Earth* exists in part to remind conservationists that in the long run all lands and waters should be left to the whims of Nature, not to the selfish desires of one species which chose for itself the misnomer *Homo sapiens*. When we don't even know within an order of magnitude how many species exist, the premise that we ought to save the full range of biodiversity leads logically to the conclusion that humanizing of landscapes must stop now and be reversed. Economies based on debasing Nature must be replaced by economies based on restoring Nature.

Does all the foregoing mean that *Wild Earth* and The Wildlands Project advocate the end of industrial civilization? Most assuredly. Everything civilized must go (excepting hot showers and bottled beverages, which will have grandfather clauses running through 2070—at which time most of us will be biodegrading with nary a thought of hot water or cold brew). At least, that's how a few wildland proponents feel.

Leveler heads, however, have pointed out that no one need advocate dismantling industrial civilization in order to join with The Wildlands Project. One need only favor the perpetuation of the full range of biodiversity and natural processes. (If you like bears, eagles, scurfpeas, and pearly mussels, join.) Never mind that said goal is anathema to industrial civilization. Born into a society fundamentally at odds with the natural world, as we are, some inconsistency is inevitable, among those who try to speak for Nature. So much protection and restoration work must commence immediately that the difficult questions of what, if any, industries and technologies are ecologically acceptable will mostly be answered by future generations.

Wild Earth's role, then, is simply to record on paper (recycled, of course) the needs and wishes of every allele, genotype, phenotype, population, deme, metapopulation, race, subspecies, species, guild, biotic community, ecosystem, landscape, bioregion, continent, hemisphere, and planet that The Wildlands Project aims to save. We welcome your contributions.

—*John Davis*

THE WILDLANDS PROJECT

LAND CONSERVATION STRATEGY

by Reed F. Noss

INTRODUCTION

We have an opportunity unique to our generation: to halt a mass extinction. In order to accomplish this feat, conservation must be practiced on a truly grand scale. Simply put, the tide of habitat destruction must be stopped. Despite growing dangers of pollution, acid rain, toxic wastes, greenhouse effects, and ozone depletion, direct habitat alteration by humans remains the greatest of all threats to terrestrial and aquatic biodiversity, from Panama to Alaska and beyond. The effect of habitat alteration, generally speaking, is to create conditions unlike those under which many species native to an area evolved. Whereas some species thrive under the new conditions (cheatgrass, Norway rats, and cowbirds are familiar examples), other species are not so adaptable — they go extinct. Hence, the biodiversity crisis.

In order to stop the destruction of native biodiversity, major changes must be made in land allocations and management practices. Systems of interlinked wilderness areas and other large nature reserves, surrounded by multiple-use buffer zones managed in an ecologically intelligent manner, offer the best hope for protecting sensitive species and intact ecosystems. This article is about how to select and design such systems at a regional scale.

Below, I discuss the application of conservation biology to wilderness recovery and large-scale land protection strategy in general. After reviewing the ecological goals of such a strategy and discussing approaches to reserve selection and design, I outline the basic components of a wilderness recovery network: core reserves, buffer zones, and connectivity. The most important considerations in designing and managing such systems are representation of all ecosystems; population viability of sensitive species, especially large carnivores because they are usually most demanding; and perpetuation of ecological and evolutionary processes. My hope is that biodiversity activists and bioregionalists will be able to use this information in the design of ambitious wilderness recovery networks in their own regions.

Wilderness recovery, I firmly believe, is the most important task of our generation.

illustration by Rose Craig

APPLICATION OF CONSERVATION BIOLOGY TO WILDERNESS RECOVERY

Preservation of large, wild landscapes for their natural features is not a new idea, as the history of the national parks and wilderness movements in the United States attests (Fox 1981, Runte 1987). The introduction of science to the process of selecting and managing parks and other landscape-sized reserves, however, is both new and promising. Science alone, of course, is not sufficient; it must be guided by a land ethic (Leopold 1949).

Most national parks, wilderness areas, and other large reserves were selected on the basis of esthetic and recreational criteria, or simply because they contained little of value in terms of extractable resources. The result is that high-elevation sites (rock and ice), wetlands, and other scenic but not particularly diverse lands dominate our system of protected areas; many ecosystem types are not represented, at least not in sizable areas (Davis 1988, Foreman and Wolke 1989, Noss 1990a). Because biology has been absent from design decisions, park boundaries do not conform to ecological boundaries and most parks and other reserves are too small to maintain populations of wide-ranging animals over the long term or to perpetuate natural processes (Kushlan 1979, Harris 1984, Newmark 1985).

Increasing discussion of "greater ecosystems" (Craighead 1979, Grumbine 1990), regional landscapes (Noss 1983), regional ecosystems (Keystone Center 1991), and ecosystem management (Agee and Johnson 1988) heralds a new way of looking at conservation, a way informed by ecological science. The basic idea underlying these new concepts is that most parks and other reserves are, by themselves, incomplete ecosystems. If parks or other reserves can be enlarged, and if the lands surrounding these areas are managed intelligently with the needs of native species and ecosystem processes in mind, a landscape as a whole may be able to maintain its ecological integrity over time.

If, on the other hand, surrounding lands are greatly altered from their natural condition, the chances that a reserve can maintain its integrity are slim. Animals with large home ranges (and therefore low population density) and other sensitive species will decline or fluctuate to extinction. Restoration may be needed to bring the complex of reserves and surrounding lands back to health. In any case, conservation biologists recognize that any system of parks, wilderness areas, and the public and private lands that envelop them must be managed as a whole in order to meet the goal of maintaining natural processes and native biodiversity over long spans of time.

Conservation biology and landscape ecology are both young sciences and show many signs of immaturity, such as theoretical confusion. However, the experience gained from myriad empirical case studies and observations, guided sometimes but not invariably by theory, has led to some general principles about how land might be "managed" (in a humble and non-manipulative sense of this term) to maintain biodiversity and ecological and evolutionary processes. The principles of conservation biology are not laws; we can expect them to be refined continually as the science matures. To put off implementing these principles until the science is completely developed, however, would be foolhardy; the forces that degrade natural ecosystems will not wait for the advice of scientists. Instead, the most prudent course for conservation is to proceed on the basis of the best available information, rational inference, and consensus of scientific opinion about what it takes to protect and restore whole ecosystems.

ECOLOGICAL GOALS

A conservation strategy is more likely to succeed if it has clearly defined and scientifically justifiable goals and objectives. Goal-setting must be the first step in the conservation process, preceding biological, technical, and political questions of how best to design and manage such systems. Primary goals for ecosystem management should be comprehensive and idealistic so that conservation programs have a vision toward which to strive over the decades (Noss 1987a, 1990b). A series of increasingly specific objectives and action plans should follow these goals and be reviewed regularly to assure consistency with primary goals and objectives (Stankey 1982). Four fundamental objectives are consistent with the overarching goal of maintaining the native biodiversity of a region in perpetuity (Noss 1991a,b):

1. Represent, in a system of protected areas, all native ecosystem types and seral stages across their natural range of variation.
2. Maintain viable populations of all native species in natural patterns of abundance and distribution.
3. Maintain ecological and evolutionary processes, such as disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions, including predation.
4. Design and manage the system to be responsive to short-term and long-term environmental change and to maintain the evolutionary potential of lineages.

Representation

Representation is one of the most widely accepted criteria of conservation. As an example, delegates of 62 nations at the Fourth World Wilderness Conference, in 1987, unanimously approved a resolution to preserve "representative examples of all major ecosystems of the world to ensure the preservation of the full range of wilderness and biological diversity" (Davis 1988). Perhaps the best way to represent all ecosystems is to maintain the full array of physical habitats and environmental gradients in reserves, from the highest to the lowest elevations, the driest to the wettest sites, and across all types of soils, substrates, and topoclimates (Hunter et al. 1988, Noss 1991a). To accommodate seral stage diversity within vegetation types, reserves must either be large enough to incorporate functional natural disturbance regimes or be managed to supplement or mimic natural disturbances (Pickett and Thompson 1978, White and Bratton 1980). Because we do not know very well how to do the latter, as well as for ethical and aesthetic reasons, emphasis must be placed on maintaining the natural condition wherever it occurs.

Representation of all ecosystems and environmental gradients is the first step toward maintaining the full spectrum of native biodiversity in a region. Representation is subtly different from the conservation criterion of representativeness (see Margules and Usher 1981), where the best or typical examples of various community types are targeted for preservation. The latter concept is typological and static; it often results in the sequestration of "museum pieces" or specimens of Nature (Noss and Harris 1986). Representation does not seek to preserve characteristic types of communities so much as to maintain the full spectrum of community variation along environmental gradients. It is understood that this variation is dynamic. The best example of a conservation program based on representation goals in North America is the Gap Analysis project directed by the U.S. Fish and Wildlife Service (Scott et al. 1991).

Viable Populations

Simply representing a species in a reserve or series of reserves does not guarantee that it will be able to persist in those areas (or anywhere) indefinitely. The representation objective must be complemented by the goal of maintaining viable populations of every species. Population viability is a central concern in conservation biology (Shaffer 1981, Soule' 1987). A viable population is one that has a high probability (say, 95 or 99 percent) of persisting for a long time (say, for 100 to 1000 years). Population viability analysis is complex, with estimates depending on the mathematical model used, its assumptions, and values used for key population parameters such as population density and birth and death rates. With a few interesting exceptions, viable populations are generally on the order of thousands of individuals (Thomas 1990).

Fortunately, one does not have to worry about each of the thousands of species that may live in a region in order to meet the ambitious goal of maintaining viable populations of all native species. Rather, "conservation should not treat all species as equal but must focus on species and habitats threatened by human activity" (Diamond 1976). Concerns about population viability should be directed toward species at most risk of extinction in the region. Vulnerable species typically include those with small populations (limited or patchy distribution or low density), large home ranges, poor dispersal abilities, low reproductive potential, as well as those subject to exploitation or persecution or dependent on habitats that are themselves rare or threatened (Noss 1991a). These are the species that require our attention; many others tolerate or even thrive on human disturbance and can get along quite well without conservation assistance. For a regional wilderness recovery strategy, large and wide-ranging carnivores — bears, wolves, jaguar, puma, wolverine — are ideal primary target species.

Although answers to population viability questions are species-specific, some general principles for managing landscapes for vulnerable species are emerging. Thomas et al. (1990: 23), in their conservation strategy for the northern spotted owl, listed five reserve design concepts "widely accepted among specialists in the fields of ecology and conservation biology." I generalize their guidelines below to multiple species, adding a sixth guideline that applies to species, such as large carnivores, that are especially sensitive to human disturbance (and, therefore, greatly in need of protection).

1. Species well distributed across their native range are less susceptible to extinction than species confined to small portions of their range.
2. Large blocks of habitat, containing large populations of a target species, are superior to small blocks of habitat containing small populations.
3. Blocks of habitat close together are better than blocks far apart.
4. Habitat in contiguous blocks is better than fragmented habitat.
5. Interconnected blocks of habitat are better than isolated blocks; corridors or linkages function better when habitat within them resembles that preferred by target species.
6. Blocks of habitat that are roadless or otherwise inaccessible to humans are better than roaded and accessible habitat blocks.

Maintaining Ecological and Evolutionary Processes

One general theme of ecosystem management is that process is at least as important as pattern (Noss and Harris 1986). In other words, our concern for maintaining particular species, communities, places, and other entities must be complemented by a concern for the ecological and evolutionary processes that brought those entities into being and that will allow them to persist and evolve over the eons. Fundamental processes critical to ecosystem function include cycling of nutrients and flow of energy, disturbance regimes and recovery processes (succession), hydrological cycles, weathering and erosion, decomposition, herbivory, predation, pollination, seed dispersal, and many more. Evolutionary processes, such as mutation, gene flow, and differentiation of populations, must also be maintained if the biota is to adapt to changing conditions.

Allowing for Change

Maintaining ecological and evolutionary processes implies that change must be allowed to occur, hopefully without a net loss of biodiversity. A glaring deficiency of many conservation plans is their failure to recognize and to accommodate change in Nature. Conservation strategy has implicitly assumed that natural communities are unchanging entities (Hunter et al. 1988) and has sought to freeze in time snapshots of nature and associations of species that may have been apart for longer periods of their evolutionary histories than they have been together. The meaning of "preservation" must be revised to emphasize processes and to interpret local patterns in the context of global biodiversity over long time periods.

Short-term (years to centuries) ecological change occurs as a consequence of natural disturbance and succession. Disturbance-recovery

illustration by Kurt Seaberg

cycles are among the most important of all ecological processes and have had a profound effect on the evolution of species (for example, many plant species are adapted to or even dependent on frequent fire). Only very large reserves or natural landscapes will be able to accommodate disturbance regimes characterized by stand replacement and large patch sizes without losing diversity (Pickett and Thompson 1978, Shugart and West 1981). In the Greater Yellowstone Ecosystem, for example, the lodgepole pine forests that cover much of the area are characterized by high-intensity, stand-replacing fires that recur naturally every two to three centuries; apparently, the landscape is not in equilibrium (Romme and Knight 1982, Romme and Despain 1989). Yellowstone National Park by itself is too small to exist in anything close to steady state with a natural fire regime — one more reason for managing the entire 19 million acres of the Greater Yellowstone Ecosystem as a whole.

Long-term (decades to millennia) change occurs largely as a result of changing climate. The response of plants and animals to climate change over time has primarily been to migrate with shifting climate zones. Communities did not migrate as intact units, however. Rather, plants and animals migrated at rates and in routes that were highly individualistic (Davis 1981, Graham 1986). The conservation strategy of maintaining all physical habitats (soil types, slope aspects, etc.) and intact environmental gradients, with corridors or other forms of connectivity linking habitats across the landscape, is perhaps the best way to accommodate change without losing biodiversity.

APPROACHES TO LAND CONSERVATION

How might a regional land conservation program meet the objectives of representing all ecosystems, maintaining viable populations, maintaining natural processes, and allowing for change? Four approaches emphasized in recent years appear promising: (1) identify and protect populations of rare and endangered species; (2) maintain healthy populations of species that play critical roles in their ecosystems (keystone species) or that have pragmatic value as "umbrellas" (species that require large wild areas to survive, and thus if protected will bring many species along with them) or "flagships" (charismatic species that serve as popular symbols for conservation); (3) protect high-quality examples of all natural communities; and (4) identify and manage greater ecosystems or landscapes for both biodiversity conservation and sustainable human use.

These four approaches have obvious relationships to the objectives posed above. Unfortunately, they have sometimes been presented as competing rather than complementary strategies. Advocates of one approach may get very attached to it and fail to see its limitations or the merits of other approaches. In practice, the familiar strategy of protecting sites that harbor rare species or natural communities has worked quite well for plants and animals with small area requirements, but has been less successful in protecting wide-ranging animals and has been unable to capture landscape mosaics and other higher-order expressions of biodiversity (Noss 1987b). Empirical evidence has demonstrated that the small reserves selected through the site-by-site approach are heavily assaulted by external influences and often fail to retain the natural qualities for which they were set aside.

On the other hand, many so-called "ecosystem" or "landscape" approaches have lacked scientific rigor and objectivity and have failed to target those elements of biodiversity that are truly most threatened.

Putting the needs of one species (humans) above those of all other species combined, as exemplified by the sustainable development theme, is one of the most pernicious trends in modern conservation.

Furthermore, most attempts to use "sustainability" as a management paradigm (Salwasser 1990) have been anthropocentric, biased toward commodity production, and seriously flawed from a biological standpoint, (Noss 1991c and in press).

These four approaches to conservation must be pursued in concert if the full spectrum of biodiversity is to be protected. Again, this can only be accomplished by representing all ecosystems (from small habitat patches to large landscape mosaics), maintaining viable populations of all native species (plant and animal, big and small), maintaining ecological and evolutionary processes, and accommodating change. The most difficult challenge is to meet all these objectives while still allowing for some kinds of human use. Most conservation biologists agree that compatible human uses of the landscape must be considered and encouraged in large-scale conservation planning. Otherwise, the strategy will have little public support. However, the native ecosystem and the collective needs of non-human species must take precedence over the needs and desires of humans, for the simple reason that our species is both more adaptable and more destructive than any other. Putting the needs of one species (humans) above those of all other species combined, as exemplified by the sustainable development theme, is one of the most pernicious trends in modern conservation.

Regionalization is a central issue in The Wildlands Project (aka the North American Wilderness Recovery Project). Trying to make sense of the distribution of biodiversity and planning reserves across all of North America at once would be overwhelming. Regionalization on the basis of physiography, biogeography, land use, and other large-scale patterns helps assure that every physically and biotically distinct region is represented in a broad conservation strategy. Omernick (1986), for example, has produced a map portraying 76 ecoregions in the 48 conterminous states and the Canadian Parks Service recognizes 39 terrestrial natural regions (Hummel 1989). Ecoregions or bioregions are a convenient scale for planning and often inspire feelings of belonging and protectiveness in their more enlightened human inhabitants. Many grassroots groups around the continent have defined bioregions and developed conservation plans for them. The Wildlands Project exists essentially to coordinate and provide technical support for these regional efforts.

Regionalization of reserve networks should be a hierarchical process; that is, we should consider regions within regions in our planning efforts. We can contemplate our homeland as a nested series, with our local watershed functioning as an interdependent part of a larger river watershed (a hydrologic unit), which in turn is part of an ecoregion or bioregion (for example, the Blue Ridge Mountains), then a biogeographical province (eastern deciduous forest), a continent, and eventually, the biosphere. Putting this nested hierarchy idea into practice means

local nature reserve systems should be linked together into regional systems, which in turn are connected by inter-regional corridors that ultimately span continents. These hierarchical connections will help promote the multiple functions of connectivity discussed later in this article.

RECONNAISSANCE AND SELECTION

How do we choose reserves in a regional land conservation strategy? The process involves field inventory, remote sensing interpretation, and biogeographical research to determine the spatial distribution of biodiversity and wild areas, followed by an evaluation of which areas are most important to protect. The next step, drawing lines on maps, is not as easy as might be expected. Each line on a reserve design map represents a decision about areas to protect and areas to leave out. Within the near future, unfortunately, not every acre can be protected or restored. Decisions must be made quickly about which areas are most valuable ecologically, before they are altered irrevocably. Such decisions should not result in any area being "trashed." Ideally, all lands should be managed, at least in part, for biodiversity. But some areas deserve and require more rigorous protection than others. We call this process of picking and choosing "conservation evaluation" (Usher 1986).

Conservation evaluation is legitimate because biodiversity is not distributed uniformly across the landscape. Certain areas, call them "hot spots," are unusually high in sheer number of species or contain concentrations of rare or endemic species or unusual natural communities. Areas of high physical habitat diversity, such as topographically complex landscapes with many distinct soil types, are often hot spots. Sites in a landscape also vary in conservation value as a result of historical influences, including past human activities. Roadless areas, especially when large (see Foreman and Wolke 1989), are of great importance because they harbor reclusive species and are often inherently sensitive to physical disturbance due to steep terrain or highly erodible soils (which made them difficult to exploit economically and explains why they are still roadless). Parking lots and corn fields, on the other hand, would score low in a conservation evaluation. Some degraded sites, however, may be priorities for restoration due to their locations relative to other landscape features, such as lying within a corridor that links hot spots across a landscape.

Core reserves and primary corridors in a regional network should enclose and link biologically critical areas (i.e., those that contribute to the goals discussed above) in a continuous system of natural habitat whenever possible. Some critical steps in selecting core reserves (the most strictly protected areas) and primary linkages in a wilderness recovery network, are as follows (Foreman 1976, Noss 1987a, 1991a,b,d, Foreman and Wolke 1989):

1. Select areas that, on the basis of field reconnaissance and interpretation of maps, aerial photographs, or satellite images, appear to be roadless, undeveloped, or otherwise in essentially natural condition. Center proposed core reserves on these undeveloped areas. A map of land ownership will show which of these areas are on public lands.
2. Add roaded landscapes that are relatively undeveloped and restorable, especially when adjacent to or near roadless areas. Addition of such areas is important to increase core reserve size and to link roadless areas into larger complexes or networks.
3. Map the distribution of rare species and community types in your region, using state natural heritage program databases (these also exist for some Canadian provinces and Latin American countries). The heritage programs use a five-point scale of global and statewide endangerment developed by The Nature Conservancy, with rank 1 signifying the most imperiled elements. Map occurrences of all species, subspecies, varieties, and communities that rank 3 (very rare and local throughout range or found locally in a restricted range) or higher at a global scale (G3 or T3, G2 or T2, and G1 or T1; the G indicates global status and the T indicates status of taxonomic subcategories). Add species that are imperiled or critically imperiled statewide (S2 and S1), though they may be less rare globally. Request a computer printout from the heritage program with data on each occurrence, including township/range/section and other location information. Map occurrences on mylar overlays on maps ranging from 1:100,000 to 1:250,000 scale (e.g., Forest Service 1/2 inch = 1 mile maps are 1:126,720). Local analyses should use 1:24,000 scale (the familiar 7.5-minute quadrangle maps) or larger. If you use a Geographic Information System (GIS), you can request a disk with longitude/latitude coordinates of occurrences. In some regions, mapping the distribution of rare species and communities might be the most practical first step in the network design process.
4. Draw polygons around clusters or constellations of rare species and community types. If not encompassed in core reserves proposed in steps 1 and 2, add these polygons to the system. Some hot spots will be naturally isolated (for instance, caves, serpentine barrens, or kettlehole bogs), so linking them by corridors is unnecesary.
5. Obtain information from the U.S. Fish and Wildlife Service GIS gap analysis (if completed for your state or states) on unprotected and underprotected vegetation types and centers of species richness in your region (see Scott et al. 1991). The purpose of gap analysis is to provide information on representation of ecosystems and species in protected areas. A similar representation study is being conducted in Canada by World Wildlife Fund-Canada (A. Hackman, personal communication). Locate areas that contain vegetation types and centers of species richness (areas where the ranges of many species overlap) that are not adequately protected in existing reserves. Add these areas to your network of sites if not already encompassed through steps 1-4.
6. You have now determined the general locations of your core reserves and some of the linkages between them. Next, you need to define boundaries more precisely, add more corridors so that all sites that would be naturally linked are reconnected, and envelop the entire network in a matrix of buffer zones (Fig. 1). To do these things, you must zoom in to the landscape scale (say, 1:24,000 or larger, if feasible). Refer to detailed road maps, land ownership maps, land-use information including grazing allotments, proposed timber sales, and mineral rights, wildlife maps such as ungulate winter range and dispersal corridors, and additional data, as available (Foreman 1976, Noss 1991b,d). This information also tells you about threats to sites which must be averted. Using this information and knowledge of the land, based on field reconnaissance and maps, adjust proposed boundaries.
7. As part of your final proposal, indicate specific actions that must be taken to secure the system. These actions include land and mineral rights acquisitions, Wilderness or other reserve designations on public lands, road closures, road modifications (such as underpasses to al-

low migration of animals beneath highways), cancellation of grazing leases and timber sales, tree planting, dam removals, stream dechannelization, and other restoration projects (Noss 1991d).

The issue of appropriate size or scope of a regional wilderness recovery network, some aspects of which will be discussed later in this article, is thorny. Each region must be assessed individually. I suggest that at least half of the land area of the 48 conterminous states should be encompassed in core reserves and inner corridor zones (essentially extensions of core reserves) within the next few decades; I also believe that this could be done without great economic hardship. Areas with more wild land remaining, such as much of Canada, Alaska, and parts of Mexico and Central America, should have higher targets. Some regions, such as the Midwestern Till Plains and Northeastern Coastal Zone, will take longer to restore to 50 percent wilderness, perhaps on the order of centuries. Nonetheless, half of a region in wilderness is a reasonable guess of what it will take to restore viable populations of large carnivores and natural disturbance regimes, assuming that most of the other 50 percent is managed intelligently as buffer zone.

Other authors, using different criteria, have arrived at similar estimates of what it might take to protect ecological integrity in a region. Odum and Odum (1972) suggested that managing half of southern Florida as natural area and half as cultural land was optimal. Earlier, Odum (1970) estimated that managing 40 percent of the state of Georgia as natural, 10 percent as urban-industrial, 30 percent in food production, and 20 percent in fiber production would maximize ecological services while maintaining the current standard of living. I would offer a more ambitious long-term goal, pending human population reduction, that at least 95 percent of a region be managed as wilderness and surrounding multiple-use wildlands. The following sections provide detailed ecological criteria for designing a wilderness recovery network.

COMPONENTS OF A WILDERNESS RECOVERY NETWORK

A wilderness recovery network is an interconnected system of strictly protected areas (core reserves), surrounded by lands used for human activities compatible with conservation that put biodiversity first (buffer zones), and linked together in some way that provides for functional connectivity of populations and processes across the landscape. These basic concepts are common to many conservation strategies, including the biosphere reserves of the Man and the Biosphere (MAB) program (UNESCO 1974, Hough 1988, Batisse 1990, Dyer and Holland 1991), and the multiple-use module idea that applies these concepts at various spatial scales (Harris 1984, Noss and Harris 1986, Noss 1987a).

Below, I discuss core areas, buffer zones, and connectivity as they apply to wilderness recovery. I follow with a brief discussion of the "bigness" issue, that is, determining how large a reserve or reserve system must be to maintain its native biodiversity over time.

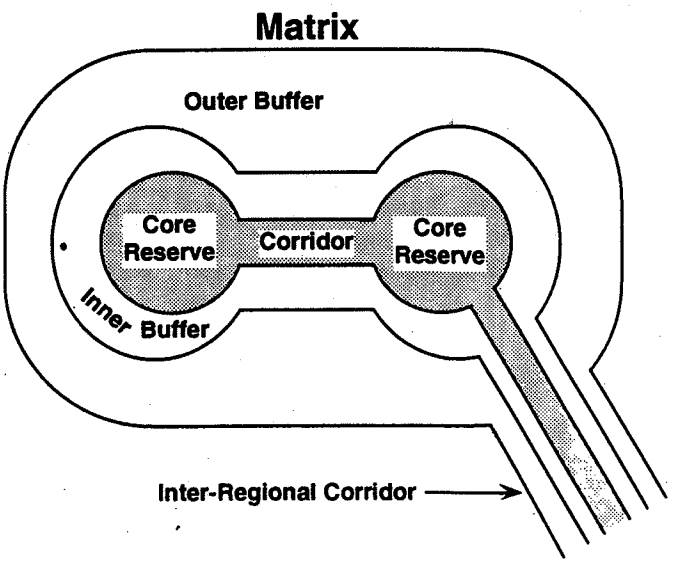

Figure 1. A regional wilderness recovery network, consisting of core reserves, connecting corridors or linkages, and buffer zones. Only two core reserves are shown, but a real system may contain many reserves. Inner buffer zones would be strictly protected, while outer zones would allow a wider range of compatible human uses. In this example, an interregional corridor connects the system to a similar network in another bioregion. Matrix refers to the landscape surrounding the reserve network, but this is only true in the first stages of a wilderness recovery project in regions now dominated by human activity. Eventually, a wilderness network would dominate a region and thus would itself constitute the matrix, with human habitations being the islands. In regions where wildland is already the matrix, the inverted model should be implemented right away.

Core Areas

The backbone of a regional reserve system is formed by those protected areas managed primarily to maintain or restore their natural values. The selection of core reserves should be based on the criteria and objectives discussed above: representing all ecosystems, maintaining viable populations of all native species, maintaining ecological and evolutionary processes, and being responsive to change. Core reserves should collectively encompass the full range of communities, ecosystems, physical habitats, environmental gradients, and natural seral stages in each region. Design and management guidelines for specific core reserves require considerable site-specific research.

Buffer (Multiple-Use) Zones

A system of core reserves is necessary but not sufficient to maintain biodiversity. In most regions, strictly protected areas will not occupy enough land, in the short term, to meet the conservation goals suggested in this article (see Brussard 1991). For a largely wild region, such as much of the western United States and Canada, the multiple-use public lands that envelop reserves should be managed in a way more sensitive to natural ecosystems and processes than what is now the custom (to put it mildly). To the extent that buffer zones are managed intelligently, core reserves have a better chance of maintaining viable populations and regional landscapes will be richer in native biodiversity than if reserves are surrounded by intensive land use.

I use the terms "multiple-use zone" and "buffer zone" interchangably (Noss 1991a). The former term, although tainted by misuse by public agencies and special interest groups, may be preferable because such zones can indeed provide for many human uses and function as much more than buffers. Multiple-use public lands adjacent to reserves should serve as at least marginal habitat for vulnerable species and should insulate reserves from intensive land uses. A reserve properly insulated from high-intensity land use by one or a series of buffer zones is, to a measurable degree, functionally enlarged as a conservation unit. In many cases, private lands will need to be acquired and added to national forests and other public lands in order to serve as effective buffers.

Physical and biotic edge effects can be serious problems for small reserves with high perimeter/area ratios (Noss 1983); buffer zones have been recommended to mitigate edge effects in these situations (Harris 1984, Noss 1987a). Among forest communities, deleterious edge effects are best documented for closed-canopy forest types. Forest interior species may be sensitive to a variety of edge-related environmental changes. Increased blowdown potential may extend at least two tree-heights into a stand (Harris 1984, Franklin and Forman 1987). Some kinds of external influences, such as invasions of weedy species, penetrate much farther — perhaps 5 km or more into a forest (Janzen 1986). Weedy, exotic species of plants and animals are often abundant in human-disturbed environments; buffer zones may help screen these pests away from reserves. Core reserves, if designed according to the criteria discussed in this article, will generally be large enough that edge effects from their boundaries should not be a significant problem. Edge effects from internal fragmentation, such as that caused by road-building and clearcutting, will be a threat until artificially disturbed habitats are restored.

Multiple-use zones have functions other than ameliorating edge effects. If maintained in low road density, they can protect core reserves from poaching and other harmful human activities that otherwise would be intense near reserve boundaries. They may also protect developed areas from depredating large mammals (such as grizzly bears and wolves) that will hopefully thrive in core reserves. Outer zones of vegetation resistant to high-intensity fire (such as grasslands), supplemented by fire lanes on the perimeter, may protect private forests and settlements from fires originating in core reserves.

An ideal function of multiple-use zones is to provide supplementary habitat to native species inhabiting a core reserve, thus increasing population size and viability. To the extent that multiple-use zones can be restored and managed to increase habitat area for those species most vulnerable to extinction, they will enlarge the effective area of the reserve. In some cases, animals that depend on several different habitat types, perhaps on a seasonal basis, will require areas not represented in a reserve to meet a portion of their annual life-history needs. Obvious examples are elk and deer that make seasonal migrations between high-elevation summer ranges and low-elevation winter ranges (Adams 1982). Core reserves can be created or enlarged to protect the most critical migration corridors, but many other movement areas will need to be protected by buffer zones.

Population dynamics across reserve boundaries can be complex. The notion of "source" versus "sink" habitats is germane here. As discussed by Pulliam (1988), source habitats are those that can support a net population increase, whereas "sink" habitats have in situ death rates higher than birth rates—they are "black holes" for wildlife. Populations are maintained in sink habitats only when subsidized by source habitats. Population density, therefore, may be a misleading indicator of habitat quality (Van Horne 1983). Concentrations of socially subordinate individuals (for instance, female and subadult male bears, or juvenile songbirds) in sink habitats may lead to mistaken impressions about habitat quality in those areas. Although most of the population may exist at any given time in the sink habitat, conservation of the source habitat is absolutely essential to the survival of the whole population (Pulliam 1988, Howe et al. 1991).

The source-sink dichotomy (really a continuum) is relevant to the planning of buffer zones, because whenever habitat quality or population density for a species differs across a boundary, we can expect net movement of individuals across that boundary. This gradient-aligned dispersal is in addition to any movements made by animals that use resources on both sides of the boundary.

The developed landscape is often a sink, relative to reserve habitat, for native species (Janzen 1986, Schonewald-Cox and Bayless 1986, Buechner 1987). In the absence of well protected buffer zones, surplus animals produced in a park or other reserve may disappear into the developed landscape matrix, seldom reproducing and often dying there. Areas near roads and developments are well known population sinks for Yellowstone grizzly bears, even within the National Park (Mattson and Knight 1991a). Across the Greater Yellowstone Ecosystem, illegal shooting and management "removals" are the major causes of mortality for the grizzly and are associated with real or perceived threats to humans or livestock, particularly sheep (Knight et al. 1988, Mattson 1990). Road closures and removal of sheep allotments are probably essential to grizzly bear recovery in this region (Mattson and Reid 1991).

If, on the other hand, lands surrounding core reserves are managed for the benefit of a sensitive species and contain habitat of moderate or high quality for that species, those lands may be minor sinks or no sink at all. If death rates in the buffer are approximately equal to birth rates, there will be no drain on the reserve population. Furthermore, a recent model suggests that sink habitats can actually contribute to metapopulation persistence (Howe et al. 1991). Although the highest priority is to identify and protect source habitats where annual reproduction exceeds mortality, a large fraction of a species's population may exist in sink habitats and those areas may extend the survival time of the metapopulation as a whole (a metapopulation is a collection of local populations linked by dispersal; Levins 1970). A buffer zone of marginal habitat quality, even if technically a sink, can be managed to reduce mortality and contribute to metapopulation persistence.

Dispersal is a key factor in metapopulation persistence (Fig. 2) and can be enhanced if buffer zones are managed to minimize road density, artificial openings, and other potential barriers.

Another advantage of buffer zones around reserves may be to allow plants and animals to shift their distributions in response to disturbances and other changes. In the long term, or perhaps rather quickly (within the next few decades, if prevailing models of anthropogenic global warming prove true), organisms will need to shift their ranges in response to climate change (Peters and Darling 1985). Buffer zones or habitat corridors between reserves will help organisms make these distributional shifts and avoid extinction (see connectivity discussion, below).

In order to protect species sensitive to legal or illegal hunting or persecution, such as grizzly bear, jaguar, and wolf, buffer zones must have low road density (say, no more than 0.5 miles of road per square mile). Research has shown that road densities as low as 0.8 or 0.9 miles per square mile may make habitat unsuitable for large carnivores and omnivores (Brody 1984, Thiel 1985, Mech et al. 1988). Road access is a major threat to wildlands throughout North America (Diamondback 1990). Road closures are one of the most effective ways to make multiple-use lands function as buffers.

Connectivity

A fundamental principle for designing regional reserve systems is connectivity. Unless many millions of acres in size, individual core reserves will not be able to function alone as whole ecosystems, in the sense of maintaining viable populations of large animals and ecological and evolutionary processes (see the following section on bigness). In the long term, regions themselves must be functionally interconnected to allow for long distance dispersal and migration in response to climate change. In order to maintain their ecological integrity, many or most core reserves will have to be functionally joined to other protected areas.

Habitat fragmentation, one of the greatest of all threats to biodiversity (Noss 1983 and 1987a, Harris 1984, Wilcox and Murphy 1985, Wilcove et al. 1986), is a process where large blocks of natural habitat are broken up into smaller and isolated pieces. Connectivity is in many respects the opposite of fragmentation. A reserve system with high connectivity is one where individual reserves are functionally united into a whole that is greater than the sum of its parts (Noss and Harris 1986).

As suggested above, properly managed buffer zones in which a constellation of reserves is embedded may provide adequate habitat connectivity. Key qualities of buffer zones that provide for animal movement are low road density and minimal development, clear-cutting, or other forms of habitat fragmentation. In some cases, however, distinct corridors of suitable habitat may be needed to link core reserves or reserve complexes into a functional network. These corridors may range in scale from short connectors a few dozen meters wide to regional corridors one hundred miles or more in length and many miles in width (Noss 1991d and 1993). I use the term "linkages" to emphasize the many types and functions of connectivity.

Linkages as Habitat: Some types of corridors are distinct in the natural landscape, riparian corridors being a good example. Riparian forests are highly productive and often very rich in species. As an illustration of how many animals may depend on riparian forests, in the Blue Mountains of Oregon and Washington 285 (75 percent) of the 378 species of terrestrial vertebrates either depend on or strongly prefer riparian zones over other habitats (Thomas 1979). Riparian forests are immensely valuable in their own right, aside from any role they may play as conduits for wildlife movement.

Wide protected corridors are basically extensions of core reserves. The width of corridor needed to contain an adequate amount of forest interior habitat and minimize edge effects is uncertain and depends on habitat quality both within and outside the corridor (Noss 1993). For example, the edge effect of increased blowdown risk extends at least two tree-heights into a forest (Harris 1984). If forest trees average 40 m in height, a corridor would have to be at least 360 m (approximately one-quarter mile) wide to maintain a modest 200 m wide strip of interior forest. Another consideration for determining optimal corridor width is the territory or home range size of target species expected to use the corridor. Because this issue also affects the ability of a corridor to promote dispersal, I discuss it below in the dispersal section.

Linkages for Seasonal Movements: The conservation function most commonly associated with corridors is to allow movement of animals between reserves. For wide-ranging animals, a small core reserve may not encompass a single annual home range. Some large car-

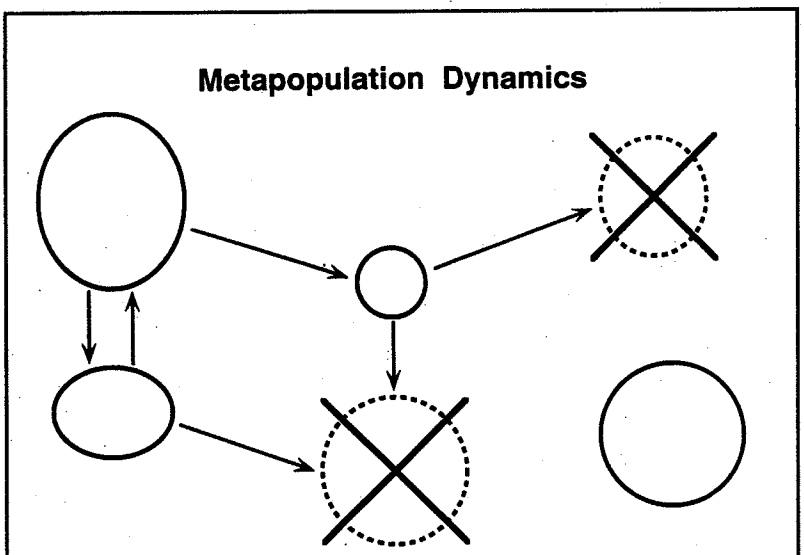

Figure 2. A hypothetical example of metapopulation dynamics. Subpopulations are connected by dispersal, which may keep local populations from going extinct (the "rescue effect") and thus stabilizes the metapopulation. In this example, two subpopulations (each marked by an "x") have recently gone extinct. Dispersal from other subpopulations allows for these areas to be recolonized. The subpopulation in the lower right is not receiving any immigrants, perhaps because developments or other barriers lie between it and other subpopulations. Should this isolated subpopulation go extinct, it can only be recolonized by restoration of dispersal corridors or active reintroduction by humans.

nivores have annual ranges of 1000 or more km², and elk and mule deer may travel over 100 km in linear distance between summer and winter ranges (Noss 1991a and 1993). Maintaining safe travel opportunities for these species is largely a matter of protecting them from human predation; wide, roadless corridors will best serve this purpose.

Vertebrates often use traditional migration routes between summer and winter range. Elk generally use forested travel lanes, when available, for migratory movements (Adams 1982). Elk migration has been disrupted by removal of security cover by logging in many regions, for example on the Targhee National Forest near Island Park, Idaho. Travel corridors used by grizzly bears include ridgetops, saddles, and creek bottoms (LeFrance et al. 1987); grizzlies avoid crossing clearcuts and other large openings (D. Mattson, personal communication). Traditional wildlife migration routes should be incorporated into corridors between reserves. Habitat nodes or staging areas for migratory animals also should be identified and protected.

Linkages for Dispersal: Dispersal refers to the movement of organisms away from their place of origin, such as the movement of subadult animals out of the parental home range. Many species are distributed as metapopulations (Fig. 2). Dispersal can counteract the isolating effects of habitat fragmentation, but only if adequate dispersal habitat remains. For a regional metapopulation of a species to persist, movement of individuals between patches must be great enough to balance extirpation from local patches (den Boer 1981). Late successional species tend to be poorer dispersers and more vulnerable to extinction in fragmented landscapes than species associated with early successional stages (den Boer 1990). Therefore, dispersal corridors are most important for late successional species and for species, such as large carnivores or ungulates, likely to be killed by humans or vehicles in developed or heavily roaded landscapes.

Dispersal is more often successful when habitat in a corridor or other linkage is similar to the habitat in which a species lives (Wiens 1989), with some exceptions (Bleich et al. 1990). Just how similar it must be is a question yet to be answered. Thomas et al. (1990) predicted, on the basis of a collective best guess, that maintaining 50% of the landscape matrix between proposed habitat conservation areas in forest stands averaging at least 11 inches dbh and 40% canopy closure would provide adequate dispersal habitat for the northern spotted owl. Other scientists might have opted for more stringent standards, for example, 75% of the matrix, more canopy closure, lower road density, and less edge to protect owls from shooting and great horned owl predation. In any case, maintaining matrix suitability, as in the multiple-use zoning strategy reviewed above, is another way to provide connectivity between core reserves. For those species most sensitive to human harassment, barrier effects of roads, or edge effects, the prudent strategy is to maintain wide corridors with roadless core zones and true interior habitat (Noss 1993).

Corridors that maintain resident populations of animals are more likely to function effectively as long-distance dispersal conduits for those species (Bennett 1990). Minimum corridor widths, then, might be based on average home range or territory diameters of target animals (Harrison 1992). Consider the grizzly bear, with an average male lifetime home range of approximately 3885 km² (1500 square miles) in the Greater Yellowstone Ecosystem (Mattson and Reid 1991). A male lifetime home range may contain, at any one time, one or two adult males, and up to a few females; thus, it would provide an adequate width for an inter-regional corridor.

If the population of grizzlies in the Greater Yellowstone Ecosystem is to be connected to other populations, which seems to be necessary to assure population viability, then wide corridors with resident grizzlies must connect Yellowstone with the Northern Continental Divide Ecosystem (about 200 miles away) and the wildlands of central Idaho (Picton 1986, Metzgar 1990). Considering rectangular lifetime home ranges twice as long as wide, a between-population corridor for grizzly bears should be at least 44.25 km (27.5 miles) wide. A corridor based on annual or seasonal home ranges would be much narrower but also less secure; it is best to risk erring on the side of caution. Because road densities above about 0.5 miles of road per square mile of habitat may be a threat to grizzlies (Bader 1991), road closures would be required to make inter-regional corridors safe. Fig. 1 portrays a wide inter-regional corridor of the type discussed here and others are shown in the statewide network proposed for Florida (Fig. 3; Noss 1985 and 1987a and *Wild Earth* 1(1)).

Linkages for Long-Distance Range Shifts: A final function of connectivity is to provide for long-distance migration of species in response to climate change. Models of anthropogenic global warming predict dramatic shifts in vegetation in most regions. In the Greater Yellowstone Ecosystem, for example, the upper and lower treelines are expected to move considerable distances (Romme and Turner 1991). Human activities have imposed a new set of barriers on the landscape that, in addition to natural barriers, may interfere with long-distance movements. Unfortunately, if rates of global warming in the next few decades are as fast as predicted, many species will be unable to migrate quickly enough, even along ideal corridors. In Yellowstone, as elsewhere, species with short and rapid life histories, such as introduced weeds, will probably adjust well to climate change, as will broadly distributed species such as lodgepole pine. On the other hand, whitebark pine and many alpine species, which already show limited and discontinuous distributions, are at high risk of extirpation (Romme and Turner 1991).

Mountainous regions with broad elevational spans are better suited for adaptation to climate change than flatter regions. A 3°C rise in temperature, as predicted with greenhouse warming, translates to a latitudinal range shift of roughly 250 km (155 miles), but an elevational range shift of only 500 m (1640 ft.) (MacArthur 1972). Perhaps the best way to facilitate adaptive migration of species in response to climate change is to maintain intact environmental gradients, as discussed earlier in this article. Complete, unfragmented elevational gradients, for example from foothill grasslands and shrub steppe up to alpine tundra, will offer the best opportunities for upslope migration of species in response to global warming.

THE ISSUE OF BIGNESS

The question that has most occupied conservation biologists for the last two decades has been "How large does a reserve need to be to maintain its diversity over time?" Researchers have sought answers in various ways and have discovered many reasons why large reserves are preferable to small ones. The desirability of large reserves, all else being equal, is one of the few almost universally accepted principles of conservation biology (Soulé and Simberloff 1986, Thomas et al. 1990).

Some of the best reasons for large reserves are quite practical: per unit area, they are usually cheaper to buy and require less management effort to maintain their natural qualities than smaller reserves (Pyle 1980,

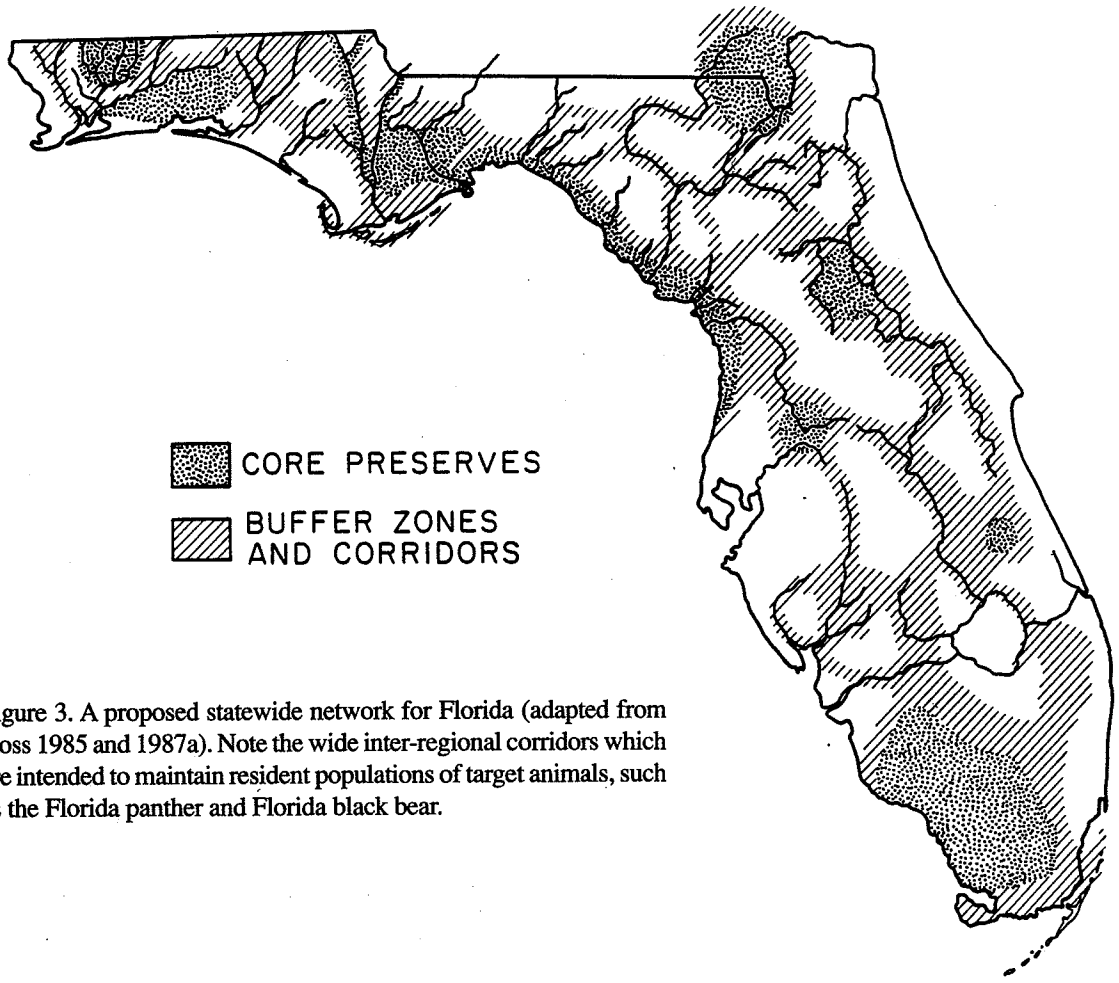

Figure 3. A proposed statewide network for Florida (adapted from Noss 1985 and 1987a). Note the wide inter-regional corridors which are intended to maintain resident populations of target animals, such as the Florida panther and Florida black bear.

White and Bratton 1980, Noss 1983). Due to the species-area relationship and its many potential causes (Connor and McCoy 1979), larger reserves also contain more species than smaller reserves in the same biogeographic region. Island biogeographic theory suggests that large islands or nature reserves contain more species because they experience higher colonization rates and lower extinction rates than smaller areas (MacArthur and Wilson 1967, Diamond 1975). But perhaps the most compelling arguments for large reserves have to do with population viability and habitat diversity in the face of environmental change.

Reserve Size and Population Viability.

Estimates of minimum viable population sizes and corresponding reserve sizes are alarmingly high. Small populations are vulnerable to extinction due to a number of factors, including environmental change, demographic stochasticity, social dysfunction, and genetic deterioration (Shaffer 1981, Soulé 1987). All populations fluctuate over time; small populations are more likely to fluctuate down to zero. A recent review of empirical studies (Thomas 1990) concluded that an average population of 1000 individuals must be maintained in order to assure population viability of species with average levels of fluctuation in abundance. Bird and mammal species with highly variable populations may require average populations of about 10,000 individuals for long-term persistence. In some cases, however, populations can persist for long periods at surprisingly small sizes, even less than 50 individuals (e.g., Walter 1990). It seems wise, however, to strive for large populations of vulnerable species whenever possible.

Habitat quality, social behavior, and other factors will determine how minimum population estimates translate to reserve size estimates. Schonewald-Cox (1983) estimated that reserves of 10,000 to 100,000 ha (25,000 to 250,000 acres) might maintain viable populations of small herbivorous and omnivorous mammals, but that large carnivores and ungulates require reserves on the scale of 1 to 10 million ha (2.5 to 25 million acres). Using a minimum viable population size of 50 (which is reasonable only under very short planning horizons), it has been estimated that grizzly bear populations in Canada require an average of 49,000 km^2 (12.1 million acres), wolverines, about 42,000 km^2 (10.4 million acres), and wolves, about 20,250 km^2 (5 million acres)(Hummel 1990). For a minimum viable population of 1000 (see Thomas 1990), the figures would be 242 million acres for grizzly bears, 200 million acres for wolverines, and 100 million acres for wolves. And, of course, it is not prudent to manage down to the minimum!

Such immense areas could not be contained today within individual reserves, but only within regional and inter-regional systems of interlinked reserves, for example, the Greater Yellowstone Ecosystem linked to the Northern Continental Divide Ecosystem and on to the Canadian Rockies; the Florida network (Fig. 3) linked to a network that parallels the Appalachian Trail to Maine (Sayen 1987, Hunter et al. 1988); and a southern Arizona network linked to the rest of the Southwest and to Mexico. Regional and inter-regional systems of protected areas con-

nected by wide corridors appear to be necessary to maintain viable and well-distributed populations of most large carnivores, hence the importance of these species as targets for wilderness recovery planning.

Reserves making up a habitat system for large carnivores should be predominately wilderness, but should include appropriately managed buffer zones. In order to protect these species, which are very sensitive to human predation and harassment (Thiel 1985, Mattson et al. 1987, McLellan and Shackleton 1988, Knight et al. 1988, Craighead et al. 1988, Mattson and Knight 1991a,b), open roads and other means of human access must be tightly restricted. Recognizing (on paper) the threats posed by open roads, the Gallatin National Forest in Montana has implemented an open road density (ORD) standard of 0.5 miles of road per square mile in critical grizzly bear and big game habitat. The 0.5 ORD standard is assumed to maintain a habitat effectiveness of at least 70 percent, an accepted minimum for population viability of grizzlies and elk (Bader 1991). Road closures to reduce the density of roads to an acceptable level (less than 0.5 miles per square mile) in each region will be among the most difficult actions politically, but most necessary ecologically.

Reserve Size and Disturbance Regimes

Maintaining habitat diversity and the full range of species associated with different seral stages requires that natural disturbance regimes be taken into account when considering reserve size. Disturbances are patchy in time and space, so that a landscape can be viewed as a "shifting mosaic" of patches in various stages of recovery from disturbance (Bormann and Likens 1979). The mosaic appears to shift because new disturbances occur in some portions of the landscape at the same time as formerly disturbed areas are growing back into forest or other mature vegetation. Reserves that are small relative to the spatial scale (patch size) of disturbance may experience radical fluctuations in the proportions of different seral stages over time, which in turn threaten populations that depend on certain stages. Many nature reserves are smaller than the area likely to be disturbed by a single wildfire or windstorm, and therefore are quite vulnerable to loss of habitat diversity and associated species.

If a core reserve is to maintain a relatively stable mix of seral stages and species over time, it must be large enough that only a relatively small part of it is disturbed at any one time. Another requirement is that a source of colonists (that is, a reproducing population of the same species) exists within the reserve or within a reasonable dispersal distance so that populations can be reestablished on disturbed sites (see Fig. 2). Disturbance patch sizes and spatial distribution, successional dynamics, potential refugia (areas within the reserve, or nearby, that are not likely to be disturbed), and dispersal capacities of species, are the ecological factors to keep in mind when planning reserves around natural disturbance regimes.

Pickett and Thompson (1978) used these criteria to define a "minimum dynamic area" as "the smallest area with a natural disturbance regime, which maintains internal recolonization sources, and hence minimizes extinction." In theory, a minimum dynamic area should be able to manage itself and maintain habitat diversity and associated native species with no human intervention. Shugart and West (1981) estimated that landscapes must be some 50-100 times larger than average disturbance patches in order to maintain a relative steady-state ("quasi-equilibrium") of habitats. In a steady-state landscape, the proportions of different seral stages in the overall landscape would be relatively constant over time, even though the sites occupied by various seral stages would change. A steady state may never be reached in some ecosystem types, such as those regularly experiencing large, catastrophic fires (Baker 1989). Romme and Knight (1982) concluded that Yellowstone National Park is not large enough to exist in equilibrium with its disturbance regime, and that a steady state for the Greater Yellowstone Ecosystem as a whole is unlikely.

Fire woodcut by Patrick Dengate

Very large but infrequent fires are characteristic of many landscapes in the central and northern Rocky Mountains. Surveys by Ayres (1901) in the Lewis and Clarke Reserve of Montana (which included what are now the Bob Marshall, Great Bear, and Scapegoat Wilderness Areas) showed that over 300,000 ha (750,000 acres) burned in the area in one year, 1889, and up to 136,000 ha in a single fire. About 100,000 ha burned in the Canyon Creek Fire in 1988 (Losensky 1990). Similarly, fires in the Coast Range of Oregon have burned as much as 200,000 ha (Spies and Cline 1988). In the Northwest, fires become smaller and less severe, but considerably more frequent, along a transect from the Washington Cascades to northern California (Swanson et al. 1990, Morrison and Swanson 1990).

Although most fires are mosaics, a minor portion of the affected acreage being of stand-replacement intensity, the immense scale of many natural disturbances provides a strong argument for establishing large reserves. Active fire suppression is simply not a reasonable option in these cases. Experience and research have shown that fire is a

natural part of these systems and essential to their overall diversity; moreover, many fires are impossible to suppress (Christensen et al. 1989).

A core reserve, by itself, need not encompass a minimum dynamic area. The concept implies that all natural seral stages be maintained over time and that dispersal distances between similar habitats are surmountable by native species; but there is no reason to insist that a steady state of seral stages be maintained, for this may rarely occur in nature (Pickett and White 1985). The steady-state concept is useful, however, in the sense that reserves large enough to be close to steady state will likely experience lower extinction rates than reserves where habitat conditions fluctuate wildly over time. Larger landscapes buffer the effects of disturbance on diversity of habitats and species (Shugart and Seagle 1985). Thus, the scale of management planning, including core reserves and surrounding multiple-use lands, should encompass something approximating a minimum dynamic area whenever possible; the complex as a whole can be managed to maintain habitat diversity.

CONCLUSIONS

This article has reviewed some considerations for designing wilderness recovery networks at a regional scale (basic recommendations are summarized in the Appendix). The spotlight has been on North America, but projects of the type described here are urgently needed worldwide. I have emphasized terrestrial ecosystems for the simple reason that this is my area of expertise. However, protection and restoration of entire regional landscapes, as promoted by The Wildlands Project, are intended to maintain aquatic and terrestrial ecosystems alike. Nonetheless, many aquatic biota will require special recovery techniques, such as dechannelization of streams and elimination of dams and water diversion structures, in order to be healthy again. Furthermore, marine ecosystems, particularly near shore, are in serious jeopardy in many regions and need comprehensive recovery strategies of their own.

I have highlighted the needs of large carnivores in this article because they are often acutely sensitive to human activity and hence are among the best indicators of wilderness condition. However, the stated goals of The Wildlands Project should make clear that not just carnivores, but all of biodiversity is the target of our efforts. Many sensitive assemblages (for example, neotropical migrant songbirds, anadromous fish, freshwater bivalve mollusks, and declining amphibian species) will require focused recovery work for many years to come. Importantly, ecosystem-level protection does not imply that we neglect individual species or assemblages on the brink of extinction; endangered species legislation should be strengthened and rigorously enforced to help imperiled taxa.

No substitute exists for detailed on-the-ground knowledge of the ecology and natural history of a region. General theory and insights gained from other regions are helpful, but do not transfer directly to areas with different biotas and histories. A long-term conservation plan for a region should be hypothesis-driven and adaptive; that is, we should scientifically test various approaches and techniques to see how well they work, then adjust our management to reflect new knowledge. Activists should enlist the participation of ecologists and other scientists most familiar with a region; if the latter will not themselves get actively involved in a project (some are afraid of tarnishing their cherished credibility as impartial observers), they may at least provide information and guidance. If all else fails, become an expert yourself on the ecology of your region!

The discussions above should make clear that planning on a bioregion by bioregion basis is incomplete. Because of the huge areas required to support viable populations of some animals and the necessity for all species to be able to migrate long distances with climate change, inter-regional and inter-continental planning is mandatory. The Wildlands Project will facilitate planning among regions and provide access to critical information, both scientific and tactical, to activists and planners worldwide. We now need, all of us, to put this information and strategy into action.

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APPENDIX: A RECIPE FOR RESERVE SYSTEM DESIGN AND MANAGEMENT

A regional reserve system consists of three basic ingredients: core reserves, multiple-use (buffer) zones, and corridors. Select your core reserves first, then interconnect and buffer them across the landscape. For many species, properly managed multiple-use zones will function as corridors. An archipelago of core reserves in a matrix with low road density and low-intensity human activities will function well for most native species. Multiple-use zones at a landscape scale can be corridors at a regional scale. Whenever possible, however, significant core reserves should be linked by corridors containing roadless interiors.

I. CORE RESERVES

A. Selecting Sites and Drawing Boundaries

1. If large reserves (e.g., national parks, large wilderness areas) already exist in the landscape, enlarge boundaries to encompass adjacent and nearby old-growth stands, roadless areas, and other ecologically important patches.
2. If no large reserves presently exist in the landscape, draw boundaries to enclose geographic clusters of the following:
   a. managed areas (wilderness areas, RNAs, designated wildlife habitat areas, etc.)
   b. old-growth stands
   c. other natural (virgin) forest
   d. other natural areas and sensitive sites
   e. roadless areas
   f. rare species occurrences (e.g., as mapped by heritage programs)
   g. under-represented vegetation types
3. At a regional scale, be certain that the overall system of core reserves includes the following:
   a. representative examples of all major ecosystem (vegetation) types native to the region, and all seral stages within each type
   b. centers of species richness and endemism (as determined, for example, by gap analysis projects)
   c. population centers of large, wide-ranging species (especially large carnivores)
   d. populations of other rare species
   e. entire environmental gradients (all physical habitat types)

B. How Large Should a Core Reserve Be?

1. The basic issue is context. Core reserves surrounded by adequate buffer zones and/or well interconnected by corridors can be quite small (say, 10,000 to 100,000 acres) and still function effectively for most target species.
2. Assuming that core reserves are isolated and surrounded by hostile habitat (tree farms, agriculture, urban areas), they may need to be 1 to 10 million hectares (2.5 to 25 million acres) or more in size to maintain viable populations of large mammals in the long term.
3. For vegetation types prone to high-intensity fire, core reserves millions of acres in size are needed to maintain seral stage diversity across the landscape. Silvicultural manipulations or prescribed fires will be necessary to maintain seral stage diversity in cases where core reserves are too small.

C. How Should Core Reserves Be Managed?

1. All else being equal, the smaller the reserve, the more management is necessary (particularly to protect the reserve from human activity and other external influences).
2. Core reserves should be managed as roadless areas (wilderness). All roads should be permanently closed. The more roads remain open, the less viable the reserve for many sensitive species.
3. Restoration will be the management emphasis in most cases. This is particularly true when a core reserve encompasses a cluster of relatively pristine sites in a matrix of human-disturbed habitat, or where no pristine habitat remains for a certain vegetation type.

4. Restorative management includes the following:
   a. thinning of plantations and planting of other native species, if necessary, to diversify structure and species composition
   b. thinning of fire-suppressed (and artificially dense) stands of naturally open-structured forest types (e.g., longleaf pine or ponderosa pine) prior to reintroduction of fire
   c. reintroduction of fire, either by allowing natural fires to burn or by prescribed fires that mimic natural fires in intensity, frequency (return interval), and seasonality
   d. road closures and (where necessary) revegetation
   e. soil innoculation with mycorrhizal fungae, where necessary to reestablish native vegetation
   f. control or (where possible) elimination of exotic species (including livestock)
   g. reintroduction of extirpated native species (for example, large carnivores)

II. MULTIPLE-USE ZONES

A. Primary Functions of Multiple-Use Zones
   1. Ameliorate edge effects on small core reserves (insulate core reserves from intensive land use).
   2. Provide a suitable matrix for animals to move between core reserves (i.e., enhance connectivity).
   3. Provide supplemental habitat for populations of native species inhabiting reserves, and stabilize population dynamics.
   4. Protect developed areas from depredating large mammals that reach relatively high densities in core reserves.

B. Design and Management Criteria
   1. Two or more zones are recommended, so that a gradation of use intensity exists from the core reserve to the developed landscape.
   2. Inner zones should have low road density (no more than 0.5 mile/square mile) and low-intensity use. Uses might include:
      a. non-consumptive recreation (hiking, cross-country skiing, birding)
      b. primitive camping
      c. wilderness hunting and fishing
      d. low-intensity silviculture (light selective cutting)
      e. limited habitat manipulation for target plant and animal species
   3. Outer zones may have higher road density (but still no more than 1 mile/square mile) and more intensive use. Uses might include:
      a. heavier recreational use (but no off-road vehicles) and campgrounds
      b. New Forestry silviculture (e.g., partial retention harvests), selection forestry, or other forestry experiments
      c. habitat manipulations to favor target wildlife

III. CORRIDORS

A. Primary Functions of Corridors
   1. Provide dwelling habitat, as extensions of reserves.
   2. Provide for seasonal movements of wildlife (e.g., elk and mule deer migrations).
   3. Provide for dispersal and genetic interchange between core reserves.
   4. Allow for latitudinal and elevational range shifts with climate change.

B. Design and Management Criteria
   1. Connect small core reserves within clusters by corridors at a landscape scale. Connect clusters of reserves by bigger corridors at a regional scale.
   2. Multiple corridors interconnecting a network of core reserves provide functional redundancy and mitigate against disturbance.
   3. Corridors aligned upslope, coast-inland, and south-north will facilitate migration of species with climate change.
   4. Known wildlife migratory routes should be incorporated into corridors.
   5. When possible, corridors should be zoned to have roadless core areas in their centers, enveloped by buffer zones.
   6. When possible, route corridors through parts of the landscape with lowest road density.
   7. When intersecting roads, corridors should include wildlife underpasses, tunnels, bridges, viaducts, and other structures that allow wildlife to cross roads safely.
   8. Width considerations:
      a. if centered on a river, a corridor should extend up each slope to overlap the ridge line (ridgetop to ridgetop)
      b. if centered on a ridge, the corridor should extend downslope on either side to encompass the riparian zones
      c. longer corridors, all else being equal, need to be wider
      d. corridors surrounded by inhospitable habitat (i.e., unbuffered) need to be wider
      e. corridors at a landscape scale should be at least 3 times wider than the longest distance penetrated by edge effects (for example, if edge effects penetrate 200 m, the corridor should be 600 m wide in order to include a 200 m-wide core of interior habitat)
      f. corridors at a regional scale (say, more than 10 miles long), should average at least one mile wide, with bottlenecks no thinner than 1/4 to 1/2 mile. Corridors several miles wide are needed if the objective is to maintain resident populations of large carnivores (necessary if the corridor is longer than normal dispersal distances)
      g. a corridor designed with a particular species in mind will function better the more similar its habitat is to the preferred dwelling habitat of that species; corridors with resident populations of target species are optimal
   9. When designing interconnected networks of reserves at a regional scale, the planning area should be at least the minimum area necessary to insure demographic and genetic integrity of the most space-demanding species.
   10. Do not allow corridors to substitute for the protection of large, intact core reserves or to divert attention from managing the landscape as a whole in an ecologically responsible manner.

DEVELOPING A REGIONAL WILDERNESS RECOVERY PLAN

by Dave Foreman

INTRODUCTION

Dr. Reed Noss presents the scientific background, a conceptual overview, and general guidelines for developing a Wilderness Recovery Plan in the centerpiece article in this special issue of *Wild Earth*. My article here is meant to be a companion to Noss's, a nuts and bolts primer from a conservation activist on how to start designing such a system in your area. In addition to being based on conservation biology concepts as developed by Noss, Dr. Michael Soulé, and others, this article is based on my twenty years of experience in drawing up Wilderness Area proposals on federal lands. These are practical tips for implementing what Noss presents.

OVERVIEW

The Mission Statement for The Wildlands Project in this issue sets forth the grand vision and strategy for the North American Wilderness Recovery Plan. Such a continent-wide plan, although holistic, is built from a multitude of pieces like a jigsaw puzzle. Local and regional reserve systems linked to others ultimately tie the North American continent into a single Biodiversity Reserve—in contrast to the present fragmented system of quasi-natural "museum pieces" in existing National Parks, Wildlife Refuges, Wilderness Areas, and other reserves.

The Southern Rockies Ecosystem can illustrate what I mean. (See *Figure 1*.) Area 1 on the map is the Weminuche roadless area of southwestern Colorado. Its 806,000 acres include the 460,000 acre designated Weminuche Wilderness Area and surrounding roadless (but unprotected) San Juan and Rio Grande National Forest, Bureau of Land Management, and private lands. Much of this contiguous roadless acreage is threatened by logging, roading, and other developments. (See Roz McClellan's article in this issue.) Thanks to its size, the Weminuche roadless area is a major Wilderness Core for a Wilderness Recovery Network in the Southern Rockies Ecosystem.

Look again at the map and note the relationship of the Weminuche to Roadless Areas 2, 3, 4, 5, 6, and 7. Together they form a complex of seven roadless areas, each more than 100,000 acres in size, in southwestern Colorado's San Juan Mountains region. As with the Weminuche, some lands in these roadless areas are protected as Wilderness while other lands are under threat of development. These areas form a logical complex totaling 1.9 million roadless acres. By connecting these seven areas through biological corridors, the complex is tied into a whole.*

To the north of the San Juan complex is a Central Colorado complex formed by Roadless Areas 11-16. This complex should also be linked together by biological corridors. North of it is another complex, centered on Rocky Mountain National Park (Roadless Areas 21-24). Smaller complexes exist in the Sangre de Cristos (Roadless Areas 8 & 9, and three other roadless areas south into New Mexico) and the Flat Tops (18 & 19).

Regional corridors are needed to connect each of these complexes for a Southern Rocky Mountains Wilderness Recovery Network. Surrounding the Southern Rockies Ecosystem (SRE) are the Central Rockies, Colorado Plateau, and Great Plains Ecosystems. The SRE needs to be linked by inter-regional corridors to similar Wilderness Recovery Networks in each of these regions to form a Subcontinental Wilderness Recovery Network for the Western United States. This system then needs to be linked to other landscapes within the Nearctic Realm. And finally, the Nearctic must be linked to the Neotropical Realm of Mexico and Central America for a North American Wilderness Recovery Plan. This all amounts to a hierarchy of Biological Corridors tying Wilderness Cores together.

The role of individuals and grass-roots groups is to develop proposals for Wilderness Recovery Networks on the regional and ecosystem level using the Noss model (or some derivation thereof) so that such plans can dovetail into similar plans for adjacent regions until the continent-wide plan is assembled.

*As I'll discuss later, we should not limit ourselves to what is currently undeveloped. At a later stage, nearly all of the National Forests of southwestern Colorado should be managed as Core Wildernesses and Biological Corridors. For the sake of simplicity in this example, I'll not go into that here. I will also later discuss tying in other roadless areas smaller than 100,000 acres.

PEOPLE

Many kinds of people are necessary to develop a regional Wilderness Recovery Plan. These include professional ecologists and other scientists who understand the local ecosystem and wildlife as well as the principles of conservation biology, and grass-roots conservation activists who understand the mechanics of public land management and conservation advocacy. It is the goal of The Wildlands Project and *Wild Earth* magazine to bring these two groups together. Sympathetic agency personnel should be recruited as well. Nature Conservancy staff should be plugged in so that gaps in reserve networks can become priorities for acquisition. These people will also help identify biologically significant sites.

PUTTING THE PIECES TOGETHER

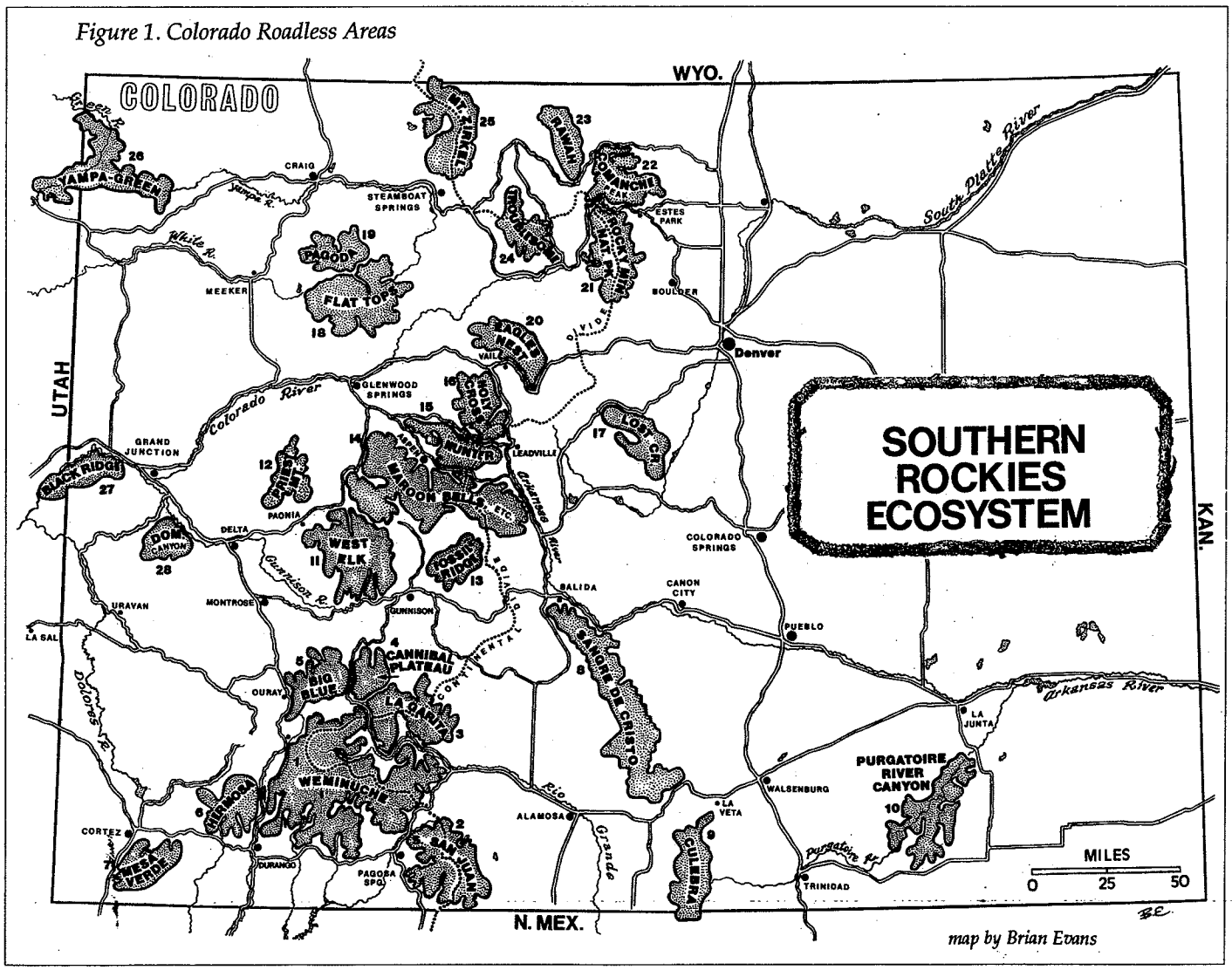
The initial stage of developing a Wilderness Recovery Plan involves looking at existing land conditions and management. This should be done in concert with the conservation biology process of identifying ecologically important areas, as discussed by Noss.

In your region, identify existing protected areas. Federal and state Wilderness Areas are generally the most thoroughly protected. Others include units of the National Park System, National Wildlife Refuges, BLM Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs) on National Forests and other federal lands, State Parks and Wildlife Refuges, and Nature Conservancy Preserves.

Some of these areas will be large enough to serve as Core Wildernesses or at least as the cores for expanded Core Wildernesses. Those too small to be Core Wildernesses might well serve as beads in Biological Corridors linking Core Wildernesses together. Remember that small natural areas, even if isolated, serve important conservation functions, such as maintaining populations of rare plants.

Overlay on a map of these areas, the large roadless areas identified in *The Big Outside*. (See *Figure 2*.) Big Outside areas are roadless areas of 100,000 or more acres in the West and 50,000 or more acres in the East. Looking at their geographic arrangement shows logical complexes of wild places that can be tied together. The protected areas

Figure 1. Colorado Roadless Areas



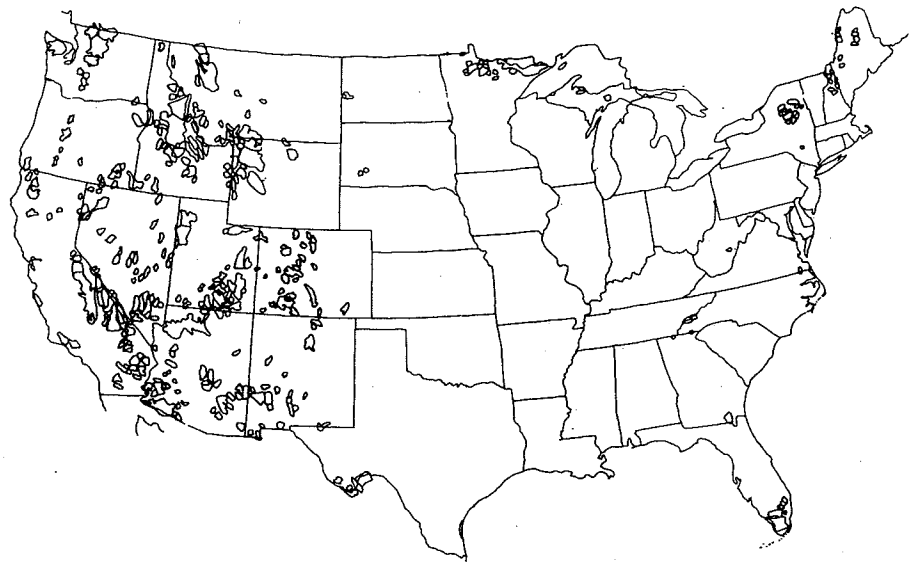


Figure 2. National Overview of Roadless Areas from The Big Outside *(see centerfold map, p. 44-45)*

(Wilderness Areas, National Parks, etc.) *within* units of the Big Outside are the key cores for a Wilderness Recovery Plan. The overlay will also show you currently wild but unprotected areas that are of high priority for protection and may comprise potential Biological Corridors.

This exercise will help establish priorities for conservation efforts. It is usually more important, for example, to stop an old-growth timber sale within a Big Outside area or in a corridor between two core areas than to stop an old-growth timber sale in an isolated, fragmented area far from potential cores or corridors. It is usually more important to establish a Wilderness Area that is part of a large complex, than one isolated in a matrix of intensive human use. (Keep in mind that this political process must go hand in hand with the ecological evaluation discussed by Noss.)

Look also for National Forests, BLM lands, state forests, county lands, military reservations, and the like. All of these public lands must play a major role in a Wilderness Recovery Network.

Finally, look for the gaps between wild lands or public lands. Such private lands often will be important areas for acquisition by public agencies or by private groups like The Nature Conservancy. Even in public land-rich regions like the West, such gaps are significant, but they are especially crucial in the East where there is much less public land and where large private holdings are critical elements for Wilderness Recovery Networks. (Look at the two sidebars accompanying this article. One lists the large roadless area complexes in the West that should serve as Wilderness Cores. The other identifies key areas east of the Rocky Mountains which are priorities for public land acquisition, consolidation, and wilderness recovery, in order to serve as Wilderness Cores. These lists are for the United States only.)

Various tools will assist you in this exercise. *The Big Outside* provides information and maps on 385 large roadless areas in the United States.* The Wildlands Project will provide more detailed state maps for Big Outside areas to those working on state or regional Reserve Systems. (Contact Rod Mondt, The Wildlands Project, PO Box 5365, Tucson, AZ 85703; 602-743-7596.) Maps are available of National Parks, Wilderness Areas, National Forests, and BLM lands from government agencies (and from Books of the Big Outside). In the West, a very good series of maps is the state "Wilderness Status" maps from BLM offices. Contact BLM and FS offices for locations of ACECs and RNAs, and Nature Conservancy offices for maps of their preserves.

Also try to get detailed maps from the Forest Service showing RARE II areas, and from BLM showing the original roadless areas identified in their early Wilderness Review. Both the FS and BLM maps were drawn in the late 1970s, so you will have to work through old files in agency offices (or conservation group offices). Although some of these areas have been roaded, logged, or otherwise developed in the last decade, in general such roadless areas will be key parts of Core Wildernesses or Biological Corridors.

PUBLIC LAND MANAGEMENT

One hundred years ago John Muir argued that the newly withdrawn Forest Reserves in the West should be protected from logging, mining, and livestock grazing. The Forest Service Organic Act in 1897, which established the Forest Reserves as National Forests, opened them to logging and grazing. A key part of the North American Wilderness Recovery Plan is to return to Muir's vision for management of our public lands. We cannot allow ourselves to be boxed in by the "reality" of current multiple-abuse management. Commercial livestock grazing on federal and state lands cannot be justified ecologically or economically. Commercial logging, with the possible exception of small pole, post, and firewood sales, should be prohibited on the National Forests, although non-commercial thinning of plantation and fire-suppressed stands may help speed recovery of natural stands. Mining is an inappropriate use of public lands in virtually all cases. Vehicle use off established roads must be entirely prohibited. By freeing Forest Service, BLM, and state lands of such multiple-abuses, many roads and other developments could be closed —thereby greatly increasing the amount of land available for Wilderness Recovery.

As we develop plans for Wilderness Recovery Networks, we should keep all of this in mind. Roads necessary only for logging and grazing or recreational access should be closed, logged areas allowed to revegetate, and overgrazed watersheds encouraged to heal. It may be necessary to allow some roads to remain open to official use for short time periods to allow active restoration in severely abused areas, or for reintroduction of extirpated species, but the majority of dirt and gravel roads on the public lands should be closed quickly.

* Available for $18 postpaid from Books of the Big Outside, POB 5141, Tucson, AZ 85703 or in better book stores.

BIG PREDATOR FOCUS

As our Mission Statement indicates, the North American Wilderness Recovery Plan is a key part of a biodiversity protection strategy for the continent, but it is not the entire strategy. Other protection schemes are also necessary. We are concentrating on the big picture: vast landscapes untrammeled and unencumbered by industrial civilization. Our plan is especially keyed to large, wide-ranging predators like Grizzly Bear, Gray Wolf, Red Wolf, Wolverine, Mountain Lion, Lynx, Jaguar, American Crocodile, Orca, Black Bear, and Harpy Eagle. They are generally the species most sensitive to human activity. Also, by protecting habitat and linkages for such species, perhaps 90 percent or more of the rest of biodiversity (rare plants, insects, songbirds) will also be protected. Those special sites that are not covered by our continental plan can be protected by conventional small reserves.

Wild Earth will continue to offer articles with elaborations on the rationale and mechanics of planning and promoting the North American Wilderness Recovery Plan and its regional components. We will present numerous proposals for regional Wilderness Recovery Networks in future issues. I will soon offer a draft overview of the entire North American Wilderness Recovery Network which will identify specific sites. The Wildlands Project will sponsor workshops and conferences in conjunction with other conservation groups and scientific societies in all parts of the continent to develop such proposals. We hope that within two or three years we will be able to present the grand plan for all of North America. Your participation will make this vision a reality.

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A further caveat: My discussion here is specific to the United States of America. Canada, Greenland, Mexico, and the nations of Central America and the Caribbean have their own special circumstances regarding land management. This discussion should be helpful to scientists and activists in those countries, however, even though the details will differ.

LARGE ROADLESS AREA COMPLEXES IN THE WEST

In the Western United States, there are presently 38 areas where minor road closures would create core roadless areas or roadless complexes of more than a million acres:

- North Cascades - Washington (3 million acres)
- Olympic Mountains - Washington (1.2 million acres)
- Kalmiopsis/Siskiyous/Trinity Alps - Oregon, California (2 million acres)
- Hells Canyon/Eagle Cap - Oregon, Idaho (1.5 million acres)
- Selway-Bitterroot/River of No Return - Idaho, Montana (5.5 million acres)
- Great Rift - Idaho (1 million acres)
- Owyhee - Idaho, Oregon, Nevada (8 million acres)
- Oregon Desert - Oregon/Nevada (3 million acres)
- Bob Marshall - Montana (3 million acres)
- Beartooth - Montana, Wyoming (1.5 million acres)
- North Absaroka - Wyoming (1 million acres)
- Upper Yellowstone/South Absaroka - Wyoming (2.5 million acres)
- Tetons/SW Yellowstone - Wyoming, Idaho (1 million acres)
- Wind Rivers - Wyoming (1.2 million acres)
- Red Desert - Wyoming (1 million acres)
- Maroon Bells - Colorado (1 million acres)
- San Juan Mountains - Colorado (2 million acres)
- Desolation Canyon - Utah (2.2 million acres)
- High Uintas - Utah (1 million acres)
- Canyonlands - Utah (3 million acres)
- San Rafael/Wayne Wonderland - Utah (1 million acres)
- Escalante/Kaiparowits/Henry Mts - Utah (3 million acres)
- Desert Game Range - Nevada (1.5 million acres)
- Black Rock Desert - Nevada (2.5 million acres)
- Smoke Creek Desert - Nevada/California (1 million acres)
- High Sierra - California (3 million acres)
- Yosemite North - California (1 million acres)
- Los Padres - California (1.5 million acres)
- Death Valley/Inyo- California (2 million acres)
- Panamint Mountains (Death Valley West) - California (1.5 million acres)
- Mohave Desert - California (1 million acres)
- Bill Williams River - Arizona (1 million acres)
- Kofa - Arizona (1.5 million acres)
- Cabeza Prieta - Arizona (2 million acres)
- Galiuro/Pinaleno - Arizona (1 million acres)
- Grand Canyon/Kaibab - Arizona (3 million acres)
- Gila/Black Range - New Mexico (1.5 million acres)
- Guadalupe Escarpment - New Mexico/Texas (1 million acres)

WILDERNESS RECOVERY AREA COMPLEXES EAST OF ROCKIES

In the United States east of the Rockies, we will need to restore large ecological wilderness preserves:

- A ten to twenty million acre Great Plains National Park with free-roaming Bison, Elk, Pronghorn, Grizzly, and Gray Wolf—perhaps in four linked units: Nebraska Sandhills, South Dakota's Badlands National Park and Buffalo Gap National Grasslands, North Dakota's Theodore Roosevelt National Park and Little Missouri National Grasslands, and Montana's Charles Russell National Wildlife Refuge and Missouri Wild & Scenic River;
- A ten million acre North Woods International Preserve around the Boundary Waters Wilderness in Minnesota and Quetico Provincial Park in Ontario, and Red Lake Peatlands in north-central Minnesota;
- A large deciduous forest Wilderness Recovery Area in the Ohio Valley with Elk, Bison, Gray Wolf, and Eastern Panther;
- A ten million acre National Park in northern Maine with Gray Wolf, Lynx, Wolverine, and Woodland Caribou;
- A 1.5 million acre Bob Marshall Greater Wilderness in the Adirondacks of New York with Gray Wolf and Eastern Panther;
- A four million acre Wilderness Recovery Area in the Southern Appalachians centered around Great Smoky Mountains National Park with Eastern Panther and Elk;
- A five million acre Everglades-Big Cypress National Park in Florida.

Editor's Introduction to the Wildland Proposals

You hold in your hands, I sincerely believe, some of the most unfinished documents in conservation history; indeed, some of the most unfinished documents in the last five hundred years.

Although each of the wildland proposals presented in this issue is the result of countless hours of research and discussion, each is incomplete, a work in progress—in two senses: First, the delineation of proposed wild cores, buffers, corridors, and ultimately matrices will undergo many moons more of refinement and expansion. Second, any implementation of these plans will entail decades—nay, centuries—of work (that's right: jobs!).

In no way is this meant to diminish the importance of these proposals. Rather, it is to stress that recovery of wild lands and waters on a comprehensive scale is a new effort, and must continue indefinitely. As Dave Foreman said earlier beside his Campfire, we are embarking in a new direction, or perhaps an old direction in new and dire circumstances.

Essentially, what we present here by way of proposals are two draft recovery plans (for the Adirondacks and Southern Appalachians), two descriptions of how recovery plans are being promoted to politicians and the public (for the Northern Rockies and Central America), and an explanation of a recovery effort already under way abroad (for Scotland) which North American restorationists would do well to emulate. Future issues of *Wild Earth* will offer refinements of these works and Wildland Project proposals for other regions.

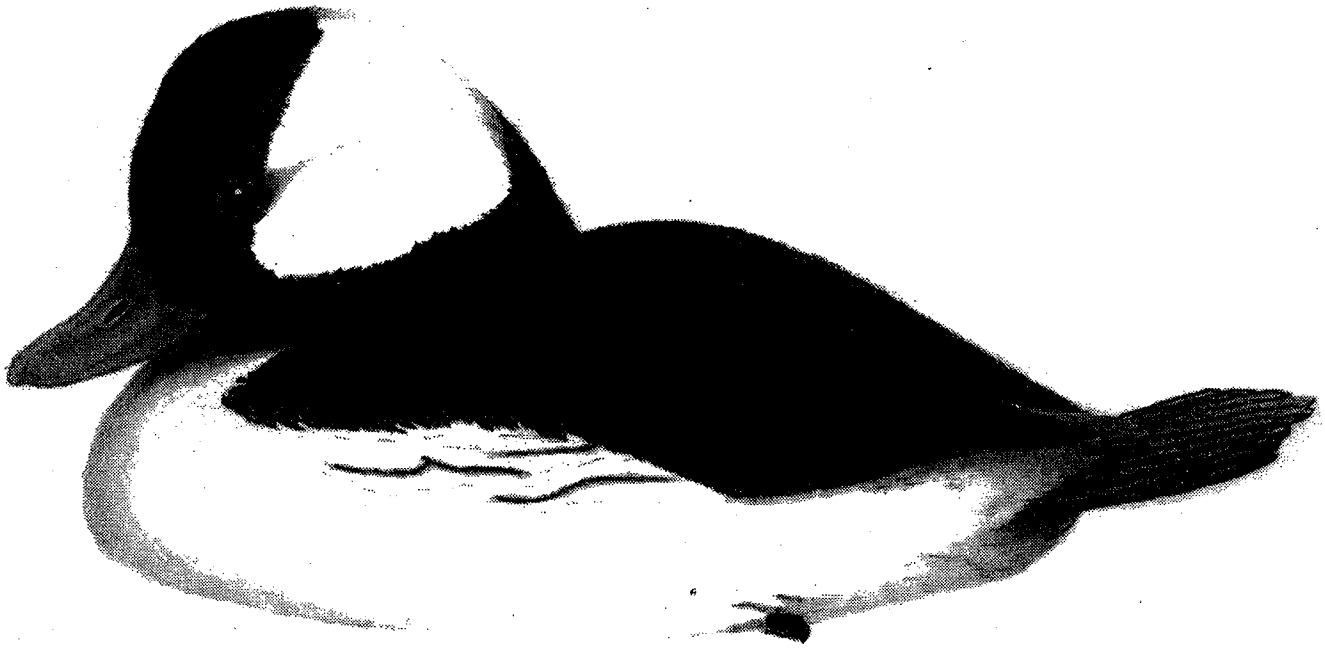
I wish to comment here in particular on one of the proposals, as it implicitly calls attention to many of the difficulties that wildland advocates will face in coming years. In his article, "A Proposal for an Adirondack Primeval," Paul Medeiros broaches subjects conservationists must face squarely in the future if the health of this continent is to be restored—concerns such as private property, local versus state or federal control, and appropriate human roles in natural areas.

Paul's proposal is not intended to, but will undoubtedly, incur the wrath of some of the human residents of Adirondack Park. It is presented by an "outsider," a person who hikes the Park but does not live there—and who would not live there, for ethical reasons. In a future issue of *Wild Earth*, we will present an "insider's" view—a response by Park resident and conservationist Bill McKibben. Paul offers a perspective of a person who lives in New York but not in the North Country. Bill will offer a perspective of a person who actually resides within the Blue Line.

This airing of controversial views is deliberate. Wildland proponents will repeatedly face many of the questions arising here: Should we try to integrate *Homo sapiens* into wild landscapes or exclude them, or both, depending on the place? Should we advocate radical long-term protection measures at the risk of losing short-term efforts by alienating potential supporters? How radical—and biologically honest—dare we be, given that many people will choose their own economic well-being over the survival of other species? Should we favor "local control" of resources, in the spirit of bioregionalism, or lean toward state or federal control, in the spirit of the Wilderness Act of 1964? (International control and more private reserves under the control of NGOs such as The Nature Conservancy are other options to consider.)

Of course, these questions are only raised here, not answered. This first Adirondack proposal tends toward exclusion of humans, radical long-term measures despite the political risks, and state rather than local control. Bill McKibben's response, I believe, will take an almost opposite tack.

As *Wild Earth* editor, as a North Country resident (about 15 miles northwest of the Park), and as a perennial moderate, I feel I may justly interject a third view. Basically, Paul says here *gradually remove humans*. Bill, I think, will say *integrate humans*. I say *ban motors*; i.e., remove the *industrial* human presence. I believe a good way to save the Adirondacks is to simply declare the Park a Motor-Free Zone. More fully, close the roads; ban motors, firearms, and livestock. This would, before long, ensure adequate habitat for all native species. Human residents need not be asked to relocate, but all people should be required to respect the wildlife of the Adirondacks by refraining from any use of



Bufflehead Drake (Bucéphala albéola) *by Douglas Moore*

motors, guns, or cows. The problem here is not so much people as it is their damnable technologies. Far from diminishing the economy, declaring the Park a Motor-Free Zone could create thousands of jobs: closing roads, dismantling dams, removing exotic species, packing in food and supplies for the remaining residents, monitoring water quality, reintroducing extirpated species, guiding birdwatchers, and such.

This brings to mind a tool that could advance wildland proposals in general: the United Nations Man and the Biosphere Program. As Tony Povilitis explained in an earlier issue of *Wild Earth*, Biosphere Reserves represent a little-appreciated but potentially potent means of protecting relatively intact bioregions. Already, some of the areas discussed in this issue are parts of designated Biosphere Reserves. Adirondack Park comprises most of the Champlain-Adirondack Biosphere Reserve. The Southern Appalachians and Northern Rockies have Biosphere Reserves. For part of the Southern Rockies, a San Juan Biosphere Reserve has been proposed. Paseo Pantera includes several proposed or existing Biosphere Reserves. So far, Biosphere Reserves offer international status but no legal protection. Wildland advocates need to work to gain on-the-ground protection for on-paper Reserves.

One last introductory observation: the issue of local versus state or provincial versus federal management is problematic. Local control of local resources seems eminently sensible and probably is a worthy goal, but let us remember that if local and state politicians had their way, the US National Wilderness Preservation System would be even more scant than it now is. "Local control" in the context of a world economy dominated by profiteering corporations and driven by overconsumption often translates into destruction. In Canada, protection of provincial parks is often weaker than protection of federal parks. Sadly, until people on this overdeveloped continent adopt ecologically benign ways, local control will often mean locally-sanctioned abuse of local resources.

Wildland advocates, then, face some tough issues. So let the dialogue begin!

—John Davis

A Proposal For An Adirondack Primeval

by Paul Medeiros

What has become of these vast contiguous shades, these shoreless seas of emerald bloom, this incalculable wealth of vegetable life? I ask, and am not obliged to wait long for an answer.

—Nathaniel W. Coffin (1864)

A recent conference commemorating the centennial anniversary of the creation of Adirondack Park brought together the conflicting visions of a land beleaguered by development and land speculation. Yet, as the conference indicated, people who have invested their hearts, wallets or lives in the uncertain future of 9375 square miles of upstate New York are quick to agree on one point: the Adirondacks are *unique*. The Constitutional amendment mandating that the Adirondack State Park be kept "forever wild," the culture of a Park population who proudly embrace their Adirondack heritage, and the checkerboard of private and State lands have created an unusual and frequently volatile mixture of public, private and environmental concerns. And a checkerboard it is; where players engage in the calculating game of give and take and where pawns fall victim to the whims of greater powers.

The Adirondack Park is *unique* in that the game has hung in stalemate for a hundred years. Neither truly wild nor truly civilized, the Adirondacks stand as a relic of another age in America's history and a living monument to a handful of individuals with a love of the wild and a grasp of forever. Yet this *uniqueness* is not something to cherish, but something to despair. The Adirondacks have been given time to return from the wasteland that Nathaniel Coffin mourns in his *The Forest Arcadia of Northern New York*, but a permanent human presence has steadily increased over the years. In the passing of a century, the Park population rose from 6167* to 135,000 year-round residents in more than a hundred Adirondack villages. The economic needs of these individuals and the environmental impact of an additional 210,000 seasonal residents, of 10 million annual visitors, of commercial timber and mining industries, and of an extensive park-wide road network are incompatible with the existence of a true Adirondack wilderness. As these interests and efforts at Park restoration become increasingly polarized, it is clear that the *uniqueness* of the Adirondacks will inevitably collapse on itself.

The six million acres found within the Blue Line, an imaginary boundary separating Park from civilization, could contain the combined areas of Yosemite, Yellowstone, Olympic and Grand Canyon National Parks. This vast island of incalculable wealth and emerald bloom, habitat for an astounding diversity of communities (Davis, 1988a), provides refuge for 90% of all the plant and animal species found in the Northeast. Here lie 2800 lakes and ponds of glacial melt and beaver craft. Here rise 2000 mountain peaks from the ancient Precambrian rock. Here run 1500 miles of river and 30,000 miles of stream. Yet only 42% of this land, 2,600,000 fragmented acres, is owned and protected by the State of New York as Adirondack Forest Preserve. And less than half of this has been classified as Wilderness, with stringent restrictions on human activities. The remaining parkland is subject to varying degrees of permanent human disturbance, ranging from snowmobiles to interstate highways and the largest garnet mine on Earth. Unfortunately, even the status of Wilderness conveys a false sense of protection as millions flock to these regions annually with the promise of 100 mile views.

Within a half day's drive of Montreal, Boston, Buffalo, Manhattan and Albany, the Park offers 70 million people ample opportunity to enjoy the magnificent mountain vistas and ski resorts within the Blue Line. The majority of the summer tourists seek the largest wilderness region, known as the High Peaks, which have the highest elevations in New York. It is not uncommon to find dozens of hikers on Mount Marcy, the highest point at 5344 feet, on a summer day. Whiteface Mountain, just below 5000 feet some miles to the northwest, provides less ambitious tourists with a conveniently paved road to the summit.

* Figure obtained from the 1891 Special Report of the New York Forest Commission.

"Civilization . . . has no business among these mountains, these rivers and lakes, these gigantic boulders, these tangled valleys and dark mountain gorges. . . . I would consecrate [them] to the Vagabond Spirit, and make them a place wherein a man could turn savage and rest, for a fort-night or a month, from the toils and cares of life."

— Journalist and outdoorsman Samuel H. Hammond in a plea for the Adirondacks in 1857.

In a tradition as old as the Park itself, wealthier visitors continue to build second homes within the Blue Line. Over the last 20 years, there has been a 43% increase in construction with the addition of 22,000 single family homes. Given recent surges in applications for subdivisions, the Park can expect up to 1000 new houses each year—a development rate three times faster than the state average. A 1990 study commissioned by Governor Mario Cuomo (Berle et al., 1990) voices a strong warning concerning development in the Adirondacks. The study estimates that over 400,000 additional houses can still be built under the existing legislation. Now that major landowners, largely timber companies, have begun selling portions of their holdings, many feel (Ibid, 1990; also Davis, 1988) that New York State faces the last chance for a true Adirondack wilderness.

THE MAKING OF A PARK

Before the European invasion of the continent, human populations didn't establish permanent dwellings in the Adirondack wilderness. What we know as the Adirondacks was known to the Iroquois as Hodenosauneega, "Land of the People of the Longhouse," or alternately, Couchsachraga, "Beaver Hunting Ground." Both the feuding Algonquins of the northern St. Lawrence Valley and the Iroquois of central New York occasionally ventured into the rugged mountains as hunters or as war refugees. When the first European to visit the region, Samuel de Champlain, observed the distant High Peaks in 1609, the seven-nation Iroquois confederacy had divided the hunting rights to the Adirondacks between the Mohawk and Oneida tribes. Yet, during the next 150 years of Dutch, French and British conquest, all native tribes would use the mountains as a refuge from the warring European armies (Vanvalkenburgh, 1979). As early as 1650, however, even the impenetrable Adirondacks began to feel the effects of the European invasion; trappers and traders began to note the scarcity of beaver. Not fifty years earlier, this "area had been the richest beaver territory on the continent" (Keller, 1980:19). It must be noted that in this instance of mass genocide, human greed spanned culture lines to include both Native Americans and Europeans. The tribes willingly fed the Europeans' insatiable appetite for beaver pelts in exchange for trinkets and weaponry.

Unlike the early Dutch settlers, the British government, which took command of the New York conquest in 1664, had no qualms about negotiating the tribes out of their lands and gifting colonists loyal to the motherland with vast parcels of northern forests (Kammen, 1975; Vanvalkenburgh, 1979). In 1759, the British government began overseeing all transactions with natives to ensure a profit to the Crown. It was toward this end that the first Adirondack land came into official European ownership. In 1771, the British negotiated a treaty with the Mohawk and Caughnawauga for the sale of 800,000 acres (later surveyed at 1,115,000 acres) to two colonial land speculators. This tract of Adirondack wilderness was purchased for a paltry $6000 and promptly resold for $40,000 at1921 currency (Donaldson,1977). Ostensibly, this transaction suggests that the Europeans were quite deft at outwitting their native counterparts on land deals. Similar stories abound concerning the purchase of Manhattan and other early colonial holdings. The explanation for these occurrences is that the tribes had no intention of relinquishing permanent claim to their ancestral territories. "In the Indians' cosmology, land could not really be bought or sold...Transactions that the [Europeans] considered final were regarded by the [tribes] as partial payment for temporary use" (Kammen, 1975:18).

The revolution of 1776 effectively nullified land treaties established between the British and the native tribes. Yet all land owned under treaty by England and by colonists loyal to the Crown, including 7 million acres of Adirondack wilderness, became the property of the union of independent states. The New York State government proceeded to sell off the huge tracts of land to speculators as fast as possible. The Adirondack region was mapped for the first time in 1837. It was also at this time that the name Adirondack (a corruption of *Ratirontack* or "those who eat bark," a derogatory Iroquoian allusion to their northern Algonquin neighbors) was given to the mountainous region that had repulsed the surveyors and settlers for so long. And with the map surveyors came the death of a wilderness.

The timber industry rapidly cut the Adirondack forests, making New York one of the nation's leading producers in lumber, tanneries

and wood pulp. In 1850, loggers were cutting at an annual rate of 1.6 billion board feet. Three decades later, in prompt fulfillment of Coffin's prophesy, more than two-thirds of the Adirondacks had been reduced to a biological wasteland (Wuerthner, 1988). Fortunately, through the inexhaustible efforts of a man named Verplanck Colvin, the wholesale destruction of the wilderness came to abrupt halt in 1885. The New York legislature acted on Colvin's call for a New York State Forest Preserve to protect the remaining 681,000 acres of Adirondack and Catskill wilderness in public ownership. In 1892, a statute setting aside these lands as "forever wild" led to the creation of Adirondack Park, then 2.8 million acres of public and private land. Two years later, the "forever wild" statute was enshrined in the New York State Constitution, making an offense against the Adirondack Park an offense against the people of New York (Schaefer, 1989).

The lands of the state, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall forever be kept as wild forest lands. They shall not be leased, sold, or exchanged, or taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed.

-Section 7, Article VII, NYS Constitution

In the last one hundred years, the Adirondacks have faced countless threats in acid rain, dams, highways, devastating fires caused by trains, absolving Constitutional amendments, mines and other amenities proffered by industrial civilization. Many efforts have succeeded in wounding the integrity of the wilderness, but many efforts have failed. Under the protection of such individuals as Bob Marshall and Paul Schaefer, the Forest Preserve has grown to encompass an area as big as most New England states and an emerald bloom once more graces the rolling peaks. Yet the scream of the puma and the bark of the harbor seal remain absent. The wolverine no longer brings down a doe struggling in the deep winter snow. A true Adirondack Primeval still sleeps, waiting to be released from the roads and dams that now shackle it.

THE ADIRONDACK WILDERNESS

The expanse covered by the Adirondack Park includes three biologically distinct regions and the watersheds for five major waterways in the northeast (Lake Champlain, the Hudson River, Black River, St. Lawrence River and Mohawk River). The regions fall into the common biome classification of temperate deciduous forests, boreal forest, and taiga (Davis, 1988a). These regional distinctions are due to variations in elevation, local topography, and microclimate. Temperate forest is the predominant biome found throughout the Adirondack Park. Taiga and boreal (northern coniferous) forest, normally found at much higher latitudes, are limited to comparatively small "islands." Although the biome level of classification is an oversimplification of the natural world, problems with existing land ownership patterns already become apparent viewing the Park through a biome lens. The taiga biome, commonly referred to as "the rocks and ice," is almost completely protected as the High Peaks Wilderness in the north-central part of the Park. Public ownership of the 100,000 acres of taiga biome is 95%. The 350,000 acres of boreal forest biome, consisting of equally rare and unusual communities, occupies much of the northwestern portion of the Park. Most of this wet, swampy region is privately owned. The boreal forest actually protected by the Forest Preserve is highly fragmented and classified as Wild Forest (Davis, 1988a). Considering the uniqueness of

FIGURE 1: NEW YORK STATE ADIRONDACK LAND USE MANAGEMENT PLAN CLASSIFICATIONS (1972)

Wilderness: Permanent human structures and motorized vehicles are not allowed (although old "lean-tos" may remain.) Land reserved for camping, hunting, cross-country skiing and hiking. 1,038,874 acres of State land in 16 Wilderness regions ranging in size from the 14,625 acre Pepperbox Wilderness to the 238,008 acre High Peaks Wilderness.

Primitive: Some permanent structures for camping (lean-tos) and other recreational uses are allowed. Motorized vehicles are prohibited. 54, 579 acres of State land in 24 distinct Primitive areas.

Canoe: Waters and their surrounding lands set aside for non-motorized use. Management of land classified as Canoe, one region of 18,606 acres of State land with 58 lakes, is essentially that of Wilderness with the exception that Park staff may use motor vehicles in daily activities (Davis, 1988b).

Wild Forest: This land is essentially set aside for human recreation and lacks the remoteness of Wilderness lands. Motorized vehicles are allowed and encouraged. This largest component of the Forest Preserve covers 1,355,000 acres in 34 small Wild Forests.

Intensive Use Areas: This consists of State land permanently devoted to public campgrounds, skiing facilities, and other intensive forms of public recreation. The State maintains two large ski areas directly adjoining Wilderness. Intensive use areas are scattered throughout the Park.

Resource Management: This private land classification is "open space" as farmland and timber company holdings. Up to15 buildings are permitted per square mile. Resource management land composes about 53% of all private property.*

Rural Use: Residential development is allowed on this private land with certain restrictions. No more than 75 buildings can be built within a square mile. Rural land composes about 34% of all private property.

Low-Intensity Use: Clustered residential construction is limited to 200 buildings per square mile. Low-intensity land composes about 8% of all private property.

Moderate-Intensity Use: Land under this classification surrounds Adirondack hamlets and is intended to absorb residential growth. Up to 500 buildings are permitted per square mile. Moderate-intensity land composes about 3% of all private property.

Hamlets: This is town land with year round habitation. There are no development restrictions established by the State, although hamlets may voluntarily impose local zoning laws. Hamlets compose about 1.5% of all private property.

Industrial: No restrictions on development for existing industry or industry that is deemed necessary or appropriate. Industrial land composes about .5% of all private property.

* These precentage figures are over a decade old (Lewis, 1976); yet the relative proportions have undoubtedly remained fairly constant over time.

cow moose (Alces alces) *with calf by Bob Ellis*

the boreal biome and its constituent communities, and the world-wide assaults on the remaining northern boreal forests, this protection is profoundly inadequate (see *Fig. 1, Land Use Management Plan Classifications.)*

As nature tends to complicate attempts at scientific classification, other, more complex forms of classification based on vegetation cover have been developed for New York State by Carol Reschke of the New York State Natural Heritage Program (NYNHP.) Under the Heritage Program's classification system, there are 98 natural communities (including both terrestrial and wetland ecosystems) found within the borders of New York State, 57 of which have representation within the Adirondack Park. Some communities are specific to one of the three biomes while others represent variations between biome regions or the effects of local climate and topography. Nineteen of these Adirondack communities are considered rare in New York. Five are globally rare. The majority of these unusual ecosystems exist within the boreal biome (Davis, 1988a).

George Davis (1988a) of the Adirondack Council has simplified this complex system by consolidating the NYNHP classification into nine dominant vegetation cover-types for the Adirondack Park. *Figure 2* summarizes these communities and current ownership patterns. Given the complexities of Adirondack land ownership, these data provide excellent insight into which ecosystems are underrepresented in the Forest Preserve. Pine and Oak-Pine Vegetation Cover-Types, for example, are generally found on the eastern slopes of the Park which are mainly owned by private interests.

The biological diversity and inadequate protection of the Adirondack wilderness can also be viewed at the species level. Within the Blue Line are found 193 species of nesting birds, 86 fish, 54 mammals, 35 reptiles and amphibians, 422 species of moss and hundreds of vascular plant species. Kudish (1992) has recorded 563 vascular plant species at the northern "upland" elevations of the Park. As a testament to the challenges faced by American wilderness restoration advocates, one-fifth of these plants are introduced species.

Many of the indigenous non-human populations have been extirpated from the Park or face extirpation in the near future in the name of human interests. An unusual member of this death toll is Lake Champlain's harbor seal (*Phoca vitulina*). Originally colonizing the shores of Lake Champlain by means of the St. Lawrence waterway, the seal populations were butchered into extirpation by the late 1800s (Chapman and April, 1991). The unexpected historical presence of the harbor seal poses an important question: How many intricacies of nature have been eternally damned to the records of butchers and bounty hunters? We must not forget our science and policies are based on models of a wounded world. The other major mammalian predators and herbivores were also quickly eliminated with the loss and fragmentation of habitat and human access provided by 19th century logging operations.

Loss of habitat, however, is not a phenomenon limited to the 1800s. Within the last decade, acid rain has claimed the lives of at least 270 of the 2800 lakes scattered throughout the Adirondacks (Berle et al., 1990). The growing density of permanent human habitations around lakes and rivers also threatens Adirondack waters with contamination and

Figure 2: Adirondack Communities (Davis, 1988a)

Vegetation Cover-Type	Total Park Acreage & Public Ownership (%)	Exemplary Vegetation
Northern hardwoods	2,665,000 at 43% ownership	sugar maple (*Acer saccharum*) American beech (*Fagus grandifolia*) yellow birch (*Betula alleghaniensis*) white ash (*Fraxinus americana*) black cherry (*Prunus serotina*)
Mixed woods	1,340,000 at 47%	red spruce (*Picea rubens*) balsam fir (*Abies balsamea*) red maple (*Acer rubrum*) yellow birch (*Betula alleghaniensis*)
Pine	700,000 at 36%	white pine (*Pinus strobus*) red pine (*Pinus resinosa*) pitch pine (*Pinus rigida*) jack pine (*Pinus banksiana*)
Oak-Pine	340,000 at 15%	red oak (*Quercus rubra*) white pine (*Pinus strobus*) red pine (*Pinus resinosa*) white oak (*Quercus alba*) American beech (*Fagus grandifolia*)
Coniferous swamps bogs, and fens	318,000 at 47%	tamarack (*Larix laricina*) black spruce (*Picea mariana*) pitcher plant (*Sarracenia purpurea*) common spatterdock (*Nuphar advena*) labrador tea (*Ledum groenlandicum*)
Hardwood swamps	106,000 at 31%	red maple (*Acer rubrum*) silver maple (*Acer saccharinum*) American elm (*Ulmus americana*) black ash (*Fraxinus nigra*)
Upper spruce slopes	88,000 at 94%	red spruce (*Picea rubens*) balsam fir (*Abies balsamea*) mountain ash (*Sorbus americana*) paper birch (*Betula cordifolia*)
Open marshes	8000 at 25%	sedges (*Carex* spp.) cattail (*Typha latifolia*) pickerelweed (*Pontederia cordata*)
Alpine tundra	85 at 100%	black crowberry (*Empetrum nigrum*) arctic rush (*Juncus trifidus*) mountain bride (*Diapensia lapponica*)

eutrophication from sewage and motorized vehicle wastes. Heavy tourism is a further impact on the land. The high level of seasonal traffic going in and out of the Park supports the existence of highways that separate otherwise contiguous wilderness regions. Hikers climbing to enjoy the 85 acres of alpine tundra on the Park's highest peaks are beginning to take a toll on these intricate ecosystems. Rare plant species, such as Boott's rattlesnake root (*Prenanthes boottii*), of which 5000 individual plants exist in the world, "are rapidly falling victim to the boots of aberrant hikers" (Anon., 1991). As is the case with most remaining wild lands, Adirondack Park is under seige by both those who seek to destroy and those who seek to enjoy the wild.

TOWARD AN ADIRONDACK WILDERNESS

Many environmental organizations have been created for the purpose of protecting and restoring the Adirondack Park. Some follow in the tradition of the national mainstream organizations while others are based on a grassroots philosophy. The Association for the Protection of the Adirondacks, the Adirondack Council, the Adirondack Land Trust, Preserve Appalachian Wilderness, and the Residents Committee to Protect the Adirondacks are a sampling of the organizations that oppose development of the Park's wildlands.

The Adirondack Nature Conservancy and Land Trust (ANC/ALT) have worked vigilantly for twenty years to protect 204,000 acres of Adirondack forests in 90 separate land transactions. This represents 3.2% of the land protected by The Nature Conservancy in the United States and Canada (Barnett, 1991). The New York State Natural Heritage Program, which is based just outside of the Blue Line and cooperates with ANC, is fronting the effort to document rare species and communities within the Park.

Three Adirondack Park proposals have been drafted within the last five years to further the restoration of the Adirondack wilderness. In 1989, New York Governor Mario Cuomo commissioned a group of state government administrators, town planners, environmentalists, representatives of industry and other interests to address threats to the Park. Entitled *The Adirondack Park in the 21st Century*, the report was heralded by Greater Adirondack Bioregion Earth First! as "the most visionary forest preservation proposal to come out of a government sponsored study" (Kahn, 1990). The commission recommended the creation of a 73,000 acre Boreal Wilderness which would cover most of what remains private land in the northwestern boreal forest biome. An acquisition of an additional 580,000 acres was recommended to link the isolated wilderness regions in the western portion of the Park to allow for the reintroduction of predators (Berle et al., 1990). However, much lip service was paid to the declining Park timber industries and to the growth of stagnating hamlet economies. Even so, upon the release of the *21st Century* report the Park became a veritable tinderbox for hostile dissent. Governor Cuomo, his commission, and Park administrative officials were the target of angry and occasionally violent attacks in the name of private property rights. The Governor quickly distanced himself from the commission's unpopular recommendations.

Two proposals by northeastern environmental organizations coincided with *21st Century*: Preserve Appalachian Wilderness's *Preliminary Wilderness Proposal* (Bennett et al., 1990) and the Adirondack Council's three volume *2020 Vision* (Davis, 1988a; 1990b; McMartin, 1990c). Both reports are focused on preserving and restoring biodiversity in the Adirondacks. The *2020 Vision* is a comprehensive summary of lands that must be acquired or upgraded to represent unique and threatened communities within the Forest Preserve. All *2020* wilderness recommendations aimed at protecting and restoring biodiversity have been adopted by this Wildlands proposal for the Adirondack Park. The Council's proposed 400,000 acre Bob Marshall Great Wilderness would consolidate isolated Wilderness Areas on the western slopes of the Park. Yet, the Adirondack Council stops far short of attempting to realize the true wilderness potential of the Adirondacks. In determining wilderness boundaries, "an effort was made not to include more land than necessary to protect and manage the resource" (Davis, 1990b:11). In comparison to the proposed 650,000 acre Wilderness additions of *2020*, the PAW proposal advocates the return of 4.5 million acres to full Wilderness. The following proposal will draw from all three proposals, but will attempt to expand on the recommendations of the PAW *Preliminary Wilderness Proposal* in light of principles of conservation biology.

A BIOCENTRIC PROPOSAL

An individual hiking through Resource Management land, through Wild Forest and into Wilderness in the Adirondack Park might be hard pressed to distinguish between the different land classifications. The vast bulk of the Park is forested, and most cleared lands in the moist East regenerate relatively quickly into forest. The only obvious way Wilderness differs from other lands within the Blue Line is its lack of roads, human habitations and the lower impact of human use. For this reason, the answer to a true Adirondack wilderness lies not so much in creating an inter-wilderness corridor system as it does in gradually lessening the permanent human impact in the Park.

The solutions proposed entail long-term efforts. All easy solutions to environmental problems are suspect. The New York Department of Environmental Conservation (DEC), the state agency that oversees management of the Forest Preserve, has a history of implementing quick-fixes to counter anthropogenic threats to the Adirondack environment. Pond "reclamation," the liming of acidified lakes, and sea lamprey control in Lake Champlain are all quick-fixes that may have produced immediate results, but the long-term effects of these methods have not been investigated in any depth (Daniels, 1992). Pond "reclamation" is the controversial practice of poisoning all fish life within a pond in order to eliminate introduced and unwanted species (see *Wild Earth* Vol. I No.3 p. 12). The long-term effects of the fish poison rotenone on Adirondack pond communities are unknown. It *is* known that many Adirondack lakes have had to be rotenoned several times over the last few decades. It is also known that the rotenoning of a pond often leads to a depauperate aquatic community governed by stochastic (random) events (Daniels, 1992). Similarly, the effects of liming on forest soils adjacent to acidified ponds are still being studied. At least until their full effects are known, these practices must be strictly controlled or halted completely.

In recognizing the need for long-term solutions, this proposal recommends broad measures to initiate the return of true Adirondack wilderness. Once these measures have begun to be implemented, it will be necessary to periodically assess the success of the restoration process and change policies accordingly. The Adirondack wilderness recovery strategy has two prongs: the creation of a 4.5 million acre Wilderness reserve with land buffers and corridors leading to other wildland areas, such as will be restored in Vermont; and the eventual reduction of the permanent human presence in most of the Park.

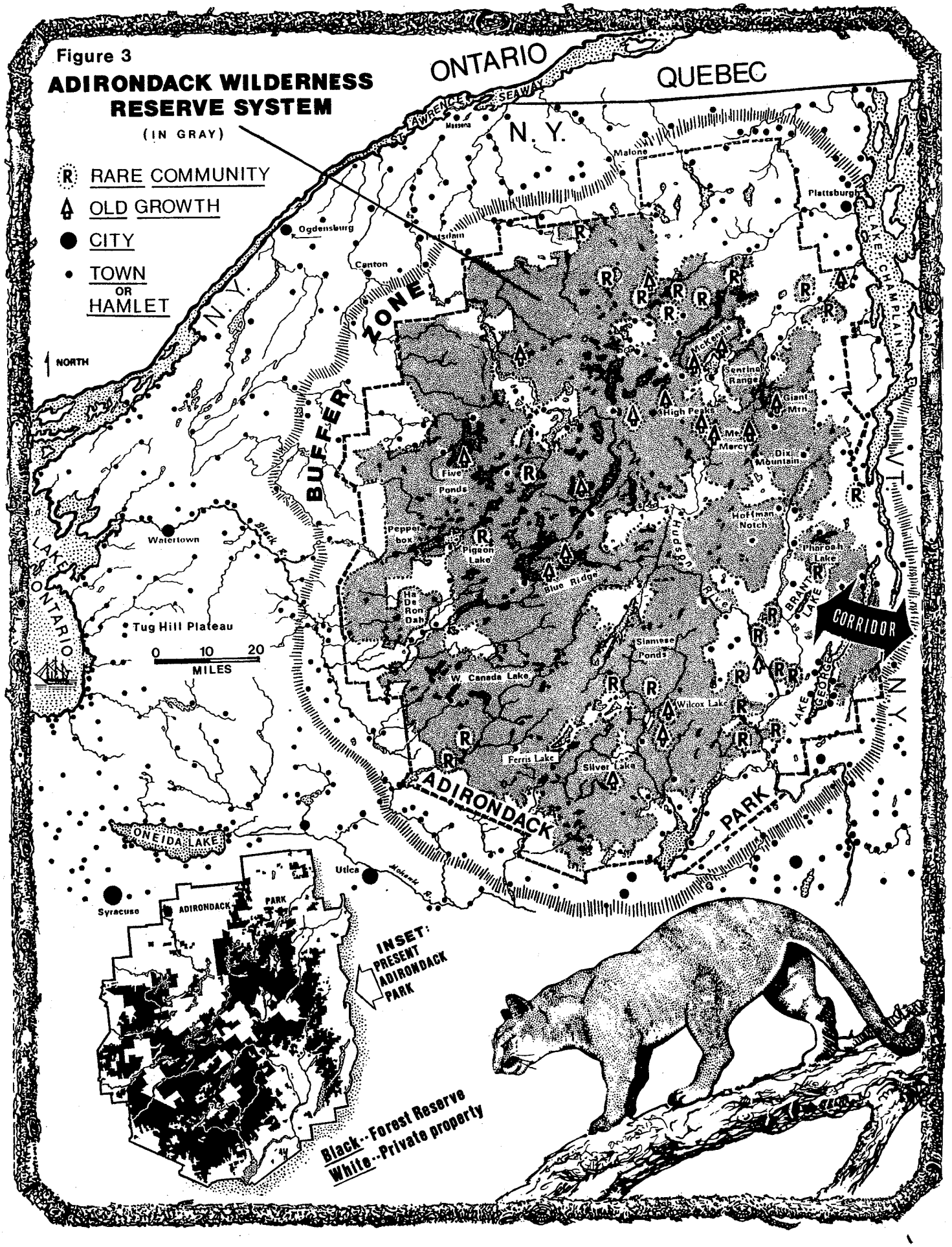


Figure 3
ADIRONDACK WILDERNESS RESERVE SYSTEM
(IN GRAY)
R RARE COMMUNITY
OLD GROWTH
CITY
TOWN OR HAMLET
NORTH
ONTARIO
QUEBEC
ST. LAWRENCE SEAWAY
N.Y.
VT.
BUFFER ZONE
ADIRONDACK PARK
LAKE CHAMPLAIN
LAKE ONTARIO
LAKE GEORGE
CORRIDOR
Massena
Malone
Plattsburgh
Ogdensburg
Canton
Potsdam
Watertown
Black R.
Tug Hill Plateau
0 10 20
MILES
McKenzie Mt.
Sentinel Range
High Peaks
Giant Mtn.
Mt. Mercy
Dix Mountain
Five Ponds
Pepperbox
Pigeon Lake
Blue Ridge
Hoffman Notch
Pharaoh Lake
Brant Lake
Hudson R.
Hi De Ron Dah
Siamese Ponds
W. Canada Lake
Wilcox Lake
Ferris Lake
Silver Lake
ONEIDA LAKE
Utica
Mohawk R.
Syracuse
ADIRONDACK PARK
INSET: PRESENT ADIRONDACK PARK
Black--Forest Reserve
White--Private property

CONSERVATION BIOLOGY AND THE ADIRONDACKS

The Adirondack wilderness reserve system is based on the guidelines established by conservation biologist Reed Noss in this issue's "Wildlands Project Conservation Strategy" article. The major goals of the system are the representation of all Adirondack communities with an emphasis on remnant old-growth stands and rare ecosystems, the maintenance of viable populations of all indigenous species, and the allowance of unrestrained ecological and evolutionary processes (including natural change through stochastic and deterministic events). The map of the Wilderness system (*Figure 3*) was formed with the following methodology:

1) Existing Wilderness, Canoe, and Primitive land classifications total 1,112,000 million acres and serve as the initial core wilderness areas. Canoe and Primitive lands must be given full Wilderness status immediately. This involves the permanent closing of roads and the dismantlement of *undegrading* human structures. The Wilderness additions to the Forest Preserve recommended by the *2020 Vision* and *21st Century* report are also included at this stage, putting the total core wilderness at 1,660,000 million acres.

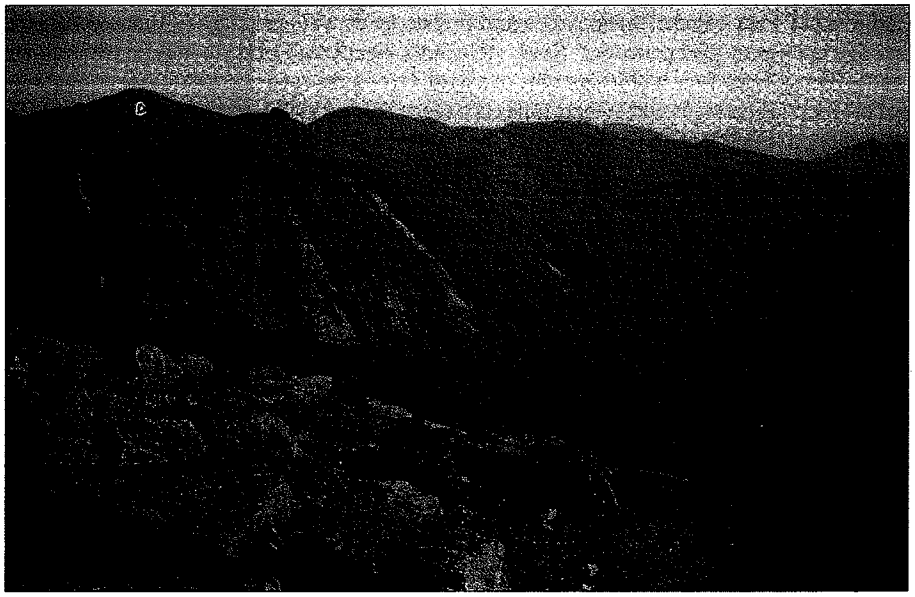
2) In order to support the existence of viable populations and natural processes, the core wilderness regions must be large and contiguous. In particular, core wilderness must be planned with wide-ranging carnivores, migratory herbivores, and gene flow between Adirondack communities in mind. The proposed upgrade of 1.2 million acres of existing Wild Forests (Wilcox, Fennis Lake, Shaker Mountain, Jessup, Black River, Independence River, Moose River Plains, Fulton Chain, Cranberry Lake, Tooley Pond, Saranac Lakes, Horseshoe Lake, Sargent Ponds, Blue Mountain, Vanderwhacker, Upper Hudson, Hammond, Trout Brook, Lake George, Brant Lake, Debar Mountain, Bloomingdale Bog and Vermontville Wild Forests) to Wilderness status would partially meet this goal. These regions are further complemented by the acquisition of 255,190 acres proposed by McMartin (1990c) and an additional 200,000 acres of other private lands. The total core Wilderness would now stand at 3.4 million acres.

3) Exemplary and rare communities described in the Adirondack Council's *2020 Vision* report, and old growth stands summarized in an upcoming *Wild Earth* Research Fund study, are given Wilderness status if they still remain outside of core wilderness regions. Currently, 21 old-growth sites have been identified throughout the Adirondacks; some stands are privately owned; some suffer from inadequate protection within the Forest Preserve. The total acreage for these sites is at least 125,000 acres. Previous old growth estimates range from 60,000 to 200,000 acres. Hopefully, future efforts will uncover more forests that survived the saw mills of the 19th century.

Total core Wilderness now stands at just over 3.7 million acres. Additional acquisitions of private land, primarily 500,000 acres of Resource Management land in the northwest boreal regions, would bring the total Wilderness to roughly 4.5 million acres.

4) Buffer zones are essential to the protection of core Wilderness from disruptive human activities. Buffer zones in the Adirondacks would function similarly to the existing Wild Forests and Resource Management Land in that human activities are limited. Yet, in this proposed Wilderness reserve system, mainly private lands, rather than public property, should be used to buffer Wilderness cores. In this way, public land can be devoted to Wilderness. Using the Adirondack Land Management Plan, land within the Blue Line should be redesignated in such a way that the intensity of human land use and presence diminishes as one nears core Wilderness regions. The 200,000 acres of highly isolated and fragmented Wild Forests could also be incorporated into buffer zones. State forests outside the Blue Line will provide the basis for future expansions of the Park.

5) As the proposed Adirondack Park Wilderness reserve system is generally contiguous, an internal corridor system to connect wild areas has been deemed unnecessary. However, inter-regional corridors connecting the Adirondacks to Vermont, southern New York and Canada are integral to the recovery of Northeastern wildlands. A corridor connecting the Park with Vermont's Green Mountains should pass east through the Lake George/Brant Lake area into Vermont.(See map.) This route is feasible as it would avoid the high human populations of the Lake Champlain Valley, Ticonderoga, and Glens Falls; and it has lower road densities than adjacent areas to the north and south.



George Wuerthner Photography

In the High Peaks region of the Adirondack State Park.

The potential for a southern corridor passing to the Catskills and the Finger Lakes regions is at present eliminated by the New York Thruway connecting Albany and Syracuse. Extensive measures will have to be taken before the species native to New York are able to freely migrate throughout their natural ranges. A northern corridor into Canada, however, has great possibilities. The recolonization of moose (*Alces alces*) into the Park has originated, in part, from Canada (Hicks and McGowan, 1992).

This suggests that there may already be natural corridors connecting the Park to other wild lands. The Adirondacks should be connected to Algonquin Provincial Park in Ontario and to reserves in Quebec.

The reintroduction of all extirpated species is an essential step in the wilderness restoration of Adirondack Park. The DEC has already begun the reintroduction process with the peregrine falcon (*Falco peregrinus*), the bald eagle (*Haliaeetus leucocephalus*) and the lynx (*Felis canadensis*) and has proposed to augment the recolonization of the moose (Hicks and McGowan, 1992; also Brocke et al., 1990). However, immediate reintroductions of large mammal populations of the mountain lion (*Felis concolor*), the timber wolf (*Canis lupus*), the wolverine (*Gulo gulo*) and the elk (*Cervus elaphus*) would be doomed to failure due to density of roads within the Park (Brocke, pers. comm.).

This warning is based on the failing attempt to reintroduce lynx to the Park (Brocke et al, 1991). Between 1988 and 1990, 50 Yukon lynx were released into the High Peaks region of which 370 square miles is mostly roadless Wilderness land. Individual male lynx were found to utilize about 700 square miles and females 150 square miles. Less than two years into the reintroduction, there were 11 recorded deaths of the introduced animals. Six were killed by cars, two were shot in attempted escapes from New York, and three, all younger cats, died of natural causes. These results lead Brocke et al. to conclude that "nowhere in the Adirondack Park can the...male lynx avoid private lands with development and forest road networks" (Ibid, 1991:308). Nearly half of the entire Forest Preserve is within one mile of a road. Over three-quarters of the Forest Preserve is within three miles of a road (Davis, 1990). With such a thorough human penetration of the Park's wildlands, the resulting mortality rate is too high to support a viable population of *F. canadensis*.

The reintroduction of the other large mammals would inevitably lead to more roadkill on America's Most Scenic Highways. The mountain lion can range up to 400 square miles (Bolgiano, 1991). As a solitary animal, the cat would encounter far too much human disturbance in the Adirondacks. A *F. concolor* study in the Southwest (Van Dyke et al., 1986) found that mountain lions will avoid an area of *temporary* human disturbance, in this case logging activity, for up to *six years* after the initial disturbance. On the opposite end of the spectrum of animal behavior, the brazen wolverine ranges 200 square miles (Ballard et al., 1986) and, as in colonial America, would find tempting forage in human habitations and household pets (Chapman and April, 1991). The Park's third absent predator, the timber wolf still roams less than 100 miles to the north in Canada. Although it has been suggested by the Adirondack Council that *C. lupus* could be reintroduced into the proposed 400,000 acre Bob Marshall Wilderness, the wolf population would also face a high mortality rate due to the permanent human presence in the Park.

Thus, the reintroduction of wide ranging mammals should await the formation of a Wilderness reserve system in Adirondack Park. However, many other species need our immediate attention. The bog turtle (*Clemmys muhlenbergi*) could be reintroduced. The Indiana bat (*Myotis sodalis*), an Endangered species, where present, should be protected at all costs.

Humans have been too quick with solutions to problems in the natural world for too long. The recovery of true wilderness will demand the patience and sacrifice of generations. Let us start with this one.

HUMAN MANAGEMENT IN THE ADIRONDACK PARK

The portrayal of human residents living within the Blue Line as a united front vehemently opposed to the protection of Adirondack wilderness is a falsehood. Some of the Park's older residents have for decades put up with ten feet of snowfall, the infamous swarms of summer insects, and a lack of many modern conveniences; they love the wild. For this reason and others, residency and land ownership within the Park should not be seen as a right, but as a privilege.

The 1400 members of the Residents' Committee to Protect the Adirondacks (RCPA) accept this point to a certain extent, but are also concerned about economic compensation and regulatory measures (RCPA., 1990a). A comprehensive study on the effects of the Adirondack Land Use Management Plan on the local economy, however, concluded that the economic impact of current Park regulations was negligible (Zinser, 1980). As of 1988, some 500 large landowners owned 2 million acres of Adirondack land. Half of that land is owned by the timber companies (Berle, et al., 1990), including such giants as Champion International.

Strong regulations and state compensation are key issues on the RCPA's agenda. Some Park residents less environmentally inclined than those of the RCPA insist that their Adirondack family heritage goes back several generations and that the state government has no right to impose environmental regulations on private landowners. Although these stances obviously represent different degrees of opposition to the realization of a true Adirondack wilderness, both rely on private property and individual rights arguments to support their claims.

I would argue that the Adirondacks represent an instance where traditional, antiquated English law has no standing. Existing land ownership in the Adirondacks is built on a legacy of lies, hate and greed. The true "residents" of the Adirondack mountains do not measure their heritage in generations, but in millennia. The true "residents" of the Adirondacks were driven out of the land by treaty or rifle, whichever the European felt would suit his ends. Can we safely allow ourselves to forget this history? Is the knife clean that has been wiped of blood? What of the blood-soaked cloth, the Akwesasnee Reservation, lying not far north of the Blue Line; an island of people stripped of their ancestry, their pride and their hope. The talk of the proud Adirondacker and economic compensation rings hollow as gunfire even now erupts across native land. The death is passed from Mohawk to Mohawk, but the trigger was pulled hundreds of years ago.

Economic compensation and development are not the answers to any of our society's accumulating injustices and failures. The problem lies in the society itself. Only a biocentric philosophy, one that shares its less trodden paths with the wisdom of the Native American, will heal the wounds of five hundred years. A return to a pre-invasion Adirondack Wilderness is what this generation should envision and begin to manifest.

I propose that the Adirondack Park Agency, which oversees the administration of the Land Use Management Plan, develop a plan for gradually reducing the impact of humans living within the Blue Line.

All new construction of seasonal homes must be halted immediately with new, stricter regulations on existing private property. In keeping with the British tradition, the State should have an opportunity to buy lands before all other bidders. Residents who suffer from the stag-

wolverine (Gulo gulo) *by Brush Wolf*

nant economy of the Park should receive government support to relocate to areas outside of the Park where employment opportunities are significantly greater. Other year-round residents should be employed by the State to implement the measures necessary for a true Adirondack wilderness. Further employment might be provided in forestry craft and other ecologically sustainable pursuits.

Camping fees, fire permits, and an extensive park-wide toll system for tourists would generate revenue for the continued acquisition of land. An additional ten dollars in fees, however, would not stop the 10 million middle to upper class visitors from coming to the Park each year. Thus, in order to facilitate the closing of many Adirondack roads, a public transportation system would meet the demands of seasonal traffic. A bus line would also provide local employment and state revenue. Such measures should go hand-in-hand with efforts to increase "lower" class access to the Wilderness. Programs in the tradition of the C.C.C. would further the restoration of the wilderness and allow the non-wealthy to experience the real world.

Eventually motor vehicle bans will have to be instituted throughout the Park. Road closings will begin within Primitive and Wild Forests. Closings should gradually spread to private areas as humans seek habitation outside of the Park. The small state highways leading between hamlets should be maintained in the short-term as human travel corridors. Low speed limits and the aforementioned visitor tolls should minimize the use of these human corridors. Airplane traffic over the Adirondacks is a direct affront to its wild character and a bane to the low impact wilderness public. Recreational and military sorties over the Blue Line should be banned immediately.

In implementing these measures, of course, one is dancing over interesting legal territory. Yet the constitutional mandate provides a unique legal basis for a strong government role in the future of the Park. Furthermore, as the Park has been in existence for 100 years, any individuals moving into the Adirondacks this century knowingly entered a land of comparatively strict regulations. The surges of seasonal residents over the last three decades, in particular, willingly "came to the nuisance," to use a legal term. They knew regulations would be strict and they should expect a government following a "forever wild" constitutional mandate to gradually increase regulations.

We must ask ourselves: What are the Adirondacks for? Are they a playground for the New York elite and their outboard motors? Are they a home for a special rustic breed with jeeps and rifles? We have paved over much of the continent. We have built monstrosities such as New York City. And we have imprisoned millions of acres under the tractor and plow. Must we allow the Adirondacks to turn into more ski resorts and charming back country villas? The Adirondack Wilderness reserve system is only a small step in a direction that we have avoided for hundreds of years; a return to our rightful place in the wild world. The Adirondacks represent one of many bioregions not meant to be permanently inhabited by the species *Homo sapiens*.

The Adirondacks do not belong to modern humanity, nor modern humanity to the Adirondacks. We are not worthy to walk among the ghosts of towering pines and hemlocks. We are not ready to share our foot paths with the cougar and the wolf. Only when humanity can learn to give what it has taken from the Adirondacks, will we find our place in those mountains. And in those days, the maps will read

> This country by reason of mountains,
> swamps, and drowned lands is
> *impassable and uninhabited.*
>
> —1775 Map of Northern New York (quoted Schaefer, 1989)

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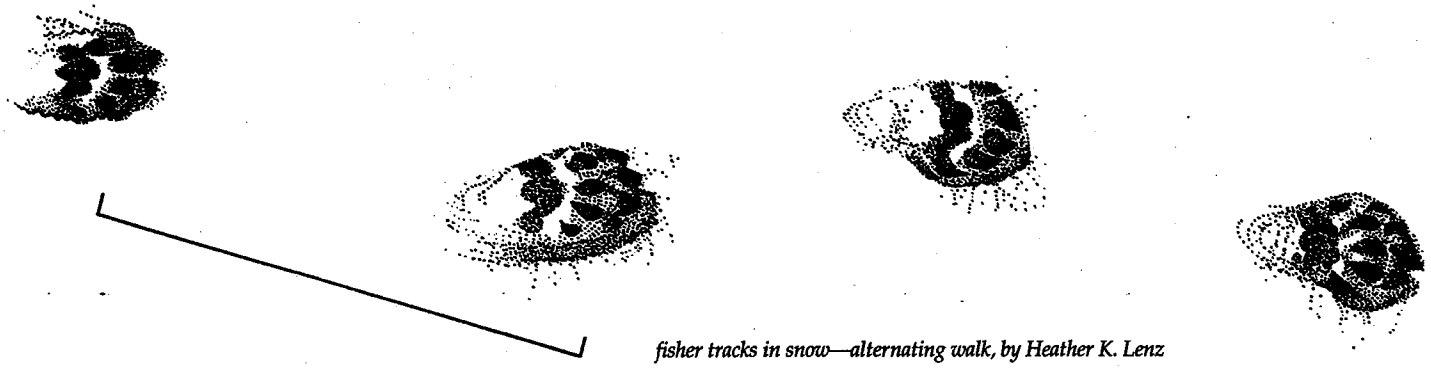
SPECIES STATUS LISTS

Activists working on behalf of the Adirondacks will want to obtain lists of the Park's rare and imperiled species. The New York Natural Heritage Program (NYNHP) has compiled the most complete lists to date. NYNHP lists 7 mammals, 64 birds, 8 reptiles, 3 amphibians, 42 fish, and 284 vascular plants as rare in the Adirondacks. These numbers do not include extirpated species. Some of those listed are naturally rare but many are in trouble due to anthropogenic habitat destruction and overkill. A small minority have been given a modicum of protection under the federal Endangered Species Act; more are listed by the state as threatened or endangered, but the state's listings carry little legal clout.

Contact NYNHP, NYS Department of Environmental Conservation, Wildlife Resources Center, 700 Troy-Schenectady Road, Latham, NY 12110. Ask for the Rare Plant and Animal Lists for the Adirondacks. Also available from NYNHP are state-wide status lists—Animal, Natural Community, Rare Plant—and the Explanation of Ranks and Codes used in the Natural Heritage lists.



fisher tracks in snow—alternating walk, by Heather K. Lenz

Park Politics

"For sale" signs litter the roadsides throughout Adirondack Park. They offer land at bargain prices, often for under $300 per acre even for parcels less than 50 acres in size. Yet the state cannot take advantage of the buyer's market, because it has no money to spend on land acquisition. Earlier this year the state Senate let bills die which would have set up an Environmental Trust Fund and stiffened control on land use in the Park.

These bills were the latest in a series of attempts to control development in the Adirondacks. In 1967 the opening of the four-lane Northway (I-87) between Albany and Montreal gave millions of people easy access to the Park's eastern forests and lakes. At that time the Park had virtually no zoning regulations. Governor Nelson Rockefeller appointed a commission to look into ways of protecting the Park. The results included the creation in 1971 of the Adirondack Park Agency (APA), and the passage in 1973 of a Private Land Use and Development Plan which set up a park-wide system of zoning.

The APA has the power to grant, or withhold, permits for "regional projects" that could damage the Park. The governor nominates and the Senate confirms its members, five of whom must be landowners residing within the Blue Line, and three, non-resident landowners. The commissioners of Environmental Conservation (DEC) and of Economic Development (DED!), and the Secretary of State are members "ex officio." Early on, the agency became a prime target for the wrath of developers, real estate agents, and those Park residents who believe that any regulations are an attack on the sanctity of private property; but this faction came to realize that the agency's authority was less wide-reaching than they originally feared. By the late eighties, as developments proliferated, environmentalists were at least as unhappy about the situation in the Park as were the APA's opponents.

A Georgia land speculator's purchase in 1988 of 96,000 acres of Adirondack land relinquished by Diamond International lumber company highlighted the danger that developers posed. Nevertheless, the state's voters in 1990 defeated an Environmental Quality Bond Act, which would have provided money for the acquisition of land in Adirondack Park and elsewhere. The major reason was the lamentable condition of the state's economy. Support for the act in southern New York was not strong enough to overcome opposition among voters in the North Country. The legislation that had provided for the referendum set up an excise tax on beer and soda, to pay the interest on the bonds that were to have been sold. This tax is currently raising money that by default goes into the state's general fund for debt reduction.

Efforts in the New York State Legislature to pass bills setting up a fund for land acquisition and regulating land use in the Park fail largely because of the intransigence of one man, Senator Ronald Stafford, Republican, deputy majority leader from Plattsburgh. The Assembly passes progressive legislation; Stafford blocks action in the Senate. His district covers less than half the Park, but he is able to effectively veto positive Park legislation, reportedly because Senator Ralph Marino, Republican, majority leader, owes him a political debt. The bills he blocks are not radical. The existing excise tax on beer and soda would have financed the Trust Fund that was proposed this year, for example; and proposed land-use regulations would merely have strengthened protection for backcountry, shorelines, and roadsides. Stafford's attitude is indicated by his introduction—in this, the Park's centennial year—of legislation to abolish the APA and to eliminate from the Park private land within its boundaries. [i.e., reduce the Park's size by more than half].

Undoubtedly Adirondack supporters will, in 1993, again make an effort to pass legislation protecting the Park; but with Stafford still in place, Governor Mario Cuomo may be the main hope for progress. Cuomo has waxed hot and cold on the Park. Disappointingly in 1990 he backed away from the enlightened proposals made by his Commission on the Adirondack Park in the 21st Century; but he proposed to the 1992 legislature moderate measures to preserve the Park, and in September he appointed a strong conservationist to be chairman of the APA.

Cuomo now has an opportunity to help the Park by committing the state to using for land acquisition a portion of the payback money that it will receive from the federal Intermodal Surface Transportation Efficiency Act of 1991, $338 million a year for 15 years. The state's Department of Transportation, which the governor controls, can determine how the millions will be spent. The money will not start arriving until 1996, but, as Eric Siy of the National Audubon Society points out, a commitment would enable the state to buy land now by borrowing against this revenue.

Cuomo also can support the Adirondacks by nominating conservationists to be APA board members. Seven of the eight members of the public on the APA board are up for replacement or reappointment. In recent years the Senate has refused to confirm new members, and Governor Cuomo, to avoid controversy, has sent up few names. Terms have simply been extended. Cuomo may not be able to get strong conservationists past Stafford, but he can at least make a statement through good nominations and avoid appointing members of the real estate lobby.

Adirondack State Park is of global significance. Send your views to Governor Mario Cuomo, State Capitol, Albany, NY 12224. New York residents should also write to their state legislators; and everyone with money should contribute to the new Buy Back the Dacks Fund (see announcement inside the back cover).

—Mary Byrd Davis

Every roadless area over 100,000 acres in the West and 50,000 acres in the East is shown.

Largest Remaining Roadless Areas in the Continental United States

Southern Appalachian Wildlands Proposal

by Brownie Newman, Hugh Irwin, Karen Lowe, Aimée Mostwill, Stephen Smith, and Jesse Jones

The following is an ecological proposal by SouthPAW for the restoration of native forests in the Blue Ridge Mountains and throughout the larger Southern Appalachian Bioregion. The paper will discuss the evolutionary and cultural history of the region, threats to the forests, and short and long term solutions to our ecological crisis.

"Such an ocean of wooded, waving, swelling mountain beauty and grandeur is not to be described."

—John Muir, Southern Appalachians 1867

Rising out of northern Georgia, extending into South Carolina, Tennessee, North Carolina, and Virginia is the region the Cherokee called *Katúah*—the Blue Ridge Mountains. The Blue Ridge Province contains the highest mountains in eastern North America. Mountain balds and red spruce/Fraser fir forests crest the highest peaks. Along the mountain slopes are cove hardwood forests, ancient rock outcrops, and highland bogs. Waterfalls channel into river gorges. Together, these and the other communities of the Southern Appalachians form one of the most biologically diverse temperate forests on Earth.

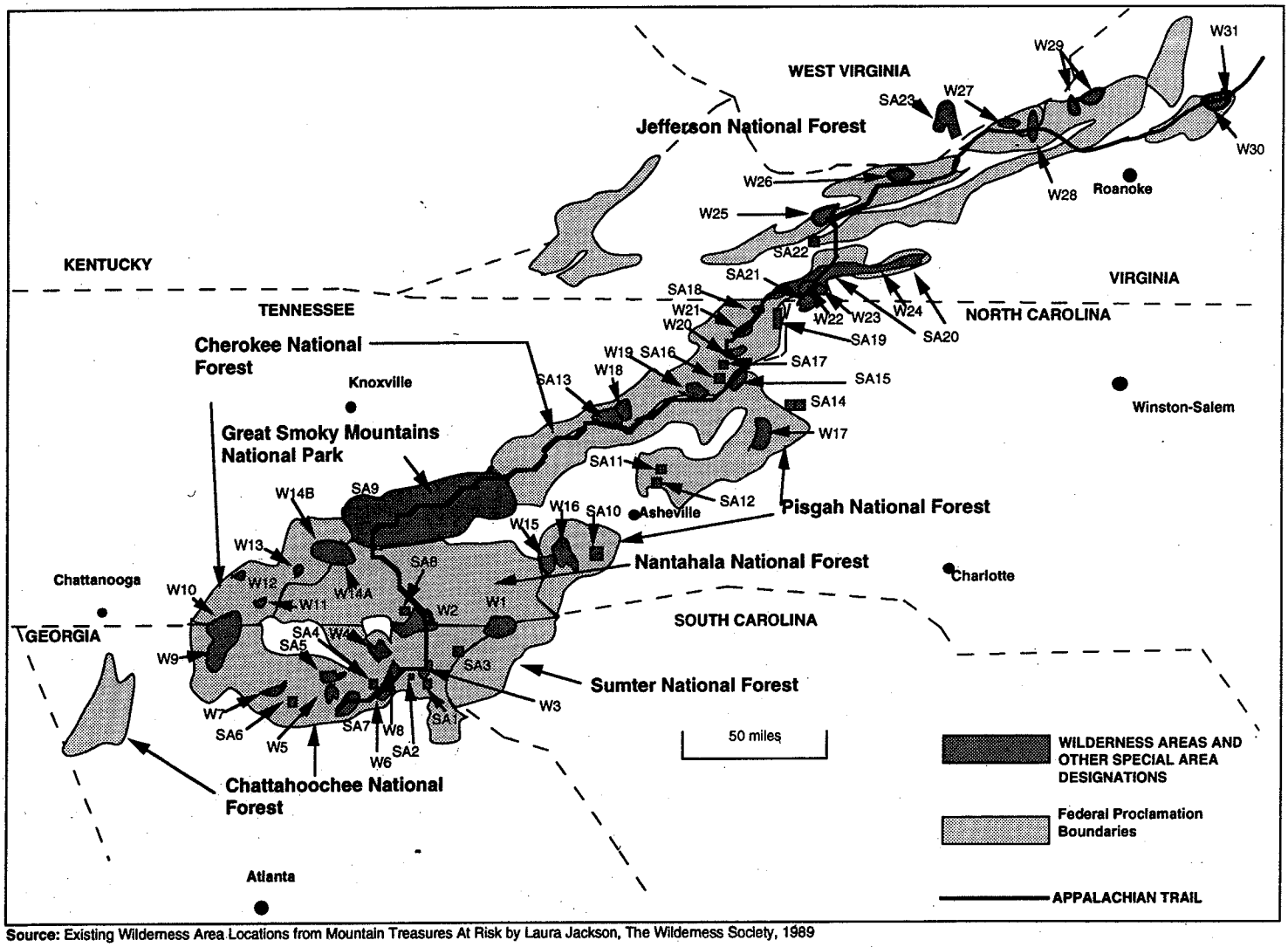
Walking through remnant old growth in the Blue Ridge Mountains, one may find as many tree species as occur in all of Europe, among them white oaks and eastern hemlocks 400 years old. Sugar maples and poplars here may rise 150 feet high. Black bears, *Myotis* bats, and numerous songbirds nest and den in the largest cavity trees. The forest floor is rich with ferns, mosses, mushrooms, and wildflowers, such as painted trillium, ginseng, Gray's lily, and baneberry. The leaf litter and creeks are home to salamander populations whose abundance and diversity is unequaled even in tropical rainforests (Petranka et al., in press). The largest of the salamanders are the hellbenders, which grow nearly three feet long. Under ridge rocks and boulders lie rattlesnakes and woodrats. Brook trout survive in the purest of the mountain streams.

AN EVOLUTIONARY PERSPECTIVE

Mountains have been present in what is now eastern North America since the end of the Paleozoic Era about 230 million years ago, going through several stages of uplift and erosion. Due to factors of geography and climatic protection, the southern portions of the Blue Ridge Mountains and surrounding highlands have been continuously vegetated for this whole period which spans the rise of flowering plants (Graham, 1964). The Blue Ridge physiographic province and the larger bioregion within which it is set, the Southern Appalachians, have thus played a crucial role in the vegetational history and evolution of North America and the world. Whittaker (1956) emphasized that the botanic diversity of the Smoky Mountains, in the heart of the Blue Ridge, is in part a result of its geological history: While other areas have been submerged under seas, covered by glaciers, and otherwise subjected to catastrophic changes, the Blue Ridge has remained a biological refuge.

By the end of the Paleozoic Era, Pangaea began to split apart. The North American and Eurasian continents slowly drifted apart, but remained joined in the north as late as 65 million years ago, leaving a broad migratory route between North America and Eurasia. At

FIG. 1: WILDERNESS AND OTHER PROTECTED AREAS IN THE BLUE RIDGE PROVINCE



Source: Existing Wilderness Area Locations from Mountain Treasures At Risk by Laura Jackson, The Wilderness Society, 1989

Wilderness Areas

W1 Ellicott Rock
W2 Southern Nantahala
W3 Tray Mountain
W4 Brasstown Bald And Brasstown Extension
W5 Blood Mountain
W6 Raven Cliffs
W7 Rich Mountain
W8 Mark Trail
W9 Cohutta
W10 Big Frog
W11 Little Frog Mountain
W12 Gee Creek
W13 Bald River Gorge
W14A Joyce Kilmer/Slickrock
W14B Citico Creek
W15 Shining Rock
W16 Middle Prong
W17 Linville Gorge
W18 Sampson Mountain
W19 Unaka Mountain
W20 Pond Mountain
W21 Big Laurel Branch
W22 Lewis Fork
W23 Little Wilson Creek
W24 Little Dry Run
W25 Beartown
W26 Kimberling Creek
W27 Peter's Mountain
W28 Mountain Lake
W29 Barbour Creek
W30 Thunder Ridge
W31 James River Face

Special Areas

SA1 Anna Ruby Falls Scenic Area
SA2 Unicoi State Park
SA3 Black Rock Mountain State Park
SA4 Vogel State Park
SA5 Coosa Bald Scenic Area
SA6 Amicalola Falls State Park
SA7 Springer Mountain National Recreation Area
SA8 Cowetta Hydrological Laboratory
SA9 Great Smoky Mountains National Park
SA10 Cradle of Forestry
SA11 Craggy Mountain Scenic Area
SA12 Mount Mitchell State Park
SA13 Bald Mountain Ridge Scenic Area
SA14 Julian Price State Park
SA15 Roan Mountain Special Management Areas
SA16 Roan Mountain State Park
SA17 Unaka Mountain Scenic Area
SA18 Flint Mill Scenic Area
SA19 Rogers Ridge Scenic Area
SA20 Mount Rogers National Recreation Area
SA21 Grayson Highlands State Park
SA22 Hungry Mother State Park
SA23 Bluestone/Pipestem State Parks

this time during the Tertiary Period, a broad-leaved forest developed over much of the northern portion of present day North America and Eurasia: the Arcto-Tertiary Forest. This deciduous forest is thought to have extended south along high elevation chains such as the Blue Ridge, while sub-tropical flora dominated near sea level in the south (Braun, 1950). The Arcto-Tertiary Forest, which had a well developed herbaceous understory, is considered ancestral to the present forest and may have closely resembled the cove hardwood forests of the Blue Ridge and the mixed mesophytic forests of the Cumberland Mountains. Cain (1943) made a persuasive case that all ferns and shrubs and most trees and herbs of the latter two forests had their origin in the Arcto-Tertiary Forest. As the continents continued to drift apart their forests became isolated from each other. The large number of plant genera that the Blue Ridge has in common with areas of Southeast Asia illustrates the common ancestry of forests in these widely separated regions. (Li,1952)

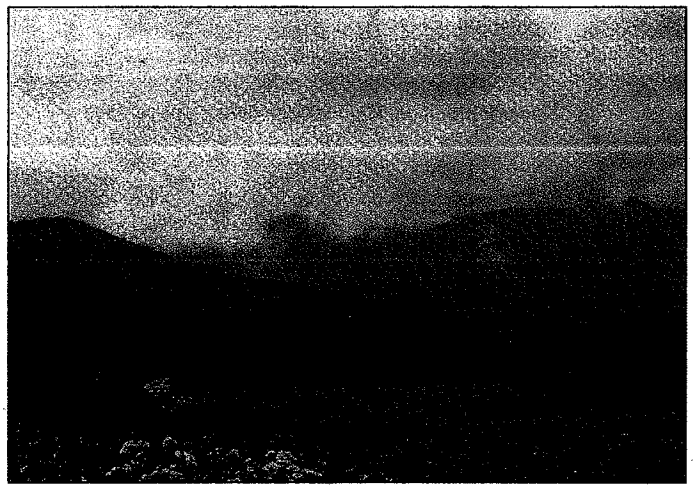
Climatic changes in the later Tertiary Period led to more temperate conditions and an expansion of the Arcto-Tertiary forest at the expense of more tropical species. Most of the elements of the modern forest were present by 34 million years ago in the Arcto-Tertiary forest, although often in combinations different from today's, and it dominated the northern and middle latitudes of North America and Eurasia. The gradual rise of mountains in western North America resulted in increasing dryness in the western interior. The Arcto-Tertiary forest was replaced in much of the West by grassland. The oak-hickory forest also developed during this period in response to dry conditions and dominated much of the continent. The mixed mesophytic forest was retained in the coves and uplands of the eastern mountains, while an oak-chestnut forest began to dominate the Ridge and Valley Province to the west of the Appalachians, and an oak-pine forest began to develop in the Piedmont Region to the east of the mountains (Braun, 1950).

The Pleistocene Epoch (3-1 million years ago) of the Quaternary Period was characterized by periods of cold lasting about 100,000 years, during which glaciers moved south. These ice ages were interrupted by periods of relative warmth, lasting 10,000 to 30,000 years, during which the glaciers receded. According to Davis (1983), from four to ten such periods occurred; other authors suggest on the order of twenty. The Southern Appalachians were south of the ice sheets, but were nevertheless greatly affected by them. Periods of cooling were associated with southward migrations of plant species; interglacial warming allowed northward migrations as the ice sheet receded. The migration south as the climate cooled is thought to have occurred much more slowly than the northward migration following climate warming. The northward migration would have been into bare or sparsely occupied land; migrants into the South would have had to compete with plants in relatively closed communities. Davis has estimated the faster northward migration at 48 miles (30 km) per century, though migration rates varied considerably between species.

It is probable that climatic cooling produced a timberline on the higher mountains of the Blue Ridge (King and Stupka, 1950). Vegetation would have been displaced to lower elevations during glacial periods. During interglacial periods vegetation would have shifted upward again. In fact, Whittaker (1956) estimated that vegetation may have been displaced upward 1000 to 1300 feet above present levels during the warm dry period following glacial retreat.

The Southern Appalachians played a major role in preserving species during this period. The mountain ranges in the Blue Ridge run generally south to north, allowing plants to migrate up or down the chain. In contrast, the mountains of Europe run east to west and formed a barrier to plant migration, resulting in the elimination of most species of plants north of the mountains (Braun, 1950). Whittaker (1956) also pointed out that the mountains of the Blue Ridge are deeply cut by stream valleys and side ridges, creating a diversity of local climates varying in temperature and moisture, depending partly on elevation and aspect. These local climates provided a continuum of conditions that allowed plants to migrate, not only north and south along the mountain chains, but up and down and around the mountains to find suitable habitat.

There is some controversy about the extent of plant migration during glaciation. However, Cain (1943) pointed out that regardless of the details the outcome has been the preservation of the Arcto-Tertiary Forest in the cove and mixed mesophytic forests of the present. Other vegetation types have elements of this ancestral forest that have adapted, evolved, and mixed in response to climatic change.



Hugh Irwin photo

Shining Rocks Wilderness, NC

During the latest ice age, 18,000 years ago, when most of what is now the northern United States was covered by a great continental ice sheet, much of the Appalachian range was crested with tundra. Boreal forests dominated the slopes and ridges (Delcourt and Delcourt, 1981). Mastodons, saber-toothed tigers, giant beavers, and dire wolves inhabited the cold woods.

During a warming period of about 8000 years, melting caused the edge of the glaciers to recede northward. An oak-hickory forest was established east of the Mississippi River (Delcourt and Delcourt, 1981). The first human inhabitants apparently moved into the Southern Appalachians at this time. These people wandered widely, hunting and gathering.

The glaciers melted farther back through Canada during the next 5000 years. A mixed mesophytic, oak-chestnut, and oak-hickory hardwood forest dominated the Appalachian landscape from northern Alabama into New England. Cove hardwood species gathered in the sheltered hollows. Red spruce and Fraser fir remained only on the tall-

est mountain peaks; today in the Southern Appalachians they are found only above 4500 feet. The past 5000 years have been a period of slight cooling to present-day temperatures, though the global climate appears to have begun warming again this century, perhaps due to anthropogenic emissions of "greenhouse" gases.

During the last glacial epoch, the unique conjunction of geology, soils, elevation, and topography may have allowed a great number of species to find refuge on high mountains, in deep river gorges, on exposed rock outcrops, and in cove forests. As plants migrated in response to climatic change, some populations were able to adapt to conditions in these habitats but were not able to survive in the surrounding areas (Roe,1987). When the main population of the species was wiped out or reached an equilibrium in far away places, the Southern Appalachian population was left isolated. This phenomenon may explain the diverse array of disjunct populations and endemic species in the region. [However, ecologists debate the importance of the Southern Appalachians as a refugium during the Pleistocene. — Sci. Ed.]

Europeans found this continent 500 years ago. They rapidly colonized eastern North America and began manipulating ecosystems to fit their agricultural way of life. Woodland bison and elk were quickly hunted to local extinction. Soon afterward came industrialization and the catastrophic events associated with it. As biologist B.C. McCarthy has written (1991), "The coming of the industrial revolution resulted in massive deforestation in the Eastern United States. Most eastern forests were logged to support an insatiable and expanding industrial base."

In the late 19th century, industrial logging came to the Southern Appalachians and crippled the forest across the landscape. Robert Zahner (1990) describes it thus:

...forest clearing and burning ravaged native biotic communities and terminated unknown numbers of species. Habitats were fragmented, and many surviving endemic species were left in small, isolated communities. [The forest of today is] similar to the original only in that it still contains most of the original plant and animal species.

Gray wolves and passenger pigeons were two of the many species lost to habitat destruction and hunters' guns. Black bear were reduced to only 5% of their former range (Pelton, 1986). Brook trout were lost in over 90% of their range. Although unconfirmed sightings are still common even today, Eastern cougar are considered extirpated in the Southern Appalachians. The great American chestnut died back in the wake of a fungal blight brought with the introduction of the Asian chestnut onto this continent.

Beginning in the 1960s, human population growth and development greatly accelerated in the Southern Appalachians. Forestlands were converted to golf courses, tobacco fields, and cow pastures, flooded by hydroelectric dams or paved over. The rich bottomlands have been particularly degraded. Airborne pollutants from coal-fired industrial plants and automobiles poison the mountains with acid deposition and ground level ozone, straining forests and pathologically altering soil and stream chemistry.

The irony of living in the Blue Ridge Province is the contrast between the ancient beauty and richness of the mountains and the sense of loss from the continuing destruction of these forests. Less than one percent of Appalachian old growth remains. However, the potential for long-range recovery is great if destruction is halted and large areas are set aside for biodiversity reserves.

THE FORESTS OF TODAY AND THREATS THERETO

We frequently hear reports from distinguished scientists warning that human-caused destruction of natural habitats is the single most serious threat to survival of life as we know it on our planet. The loss of genetic diversity and the loss of entire ecosystems are occurring at an accelerating pace around the world. The Southern Appalachian Mountains are part of this grim picture. But the existing public lands have the potential to restore the natural diversity provided by the old-growth forests currently missing from the Appalachian bioregion.

—Robert Zahner, "Restoring Forest Diversity in the Southern Appalachian Mountains"

The Southern Appalachian Bioregion is an area of about 16,000 square miles. The region is blessed with large areas of public lands, relative to the rest of the eastern United States. The Sumter, Chattahoochee, Pisgah, Nantahala, Cherokee, and Jefferson National Forests together with the Great Smoky Mountains National Park total 3.5 million acres. Additional holdings by the Tennessee Valley Authority (TVA), state forests and parks, and land trusts provide protection for other areas to varying degrees.

Most of the forests in the region, however, are held privately. The timber industry and other corporations comprise a portion of these private landholders, but by far the majority are non-industrial private forest holders; that is, farmers, woodlot owners, and real estate investors.

Following the catastrophic logging frenzy around the turn of the century, the federal government began purchasing cut-over lands; these form our present-day public forests. Though logging has been a part of the management regime of the Southern Appalachian National Forests since their formation, most of the lands purchased were so degraded that the only management option for hundreds of thousands of acres was benign neglect: restoration. For half a century, the only active management imposed on most of the public forests was fire suppression.

Of all today's threats to natural communities in the Southern Appalachians, the most serious are forest fragmentation, air pollution, and accelerated climatic warming. Federal agencies and private land holders have yet to consider the cumulative impacts of these threats on regional biodiversity and ecosystem stability. Because these threats are not considered together, current policies and management regimes cannot restore or even maintain forest health over time. In fact, most current management activities cause pollution and fragmentation.

During the 1960s large areas of National Forest reached an age where logging was again feasible. Forest Service priorities in the Southern Appalachians changed radically in favor of exploitation. Selective logging was replaced by clearcutting. Since then tens of thousands of acres have been clearcut, some of them replanted as pine plantations. The Forest Service maintains over 5000 miles of permanent roads in the 6 National Forests of the Southern Appalachians: the Nantahala, Pisgah, Cherokee, Chattahoochee, Sumter, and Jefferson. State, county, and other federal roads through the Forests push the figure still higher. Current plans call for construction of 3236 more miles of Forest Service roads in these 6 Forests by the year 2030 (Jackson, 1989).

The percentage of National Forest lands protected as Wilderness in the Southern Appalachians is far less than in the western United States. Eastern Wilderness Areas average under 10,000 acres (Mueller, 1985). What few areas are protected as Wilderness are mostly the highest el-

evation lands in the region—the Eastern equivalent of "rock and ice" wilderness. These high elevation communities are very diverse, but the even more diverse and productive valley lands have little protection.

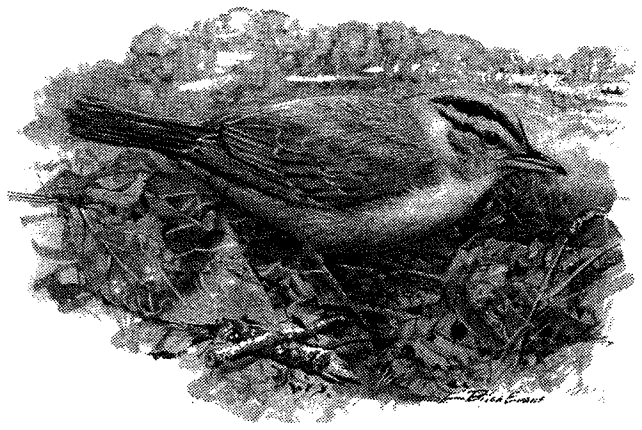
Recent research on the effects of forest fragmentation has revealed that impacts on many species and communities are more dramatic and irreversible than previously supposed. Some of the natural communities that contribute most to diversity in the region seem to be the ones most adversely affected by fragmentation. For example, Petranka et al. (in press), in their study conducted on the Pisgah National Forest in 1991, report:

We found compelling evidence that clearcutting strongly depletes local populations of salamanders and reduces local community diversity. We estimate that 75-80% of salamanders in mature stands are lost following timber harvest by clearcutting... [W]e estimate that if forests continue to be cut at 1981-1990 rates, regional populations will be chronically reduced by about 8.5% or 267 million animals below the numbers which could be sustained in mature forests... We consider the chronic depletion of populations in National Forests in western North Carolina by more than a quarter of a billion animals to be significant from a regional perspective, particularly when one considers that a significant portion of the eastern U.S. has been deforested since its colonization by Europeans.

Recent studies indicate that the rich herbaceous understories of Southern Appalachian forests require centuries to recover following clearcutting. To regain species diversity, the understories require the restoration of old-growth forests, with pit and mound topography. Duffy and Meier (1992) report:

Our results suggest that even 50 to 85 years following deforestation [clearcutting], succession of herbaceous understory plants in secondary mixed mesophytic forests of the southern Appalachian Mountains resulted in only half the species richness and one-third the total cover measured in primary [old-growth] forests... [H]erbaceous cover and species richness may continue to decline with time until trees become large and old enough to die, fall, and decay. The resulting pit and mound micro-topography of fallen tree trunks and bare soil would provide a continual source of unvegetated areas for colonization. Gaps and pit and mound effects maintain herb diversity in primary forests. They may also initiate it... [T]he data presented here strongly suggest that recovery requires at least several centuries, longer than the present logging cycles of 40-150 years for Appalachian cove hardwoods. Management of fully-functioning forest herbaceous communities to maintain biological diversity as mandated by the 1976 National Forest Management Act may require greatly lengthened tree harvest cycles, extraction methods less damaging to herbs, intensive management and planting of herbaceous species to speed up secondary succession, and the maintenance of sufficient primary forest to sustain intact herbaceous communities and to serve as sources for recolonization.

Rapid declines in neotropical migrant songbirds in the eastern United States have brought attention to the effects of forest fragmentation. It is no coincidence that most of the species in decline are those that require large, contiguous areas of biologically mature forest. Biologists (Wilcove 1988, Robbins et al. 1989, Terborgh 1992) recognize the declines as a result of the cumulative impacts of pesticide use and forest fragmentation in both tropical and temperate forests, including an overall reduction in breeding habitat and increased exposure to nest predators and parasites.



worm-eating warbler by Brian Evans

David Wilcove, in a presentation to the Society of American Foresters (1988) reported:

[S]tudies have shown that nesting success of songbirds is lower near forest edges than in the interior. This is because nest predators [blue jays, American crow, common grackle, eastern chipmunk, short-tailed weasel, raccoon] and brood parasites [brown-headed cowbirds] occur in higher densities around forest edges. Brittingham and Temple have also shown that cowbird parasitism increases near openings within large forest tracts, a finding with obvious implications for forest management.

In 1985 Wilcove published a study of nest predation (Wilcove 1985). He put quail eggs in artificial nests and placed them in small, medium, and large forest tracts. The largest forest area utilized was the 500,000 acre Great Smoky Mountain National Park. In some of the smaller forest fragments, almost 100% of the nests were raided. In the Smokies, only one of the fifty nests was discovered and raided. Along with low levels of nest predation, Wilcove noted a complete absence of cowbirds within the Smokies.

John Terborgh (1989) states, "Apart from a few remaining large tracts of unbroken forest, most of which are in the Appalachians, songbirds now have few refuges from cowbirds." Black-throated blue warbler and cerulean warbler are among the many neotropical migrants that require large contiguous forests to breed successfully. The cerulean warbler is declining by 4.6% a year in Virginia and almost as rapidly across the rest of its range (from Breeding Bird Survey data 1980-1989, U.S. Fish and Wildlife Service) and is a candidate species for listing under the Endangered Species Act. Other neotropical migrants showing rapid declines in the Southern Appalachians include yellow-billed cuckoo, least flycatcher, northern oriole, scarlet tanager, summer tanager, worm-eating warbler, Canada warbler, and wood thrush (Breeding Bird Survey data, 1980-1989).

It seems little can be done to reduce predation and parasitism of songbird nests in suburban parks and woodlots. "Conservation efforts should therefore be directed towards consolidating and expanding the largest tracts of forests, such as the Smokies, Adirondacks and the North Woods of Minnesota and Maine, to maximize the habitat in which birds can nest successfully... It would be useful to prohibit the subsidized clear-cutting of our national forests..." (Terborgh 1992)

Black bear now occupy only 5-10% of their former range in the Southeast. The largest, and perhaps the only viable, bear habitat in this part of the continent is in the Southern Appalachians. Continuing development on private and public lands poses an increasing threat to the long-term viability of black bear. As stated by Michael Pelton (1986):

Increasingly fragmented and patchy, occupied bear habitat gets squeezed tighter and tighter as potential dispersal corridors between

occupied sites or to alternative fall feeding grounds on the periphery and surrounding the public lands are reduced or eliminated. Mixing of gene pools is substantially lessened or totally stopped between cohorts of populations....

In recent years, new roads, both within and surrounding publicly-owned lands, particularly National Forests, have increased access into bear habitat or along its perimeter. Accompanying this access also is an increased use of modern technology by bear hunters; the availability of CB radios, 4-wheel drive vehicles, ATV's, and radio-collared hunting dogs has led to increasing efficiency in harvesting bears. Growing numbers of other kinds of hunters also put pressure on the resource. In addition, there are added economic incentives to kill bears for their hides, claws, teeth, cubs, and more recently, gall bladders.

Unless current trends are reversed, future bear habitat will be present almost exclusively on public forests and dispersal corridors will be eliminated. Protecting large roadless or very low road density areas, coupled with restoring old growth, is the preferred management for the future of Southern Appalachian *Ursus americanus*.

Michael Pelton (1986) explained the importance of old growth:

Winter cover needs are for prime denning sites. Black bear are adaptable enough to den in a number of different kinds of sites. However, the needs of adult females for highly protected sites is greater than that of males. Most of the more protected sites are associated with old growth forests—under root mats or in cavities of large living or dead trees, either standing or fallen. .... it is now evident from years of telemetry data in both mountain and swamp or lowland areas that bears prefer old growth as a vital part of their habitat needs. Ages of large trees containing cavities big enough to hold a female and her young range from 150 to 400 years.

The US Fish and Wildlife Service recently released four red wolves into Great Smoky Mountains National Park. The efforts to recover this Endangered carnivore of the Southeast face many problems, such as limited genetic diversity in the remaining wolves and an expanding coyote population. But by far the most most serious problem is a limited supply of wild forest. Only the Okefenokee Swamp on the Georgia/Florida border, the Atchafalaya Swamp in Louisiana, the Big Cypress and Everglades in Florida, and the Smokies in the Southern Appalachians currently contain roadless areas over 50,000 acres.

Even more severe than the forest fragmentation on the Southern Appalachian National Forests is the development occurring on private lands. The human population of the region is growing at twice the national rate (Jackson 1989). New highways, golf courses, and shopping centers daily consume forests and farmland. The recent economic recession was a brief blessing, but the frenzy seems to be resuming.

Development in the region serves not only to destroy habitat directly; it contributes heavily to the second major threat to ecological health in the region—air pollution. The two most serious forms of air pollution in the Southern Appalachians are ground level ozone and acid deposition.

Ground level ozone is caused by chemical reactions involving nitrogen oxides, hydrocarbons, and existing ozone. Ozone impairs photosynthesis, stunts root growth, inhibits reproduction, and increases plants' susceptibility to pathogens, insects, and drought (National Park Service, 1991). In a recent survey, 41 air pollution experts named ground level ozone as the most damaging air pollutant in America. All surveyed believed that growth declines in plants will accelerate over the next 20 years even if emissions are held constant (Park Service 1991). Ninety-five plant species in the Smoky Mountains show what Park Service plant physiologist Jim Renfro calls "classic ozone damage symptoms" (Renfro, pers. comm.). White oak, white pine, white ash, black cherry, and sweet gum have all been found to be sensitive to ozone. High elevation Fraser fir forests in the Southern Appalachians are in a state of ecological collapse as a cumulative result of previous logging, invasion by the exotic balsam wooly adelgid, ground level ozone, and acid deposition. Many Fraser fir stands within the Black and Smoky Mountains now have a skeletal appearance; some stands are 90% dead.

Red spruce in the Black Mountains show reduced growth rates. Some stands are 50% dead. As wooly adelgids do not attack spruce, scientists believe the decline is primarily due to acid deposition (Flynn, 1991).

Ursus americanus by Celeste Poulin

A recent Forest Service publication (Sesco, 1989) titled "Global Climate Change: A Forest Service Priority Research Program" stated:

Climatic changes over the next 50 years could occur up to 100 times faster than during any period since people have lived on the earth—so fast that some species may not be able to keep up at all... A drastic increase in atmospheric carbon dioxide—brought about by the burning of fossil fuels and the clearing and burning of forests—is behind the rapid climate change now being predicted. The temperature of the globe is expected to rise between 4 and 7 degrees Fahrenheit over the next 50 years. In the past warmings of this magnitude have taken 10,000 to 30,000 years to come about. A change in precipitation patterns will accompany this global warming. The frequency and severity of drought are expected to increase.

Unfortunately, as the title suggests, the Forest Service publication merely calls for "more research" to determine if action is necessary to deal with accelerated climatic warming. While more research is certainly vital to conservation efforts, immediate action based on current knowledge of climatic effects is needed. In their article "The Greenhouse Effect and Nature Reserves," Peters and Darling (1985) stated:

Without heroic measures of habitat conservation and intelligent management, hundreds of thousands of species could become extinct by the end of this century, with more to follow in the next.... We feel the possible negative effects of global warming could be so severe that conservation plans should be amended to reflect knowledge of climatic effects...

Robert Zahner added (1989):

With the acceleration of man-caused [climatic] changes... species adapted to slopes must migrate to coves. Species normally adapted to mid-elevations may have to migrate to higher, cooler habitats.... Ecologists believe the natural ranges of species will have to shift from south to north... During and following the advances and retreats of continental glaciers, forest communities easily migrated at a rate of a few miles per century as the climate cooled or warmed over thousands of years. In the coming century, however, individual species and entire communities may have to migrate at a rate perhaps ten times faster, an impossible feat from isolated, fragmented old-growth habitats.

Species and biotic communities would continue to be severely affected by landscape fragmentation even without climatic variation. The negative impacts associated with fragmentation become all the more acute with global warming. If species cannot survive in a given area due to altered climate conditions and can not colonize elsewhere, they go extinct. Fragmentation severely restricts migration and colonization.

The SouthPAW Blue Ridge Province Proposal

Since there is nowhere enough wilderness to permit the full mystery of evolution to flourish, we, as a culture, must begin the daunting task of restoring vast tracts of damaged land to a condition where they can re-wild themselves. To speak of ecological restoration by humans of ecosystems is to speak in paradoxes. Enter at your own risk. Bring a healthy dose of humility and recognize that you are doing work that only Mother Earth can properly do. Be not deterred by the apparent absurdity of the task. The alternative is the collapse of the biosphere.

— Jamie Sayen, (1990) Towards A Restoration Ethic

In response to the incredible destruction inflicted upon the Blue Ridge Province and the rest of the Southern Appalachian Bioregion over the last two centuries, the polluting and fragmenting effects of current management practices and land use, and the anticipated effects of chronic air pollution, accelerated climatic warming, and a burgeoning human population, a new vision for our mountain region is needed — a vision of health. SouthPAW's vision is both ecological and cultural. We speak in ecological terms because it is ecosystems that we seek to protect. Our proposal is culturally oriented because it is our culture that has been unable to find its proper niche within the region.

Because the Blue Ridge Province has more land in public ownership, and because it already has significant areas in protected categories, we have concentrated initially on establishing biological reserves and corridors in this portion of the Southern Appalachians. It should be easier to designate a system of interconnected core areas in this part of the bioregion. The constituency for protecting Blue Ridge areas is already well developed. The Southeast Office of The Wilderness Society has a very effective and aggressive program in the Southern Appalachians to identify and protect the key National Forest roadless areas in the region (see, for example, Jackson, 1989, and McClure, 1992). Each of the Sierra Club Chapters in the region is actively pursuing protection of National Forest lands. A wide variety of grass-roots groups, including SouthPAW, are advocating protection of the region's forests. This constituency, which has traditionally emphasized protection of specific areas, seems to be moving toward the establishment of a system of protected core areas and corridors throughout the Blue Ridge.

SouthPAW's proposal is based in part on concepts from the relatively new fields of landscape ecology and conservation biology. Other foundations of the vision are rooted in the oldest of human traditions— that humans are a part of a larger community and that all creatures have inherent worth. The term ecosystem comes from the Greek *oikos*, meaning home. To restore our native forests is to reclaim our home. In a biological sense, the SouthPAW proposal is a human adaptation to the current ecological crisis.

Our purpose is to develop a protected ecological complex which can function in perpetuity. The native communities must be given enough space and time to heal themselves. The human culture in the region must be transformed so that it too can function in a healthy, sustainable manner. The human community must fit within the limits of native ecosystems, rather than the other way around. The laws of nature are not malleable. Ecological health takes precedence.

The 3.5 million acres of public trust lands should be protected as life support systems and habitat for the creatures (including humans) of the Blue Ridge Mountains. Recognizing the importance of the public lands as a bioregional habitat reserve would necessitate several changes in present policies:

1) Commercial logging and developed recreation are incompatible with healthy native forest communities and therefore should not be allowed on public lands.

2) No further road construction within the public forests should be allowed. Extensive road closures should be made to expand and connect existing roadless areas. The SouthPAW roads policy is: Obliterate! Revegetate!

Restoration and expansion of roadless areas is the most direct way to maintain the region's native forest communities. Allowing large, contiguous blocks of forest to recover will maximize forest interior habitat and minimize the deleterious effects associated with artificial edges. Habitat for numerous species will become more abundant as forests mature. Large old trees, which are utilized by black bear, cavity nesting songbirds, and an array of other species, will become widely available. As natural disturbance regimes restore themselves, diversity will increase even more. Species that thrive in snags and tree fall gaps will become more abundant. Natural disturbance will increase forest heterogeneity and provide early successional habitat, without the impacts associated with logging, such as soil compaction, stream siltation, and forest simplification. At a watershed level, a shifting mosaic of natural seral stages will develop.

Where roadless areas are connected to other roadless areas by broad biological corridors, species dispersal will be facilitated and genetic viability can be expected to increase. Native species will have a better chance to successfully react to accelerated climatic warming by elevational or latitudinal migration.

3) The existing public lands are extremely unconsolidated, with their small sizes, isolation from other protected areas, and numerous private inholdings. By gradually purchasing private inholdings, obtaining conservation agreements and easements, and creating private land trusts, the bioregional reserve network can be extended. Highest priority should be given to habitats scientifically determined to be of strategic importance.

4) Native communities should be restored. Extirpated species such

opossum (Didelphis virginiana) *by Kurt Seaberg*

as the Eastern cougar, gray wolf, red wolf, elk, beaver, and many freshwater mussel species should be reintroduced once their various habitats are secured. The American chestnut must be restored to its former health. Bottomland forests, the first victim of the colonial invasion, should be resurrected.

Exotic species such as kudzu, Japanese honeysuckle, and the European wild boar, which are overrunning native habitats, must be eliminated. It has been made illegal in 37 states to allow the Canada thistle to grow on one's land. A similar ban should be enacted on kudzu and Japanese honeysuckle in the Southern Appalachians.

5) Broad biological corridors should be established to connect the Southern Appalachian Bioregional Reserves to other reserve areas currently proposed in neighboring regions, specifically the Central Appalachians, the Tennessee River Watershed, the Ohio River Valley, the Atlantic Coast, and the Florida Peninsula.

Following the above guidelines, there is immediate potential to consolidate an interconnected network of large roadless and sparsely roaded areas in the Southern Appalachians. The reserve network outlined below will provide the initial building blocks for further ecological restoration efforts. These reserve complexes are not meant to be seen as the end-all of the SouthPAW Proposal. This aspect of the proposal is merely intended to point out the immediate potential for big wilderness in the region and possible linkages among existing natural areas. Ecosystem reserve mapping is in an early phase in the Southern Appalachians. This should be seen as a draft proposal. SouthPAW's vision, like the ecosystem we seek to protect, is evolving.

The following is a description of the Blue Ridge's most intact forest areas and SouthPAW's Proposal to consolidate them to serve as Core Reserves. If properly buffered and linked together, these areas would provide a functional network of large, interconnected reserves for the bioregion. All of the proposed areas are fragmented by private inholdings and roads. All private inholdings should be protected by acquisition or other means. Most Forest Service roads should be closed; and some state, county, and federal roads, such as the Blue Ridge Parkway, should be immediately closed to motorized vehicles, with more closings in the future.

1) **Chattooga River Core Area.** This area stretches from just north of the Ellicott Rock Wilderness at the headwaters of the Chattooga River (not to be confused with the Chattooga River of western Georgia), southward down the Chattooga Watershed to Tugaloo Lake, where the river is dammed. The Chattooga River Core Area is comprised of the southern end of the Highlands Ranger District of the Nantahala National Forest, the western portion of the Andrew Pickens Ranger District on the Sumter National Forest, and the eastern portion of the Tallulah Ranger District on the Chattahoochee National Forest. Included in this area is the Black Rock Mountain State Park. This area of almost 150,000 acres is dissected by Highways 28, 121, 884, 76, 538, and 107.

To the south is the Lake Russell Wildlife Management Area. This 15,000 acre tract on the Tallulah District extends into the Piedmont region, protecting this ecotone. The area is ecologically dysfunctional due to high road densities, but has strong potential for restoration.

The Chattooga Core Area is bordered on the east by the Chauga

River area on the Andrew Pickens District. This area of almost 16,000 acres has been heavily roaded and logged over the past fifteen years, but still retains some of South Carolina's most intact old hardwood forest.

The northeastern end of the Chattooga Core Area is linked to a series of protected areas called the South Carolina Mountain Bridge, which is made up of the Table Rock, Caesar's Head, and Jones Gap State Parks, the two sections of the Greenville Watershed, and several other linked pieces. The Mountain Bridge totals over 40,000 acres.

The Chattooga River Core Area links into the Central Chattahoochee Core Area to the west. It is linked to the Shining Rock Core Area to the northeast by private forest lands, though developments threaten to destroy the corridor. These lands are a high priority for protection.

2) **Central Chattahoochee Core Area.** This area of almost 180,000 acres stretches south from the existing Southern Nantahala Wilderness to Springer Mountain on the Chattahoochee National Forest, which is the southern end of the Appalachian Trail. The complex unifies the existing Raven Cliffs, Brasstown Bald and Brasstown Extension, Tray Mountain, Blood Mountain, and Southern Nantahala Wilderness Areas; as well as the Anna Ruby Falls Scenic Area, Unicoi State Park, Coosa Bald Scenic Area, Amicalola Falls State Park, and the Springer Mountain National Recreation Area. The current road density here is ludicrous with Highways 19/129, 60, 76, 197, 23/441, 348, 356, 17/75, and 255 fragmenting the area. Serious consideration should be given to eliminating several of these roads and constructing wildlife viaducts under or overland passages above others. From the southwestern corner of this complex a corridor would connect with the Cohutta/Big Frog Core Area via the Ellijay River and its tributaries and encompassing the Rich Mountain Wilderness Area.

3) **Nantahala Mountains Core Area.** This proposed reserve stretches southward from the Great Smoky Mountains National Park to the Southern Nantahala Wilderness and the Central Chattahoochee Core Area. It encompasses the Cheoah Mountains, Tusquitee Mountains, Nantahala Mountains, Chunky Gal Mountain, portions of the Snowbird Mountains, the Coweeta Hydrological Laboratory, and the Southern Nantahala Wilderness. This vital 160,000 acre complex, in the heart of the bioregion, is fragmented by Highways 28, 143, 19, 129, and 64, and by two reservoirs, on the Nantahala and Little Tennessee Rivers. Fontana Dam, which floods the Tennessee River, blocks migration from the Smoky Mountains National Park into the Nantahala Core. Both the Nantahala and Fontana Dams should be dismantled to allow the rivers freedom and to restore biological linkages.

4) **Shining Rock Core Area.** This complex encompasses all of the Pisgah Ranger District of the Pisgah National Forest and the far eastern section of the Highlands Ranger District of the Nantahala National Forest. It includes and expands the existing Shining Rock and Middle Prong Wilderness Areas, linking them with the Daniel Ridge Area, Cedar Rock Mountain, South Mills River, Laurel Mountain, as well as Coward Mountain, Rich Mountain, Pisgah Mountain, the headwaters of the French Broad River, and the Cradle of Forestry. This contiguous block of public land totals over 160,000 acres. The Blue Ridge Parkway and Highway 276 bisect the Shining Rock Complex. The Parkway should be closed to restore a biological linkage to the Great Smoky Mountains National Park. A corridor would run south out of the Pisgah Ranger District via the headwaters of the Tuckasegee River and the Toxaway River to link with the Chattooga River Core Area.

5) **Cohutta/Big Frog Core Area.** This proposed reserve encompasses almost all of the Cohutta Ranger District of the Chattahoochee National Forest and the Ocoee and Hiwassee Ranger Districts of the Cherokee National Forest. The area would include Big Frog, Cohutta, Little Frog Mountain and Gee Creek Wilderness Areas. It would be bordered by Highway 68 in southeast Tennessee and would extend to the southern end of the Cohutta Ranger district in northern Georgia. Unique botanical areas are included in this complex, with a number of rare plants, including Ruth's golden aster, which is found only in the Ocoee and Hiwassee River Gorges. The only non-Forest Service roads passing through this area are Highway 64 and a portion of Highway 30.

A biological corridor would run southeast out of the Cohutta Ranger District via the Ellijay River and its tributaries to the Central Chattahoochee Core Area. To the north of the Cohutta/Big Frog Core Area lies the Unicoi Mountains Core Area.

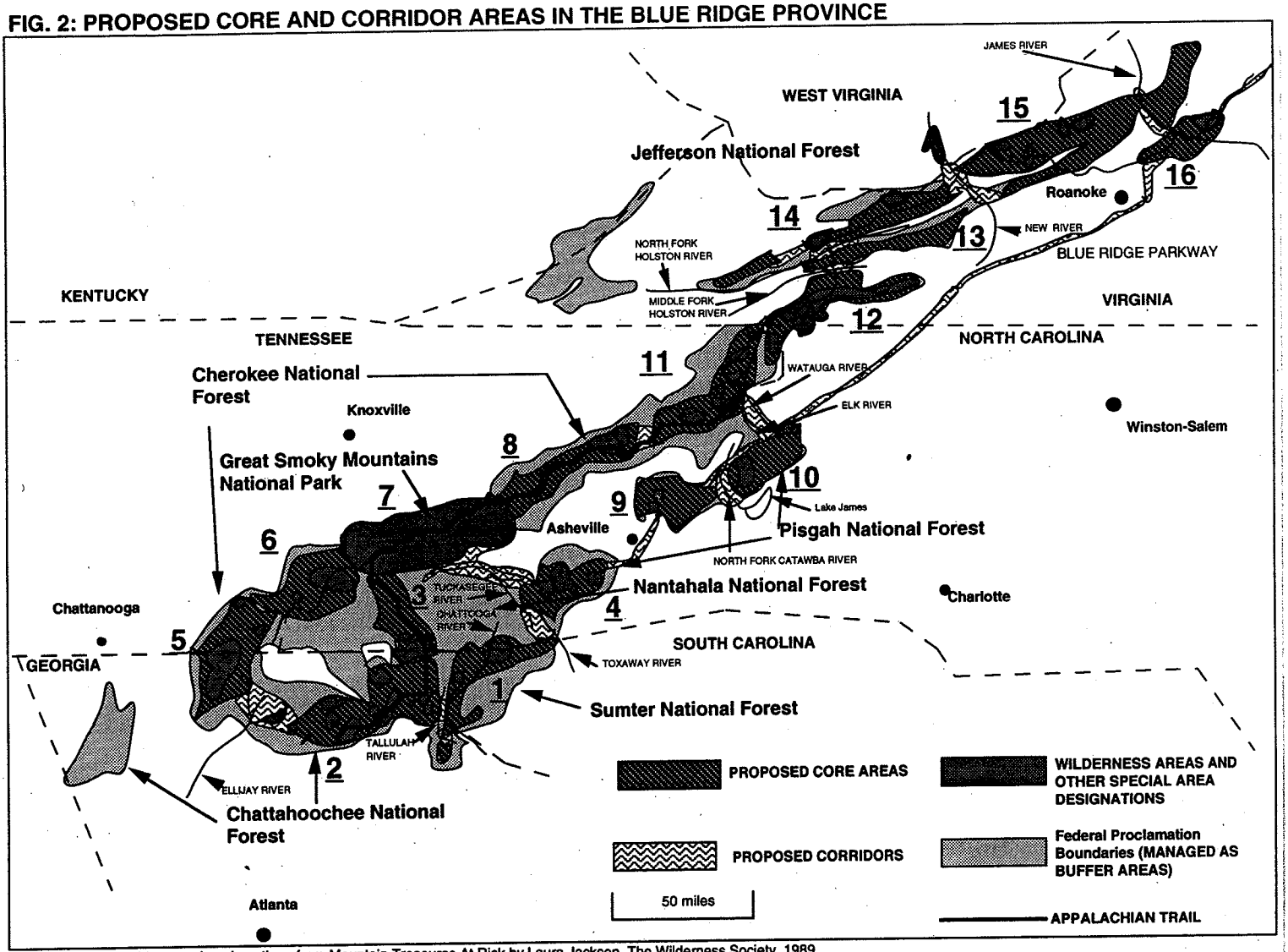
6) **Unicoi Mountains Core Area.** This complex extends from Highway 68 to the Great Smoky Mountains National Park. It encompasses the Tellico Ranger District on the Cherokee National Forest and western portions of the Tusquitee and Cheoah Ranger Districts on the Nantahala National Forest. This complex includes and expands the famous Joyce Kilmer/ Slickrock and Citico Creek Wilderness Areas, as well as the Bald River Falls Wilderness. Very high priority roadless areas, including Upper Bald River, Snowbird, and additions to Joyce Kilmer/Slickrock and Citico, need protection as soon as possible. Rare animals in the area include the federally Endangered smoky madtom and the federally Threatened yellowfin madtom, which are found in Citico Creek.

This core area is relatively free of major roads with the exception of Highway 165. This road is completed only on the Tennessee portion of the area and is currently under construction in North Carolina. It has caused serious damage to some streams in the area and will be a major barrier to wildlife migration when completed. Stopping construction of this highway, while politically difficult, would save having to close it at a later time. Highway 129 separates the Unicoi Mountains Core Area from the Smokies.

7) **Great Smoky Mountains Core Area.** These 517,000 acres straddling the Tennessee/North Carolina border are the biological heart of the Southern Appalachians. The Smokies are extremely diverse in habitats, from the grassy balds of the high elevations to broad mountain valleys at the lower elevations. Going from lower to higher elevations, one can find forests similar to the oak-pine forests of Georgia, the oak-hickory forests of Virginia, the northern hardwoods of Massachusetts, and the spruce-fir forests of Maine and Canada. The varied habitats are home to about 1350 species of vascular plants, including 130 species of native trees. The area is also known to have 1800 species of fungi, 330 species of mosses and liverworts, and 230 species of lichens (King and Stupka, 1950). The wide variety of animals includes 50 species of mammals, 200 birds, 70 fish, and over 80 reptiles and amphibians (National Park Service, 1981). Many of these species are rare and some occur only in Great Smoky Mountains National Park. The Smokies retain more old-growth forest than any other portion of the Southern Appalachians.

Almost all of the Smokies are managed as wilderness, although not officially designated so. The Smokies are facing many of the same problems as the surrounding National Forests, including air pollution, exotic species, and roads. In addition, tourist impact is significant. The

FIG. 2: PROPOSED CORE AND CORRIDOR AREAS IN THE BLUE RIDGE PROVINCE



Source: Existing Wilderness Area Locations from Mountain Treasures At Risk by Laura Jackson, The Wilderness Society, 1989

CORE AREAS

1	Chattooga River
2	Central Chattahoochee
3	Nantahala Mountains
4	Shining Rock
5	Cohutta/Big Frog
6	Unicoi Mountains
7	Great Smoky Mountains
8	Bald Mountains
9	Black/Craggy Mountains
10	Grandfather Mountain
11	Pond Mountain/Iron Mountain
12	Mount Rogers
13	Brushy/Walker Mountain
14	Beartown/Kimberling Creek
15	Peter's Mountain
16	James River/Thunder Ridge

Park is bisected by the Newfound Gap Road. Consideration should be given to closing or altering this road to lessen its effects.

The core area would include a small section of Cherokee and Pisgah National Forests to the north of the Park. It would be connected with the Unicoi Mountains Core Area to the southwest and the Nantahala Mountains Core Area to the south. On the east, the Park would be connected to the Shining Rock Core Area via a corridor along the Blue Ridge Parkway and the Tuckasegee River drainage. In the north the Park is separated from the Bald Mountains Core Area by Interstate 40. In addressing the tremendous barriers that this interstate imposes on migration at this particular point, serious consideration should be given to closing, relocating, or redesigning this section of Interstate 40. Indeed, such a barrier to species migration highlights the need for major changes in the transportation systems of the region.

8) **Bald Mountains Core Area.** This area extends from the Smoky Mountains northeast through the French Broad Ranger District of the Pisgah National Forest and the Nolichucky and part of the Unaka Ranger Districts on the Cherokee National Forest to Sam's Gap and Highway 19. The Appalachian Trail runs the length of this area, which includes Bald Mountain Ridge Scenic Area and Sampson Mountain Wilderness Area. A corridor would run north out of the complex along the Appalachian Trail following the southern tributaries of the Nolichucky River to the Pond Mountain/Iron Mountain Core Area.

This complex is highly fragmented by private lands, which should be acquired. It is bordered on the south by I-40 and on the North by Highway 23, which is currently being upgraded to Interstate standards (I-26).

9) **Black/Craggy Mountains Core Area.** This nearly 120,000 acre area encompasses the Craggy Mountains, Black Mountains, Jarret Creek, Mackey Mountain, and Woods Mountain areas on the Toecane and Grandfather Ranger Districts of the Pisgah National Forest, as well as Mount Mitchell State Park, the Asheville Watershed, the Woodfin Watershed, and parts of the privately owned Cane River Hunt Club.

Here are the highest mountains in eastern North America and some of the most significant old-growth forests in the Southern Appalachians. During a recent field hike in the Craggy Mountains, old-growth expert Robert Leverett measured a sugar maple 150 feet tall, although he cautioned that it was only a "preliminary measurement." It may only be 135 or 140 feet tall, still close to a world record. This area also contains circumneutral soils, which result in incredibly diverse plant communities. The old-growth coves within this complex are among the most diverse temperate forest communities in North America.

The complex is fragmented by Highway 221 and the Blue Ridge Parkway. Pavement runs to the very peak of Mount Mitchell. Again, the Parkway should be closed to motorized vehicles. This core area links with the Grandfather Mountain Core Area to the northeast through a corridor along the North Fork Catawba River.

10) **Grandfather Mountain Core Area.** This 130,000 plus acre complex comprises all of the eastern portion of the Grandfather Ranger District, the Julian Price/Moses Cone Memorial Parks, and the privately owned Grandfather Mountain. The Grandfather Ranger District portion includes Linville Gorge Wilderness, Harpers Creek, Lost Cove Creek, and Wilson Creek drainages. Linville Gorge hosts remnant old-growth forests along its incredibly steep slopes, with a high diversity of communities and species, including mountain golden heather, which occurs only in the Gorge. Julian Price Memorial Park contains good examples of the now rare Southern Appalachian highland bogs. These marsh-bogs are interspersed with small creeks and pools, hummocks, and higher rises with red spruce, hemlock, red maple, yellow birch, and white pine.

Grandfather Mountain itself is geologically and biologically spectacular, with rock outcrops over a billion years old, old-growth forests, many rare plants, and 16 species of salamanders. The area is held by Grandfather Mountain Inc., which has plans to develop several hundred acres of sensitive forest. Local conservationists are fighting to gain permanent protection for Grandfather Mountain.

The Grandfather Mountain Core Area is separated from the Pond Mountain/Iron Mountain Core Area to the north by about ten miles of private lands within Forest Service purchase boundaries. Fortunately this area is relatively undeveloped. The Elk and Watauga Rivers should be protected as biological corridors to link these areas.

11) **Pond Mountain/Iron Mountain Core Area.** This complex extends from the northern end of the Bald Mountains in the Unaka District of the Cherokee through the western sections of the Grandfather and Toecane Districts of the Pisgah and north through the Iron Mountains and Holston Mountain bordering the Mount Rogers Core Area. This area would connect with the Bald Mountains Core Area to the south via a corridor following the Appalachian Trail as well as the southern tributaries of the Nolichucky River. It would connect directly to the Mount Rogers Core Area in the north. However, since this connection is narrow, we are proposing a wide buffer zone around this direct link. The prompt protection of the Pond Mountain/Iron Mountain Core Area is crucial for rejoining the southern bear population to a more northern bear population coming down through the Jefferson National Forest. These populations are presently separated because of fragmentation from land development and hunting pressures (Jackson, 1989).

A number of protected areas already exist in the complex. Unaka Mountain, Pond Mountain, and Big Laurel Branch are designated Wilderness Areas. Unaka Mountain Scenic Area, Roan Mountain State Park, and Flint Mill Scenic Area also receive some protection. The Roan Mountain Special Management Areas in the Cherokee and Pisgah National Forests protect many unique plant populations. Indeed the whole Pond Mountain/Iron Mountain Core Area is home to a large number of rare plant species.

Despite the many protected areas in this complex, numerous roads fragment the area. These include U.S. Highways 19E, 321, 421, and 19W/23, which is being upgraded to Interstate standards as I26, State Highways 91, 133, 107/226, 67, 167, and 143.

12) **Mount Rogers Core Area.** This core area is currently fragmented by parts of Highways 58, 16, 21, and 94. The core reserve would extend to the purchase boundaries of the Mount Rogers National Recreation Area as well as encompassing the Grayson Highlands State Park and the Rogers Ridge Scenic Area and surrounding forest in the Cherokee National Forest, for a total size of over 150,000 acres. The proposed core already has three designated Wilderness Areas: Little Dry Run, Little Wilson Creek, and Lewis Fork. This core would connect in the south through a corridor with the Pond Mountain/Iron Mountain Core Area. It would connect in the north with the Brushy/Walker Mountain Core Area via the Middle Fork of the Holston River and its tributaries.

13) **Brushy/Walker Mountain Core Area.** This complex would run along mountain ridges parallel to and north of the Mount Rogers

Core Area. Geographically, this area lies in the Ridge and Valley Province adjacent to the Blue Ridge Mountains. It will help link the Ridge and Valley with the northern portion of the Blue Ridge. The Hungry Mother State Park is in the southwest section of the complex. The core would connect to the Beartown/Kimberling Creek Core Area via the North Fork of the Holston River. It would connect to the Mount Rogers Core Area via the Middle Fork of the Holston River and its drainages. This complex is bisected by Highways 16, 21/52, and 77.

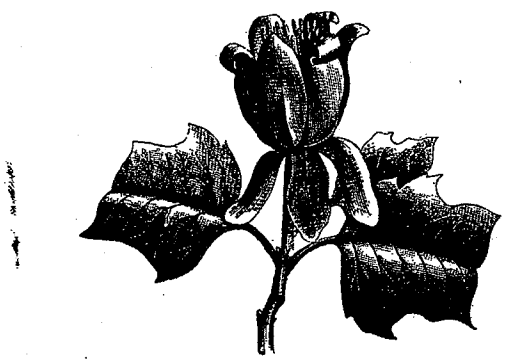
14) **Beartown/Kimberling Creek Core Area.** This area's borders would extend to the purchase boundaries of the Jefferson National Forest. It would encompass the existing Beartown and Kimberling Creek Wilderness Areas, and the Clinch Mountain Wildlife Management Area via a corridor along Tumbling Creek and Laurel Creek. Like the Brushy/Walker Mountain Core Area, this core area lies in the Ridge and Valley Province of the Southern Appalachians but is integral to our Blue Ridge proposal.

A corridor would connect this complex to the Brushy/Walker Mountain Core Area via the North Fork of the Holston River. In the northern section of this complex there would be a corridor via the New River and its tributaries to the Peter's Mountain Core Area. The complex is currently fragmented by Highways 91, 16, and 77.

15) **Peter's Mountain Core Area.** Highways 311 and 460 fragment this core area. The area would encompass most of the Blacksburg Ranger District to the south and all of the New Castle Ranger District to the north and would include the existing Peter's Mountain, Barbour Creek, and Mountain Lake Wilderness Areas. The northern tip of this core area would include a significant amount of private land within the National Forest purchase boundaries. This is our third core area in the Ridge and Valley Province.

A corridor via the New River and its drainage system would connect the southern end of the core area to the Beartown/Kimberling Creek Core Area. In the northern section of the core area would be a corridor via the James River to the James River/Thunder Ridge Core Area. This core area would connect with our larger Southern Appalachian Proposal directly at the George Washington National Forest boundary.

16) **James River/Thunder Ridge Core Area.** The Blue Ridge Parkway runs through the middle of this complex. As in other areas of the region the Parkway should be closed to motorized traffic and protected as a biological corridor, open to hiking, biking, and horseback riding. Highway 43 bisects this complex as well. The James River/Thunder Ridge Core would extend to the purchase boundaries of the Glenwood Ranger District. The northern end of the complex would connect directly to the Central Appalachians at the George Washington National Forest. In the western section of the complex there would be a corridor via the James River to the Peter's Mountain Core Area.



SouthPAW's Broader Southern Appalachian Bioregion Proposal

We must consider the natural history of the region and the ecological needs of the wildlife and the landscape, rather than continuing to ask, "What is politically realistic in the context of industrial America?".... We must consider the whole system, not what sort of a compromise we can sneak through Congress.

—*Jamie Sayen (1990),* Towards a Restoration Ethic

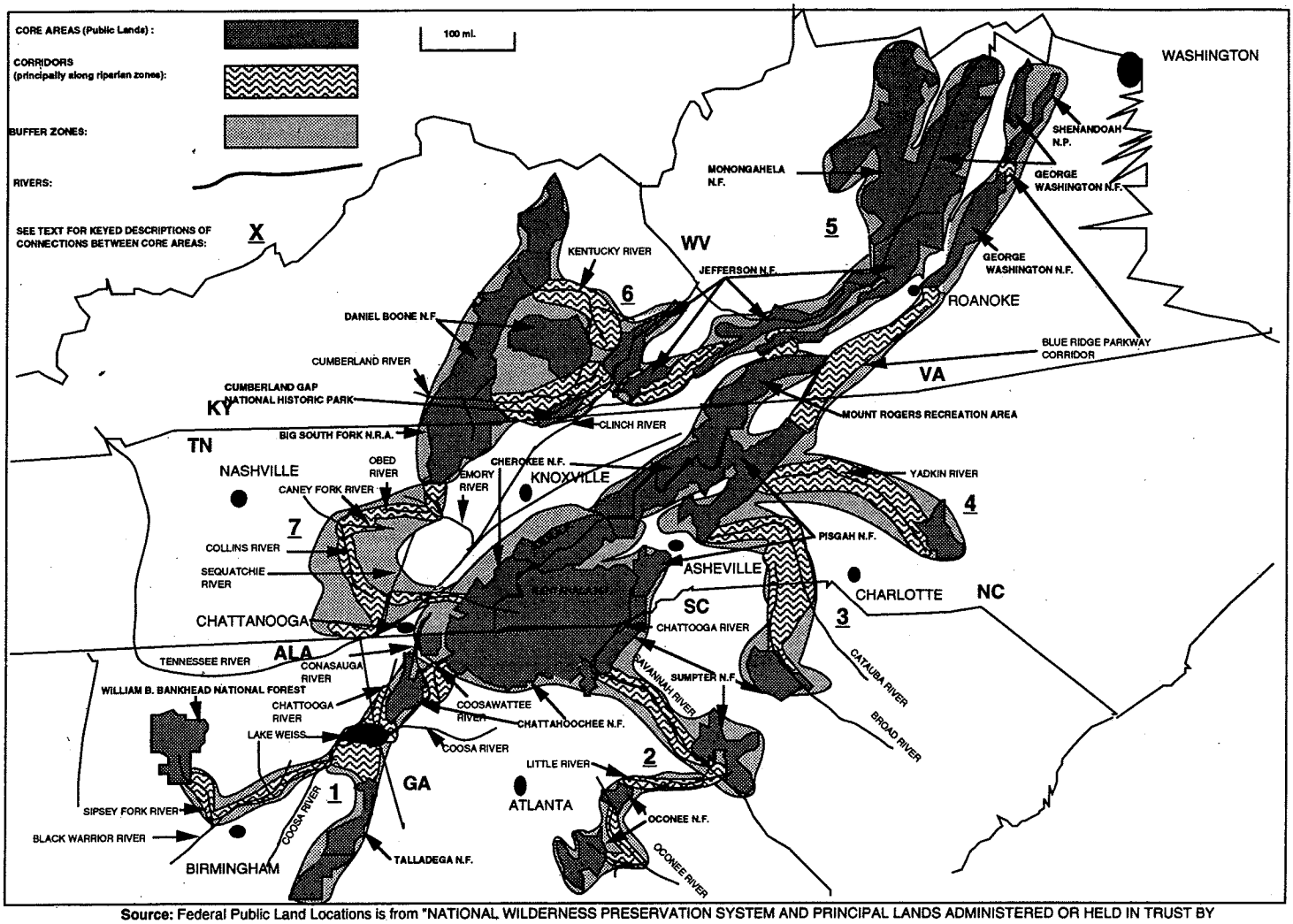
The Southern Appalachian Bioregion is a larger region that includes the Blue Ridge Province, and to the west of the Blue Ridge Mountain chain the southern portion of the Ridge and Valley Province, which is typified by alternating ridges and valleys. Also included in the Southern Appalachian Bioregion is the southern portion of the Appalachian Plateau farther west of the mountains. This province is a structural plateau deeply cut by streams and includes the Allegheny Mountains, the Cumberland Mountains, and the Cumberland Plateau. Also included in the bioregion is the southern portion of the upland Piedmont, which is a plain east of the Blue Ridge Mountains underlain with resistant crystalline rock and characterized by rolling, gentle slopes and relatively shallow river valleys (Raitz, 1984).

Because of its less rugged terrain, much of the Southern Appalachians outside the Blue Ridge has been more developed and fragmented. Also, the rest of the Southern Appalachian Bioregion has a much lower proportion of its land in public ownership than has the Blue Ridge. Thus, putting together a system of biodiversity cores and corridors for the whole bioregion will take longer. Building on the core and corridor system that should have already been protected in the Blue Ridge Province, we can expand this system out into the surrounding provinces. Most or all of the public lands within the Southern Appalachians should be managed for maximum native biodiversity as core and corridor areas. High priority inholdings and border areas, especially within purchase boundaries, should be acquired and included in these core and corridor areas. After careful consideration of the long-term evolutionary needs of all native species of the region, additional areas of private land should be acquired or zoned for uses compatible with the long-term health and evolution of all native species.

Many details of a viable reserve system for the Southern Appalachians are not yet clear. However, looking at existing public lands, the broad outlines begin to emerge (see Fig 3).

1) Beginning at the southern tip of the Blue Ridge Mountains there would be a corridor connecting our proposed Cohutta/Big Frog Core Area to the northern half of the Talladega National Forest in Alabama. Coming south out of the Cohutta and Toccoa Ranger District of the Chattahoochee, a corridor via the Coosawattee River, the Conasauga River and their tributaries would connect to the Armuchee Ranger District, the southernmost district of the Chattahoochee National Forest. From the Armuchee the corridor would continue via the Chattooga River into Lake Weiss. From there the corridor would follow the Coosa River connecting through a land corridor north of Gadsden, Georgia to the

FIG.3: PROPOSED SYSTEM OF LINKED CORE AREAS, CORRIDORS, AND BUFFER ZONES IN THE SOUTHERN APPALACHIAN BIOREGION



Source: Federal Public Land Locations is from "NATIONAL WILDERNESS PRESERVATION SYSTEM AND PRINCIPAL LANDS ADMINISTERED OR HELD IN TRUST BY FEDERAL AGENCIES: APRIL 1, 1978, USGS MAP PREPARED FOR THE USFS, 1978

northern half of the Talladega National Forest.

2) Coming out of the Highlands Ranger District of the Nantahala National Forest a corridor down the Chattooga Wild and Scenic River (not to be confused with the other Chattooga River in #1 above), would connect with the Savannah River and continue to the southern districts of the Sumter National Forest. Coming out of the Sumter National Forest, a corridor along the Little River and the Oconee River would connect to the Oconee National Forest.

3) Coming out of the Black/Craggy Mountains Core Area of the Pisgah National Forest, the Catawba River drainage would connect with the Broad River drainage and follow the river as a corridor to the northern districts of the Sumter National Forest.

4) A corridor leading east out of the Grandfather Mountain Core Area of the Pisgah National Forest would follow the Yadkin River through the Piedmont area of North Carolina connecting to the Uwharrie National Forest.

5) In the northeast of the Southern Appalachian Bioregion, the Peter's Mountain Core Area and the James River/Thunder Ridge Core Area link directly with the George Washington National Forest. In the northwest the Peter's Mountain Core Area links directly to the Monongahela National Forest. Converting the Blue Ridge Parkway into a biodiversity corridor would connect the Jefferson National Forest to Shenandoah National Park and the George Washington National Forest. These would be the connections to core areas of the Central Appalachians.

6) The Beartown/Kimberling Creek Core Area of the Jefferson National Forest would connect to the Clinch Ranger District of the Jefferson following a corridor leading southwest along the Clinch River. From the Clinch Ranger District, a corridor would lead northwest following tributaries of the Kentucky River into the Daniel Boone National Forest. A corridor would lead to the southwest from the Clinch Ranger District following the Cumberland River and its tributaries, encompassing Cumberland Gap National Historic Park and connecting with the southern section of Daniel Boone National Forest. The Daniel Boone National Forest connects directly with the Big South Fork National Recreation Area in Kentucky and Tennessee.

7) The Cohutta/Big Frog Core Area would connect via the Hiwassee River to the Sequatchie Valley area and through the valley to the Cumberland Plateau. The corridor would continue north on the plateau, following sections of the Collins, Caney Fork, and Obed Rivers to connect with the southern section of the Big South Fork National Recreation Area. This corridor would encompass Savage Gulf State Natural Area, Rock Island State Rustic Park, and Catoosa Wildlife Management Area.

Connecting with other Big Wilderness

Once core areas with buffer zones and connecting corridors have been established within the Southern Appalachians, the next step will be to make connections with the Central Appalachians, the Tennessee River Watershed, the Atlantic Coast, the Ohio River Valley, and the Florida Peninsula. These corridors would primarily follow existing natural areas, riparian zones, and mountain chains.

The Blue Ridge Reserves and the encompassing Southern Appalachian Bioregional Reserves proposed here would expand upon the original PAW Proposal (Sayen, 1987). This PAW proposal advocates a system of wilderness habitat the length of the Appalachian Mountains using the Appalachian Trail as its backbone. As envisioned by Jamie Sayen, the proposal's author:

A continuous wild habitat the length of the Appalachian Range could provide the first requirement for wilderness, space, and in time enable the return of unique plants and large animals—panthers, bears, wolves moose—that have been exterminated throughout all or parts of the mountain chain....

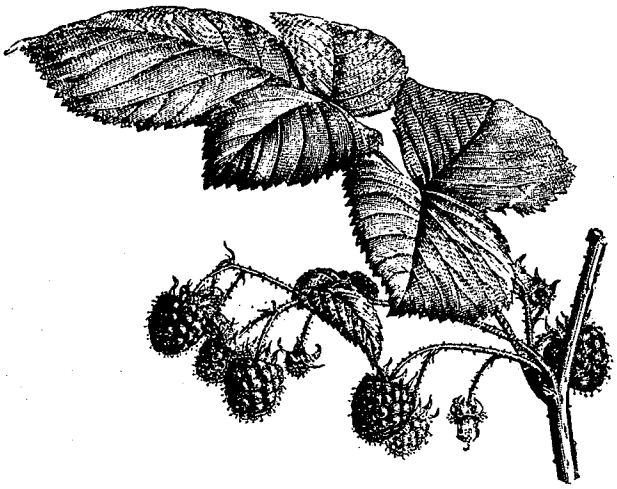
Wild areas along the Appalachian Trail must be expanded, buffered, and protected in perpetuity as wilderness. Only then will the backbone support the weight of the massive wild areas throughout the reaches of Turtle Island which will be joined to the Appalachian Trail 'wilderness backbone' by means of wild, natural corridors.

Raccoon Tracks *by Heather K. Lenz*

RESTORING BIOREGIONAL ECOLOGICAL INTEGRITY

Meanwhile, to further protect the ecological integrity of the Southern Appalachian Bioregional Reserves and to heal the human communities in the region, SouthPAW proposes the following:

1) Create a regional economy based on organic agriculture and truly sustainable use of forest products. Strive to become regionally self-sufficient. Promote physical and spiritual healing and low-impact recreation as appropriate ways for humans to interact with the land.
2) Redesign the transportation system based on the ecological and evolutionary needs of native plants and animals. Close roads wherever possible. Relocate transportation corridors, especially major highways, to lessen their impact on the natural movement of animals and to remove barriers to long term migration and gene exchange of plant and animal populations. Where highways and other transportation corridors must cross migration routes, lessen their impact through tunneling, wildlife viaducts, and other innovative designs. Favor public mass transportation.
3) Stop "acid rain" and other toxic atmospheric pollutants that are straining Appalachian forest communities.
4) Halt the dissemination of pollutants that are contributing to global climate change, including chemicals that are also depleting the upper-level ozone shield.
5) Bring the human population and the technology we utilize to levels within the region's carrying capacity for our species. First steps are:
   - passing a moratorium on paving and road-building in the region,
   - prohibiting further intrusions by the centralized power grid,
   - outlawing degradation of the region's water bodies,
   - banning new dams,
   - recycling and composting solid wastes and banning waste incineration.
6) Simplify our lives to reduce our resource requirements.
7) End our dependence on unsustainable fuel sources. Nuclear and fossil fuels must go! Design our living to reduce transportation and develop "softer" means of power generation.
8) Encourage a movement to reestablish the cultural heritage and traditional identity of the Cherokee Nation with a goal of tribal autonomy.
9) Encourage individual, family, community, and regional self-reliance to free ourselves from bureaucracy and state coercion.
10) Encourage a spiritual reawakening to the One Great Life, of which we are all a part, to reconnect ourselves to the sacred nature of the Earth and the spirits of all living things. We will find that in serving the needs of habitat and the demands of other species as represented in the creation, restoration, and maintenance of the bioregional reserve, our own lives and society will be transformed in the process.



SouthPAW is the southern extension of the Preserve Appalachian Wilderness (PAW) network/vision. SouthPAW receives resource support from the Foundation for Global Sustainability's Forest Protection/ Biodiversity Project based in Knoxville, Tennessee. The Forest Protection/Biodiversity Project through SouthPAW monitors the activities of the Forest Service in the six National Forests surrounding the Great Smoky Mountains National Park. SouthPAW works to educate the public about forest fragmentation and loss of biodiversity on both public and private lands. SouthPAW has established a five-state activist network to monitor and respond to Forest Service plans which damage the Southern Appalachian Bioregion. The authors welcome and encourage comment on this developing proposal. Those wishing to support the SouthPAW vision and the work of Global Sustainability's Forest Protection/Biodiversity Project are encouraged to contact:

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A Northern Rockies Proposal for Congress

by Mike Bader

Over four decades ago, Aldo Leopold, the father of the modern conservation movement stated, "the first step in intelligent tinkering is to save all the parts." Throughout the North American continent, we've failed to heed Leopold's timeless advice.

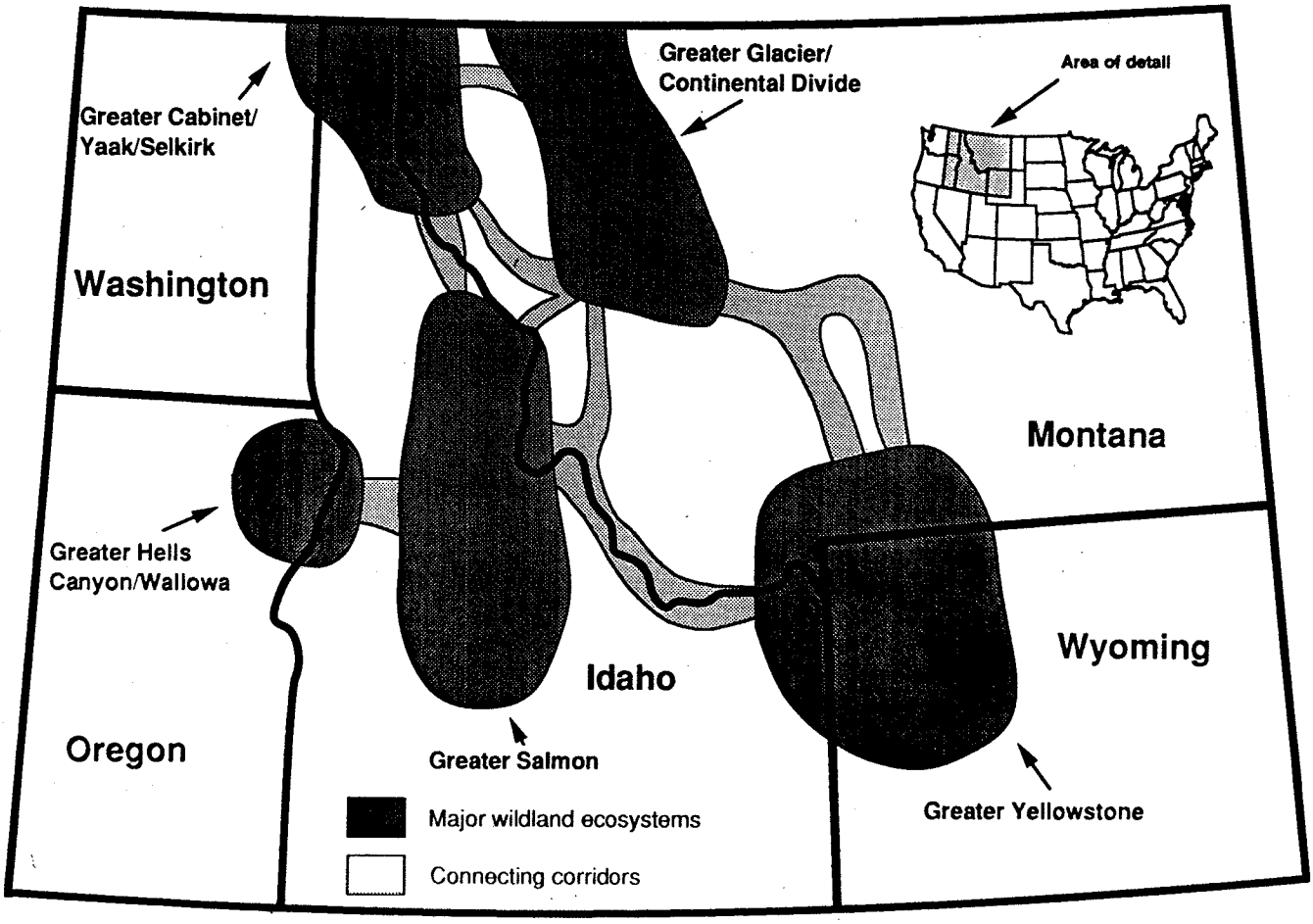
The Northern Rockies Ecosystem Protection Act (NREPA), a product of countless individuals covering decades of thought and action, attempts to put an end to the outmoded concept of wilderness protection malingering in the halls of Congress and the offices of many mainstream conservation groups. Sponsored in the US House of Representatives by Representative Peter Kostmayer (D-PA), NREPA would implement protective designations for over 20 million acres of public lands in the Northern Rockies. NREPA is a first response to an emergency situation brought about by decades of road-building, clearcutting, mining, and other developments.

The Northern Rockies contain virtually the full complement of native species that were here nearly two hundred years ago at the time of the Lewis and Clark Expedition. High profile species include grizzly bears, gray wolves, woodland caribou, lynx, wolverine, bison, moose, bighorn sheep, mountain goats, mountain lions, several species of anadromous salmon and trout, bull trout, eagles, and trumpeter swans. Rare plants and a host of others both known and unknown are here too. Most of the biological "parts" that Leopold spoke of remain—in an incredible diversity of landscapes ranging from high cactus desert to temperate rainforest. Yet today, most of the key indicators of ecosystem health and stability are on the federal Threatened and Endangered species lists, with more headed that way.

Traditionally, wilderness legislation has passed Congress based on several anti-wilderness precepts. First, all designations are made according to arbitrary political boundaries, such as state lines or administrative boundaries. Second, lands eligible for Wilderness designation are lands in which extractive industry has no interest or prior claims. Third, Wilderness designations conform to subjective determinations of what constitutes nice scenery and recreational opportunity. This often means high alpine "rocks and ice," allowing for a "snapshot" approach to wildlands protection, since these high alpine areas are predictable in appearance over several decades. Little or no consideration at all is given to the ecological significance of a land area, or what role that land area plays in a greater ecosystem or bioregion. And fourth, any analysis of the economic values of the landscape assess only the commercial extractive values, such as timber jobs and the local tax base. Virtually no assessment is made of the economic value of wildlands left in their natural condition in perpetuity, even though such analyses do exist.

The key purpose of the Northern Rockies Ecosystem Protection Act is protection of native biodiversity. It would protect five major ecosystems—Greater Glacier, Greater Yellowstone, Greater Salmon, Greater Hells Canyon/Wallowa, and Greater Cabinet/Yaak/Selkirk—and interconnecting linkages, allowing for genetic interchange and landscape-scale disturbances such as wildfires, which can occur across millions of acres in just one season.

The designations made by NREPA would be made without regard to arbitrary political boundaries such as state borders. NREPA covers parts of five states: Idaho, Montana, Wyoming, Oregon and



U.S. portion of the Northern Rockies Bioregion, its five major ecosystems and connecting corridors.

Washington. Since the bill was drafted for introduction in the US Congress, only lands south of the US/Canada border are included. However, efforts are under way to seek a NREPA counterpart in the Canadian Parliament and the provincial governments of British Columbia and Alberta. International treaties could also provide protection of international wildland resources.

Several criteria used in the formation of NREPA are closely aligned with those presented by Dr. Reed Noss. These include the concept of large core reserve areas, comprised mainly of Wilderness Areas and National Parks, where resource extraction is prohibited entirely.

An important purpose of NREPA is making sure that leading indicators of ecosystem health retain enough suitable, secure habitat to remain viable over the long-term. In the Wild Rockies (a popular name for the Northern Rockies) there are several indicator species. Two that have received extended scrutiny are the grizzly bear and the gray wolf, which are wide-ranging, low-density species. Recent geographic and population analysis has led population ecologist Dr. Lee Metzgar and myself (in press) to conclude that a ballpark figure of 2000 grizzly bears constitutes a viable population. An analysis of known densities of grizzly bears in the Northern Rockies produced a figure of about 4 bears per hundred square miles as a working figure for average density of a restored grizzly bear population in the Northern Rockies. Based on these data, secure habitat for a population of 2000 bears would be on the order of 50,000 square miles (32 million acres). Similar requirements are known for other wide-ranging, low-density species.

The good news is that publicly owned pristine habitat of this magnitude still exists in the Wild Rockies. The bad news is that it is not optimally located, but rather exists as isolated blocks that need secure linkages between them to ensure sufficient genetic interchange among the subpopulations of large predators. Further bad news is the development plans of the US Forest Service. At least 500 developments are planned for roadless areas in the Northern Rockies over the next five years. These are mainly road-building projects and associated timber sales. Unless NREPA or something like it is instituted in the near term, the wildlife treasures of the Northern Rockies will be lost.

NREPA would implement a wide array of protective designations for the five major ecosystems in the Northern Rockies and suitable corridors for movements of wild animals and plants. The Act would designate Wilderness Areas, Wild and Scenic Rivers, National Park and Preserve study areas, biological linkage corridors with special man-

agement provisions, and a new system of Wildland Recovery Areas. The linkage areas would protect existing roadless lands, and an aggressive road closure program within linkages would reduce open road densities to near zero. The multiple designations are designed to work in concert for ecosystem protection. For example, the Swan Crest/ Hungry Horse Reservoir area south of Glacier National Park would receive Wilderness designation for the roadless Swan Crest, maintaining existing wilderness lands, and a large recovery zone to rehabilitate heavily roaded and logged lands where habitat use by threatened and endangered species has been impeded and native fisheries degraded. The result would be restoration and maintenance of a major portion of the Greater Glacier (Northern Continental Divide) Ecosystem. The needs of key indicator species such as wolves, elk, and grizzly bears are taken into account. Ancient forests and pristine watersheds would be protected.

NREPA can be thought of as a peace treaty between humankind and nature. As is normal at the cessation of hostilities, reparations are in order. NREPA would start a pilot system of National Wildland Recovery Areas. These would be established in linkage corridors, once-prime fisheries and spawning grounds, and vital habitats that have been damaged by excessive roading, clearcutting, livestock grazing, and mining. Recovery Areas would be managed by a new branch of the Forest Service—the Wildlands Recovery Corps. Its mission would be to restore as much as possible the native vegetative cover and species diversity, stabilize slopes and soils to reduce erosion, close and revegetate unneeded roads, reestablish native fish spawning runs and fisheries, and restore linkage corridors.

NREPA contains 18 sections, including findings and purposes, a section for each of the land designations, and a section on implementation and monitoring of the Act after its passage. Traditionally, protection bills are passed and then forgotten, with little attention paid to whether or not the purposes of the act are ever achieved. NREPA directs that within three years following enactment, the Secretaries of Interior and Agriculture must submit a report to the appropriate Congressional committees detailing implementation of the act. The report, to be produced by a panel of independent scientists, would detail any additional work and funding necessary to achieve the purposes of the act.

NREPA would create an interagency team with an equal number from the private sector to monitor, evaluate, and make adjustments to insure long-term results prescribed by the act. The team would develop a geographic information system (GIS) for monitoring the Northern Rockies Bioregion. The GIS would be based on satellite data and would include comprehensive maps and databases in order to detect change in the following variables: vegetation cover, species occurrences and densities, direct human impacts, and water and air quality. The team would issue reports on the progress of corridor consolidation and forest recovery, as well as on the status of threatened and endangered species.

Wolf *by Nancy Roy*

NREPA recognizes the unique cultural and historical significance of these lands to Native Americans. Two sections protect cultural sites, and Native Americans' religious and spiritual uses of these lands.

NREPA not only enjoys strong scientific and grassroots citizen support, it also rests on a strong economic foundation. The Northern Rockies region has been plagued for years by boom and bust cycles of extractive exploitation, destabilizing our economy and leaving behind charred and twisted landscapes. Extensive research by Dr. Thomas Power (1992), chairman of the economics department at the University of Montana, shows that NREPA would have a beneficial effect on the regional economy. Protection of all remaining wildlands in the bioregion would affect only about 1300 timber jobs. When the indirect and induced effects of these direct job losses are taken into account, the total employment impact would be the loss of about 2800 jobs. At the current rates of job growth in the region, these jobs would be made up in about five to twelve weeks. Additionally, Power found that many jobs are tied to the pristine landscapes. People are attracted to the region because of its clean water, air, and wildlife. The part of the economy represented by extractive resource industries has been on a steady decline. The rest of the economy has been on a steady rise. Moreover, NREPA would provide new jobs repairing damaged landscapes.

A bill this large, based on the principles of conservation biology, would appear to be only a pipe dream. However, the bill has received widespread support

throughout the country. Over 200 organizations have endorsed NREPA, ranging from the Idaho Sportsmen's Coalition to Greenpeace to the Association of Forest Service Employees for Environmental Ethics. Tens of thousands of letters and cards were sent to Congress in support of the Act before it was even introduced! Top scientists support NREPA: Dr. John Craighead, Dr. Reed Noss, Dr. Maurice Hornocker, Dr. Lee Metzgar, and many others.

Despite the reluctance of the large Washington, DC based groups to embrace ecosystem protection for the Northern Rockies, several national group affiliates have endorsed NREPA including several Audubon Society chapters, the Wyoming and Oregon Wildlife Federations, and the Headwaters chapter of the Sierra Club. Grassroots wildland groups from throughout the bioregion have joined together, merging science and activism into a powerful force for ecosystem protection.

As NREPA moves forward for possible hearings early in 1993, it is receiving increasing attention from the national media. Rep. Kostmayer announced his intentions to sponsor the bill at a Washington, DC press conference in June. Held the morning of hearings on the Montana National Forest Management Act (an anti-wilderness bill), the press conference was the lead story that night on CNN, and was covered by radio, newspapers, and magazines. NREPA has also been featured, with maps, in the Christian Science Monitor, the Spokane Spokesman-Review, and in opinion pieces in major papers across the nation. Ecosystem protection is an idea becoming known to Americans.

However, old habits die hard. The mainstream national conservation organizations have still not endorsed NREPA, perhaps fearful of losing access to Western politicians, who are all anti-wilderness anyway. Members of Congress and their staffs have unleashed a smear and slander campaign against ecosystem activists. Some of the press have joined the attack. But the emerging grassroots conservation movement, armed with the new findings and concepts of conservation biology, is turning the tide. NREPA is designed not only to protect the biodiversity of the Northern Rockies, it is meant to do away with the whole archaic view of public lands legislation and management, relegating extractive uses of the public lands to the back of the bus, and putting the Leopold land ethic in the driver's seat.

Time is short, as the destruction of wildlands continues apace. Bold, visionary members of Congress must step forth to protect our national interest wildlands and save the biotic "parts" spoken of more than forty years ago by Leopold. Hard work lies ahead in building the support necessary to pass NREPA through Congress. Let's accomplish something that Aldo Leopold and all of us could be proud of.

Mike Bader is a founder of the Alliance for the Wild Rockies, Box 8731, Missoula, MT 59807.

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POSTSCRIPT

KOSTMAYER INTRODUCES NORTHERN ROCKIES ECOSYSTEM PROTECTION ACT

On September 9 Representative Peter Kostmayer (D-PA) introduced the Northern Rockies Ecosystem Protection Act. He was joined at a Washington DC press conference announcing the bill by co-sponsors Gerry Sikorski (D-MN), Jim Jontz (D-IN), and Sherwood Boehlert (R-NY), and singer Carole King, actor Stephen Baldwin, Alliance for the Wild Rockies executive director Mike Bader, and Greenpeace forest campaign director Peter Bahouth. The bill is also co-sponsored by Representative Arthur Ravenel (R-SC).

Kostmayer noted the historic importance of the bill: "This bill constitutes a radical departure from the state-by-state approach to wilderness protection ordinarily pursued by Congress. The Northern Rockies bill represents the first-ever attempt to deal with forest service management questions in a multi-state, ecosystem-wide approach. For the first time, the bill injects economic reality into what has become a massive porkbarrel program."

Sikorski added a hint of urgency: "The issue we have to remember is that all Americans own these lands...They don't belong to the timber companies, or the miners, or the politicians. If the American people saw what I saw from a helicopter and a plane, the endless draglines that have eroded into gully washes, the hundreds and hundreds of acres of clearcuts over the past 20 years that have never been replanted in any way, or unsuccessfully replanted, they would go absolutely ballistic. If the American people knew that their taxpayer dollars are subsidizing this destruction, they'd go thermonuclear."

The Alliance asks concerned citizens to write their representatives (U.S. House of Representatives, Washington, D.C. 20515) and ask them to co-sponsor the Northern Rockies Ecosystem Protection Act; and to write their senators (U.S. Senate, Washington, D.C. 20510) urging them to sponsor similar legislation in the Senate.

Post-Postscript: Unfortunately, three of the NREPA co-sponsors, Reps. Jontz, Kostmayer, and Sikorski, lost their reelection bids. The Aliance for the Wild Rockies is working to find new sponsors in the next session of Congress. Letters to legislators are urgently needed.

Coming In To The Watershed

watershed: 2. The whole region or area contributing to the supply of a river or lake; drainage area.
—Webster's New Collegiate Dictionary

by Gary Snyder

In February of 92 Jeff Lustig asked me to give the keynote talk for the annual conference of the Center for California Studies based at Sacramento State University. The theme of the conference was "dancing on the edge"—of ecological breakdown, social confrontations, and versions of history. I wanted to look again at the question of engagement with place, and speak of bioregional and watershed organizing as ways to get down, get on the ground, and make "biodiversity" and public lands issues walk, not just talk. Although framed in terms of California, the same points can be made for the whole country. The possibility of Watershed Councils becoming the building blocks of a continent-wide bioregional/ecosystem governance has broad relevance. Recovering wilderness in North America must start with grassroots (tree roots, sagebrush roots. . .) people and their communities.

BIOLOGICAL AND CULTURAL DIVERSITY IN OUR CALIFORNIA HABITAT

The question of "place" is curiously cogent to our present political, social, and environmental condition. Economically we're in misery, politically we are hopelessly stagnant, educationally we're a disgrace, and socially we are watching the emergence of a multi-racial multi-ethnic population that will radically shape the future direction of the culture of our country. We are also seeing the reemergence of a crude racism and chauvinism that may destroy us all. As for the land itself we see fine agricultural soils and orchards being steadily converted by real estate development. The publicly owned forests of the West are being overcut, and the long-range effects of erosion and air pollution raise the very real possibility of their gradual slide from productive forest lands to steady-state brushfields. There's a parallel deterioration of grasslands and semi-desert. Yet, at the same time it looks as though non-indigenous North Americans are on the verge of discovering—for the first time—their place. People are slowly coming to the realization that they can become members of the deep old biological communities of the land in a different kind of citizenship.

In February my son Gen and I were visiting friends in Arcata and Crescent City on the north coast of California. We drove north from Marysville—through that soulful winter depth of pearly tule fog—paralleling the Feather and then crossing the Sacramento at Red Bluff. From Red Bluff north the fog began to break, and by Redding we had left it behind. As we crossed the mountains westward from Redding on 299 we paid special attention to the transformations of the landscape and trees, watching to see where the natural boundaries could be roughly ascertained. From the great valley with its tules, grasses, valley oak and blue oak, we swiftly climbed into the steep and dissected Klamath range with its ponderosa pine, black oak, and manzanita fields. Somewhere past Burnt Ranch we were in the redwood and doug-fir forests—soon it was the coastal range. Then we descended past Blue Lake to come out at Arcata.

We drove on north. Just ten or fifteen miles from Arcata, around Trinidad Head, the feel of the landscape subtly changed again—much the same trees, but no open meadows, and a different light. At Crescent City and again Manila we asked friends Jim Dodge (the novelist) and poet Jerry Martien just what the change between Arcata and Crescent City was. They both said

The watershed is the first and last nation, whose boundaries, though subtly shifting, are unarguable. Races of birds, subspecies of trees, and types of hats or rain gear go by the watershed. The watershed gives us a home, and a place to go upstream, downstream, or across in.

landscape by Rose Craig

(to distill a long discussion), "You leave 'California.' Right around Trinidad Head you cross into the maritime Pacific Northwest." Even though the political boundary is many miles yet to the north.

So we had gone in that one afternoon's drive from the Mediterranean-type Sacramento Valley climate, with its many plant alliances toward the Mexican south, over the interior range with its dry pine forest hills, into a uniquely Californian set of redwood forests, and on into the maritime Pacific Northwest: the edges of four major areas. These boundaries are not hard and clear, though. They are porous, permeable, arguable. They are boundaries of climates, plant-communities, soil-types, styles of life. They change over the millennia, moving a few hundred miles this way or that. A thin line drawn on a map would not do them justice. Yet such are the markers of the natural nations of our planet, and they establish real territories with real differences, to which our economies and our clothing must adapt.

On the way back we stopped at Trinidad Head for a hike and a little birding. Although we knew they wouldn't be there until April, we walked out to look at the cliffs on the Head, where tufted puffins nest. This is virtually the southernmost end of the tufted puffins' range. Their more usual nesting ground is from Southeast Alaska through the Bering Sea and down to northern Japan. In winter they are far out in the open seas of the North Pacific. At this spot, Trinidad, we could not help but feel that we touched on the life-realm of the whole North Pacific and Alaska. We spent that whole weekend enjoying "liminality" and dancing on the brink of the continent.

I have taken to watching the subtle changes of plants and climates as I travel over the West. This vast area called "California" is large enough to be beyond any one individual's ability to travel it and take it all into imagination clearly enough to see the whole picture. Michael Barbour, a botanist at UC Davis, is bringing out a book to be called *California's Changing Landscapes*. He writes of the complexity of California: "of the world's 10 major soils, California has all 10...As many as 375 distinctive natural communities have been recognized in the state...California has more than 5000 kinds of native ferns, conifers, and flowering plants. Japan has far fewer species with a similar area. Even with four times California's area, Alaska does not match California's plant diversity, and neither does all of the central and northeastern United States and adjacent Canada combined. Moreover about 30% of California's native plants are found nowhere else in the world."

But all this talk of the diversity of California is a trifle misleading. Of what place are we speaking? What is this "California?" It is, after all, a recent human invention with straight-line boundaries that were drawn with a ruler on a map and rushed off to an office in DC. This is another illustration of Robert Frost's lines, "The land was ours before we were the land's." The political boundaries of the Western states were established in haste and ignorance. Landscapes have their own shapes and structures, centers and edges, which must be respected. If a relationship to a place is like a marriage, then the Yankee establishment of a jurisdiction called California was like a shotgun wedding with six sisters taken as one wife.

California is made up of what I take to be about six regions. (The numbers could be argued, but the main outlines of agreement will remain.) They are of respectable size and native beauty, each with its own makeup, its own mix of bird calls and plant smells. Each of these proposes a slightly different life style to the human beings who live there. Each led to different sorts of rural economies—for the regional differences translate into things like raisin grapes, wet rice, timber, and cattle pasture.

The central coast with its little river-valleys, beach dunes and marshes, and oak-grass-pine mountains is one region. The Great Central Valley is a second, once dominated by swamps and wide shallow lakes and sweeps of valley oaks following the streams. The long mountain ranges of the Sierra Nevada are a third. From a sort of Sonoran chaparral they rise to arctic tundra. In the middle elevations they have some of the finest mixed conifer forests in the world. The Modoc plateau and volcano country—with its sagebrush and juniper—makes a fourth. Some of the Sacramento waters rise here. The fifth is the northern coast with its deep interior mountains—the Klamath region—reaching (on the coast) as far north as Trinidad Head. The sixth of these six sisters is the coastal valleys and mountains south of the Tehachapis, with natural connections on into Baja. Although today it supports a huge population with water drawn from the Colorado River, the Owens Valley, and the Great Central Valley, it is naturally almost a desert.

One might ask what about the rest? Where are the White Mountains, the Mojave Desert, the Warner Range? They are splendid places, but they do not belong with California. Their watersheds and biological communities belong to the Great Basin or the lower Colorado drainage, and we should let them return to their own families. Almost all of core California has a summer-dry Mediterranean climate, with (usually) fairly abundant winter rain. More than anything else, this rather special type of climate is what gives our place its fragrance of oily aromatic herbs, its olive-green drouth-resistant shrubs, and its patterns of rolling grass and dark forest.

I am not arguing that we should instantly re-draw the boundaries of the social construction called California, although that could happen some far day. We are becoming aware of certain long-range realities, and this thinking leads toward the next step in the evolution of human citizenship on the North American continent. The usual focus of attention for most Americans is the human society itself with its problems and its successes, its icons and symbols. With the exception of most Native Americans and a few non-natives who have given their hearts to the place, the land we all live on is simply taken for granted—and proper relation to it is not taken as part of "citizenship." But after two centuries of national history, people are beginning to wake up and notice that the United States is located on a landscape with a severe, spectacular, spacey, wildly demanding, and ecstatic narrative to be learned. Its natural communities are each unique, and each of us, whether we like it or not—in the city or countryside—live in one of them. When enough people get that picture, our political life will begin to change, and it will be the beginning of the next phase of American life, coming to live on " Turtle Island."

✥

Those who work in resource management are accustomed to looking at various maps of the West, each of which addresses a rich set of meanings. Land ownership categories give us (in addition to private land) Bureau of Land Management lands, National Forests, National Parks, State Parks, military reserves, and a host of other public holdings. The idea of public domain is descended from the historic institution of the Commons in Europe. These lands host much of the water, forest, and wildlife that is left to us. Although they are in the care of all the people, they have been too often managed for special interests.

Conservationists have been working since the 1930s for the preservation of key blocks of public land as wilderness. There has been some splendid success in this effort, and we are all indebted to the single-minded (and often unpaid) dedication of the people who are behind every present-day Wilderness Area that we and our children walk into, take heart in. Our growing understanding of how natural systems work brought us the realization that an exclusive emphasis on disparate parcels of land ignored the insouciant freeness of wild creatures. Although individual islands of wild land serving as biological refuges are invaluable, they cannot of themselves guarantee the maintenance of natural variety. As biologists, public land managers, and the involved public have all agreed, we need to know more about how natural systems work at larger scales, and find "on the ground" ways to connect wild zone to wild zone wherever possible. Thus the notion of biological corridors or connectors. The Greater Yellowstone Ecosystem concept came out of this sort of recognition. Our understanding of nature and our practice in regard to it has been radically altered by systems theory. Specifically, systems theory as it comes through the science of Ecology, and in particular the very cogent sub-disciplines called Island Biogeography and Landscape Ecology. They provide some extraordinary detail to fill out the broader generalization that comes both from John Muir and the 8th century AD Chinese Buddhist philosophers, " Everything is connected."

No single group or agency could keep track of or take care of grizzly bears, which do not care about park or ranch boundaries and have ancient territories of their own. A recognition that habitat flows across private and public land is needed to provide the framework for the "management" of bears, owls, or redwoods. A definition of place unencumbered by the illogical boundaries of states and counties is essential. Such a territory would have its own functional and structural coherence. It often might contain or be a watershed system. It would usually be larger than a county, but smaller than a western U.S. state. One of the names for such a space is "bioregion." The concept is basic and sensible, that of the simple fact of naturally observable regions.

COLORS OF THE LAND, COLORS OF THE SKIN

The word "bioregion" has thus begun to be common vocabulary in California, but in a context of some dubiousness. A group of California-based federal and state land managers trying to work together on biodiversity problems saw that it must be done in terms of natural regions. Their "memorandum of understanding" calls for us to "move beyond existing efforts focused on the conservation of individual sites, species, and resources. . . to also protect and manage ecosystems, biological communities, and landscapes." The memorandum goes on to say that "public agencies and private groups must coordinate resource management and environmental protection activities, emphasizing regional solutions to regional issues and needs." The group identified 11 or so such working bioregions within California, making the San Francisco Bay/Delta into one, and dividing both the Sierra and the Valley into northern and southern portions. There are lumpers and there are splitters. It is entirely appropriate that the heads of the BLM, the Forest Service, Fish and Wildlife Service, California Department of Fish and Game, California Department of Forestry, and such should take these issues on: almost 50% of California is public domain.

Hearing about this agreement, some county government people, elected officials, and timber and business interests in the mountain counties went into a severe paranoid spasm, fearing—they said—new regulations and more centralized government. An anonymous circular made its way around towns and campuses in northern California under the title "Biodiversity or New Paganism?" It says that "California Resource Secretary Doug Wheeler and his self-appointed bioregional soldiers are out to devalue human life by placing greater emphasis on rocks, trees, fish, plants, and wildlife." It quotes me as having written that "Those of us who are now promoting a bioregional consciousness would, as an ultimate and long-range goal, like to see this continent more sensitively redefined, and the natural regions of North America—Turtle Island—gradually begin to shape the political entities within which we work. It would be a small step toward the deconstruction of America as a super power into seven or eight natural nations—none of which have a budget big enough to support missiles." I'm pleased to say I did write that. I'd think it was clear that my statement is not promoting more centralized government, but these gents want both their small town autonomy and the Military-Industrial State at the same time. Many a would-be Westerner is a "libertarian" in name only, and will scream up a storm if taken too far from the government tit. The real intent of the circular seems to be—as it urges people to write the state Governor—to resist long-range sustainability and the support of biodiversity, and to hold out for maximum resource extraction.

As far as I can see, the intelligent but so far toothless California "bioregional proposal" is simply a basis for further thinking and some degree of cooperation between agencies. The most original part is the call for the formation of "bioregional councils" that would have some stake in decision-making. Who would be on the bioregional councils is not spelled out. Even closer to the roots, the memorandum that started all this furor suggests that "watershed councils" be formed, which would be the truly local bodies that could help design agreements for the preservation of natural variety. Like, let's say, helping to preserve the spawning grounds for the wild salmon that still come (amazingly) into the lower Yuba River gravel wastelands. This effort would have to involve a number of groups and agencies, and would have to include the blessing of the usually development-minded Yuba County Water Agency.

The term "bioregion" was adopted by the signers to the Memorandum on Biological Diversity as a technical term from the field of biogeography. I'm sure they couldn't have known that there were already groups of people around the United States and Canada talking in terms of bioregionally-oriented societies. They could not have known about the first North American Bioregional Congress held in Kansas in the late 80s, and subsequent gatherings right down to a "Shasta Nation" (northern California) gathering held last September in the Napa Valley. (Continent-wide gatherings have dropped the name North America and refer to our larger place as "Turtle Island," after the Native American creation myth.) They had no idea of the twenty-year history of community and ecology-minded dwellers-in-the-land living in places called "Ish" (Puget Sound and lower British Columbia) or "Columbiana" (upper Columbia River) or "Mesechabe" (lower Mississippi), or "Shasta" (northern California), all of whom had periodicals, field trips, gatherings, and were active in local politics.

That "bioregion" was an idea already in circulation was the bad, or good, luck of the biodiversity agreement people, depending on how you look at it. As it happens, the bioregional people are also finding "watershed councils" to be the building blocks of a long-range strategy for social and environmental sustainability.

A watershed is a marvelous thing to consider: This process of rain falling, streams flowing, and oceans evaporating causes every molecule of water on Earth to make the complete trip once every two million years. The surface is carved into watersheds—a kind of familial branching, a chart of relationship, and a definition of place. The watershed is the first and last nation, whose boundaries, though subtly shifting, are unarguable. Races of birds, subspecies of trees, and types of hats or rain gear go by the watershed. The watershed gives us a home, and a place to go upstream, downstream, or across in.

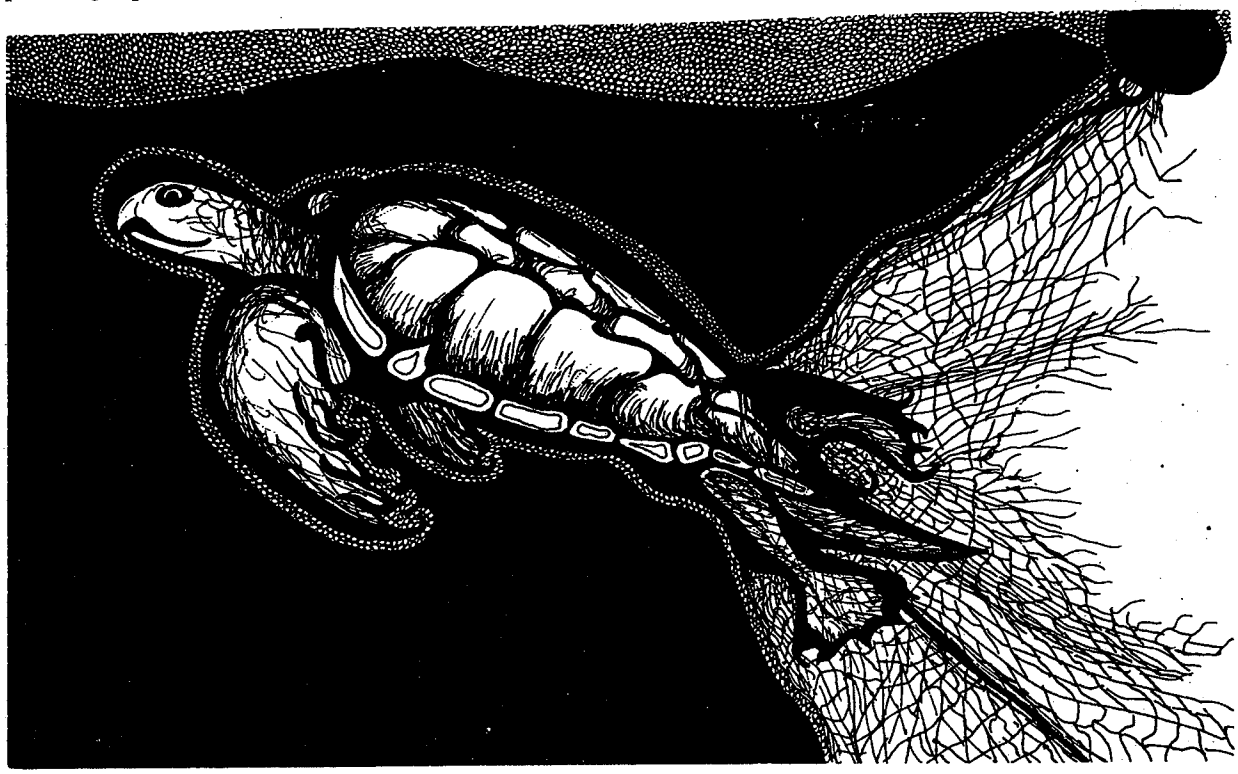


illustration by Jim Nollman

For the watershed, cities and dams are ephemeral, and of no more account than a boulder that falls in the river, or a landslide that temporarily alters the channel. The water will always be there, and it will always find its way down. As constrained and polluted as it is at the moment, it can also be said that in the larger picture the Los Angeles River is alive and well under the city streets, running in giant culverts. It is possibly amused by such diversions. But we who live in terms of centuries rather than millions of years, must hold the watershed and its communities together, that our children might enjoy the clear water and fresh life of this landscape we have chosen. From the tiniest rivulet at the crest of a ridge, to the main trunk of a river approaching the lowlands, the river is all one place, and all one land.

The water cycle is our springs and wells, our Sierra snowpack, our irrigation canals, our carwash, and the spring salmon run. It's the spring peeper in the pond and the acorn woodpecker chattering in a snag. It's where our friends live, it *is* our friends. The watershed is beyond the dichotomies of orderly/disorderly, for its forms are free, but somehow inevitable. And the life that comes to flourish within it constitutes the first kind of community.

The agenda of a watershed council starts in a modest way: like saying "Let's try and rehabilitate our river to the point that wild salmon can successfully spawn here again." In pursuit of this local agenda, a community might find itself combating clearcut timber sales upstream, water-selling grabs downstream, Taiwanese drift-net practices out in the North Pacific, and a host of other national and international threats to the health of salmon. A small but significant number of watershed councils are already in existence, fully awake and conscious, with some strong views about what should be done. These include the Friends of the Los Angeles River, the Putah Creek Council, the Yuba Watershed Institute, The Greenwood Watershed Association, The Redwood Coast Watersheds Alliance, and the Mattole Restoration Council.

They are ready and willing to play ball with the California BLM, the State, the Pacific Southwest Region office of the Forest Service, and the others who signed the 1991 Agreement for a "coordinated regional strategy for saving biological diversity in California." If a wide range of people join this effort—people from timber and tourism, settled ranchers and farmers, fly-fishing retirees, the businesses and the forest-dwelling new settlers—something might come of it. But if this joint agreement is implemented as a top-down prescription it will go nowhere. Only a grassroots engagement with long-term land issues can provide the political and social stability needed to keep the biological richness of California's regions intact.

All public land ownership is ultimately written in sand. The boundaries and the management-categories were created by Congress, and Congress can take them away. The only "jurisdiction" that will last in the world of nature is the watershed, and even that changes over time. If public lands come under greater and greater pressure to be opened for exploitation and use in the 21st century, the local people, the watershed people, will prove to be the last and possibly most effective line

of defense. Let us hope it never comes to that.

The mandate of the public land managers and the Fish and Wildlife people inevitably directs them to resource concerns. They are proposing to do what could be called "ecological bioregionalism." The other movement could be called "cultural bioregionalism." I would like to turn my attention now to cultural bioregionalism and to what practical promise these ideas hold for *fin de millennium* America.

Living in a place. The notion has been around for decades, and has usually been dismissed as provincial, backward, dull, and possibly reactionary. But new dynamics are at work. The mobility that has characterized American life is coming to a close. As Americans begin to stay put, it may give us the first opening in over a century to give participatory democracy another try.

Daniel Kemmis, the mayor of Missoula Montana, has written a fine little book called *Community and the Politics of Place*. Mr. Kemmis points out that in the 18th century the word *republican* meant a politics of community engagement. Early republican thought was set against the federalist theories which would govern by balancing competing interests, devise sets of legalistic procedures, maintain checks and balances (leading to hearings held before putative experts) in place of direct discussion between adversarial parties.

Kemmis quotes Rousseau: "Keeping citizens apart has become the first maxim of modern politics." So what organizing principle will get citizens back together? There are many and each in its way has its use. People have organized themselves by ethnic background, religion, race, class, employment, gender, language, and age. In a highly mobile society where few people stay put, thematic organizing is entirely understandable. But place, that oldest of organizing principles (next to kinship), is a novel idea in the United States.

"...what holds people together long enough to discover their power as citizens is their common inhabiting of a single place," Kemmis argues. Being so placed, people will volunteer for community projects, join school boards, and accept nominations and appointments. Good minds, which are often forced by company or agency policy to keep moving, will make notable contributions to the neighborhood if allowed to stay put. And since local elections deal with immediate issues, more people will turn out to vote. There will be a return of civic life.

This will not be "nationalism" with all its dangers as long as sense of *place* is not entirely conflated with the idea of a nation. Bioregional concerns go beyond those of any ephemeral (and often brutal and dangerous) politically designated space. They give us the imagination of "citizenship" in a place called (for example) the Great Central Valley, which has valley oaks and migratory waterfowl as well as humans among its members. A place (with a climate, with bugs) as Kemmis says, "develops practices, creates culture."

Another fruit of the enlarged sense of nature that systems ecology and bioregional thought have given us is the realization that cities and suburbs are parts of the system. Unlike the ecological bioregionalists, the cultural practice of urban bioregionalism ("Green Cities") has made a good start in San Francisco. One can learn and live deeply in regards to wild systems in any sort of neighborhood—from the urban to a big sugarbeet farm. The birds are migrating, the wild plants are looking for a way to slip in, the insects live an untrammeled life, the raccoons are padding through the crosswalks at 2 am, and the nursery trees are trying to figure out who they are. These are exciting, convivial, and somewhat radical knowledges.

An economics of scale can be seen in the watershed/bioregion/city-state model. Imagine a Renaissance style city-state facing out on the Pacific, with its bioregional hinterland reaching to the headwaters of all the streams that flow through its bay. The San Francisco/Valley rivers/Shasta headwaters bio-city-region! I take some ideas along these lines from Jane Jacobs's tantalizing book, *The Wealth of Cities*, in which she argues that the city, not the nation-state, is the proper locus of an economy, and then that the city is always to be understood as being one with the hinterland.

Such a non-nationalistic idea of community, in which commitment to pure place is paramount, cannot be ethnic or racist. Here is perhaps the most delicious turn that comes out of thinking about politics from the standpoint of place: anyone of any race, language, religion, or origin is welcome, as long as they live well on the land. The Great Central Valley region does not prefer English over Spanish or Japanese or Hmong. If it had any preferences at all, it might best like the languages it heard for thousands of years such as Maidu or Miwok. Mythically speaking the region will welcome whoever chooses to observe the etiquette, express the gratitude, grasp the tools, and learn the songs that it takes to live there.

This sort of future culture is available to whoever makes the choice, regardless of background. It need not require that a person drop his or her Buddhist, Voudun, Jewish, or Lutheran beliefs, but simply add to his or her faith or philosophy a sincere nod in the direction of the deep value of the natural world, and the subjecthood of non-human beings. A culture of place will be created that will include the "United States," and go beyond that to an affirmation of the continent, the land itself, Turtle Island. We could be showing Cambodian and Vietnamese newcomers the patterns of the rivers, the distant hills, saying "It is not only that you are now living in the United States. You are living in this great landscape. Please get to know these rivers and mountains, and be welcome here." Euro-Americans, Asian Americans, African Americans, can—if they wish—become "born-again" natives of Turtle Island. In doing so we also might even (eventually) win some respect from our Native American predecessors, who are still here and still trying to teach us where we are.

Watershed consciousness and bioregionalism is not just environmentalism, not just a means toward resolution of social and economic problems, but a move toward a profound citizenship in both the natural and the social worlds. If the ground can be our common ground, we can begin to talk to each other (human and non-human) once again.

California is gold-tan grasses, silver gray tule fog,
olive-green redwood, blue-gray chaparral,
silver-hue serpentine hills.
Blinding white granite,
blue-black rock sea cliffs.
—blue summer sky, chestnut brown slough water,
steep purple city streets—hot cream towns.
Many colors of the land, many colors of the skin.

Gary Snyder walks and writes around the Pacific Rim. He is the author of Turtle Island, The Practice of the Wild, *and most recently a volume of selected and new poems,* No Nature *(Pantheon). His home base is in the northern Sierra where he is one of the founders of the Yuba Watershed Institute.*

PASEO PANTERA

THE GREAT AMERICAN BIOTIC INTERCHANGE

by Susan Marynowski

Supercontinent Pangaea had long ago split up. North and South America had drifted near their present positions. It was the Pliocene Era, about three million years ago, when the continents were finally joined by what 20th century humans call the Central American isthmus. From the time of connection began a flow of species and ecological processes north and south along the bridge, and the evolution of new species on the land itself. Paleontologists refer to this process as the "Great American Biotic Interchange." As a result, the Central American land mass is one of the most biologically important areas on Earth, covering less than one percent of the Earth's surface, but containing an estimated 10 percent of the world's plant and animal species.

The narrow Central American isthmus is a valuable and vulnerable link across continents. It serves as the migratory funnel for songbirds and other dwindling vertebrate and invertebrate species of the Americas. On an evolutionary scale, the isthmus has served as a passageway for the spread and development of species and communities, contributing greatly to the biodiversity in both hemispheres. (*Science editor's note*: as well as leading to some losses, presumably due to interspecific competition).

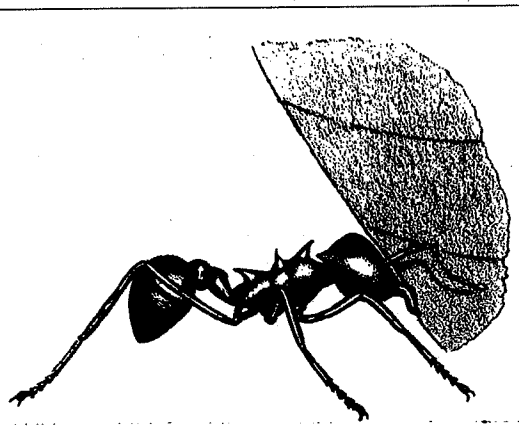
Unfortunately, the region has one of the highest rates of tropical deforestation in the world. The integrity of the isthmus is threatened by unbridled population growth, an eastwardly expanding colonization front, subsistence ("slash and burn") farming, and large-scale intensive agriculture. The severe human-induced fragmentation along the isthmus has reduced a once-continuous biotic corridor to a series of habitat islands in a sea of development, threatening many species, communities and systems. Many of the forest fragments are too small to be ecologically viable. Another link has been broken in the magnificent continental landscape that once extended from Tierra del Fuego to Alaska.

The most widely distributed terrestrial vertebrate in the New World is the panther, or "pantera" in Spanish (*Felis concolor*: known as puma, cougar, mountain lion), which once occurred along this corridor, from Patagonia, throughout the Americas to the Yukon. From this animal a new Central American conservation project has taken its symbolic name: Paseo Pantera, "Path of the Panther."

PASEO PANTERA

The regional Paseo Pantera project, with the backing of the United States Agency for International Development (USAID), seeks to reconnect, restore and better manage the fragments of the biotic corridor along the length of Central America. The five-year, $4+ million project is rooted in the principles of conservation biology and in the notion that nature tourism ("ecotourism") can provide a portion of the financial resources necessary for maintenance of a system of interconnected protected areas.

Paseo Pantera is being implemented by Wildlife Conservation International (WCI: a division of the New York Zoological Society) and Caribbean Conservation Corporation (CCC), both U.S.-based non-profit organizations with prior research and conservation experience in Central America. The partners are collaborating with a consortium of U.S. and Central American private, governmental and non-governmental organizations. Project directors are Archie "Chuck" Carr III and David Carr, sons of internationally recognized zoologist Archie Carr Jr., who first alerted the public to the plight of the world's endangered sea turtles (see conservation classics *The Windward Road and The Sea Turtle: So Excellent a Fishe by A.Carr).*



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Paseo Pantera aspires to preserve biological diversity and enhance wildlands management in Central America by ensuring real protection of lands already set aside for conservation, and by restoring sections of the fragmented Central American isthmus. The project

map by Brian Evans

consortium envisions a chain of parks stretching the length of Central America, protecting some of the world's most pristine terrestrial and aquatic ecosystems with wildlife corridor and buffer zone management techniques. The project was proposed by the consortium to the Regional Environmental and Natural Resources Management Project (RENARM) initiated by USAID's Regional Office for Central America.

While the project focuses on a number of outstanding tropical forests, it also highlights endangered coastal and marine systems, ignored in many corridor schemes. Central America's coastal ecosystems provide critical wildlife habitat, support economically important sport and commercial fisheries, provide livelihoods for many indigenous peoples, serve as the base for an increasingly lucrative ecotourist trade, and buffer inland systems and communities from storms. Natural resources on both of Central America's coasts are under tremendous pressure from overfishing, habitat destruction, pesticide contamination and sedimentation from upstream deforestation.

Thanks to forward-looking conservationists in Central America, protected areas today cover roughly 15 percent of the territory. About one-third of the land identified for the Paseo Pantera corridor already enjoys some kind of protected status. Major areas to be included in the project are the Peten region of Guatemala, the Belize Barrier Reef, the Bay Islands of Honduras, the Miskito Coast of Nicaragua, and the Caribbean coastal lowland forests of Honduras, Nicaragua, Costa Rica and Panama.

In addition to wildlands preservation, Paseo Pantera hopes to contribute to sustainable socioeconomic development of the region, noting that over-exploitation and poor management of natural resources have a devastating effect on the 30 million people living in the region. The project's ultimate goal is to provide the methods, tools and knowledge to the nations of Central America to work together toward conservation and sustainable development.

REGIONAL COMPONENTS

Now in its second year, Paseo Pantera is addressing wildlands preservation and socioeconomic goals through both regional and site-specific activities. Regional activities include buffer zone management training, ecotourism promotion, environmental education, a small grants program, and a regional conservation strategy.

Techniques of buffer zone management directed toward preservation of biological integrity of protected areas are being researched and developed by the consortium, with special emphasis on the principles of island biogeography and wildlife corridors. This is particularly important in Central America, where protected area borders are often not patrolled or clearly defined. The project supported an international seminar on the design and management of buffer zones, with the published results distributed throughout Central America. The project is supporting annual international training workshops on buffer zone management organized by the University for Peace in Costa Rica.

Faced with the economic reality that governments of Central America can not and will not operate at a deficit in order to protect natural areas, one of Paseo Pantera's main goals is to ensure that profits from ecotourism are used to support wildlands. With the exception

of Costa Rica, monoculture crop agriculture presently provides the principal source of foreign exchange in the region: beef, bananas, coffee, fisheries and forestry account for approximately 25 percent of the region's total domestic economic production.

The project's regional ecotourism component is based on the theory that properly planned tourism can provide funds for acquisition and management of protected areas, enhance the economies of local communities, and advance environmental education for both national and international park visitors. The consortium is researching and promoting development of sustainable tourism. National and international ecotourism councils are receiving assistance in developing means of channeling revenues generated from ecotourism to protected areas and local communities, and in using ecotourism to foster regional cooperation.

Archie Carr III, director of Meso-American programs for Wildlife Conservation International, has explained well the emphasis on ecotourism: "We believe a journey through a chain of parks in Central America would be compelling to the traveler. Collectively, the parks in Central America could tell a tale of grand and sweeping themes: stories of primal upheavals of the earth's crust; stories of biological phenomena as fundamental to the understanding of life in the New World as anything Charles Darwin found in Patagonia or the Galapagos; and stories of an incredible quest by *Homo sapiens* itself, that irrepressible transient who traversed the land bridge to colonize South America. Those three themes — geomorphology, the biotic interchange, and the history of early man — cannot be given adequate treatment by any single park in the region, nor by any single national park system. Those are themes that are best seen and best interpreted on the macroscopic or regional scale."

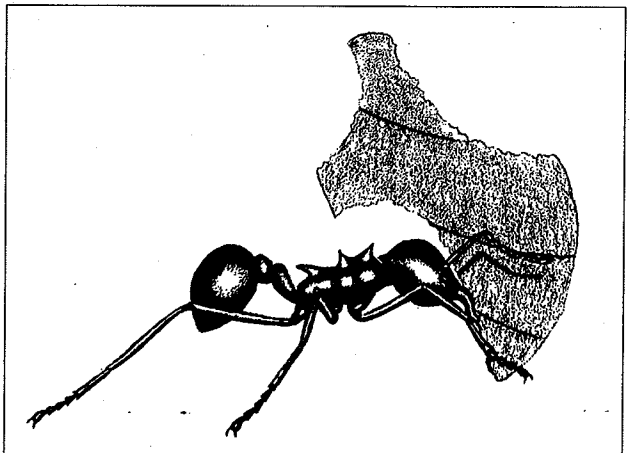
Paseo Pantera will produce two books with the goal of educating audiences about Central America's natural areas and their importance to biodiversity conservation. The first book will cover the natural and cultural history of the Central American isthmus; the second will be a guide to outstanding natural areas of Central America.

In 1992, the Paseo Pantera consortium initiated a Small Grants Program for Conservation Biology in Central America. The program is designed to bolster opportunities for young scientists, and support individual research projects incorporating conservation components that lead to concrete advances in the conservation of Central American wildlife and wildlands.

Paseo Pantera ultimately seeks to update regional conservation strategies to incorporate a regional biotic corridor, buffer zone management and concepts of conservation biology. The project is designing several binational protected areas as well as corridors to connect existing Central American wildlands.

SITE-SPECIFIC COMPONENTS

The Paseo Pantera consortium is conducting pilot projects in applied field research, wildlands planning, environmental education, buffer zone management, and ecotourism in key protected areas throughout Central America.



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In Honduras, Paseo Pantera is working with the government and non-governmental organizations to formally establish a network of protected areas, and to protect the coastal resources of the Bay Islands through environmental education and buffer zone management. In the forested interior of Honduras, the consortium is striving to protect more fully the Rio Platano Biosphere Reserve, one of the largest protected areas in Central America. The Reserve is threatened by colonization and illegal harvesting of forest resources. Paseo Pantera is establishing a protected corridor linking the Rio Platano with Nicaragua's Bosawas Biosphere Reserve and working to provide secure land tenure for indigenous peoples of the area. Paseo Pantera is providing technical assistance to the Honduran wildlife department in management of protected areas. Consortium researchers also are completing wildlife inventory and management planning work in La Murella Wildlife Refuge, a cloud forest preserve.

Paseo Pantera is working with Belize government authorities and national conservation groups to establish two new Biosphere Reserves—one to include the entire Belize Barrier Reef, the largest coral reef in the Western Hemisphere, the other to include the rugged massif of the Maya Mountains, which cover nearly 20 percent of the country. Researchers are conducting biodiversity inventories in the Belize rainforest and research on coral reef species of the Belize Barrier Reef.

In Costa Rica, the Paseo Pantera consortium is assisting the Costa Rican government in expanding the Tortuguero National Park to four times its current size. The park then will be linked with vast protected forests across the Nicaraguan border in the binational Si-A-Paz ("Yes to Peace") park. This large border park will be one of the most important in the entire region for Caribbean lowland biodiversity, protecting one percent of the world's plant and animal species in an area the size of Delaware. This park is essential for the survival of such wide-ranging mammals as white-lipped peccary (*Tayassu pecari*) and jaguar (*Felis onca*).

Consortium partner CCC is developing strategies to ensure adequate financial and human resources to guarantee long-term protection of the popular Costa Rican national parks. As part of the effort to better understand the potential of ecotourism, the project is looking at the effects of tourism on the endangered green sea turtles of Tortuguero, visited by over 20,000 people each year.

Working with national non-governmental organizations, Paseo Pantera has launched a conservation project in Bocas del Toro, Panama. This great Caribbean coastal bay supports manatees, four species of sea turtles, vast wading bird rookeries, lobster fisheries, and homelands of the Guaymi Indians.

In Guatemala, Paseo Pantera field biologists are helping design the 1.4 million hectare Maya Biosphere Reserve, surrounding the fabled Maya ruins of Tikal and running in a continuous sweep of forest into neighboring Mexico and Belize. Biologists are conducting species-specific research, validating a field method for censusing tropical vertebrates, and training Guatemalan nationals in research methods.

In Nicaragua, Paseo Pantera is ad-

vocating the establishment of three huge protected areas: Bosawas, a pristine mountain rainforest, nearly one million hectares in extent and adjoining wild areas in Honduras; the San Juan River valley, where the huge binational Si-A-Paz protected area will be created with Costa Rica; and the Miskito Cays, a 5000 square mile coastal area which is the most important feeding ground for the green sea turtle in the Caribbean and the traditional homeland of the Miskito Indians. Though not officially a part of the Paseo Pantera project, CCC's Miskito Cays conservation project is related in spirit and philosophy and eventually will be part of the Central American corridor.

REGIONAL POLITICS

International cooperation is essential in an isthmus of small countries and complex problems. The Paseo Pantera project has inevitably become political by striving to establish biological unity in a region that has traditionally been torn and fragmented by national forces. The proposed binational border parks and regional corridors have become a means for promoting communication and easing tensions along sometimes hostile frontiers. Paseo Pantera has capitalized on a growing regionalist fervor in Central America, which has perhaps increased in response to the formation of regional economic blocks in other parts of the world. Regional environmental cooperation now seems possible.

Successful programs exist for international recognition of valuable wildlands. If the countries involved commit to the corridor concept, regional natural areas can be protected as Biosphere Reserves under UNESCO's Man and the Biosphere Program or as World Heritage Sites under the World Heritage Convention. Some areas to be included in the corridor are already protected under these international programs.

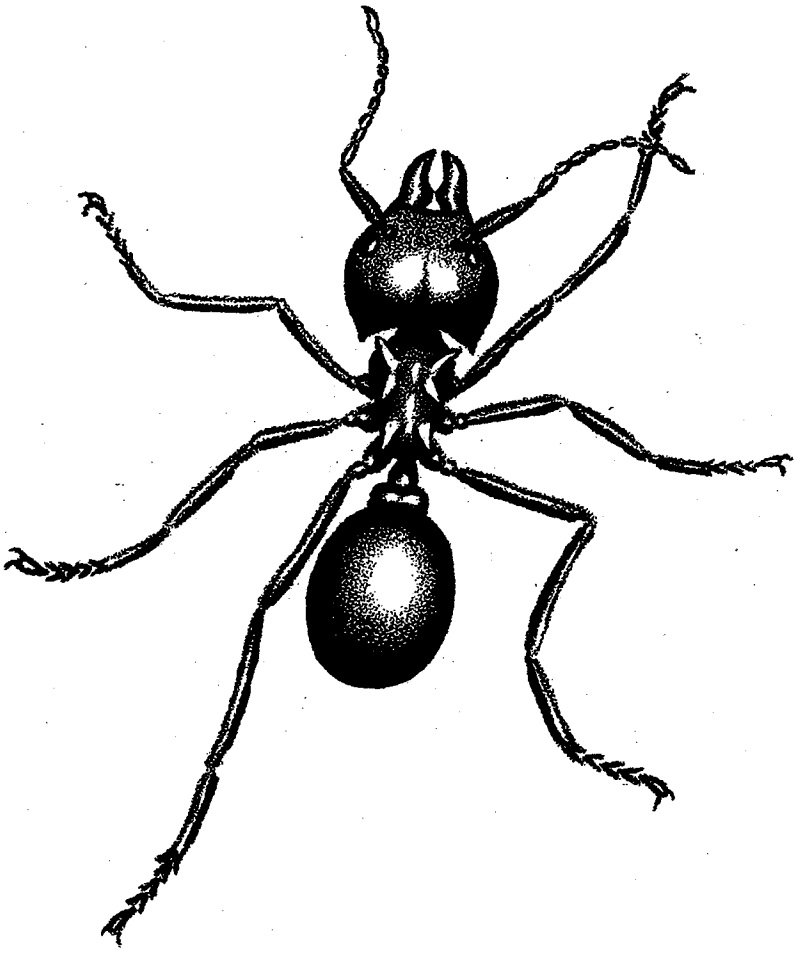
Regional political mechanisms must also be developed. Paseo Pantera has completed a study on potential multilateral mechanisms for wildlands conservation. The seven-nation cabinet-level Central American Council for Environment and Development (CCAD) has been identified as perhaps the most appropriate vehicle for multilateral environmental cooperation. CCAD recently prepared a regional accord for the conservation of biodiversity which recognizes a "Central American Biological Corridor" and mentions the economic potential of ecotourism. The Paseo Pantera consortium hopes that eventually a regional corridor convention will be signed and a region-wide non-governmental organization established to manage and promote the system.

"By thinking in terms that reach beyond the cramped political boundaries of modern-day Central America, we may intelligently address the challenge of biodiversity conservation in the entire region," WCI's Chuck Carr said. "Paseo Pantera originates from a phenomenon of nature, but its successful completion will breach a human phenomenon in the region: the partitioning of the isthmus into seven small nations whose isolation and independence from one another is considered by economists and historians to be a major factor contributing to the chronic underdevelopment of the region."

Success will depend upon whether population growth and political tensions in Central America can be overcome, whether the people and governments of the region will support increased wildlands protection, and whether regional ecotourism can provide an adequate and sustainable economic alternative that supports protected areas. Even if the consortium's ambitious goals are not realized, the Paseo Pantera project will at least begin to preserve globally significant Central American habitat islands and raise human awareness of the importance of wildlands protection in the region.

At best, Paseo Pantera will serve to reconnect the fragmented biotic corridor of the Central American isthmus, the Path of the Panther. "Whatever else divides the human inhabitants of the Western Hemisphere, the Paseo Pantera silently unites us," Carr concluded.

Susan Marynowski (Rt. 3 Box 244, Hawthorne, FL 32640) is a wilderness advocate and editor of the Florida biocentric publication Wiregrass. *She is currently a graduate student in wildlife ecology at the University of Florida, specializing in human education in support of ecosystems. She lives in a swamp and is sometimes known as Sarcastodon, the Eocene bear.*



leaf cutter ant series by Douglas W. Moore

Regenerating the Caledonian Forest

An Ecological Restoration Project in Scotland

by Alan Watson

Rampant deforestation predates the arrival of Europeans in the Americas and Australia. Natural forests have suffered the longest abuse in Europe itself, and also around the Mediterranean Basin. In Scotland today we are witness to the sad remains of an ecosystem that has been steadily degraded for hundreds of years. Between 70% and 80% of Scotland was originally forested, but today natural forests cover a mere 1% of the land. Total tree cover is estimated at 8% or so, but most of that is commercial monoculture plantations of non-native trees.

As Scotland's forest cover shrank, so too did its populations of wildlife species, and most of the large land mammals are long since extinct. The brown bear, wild boar, beaver, lynx, moose, and wolf vanished with the forests—the last of them, the wolf, in 1743.

Nowadays, Scotland is famous for its rounded, bare, heather-clad hills and empty glens, but this is an unnatural landscape. Factors behind Scotland's forest loss range from clearance of the land for agriculture and felling of trees for timber (particularly in the 17th and 18th centuries) to the deliberate burning of forest to eradicate "vermin" such as the wolf, and the notorious Highland Clearances of the 19th century when land-owners evicted many of the small-scale peasant crofters from their holdings and gave the land over to extensive sheep grazing. Incidentally, many of those evicted crofters went to Canada, the United States and Australia, where they contributed to the deforestation process in the previously untouched forests there. More recently, large areas of natural forest have been lost by underplanting with commercial crops of exotic species, such as North American sitka spruce.

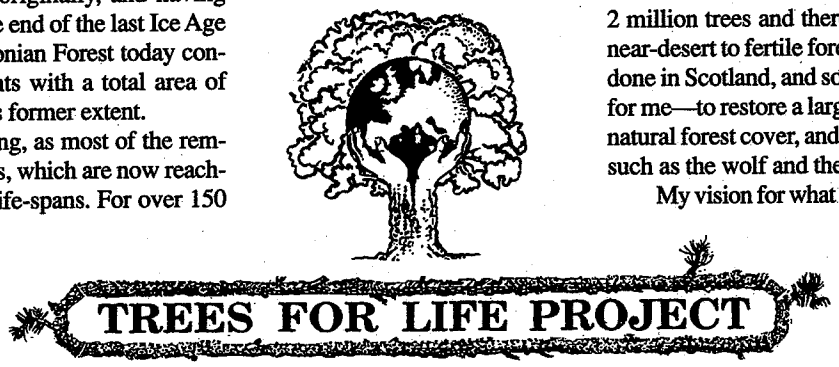
Most of the Highlands of Scotland were originally covered in what is known as the Caledonian Forest, a boreal forest dominated by Scots pines and interspersed with deciduous trees such as birch, rowan, aspen, alder and willow. The name Caledonia was given to the area by the Romans, and means wooded heights. Estimated to have covered about 1.5 million hectares originally, and having grown continuously since the end of the last Ice Age 10,000 years ago, the Caledonian Forest today consists of 38 scattered remnants with a total area of 12,000 hectares—0.8% of its former extent.

This decline is continuing, as most of the remnants consist only of old trees, which are now reaching the end of their natural life-spans. For over 150 years, no new trees have grown to maturity because of the intense grazing pressure of an increasing deer population. In the absence of natural predators such as the wolf, and actively encouraged by the mostly-absentee landowners, whose only way to make money from the impoverished landscape is by "sport" hunting of the deer stags for the trophy value of the antlers, the deer have literally been eating their own forest habitat out of existence. With the last of the old trees dying, it is truly the end of the line for the Caledonian Forest unless remedial action is taken now.

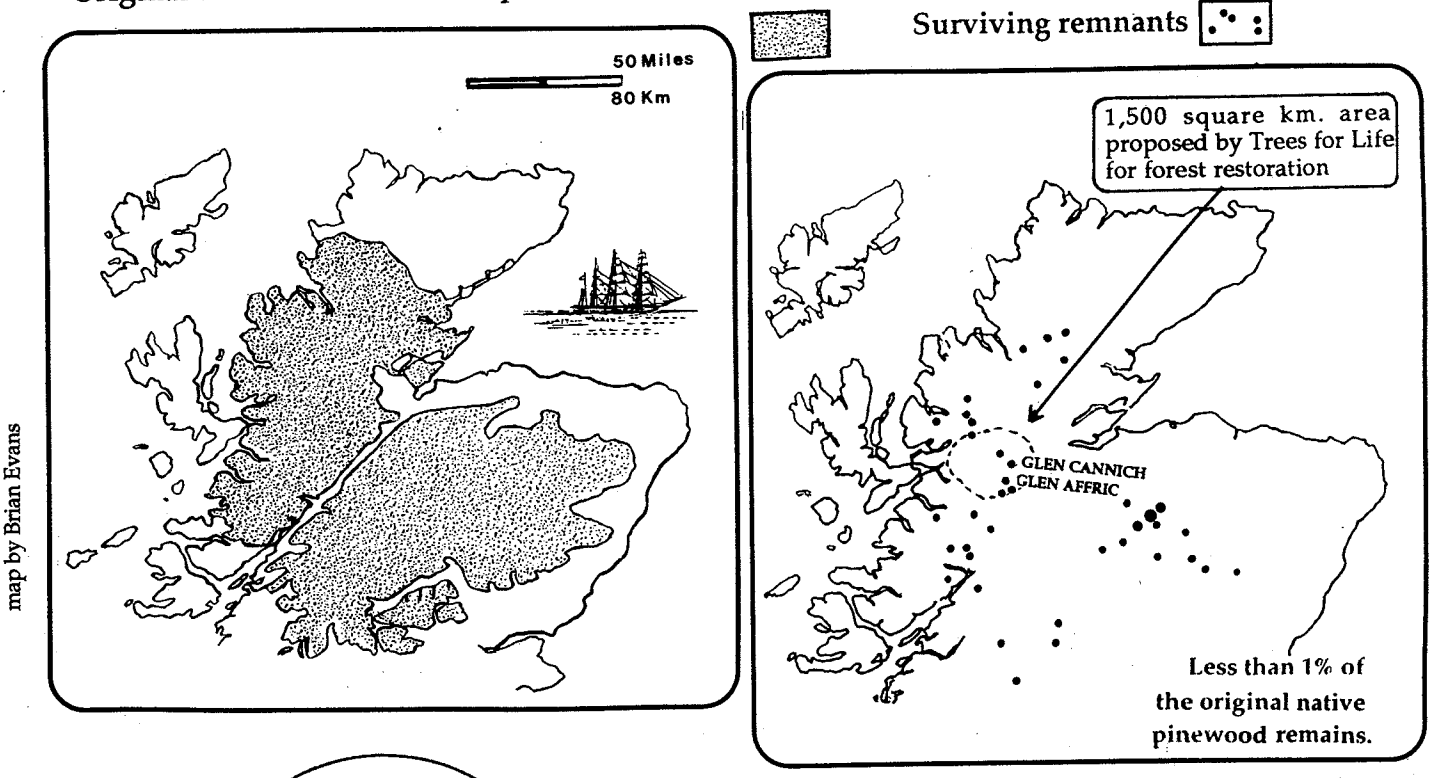
Scotland's feudal-like system of land-ownership is one of the reasons why the forest has continued to decline in this century. The Highlands of Scotland are like a Third World country in that it has never had any type of land reform, and a very small number of people own the vast bulk of land in huge estates. Most of these owners live either in the south of England or abroad and individual holdings of 10,000 hectares are common. Foreign owners include an Arab prince, a mysterious Malaysian or Indonesian tycoon (whose identity is kept secret), and the third richest man in the US (who owns the 30,000 hectare Mar Lodge Estate, including 3 of the 5 highest mountains in Britain and some of the best remnants of the forest). Most of these people have no interest in regenerating the forest and as long as large tracts of land are in their hands, many parts of the Highlands will remain bleak, impoverished and treeless.

Fortunately, there is now a groundswell of concern for the future of Scotland's native pinewoods and their wildlife, including the pine marten and birds such as the capercaillie and the endemic Scottish crossbill. Measures to regenerate the forest remnants are being taken by various land owning bodies, including the Forestry Commission and the Nature Conservancy Council for Scotland, as well as some private landowners and conservation groups like the Scottish Wildlife Trust and the Royal Society for the Protection of Birds. So far, the efforts are all uncoordinated and relatively small in scale.

In 1985, I visited the community of Auroville in the south of India and saw firsthand how the people there had planted 2 million trees and thereby restored their land from near-desert to fertile forest. I knew the same could be done in Scotland, and so a vision began to take shape for me—to restore a large area in the Highlands to its natural forest cover, and reintroduce missing species, such as the wolf and the bear.



My vision for what has become the Trees for Life Project is to restore the natural forest ecosystem to an area of approximately 1500 square kilometres in the north-central Highlands. This area contains



map by Brian Evans

three of the best surviving forest remnants. It is remote and roadless except on the eastern periphery and is not used for economic gain, other than deer-stalking. Utilising the principles of the newly-emerging field of restoration ecology, the aim is to begin with the parts most like the original ecosystem —the pinewood remnants—and facilitate their expansion. As a new generation of young trees begins to re-create a forest habitat, some species of plants and animals will recolonise the north-central Highlands naturally, while others will have to be physically reintroduced. Over a period of decades the area can gradually be returned to something like its natural state and can offer perhaps the closest thing to a true wilderness area in Scotland.

In this we are seeking to help nature do what she herself is seeking to do in Scotland—cover the land in trees again. Only the imbalances we humans artificially maintain prevent this from occurring of its own accord. In this restoration effort, we are acting from the same principle—of listening deeply to the spirit of nature, and then acting in cooperation with that—as the founders of the Findhorn community, whose famous gardens in the 1960s produced 40 pound cabbages.

We intend the project to be an example to the world of how to rehabilitate highly degraded ecosystems. This is work humanity must do on a global scale in the next century, to repair the damage done by 150 years of uncontrolled industrial exploitation of nature. We have to find out how to reforest areas such as the Sahel in Africa, the Black Forest in Germany which is dying of acid rain, and the wastelands left behind when tropical rainforests are clearfelled. Our project is a pilot scheme to develop the skills and techniques we will need when our species begins in earnest to help the healing of the Earth.

For several years I worked to raise funds for the Trees for Life Project, contacted sympathetic landowners, and researched the current state of the forest and possible options for its expansion. As one method of raising funds, I launched the Trees for Life Calendar and Engagement Diary, which features photographs and information about threatened forest areas around the world and details of groups working to protect them.

Practical work on the project began in 1989 when our volunteers protected naturally-occurring Scots pines seedlings with plastic tubes in two forest remnants in Glen Cannich. Safe from grazing deer, these seedlings grew on until a larger area around them could be fenced (this has since been done). From that small beginning, our work has expanded substantially and in 1990 and 1991 we fenced off two areas, totalling 105 hectares, on the periphery of the forest remnants in Glen Affric.

The first of these fenced areas attracted a scientific study by a student from Edinburgh University, who had heard about our project from the community of Auroville in India. He found in the area enclosed by the fence approximately 100,000 pine seedlings, which are on average 9.9 years old but only 8.5 centimetres (3.3 inches) high—this shows how serious the grazing damage has been! By excluding the deer from the fenced enclosure, pine seedlings inside, and the various birch and rowan seedlings there as well, are free to grow to maturity—the first to do so there for over 150 years.

The natural regeneration of the forest which will take place inside these first two enclosures (and additional ones we will fence each year) forms the first of three key elements of our restoration strategy. The

second involves planting trees in completely barren areas—most of the 1500 square kilometres we envision returning to forest is completely treeless and natural regeneration is not an option as there are no nearby trees to provide seed. Work on this began in 1991 when we planted 8000 Scots pine seedlings in a deforested area of Glen Affric. These seedlings were grown from seed collected from mature pines elsewhere in the glen to ensure that the unique genetic heritage of the local trees is maintained, and were planted out in a random, non-linear fashion, to duplicate as much as possible natural regeneration. This area had previously been fenced by the Forestry Commission, the UK government forest agency with whom we are cooperating. We've been collecting seed for the last two years and we now have 36,000 pine seedlings growing in a nursery and a lot of birch, rowan, alder, juniper and holly seeds to sow in 1992.

The third element of our strategy involves the removal of non-native trees (principally North American sitka spruce and lodgepole pine) which were planted around and under some of the old native pines as a commercial crop. The Forestry Commission now realises this planting was a mistake in those areas, and has asked us to remove the exotic species so that the areas revert to their native species composition.

A key feature of our project is the close cooperation with both the Forestry Commission, on whose land we have been working, and the Nature Conservancy Council for Scotland, who have helped to fund our fences. These two bodies are often in conflict over the former's widespread establishment of monocultural plantations in the Highlands, yet we have been able to bring them together in the common cause of regenerating the pinewoods. Cooperation such as this is essential to return the forest to a substantial area, and we will begin cooperating with both corporate and private landowners in 1992.

Another important dimension to our project comes with the week-long work projects we run in Glen Affric for volunteers to participate in our work. The participants, who have ranged in age from 18 to 58 and come from as far away as Australia, Canada, South Africa, and Finland, receive a powerful nature experience in a remote part of the Scottish Highlands, and they participate in a very simple, effective and meaningful action to reforest Scotland (and hence the planet). The weeks also offer an experience of the Findhorn principles of cooperation with nature and of working together consciously in a group.

With our project thus well established, we have begun to receive considerable interest in our work, both from concerned individuals and from the media. We've been featured in magazines and newspapers in Finland, Australia, and the US, as well as Great Britain.

The future for the project is exciting as more possibilities open for us to expand the area we are restoring. The large vision of reforesting all 1500 square kilometres and returning wolves to Scotland is still some decades away, but we're moving in that direction.

Serious challenges remain, of course, and perhaps the largest is the issue of land-ownership. However, I am optimistic that the tide of awareness about the plight of the Caledonian Forest has already turned. Due to the proposed sale of the Mar Lodge Estate, and the attempts of conservation groups such as World Wildlife Fund and the Royal Society for the Protection of Birds to get government backing to purchase it, the plight of the Caledonian Forest has received constant publicity in the last year.

Perhaps most important, the restoration of the Caledonian Forest is a powerful and inspiring demonstration of what can happen when a small group of people work together with nature.

If you would like further information about the Trees for Life project, or would like to help us in any way, please write to us at: Trees for Life, Findhorn Foundation, The Park, Forres IV36 0TZ, Scotland.

Alan Watson is the coordinator of the Findhorn Foundation's Trees for Life Project, and has been a member of the Findhorn community since 1978.

Update

In November 1991, the Trees for Life Project was named the United Kingdom's Conservation Project of the Year in the annual Ford Conservation Awards Competition. The award netted the project two trophies, a check for 6500 pounds, and considerable press coverage. Alan Watson described the recognition as "a reflection of both the cooperation we have developed with the Forestry Commission and the Nature Conservancy Council for Scotland . . . and especially the support we receive from individuals."

The following month the project finished fencing its second enclosure in Glen Affric, Meallan 1. On Forestry Commission land like the first enclosure, Meallan 1 encompasses 55.5 acres. Seedlings from a group of old mature Scots pines and native broadleaved trees within the enclosure will now be able to regenerate. Elsewhere in the area the Project will plant pine and other seedlings grown in its nursery.

The Project expanded its seed collecting in 1991. The spring 1990 sowing had yielded only 6,000 seedlings. Thirty thousand seedlings germinated from the pine cones that volunteers collected the next spring. Volunteers planted 3000 of the 36,000 pine seedlings in Meallan 1 in the spring of 1992. They plan to plant the other 33,000 there in 1993.

During the autumn 1991 work weeks volunteers collected seed from a variety of broadleaved and other native trees in Glen Affric. They sowed the seed in the spring of this year. The project plans to propagate aspen vegetatively by transplanting suckers and root sections, since aspen almost never reproduce from seed.

In 1992 volunteers participated in 10 work weeks. Besides collecting and saving seeds, they cut introduced sitka spruce saplings, and surveyed areas for signs of natural regeneration of native trees.

The Project has now erected a third fence on Forestry Commission land in Glen Affric; it will put up a fourth fence in 1993. There will then be an enclosure on each side of Beneveas Hill. Watson hopes that eventually trees will grow between the enclosures as a result of natural regeneration.

The Forestry Commission will henceforth have sufficient funds to pay for fencing on its land.

The Wildlands Project Clearinghouse

by Rod Mondt and David Johns

How is The Wildlands Project* working to make the vision a reality? By bringing together the passion, skills and talents of committed biodiversity advocates from across the continent. By focusing our energies and abilities through an organizational structure that simultaneously pulls together and diffuses information on threats to biodiversity and the implementation of proposals to protect wilderness. The Project is governed by a Board of Directors consisting of regionally based grass-roots activists and conservation biologists. The board, not yet complete, is intended to represent the spectrum and breadth of ecosystems and landscapes. There are currently 15 Board members.

A central office in Tucson provides support to the Board and operates the clearinghouse for the project. Additionally, the staff is responsible for the Project publishing program, and for organizing conferences, supporting scientific research, fundraising and press relations. The staff at present consists of three part-time folks. The Project also utilizes the services of several experts on a consulting basis.

CLEARINGHOUSE

The clearinghouse function of The Wildlands Project is central to the mission of developing regional proposals. The staff will identify and contact regional groups throughout the continent working on biodiversity and wilderness preservation. Where such groups do not exist the Project will attempt to provide support to get them under way or to allocate resources to develop reserve proposals itself for the region.

Where active grassroots groups do exist The Wildlands Project will assist as needed in the development of scientifically sound reserve proposals. This will include putting groups in touch with scientific and technical resources, as well as making available information on proposals from other regions. The Project will also provide scientific analysis of proposals as well as support research on reserve system models (see Reed Noss's article in this issue), and make the findings available to regional activists and biologists. Technical support on mapping, use of GIS, and Gap Analysis will also be available.

The Wildlands Project recognizes that reserve proposals develop over time and are the product of the work of many. Thus the organization will support regional conferences. This support will include help in organizing, financial help, and assisting in obtaining speakers and workshop leaders.

PUBLISHING PROGRAM

Central to the educational and scientific purposes of The Wildlands Project is the publication program. As reserve proposals are developed for each region The Wildlands Project will publish them through arrangement with *Wild Earth* and in pamphlet form. The Project will also publish information on the scientific basis for reserve creation and on the nuts and bolts of creating a reserve proposal. This special issue of *Wild Earth* is an example of that. Additionally the Project will create or cooperate in the creation of videos, slide shows and other informational formats about reserve proposals for dissemination to the media, educators, policy makers, and cooperating groups. The Project will also undertake to place materials in libraries and encourage publication of materials in a wide variety of media, from scholarly to popular. At least one issue of *Wild Earth* a year will be specially devoted to the Project. Reserve proposals and related information will be published in *Wild Earth* on an ongoing basis.

When proposals have been developed for the entire continent, The Wildlands Project will publish the proposals in book, video and slide show formats. In cooperation with regional organizations, the Project aims for as wide dissemination as possible. While the final proposal will continue to change, the existence of a continent-wide reserve proposal merits publication in lasting formats such as books, as well as mass produced pamphlets.

PUBLIC RELATIONS

The Reserve System developed out of research and the work of regional activists will define a vision for a healing North America. Essential to making the vision real is entering the public debate and placing our vision on the agenda: presenting it to activists who may be unfamiliar with it, to mainstream environmental groups, the media, the public, educators and policy makers. The Project will put the vision before all of these groups through publications, speakers, conferences, press conferences, advertising, educational outreach in schools and testimony before public bodies.

FUNDRAISING

Fundraising will be undertaken through direct mail, advertisements, grant proposals and appeals to the public. Sales of publications will, in some instances, result in a return. The Wildlands office is your office. It can be an important adjunct and resource to your regional group. We can be reached at:

The Wildlands Project
PO Box 5365
Tucson, AZ 85703
(street address: 2721 W. Calle Carapan, 85745)
Ph: (602) 884-5106

*The Wildlands Project is organized under the laws of Arizona and is a non-profit educational and scientific organization under the Internal Revenue Code.

Groups Leading the Way

by Rod Mondt

The groups below stand out as prime examples of the types of groups that will be working with The Wildlands Project. This list is in no way complete and we look forward to working with all organizations that hold to the vision of an ecologically sound North America.

Alliance for the Wild Rockies:

Box 8731, Missoula, MT 59807. This grass-roots umbrella group is fighting for wildland restoration and the preservation of all remaining roadless areas in the Northern Rockies. AWR has gained introduction in Congress of the Northern Rockies Ecosystem Protection Act.

Biodiversity Legal Foundation:

POB 18327, Boulder, CO 80308-8327. BLF's efforts incorporate lawyers, activists and scientists in the fight to save North America's biodiversity. Using the Endangered Species Act and other environmental laws, this group challenges agency plans that threaten native species and ecosystems.

California Wilderness Coalition:

2655 Portage Bay East, Suite 5, Davis, CA 95616. CWC leads wilderness protection efforts in the state of California. CWC will work in 1993 to gain passage of a strong California Desert Wilderness bill.

Environmental Ethics:

Dept. of Philosophy and Religion Studies, Univ. of North Texas, POB 13496, Denton, TX 76203-3496. *EE* is an interdisciplinary journal dedicated to the philosophical aspects of environmental problems. A forum for diverse ideas on ethical issues related to the environment, it is published by the University of North Texas and the Center for Environmental Philosophy.

Finger Lakes Wild!:

POB 4542, Ithaca, NY 12932. One of a small but growing number of visionary groups advocating the ecological restoration of the hardwood forests of eastern North America, FLW focuses on central New York's Finger Lakes region.

Forest Guardians:

612 Old Santa Fe Trail, Santa Fe, NM 87501. As a grass-roots biodiversity group dedicated to saving the forests of the Southwest, Forest Guardians fights Forest Service timber sales in Arizona and New Mexico. Forest Guardians leads the campaigns to save the Mexican spotted owl and northern goshawk.

Forest Reform Network:

5934 Royal Lane, Suite 223, Dallas, TX 75230. This nation-wide coalition is working to reform Forest Service timber programs by repealing the Knutson-Vandenberg Act and Salvage Timber Sale Act. The Network supports legislation to ban clearcutting on federal lands.

Friends of the Bow:

POB 6032, Laramie, WY 82070. Founded in 1988 to foster ecologically sensitive management of the Medicine Bow National Forest in southeast Wyoming, Friends of the Bow has increased public awareness about Forest issues through public meetings, workshops, posters, and mailings. FOB has appealed several agency decisions and is now preparing four lawsuits pertaining to sustainability and biodiversity.

Gila Watch:

POB 309, Silver City, NM 88062. Gila Watch formed to oppose Forest Service plans to develop stock tanks and increase the number of cattle in the Gila Wilderness. Unlike the agency charged with protecting the Gila, this group works to support the integrity and biodiversity of the nation's first designated Wilderness.

Great Old Broads For Wilderness:

POB 527307, Salt Lake City, UT 84152. Founded by some of the strongest wilderness advocates in Utah, this group consists of individuals who are, or would like to be, women over 45 dedicated to saving large Wilderness Areas.

Greater Ecosystems Alliance:

POB 2813, Bellingham, WA 98227. GEA is a small organization with a large vision for the Pacific Northwest. Drawing from conservation biology, GEA has developed visionary plans for the Cascades and surrounding ecosystems, and works to educate agencies, politicians, and the general public.

Heartwood:

Rt. 3, Box 402, Paoli, IN 47454. More an idea than an organization, Heartwood works to stop logging and restore ecological balance in the National Forests of the Central Hardwoods region.

Hells Canyon Preservation Council:

POB 908, Joseph, OR 97846. This regional group is working to preserve the Hells Canyon of the Snake River as a National Park and to protect other ecologically important areas in northeastern Oregon.

Idaho Conservation League:

POB 2671, Ketchum, ID 83340. ICL has been in the forefront of conservation in Idaho for many years. ICL lobbies for Wilderness legislation to protect Forest Service roadless areas in Idaho.

Klamath Forest Alliance:

POB 802, Etna, CA 96027. KFA wotks on biodiversity issues in

northwestern California. In conjunction with other bioregional groups, the Alliance has fostered a new era of dialogue for promoting the restoration and protection of watersheds.

Lighthawk:

POB 8613, Santa Fe, NM 87504-8613. Lighthawk's airborne surveys clearly reveal human impacts on the land. Known as the "environmental air force," this group has dramatically demonstrated the impacts of clearcutting to policy makers in the Americas.

Native Forest Council:

POB 2171, Eugene, OR 97402. NFC works to protect our last remaining natural forests. NFC authored the "Native Forest Protection Act," soon to be called the "National Forest Protection Act," and continue their uncompromising advocacy of native forest ecosystems throughout the US.

Oregon Natural Desert Association:

16 NW Kansas, Bend, OR 97701. Dedicated to protecting and restoring desert ecosystems, ONDA is proposing a 5 million acre cow-free wilderness bill for Oregon, has launched a nationwide boycott of beef and is calling for a total phase-out of public lands grazing with an economic transition program for rural communities in the West.

Oregon Natural Resources Council:

1050 Yeon Building, 522 Southwest Fifth Ave., Portland, OR 97204. ONRC coordinates wilderness preservation efforts in Oregon. Its constituents include Pacific salmon and ancient forests both east and west of the Cascade crest.

Planet Drum Foundation:

POB 31251, San Francisco, CA 94131. Planet Drum Foundation promotes a bioregional perspective and encourages the general public to re-think attitudes about where they live and develop activities that harmonize with natural characteristics. Publications include the biannual review *Raise the Stakes* and *A Green City Program for the San Francisco Area and Beyond.*

Preserve Appalachian Wilderness:

117 Main St., Brattleboro, VT 05301. This umbrella group works for wilderness restoration, predator reintroduction, and large wilderness preserves in the East. PAW has stopped countless timber sales in the National Forests of the Appalachians.

Public Lands Action Network:

POB 5631, Santa Fe, NM 87502. PLAN publicizes the problems of livestock grazing on National Forests and BLM lands. This group has become like a cholla spine in the ankle for many Southwestern ranchers.

Rest The West:

POB 10065, Portland, OR 97210. This new group is campaigning for an end to public land livestock grazing. Rest The West is one of the strongest voices for native ecosystems, cattle-free, in the high desert country of Oregon, Washington, and Idaho.

Save America's Forests:

4 Library Court, SE, Washington, DC 20003. Lobbying to protect the last native forest ecosystems in the United States, this coalition represents grass-roots forest defenders in the nation's capital.

Siskiyou Regional Education Project

POB 220, Cave Junction, OR 97523. SREP's main focus is protecting the Siskiyou Wildlands (over 300,000 acres of roadless habitat near or adjacent to existing wilderness) and their associated watersheds. The Project has filed endangered species petitions, appeals, and lawsuits and is taking a pro-active role in National Forest legislation.

Southeast Alaska Conservation Council:

POB 021692, Juneau, AK 99802. SEACC was named the conservation organization of the year by the National Wildlife Federation in 1991. SEACC led the effort that resulted in the passage of the Tongass Timber Reform Act of 1990.

Sky Island Alliance:

1639 E. 1st Street, Tucson, AZ 85719. SIA works to protect the biodiversity of the sky island mountain ranges of southeastern Arizona and southwestern New Mexico. Sky Island Alliance is undertaking cooperative efforts to research and preserve needed habitat for extirpated Southwestern species such as the Mexican wolf and the jaguar.

Society for Ecological Restoration:

1207 Seminole Highway, Madison, WI 53711. An organization for individuals committed to the restoration of degraded natural areas, the Society serves landscape architects, land managers, academics, scientists and administrators by providing technical information, networking services, journals and annual conferences.

Sonoran Arthropod Studies Inc.:

POB 5624, Tucson, AZ 85703. This small but growing group works to educate the general public about the vital role arthropods play in the circle of life. SASI sponsors seminars, produces educational materials, and otherwise gives prominence to many smaller life forms.

Superior Wilderness Action Network:

c/o Biology Dept., University of Wisconsin Oshkosh, Oshkosh, WI 54901. SWAN formed to coordinate the efforts of scientists, environmentalists, legal experts, and economists in producing a scientifically guided proposal for a biodiversity reserve system across the Upper Great Lakes Bioregion.

Tatshenshini Wild:

843-810, West Broadway, Vancouver, BC V524C9. This international group works to protect "North America's wildest rivers"— the Tatshenshini and the Alsek. Their larger goal is to protect some 25 million acres of wilderness in the largest contiguous wilderness ecosystem of its type in the world.

Virginians for Wilderness:

Route 1, Box 250, Staunton, VA 24401. The Virginians further the cause of wild lands in Virginia, West Virginia, and throughout the Central Appalachians.

Wildlife Damage Review:

POB 2541, Tucson, AZ 85702. WDR works for the elimination of the United States Department of Agriculture's Animal Damage Control agency, which is funded by the taxpayers to "control" predators throughout the US and to provide "assistance" to other countries.

The Xerces Society:

10 Southwest Ash St., Portland, OR 97204. Xerces is an international, non-profit conservation organization dedicated to preserving invertebrates, the organisms that comprise 95% of animal life on earth. The Society actively seeks intellectual participation from its academic and scientific membership while supporting a variety of invertebrate conservation efforts around the globe.

Technology Isn't Entirely Evil*

Geographic Information Systems in the Service of Wildlands

by Sandra Coveny

Restoring native biodiversity, even managing to maintain it, requires detailed knowledge of ecosystem components. Geologists, geographers, dendrochronologists, botanists, zoologists, soil scientists, and hydrologists all focus on different aspects of ecosystems. If all of their information were compiled into comprehensive regional databases, where it was periodically updated and made accessible to land-use managers and applied ecologists, then perhaps land-use decisions could be made responsibly. Such is the potential for Geographic Information Systems.

Geographic Information Systems (GIS) are a fairly recent (1985) form of computer technology resulting from the synthesis and maturation of years of mapping technologies. Essentially, GIS is an organizational tool that allows the user to collect,store, retrieve, transform and display spatial data from the real world. Activists and applied ecologists would do well to acquire or take advantage of existing regional Geographical Information Systems to serve as consulting networks for regional Wildland Projects.

GIS is becoming increasingly useful because of the need for biogeographic information to be considered in land-use plans. Federal agencies are mandated by the National Environmental Policy Act (NEPA) to *manage* for diversity. The Forest Service is, ostensibly, governed by an even stricter law, the National Forest Management Act (NFMA) which calls for the *protection* of diversity. These laws are good on paper, but are so broad as to be difficult if not impossible to enforce. Furthermore, neither act conveys the concept of biodiversity as presently understood by biologists.

In the past, a limiting factor in designing nature reserves has been the storage space required to house the necessary data. In an article on population vulnerability, Gilpin explains the difficulty of tracking the location of organisms, especially mobile vertebrates, and the computational problems of dealing with what would be a huge data set, since information is needed on feeding areas, migration routes, suitable habitat, present range, etc. Many of the difficult steps in designing viable reserves, such as documenting all essential components of the landscape (including soil types, vegetation types, aspects and gradients, watersheds, and species occurrences both present and historical) and storing this information in some manageable form, are within the realm of capabilities of a GIS.

WHERE TO LOOK FOR A GIS

Wildlands Project groups beginning reserve design should locate GIS data. Though availability and accuracy of information varies greatly, there is likely already some useful information in a GIS concerning your region. By contacting the various agencies and organizations, you may identify potential donors of GIS computer time. At the very least, you can acquire all existing information in map form.

Government Programs

The United States Forest Service (FS) was to have had GIS capabilities on all National Forests by January 1991. Most National Forests have the capability now, but some, including New Hampshire's White Mountain and Vermont's Green Mountain, still do not. Congress established the National Forest system at the turn of the century to protect water quality and long-term timber resources for the nation. Over the years, the Forest Service's scope has expanded to include recreation, wildlife, archaeological sites, wilderness and other "resources." Protecting all these values would be a huge task, and the Forest Service has been accused of failing to manage adequately for biodiversity. The acquisition of a GIS for every Forest was to help remedy this problem.

Under NEPA the Forest Service is required to involve the public in its planning processes. A GIS can be especially useful in the initial "scoping" process. During the scoping process, notices of proposed actions are sent to the "interested public," inviting people to comment on these actions. However, there is rarely enough information available for determining broader impacts of a proposed action. GIS generated maps can be used to show where proposed actions (such as timber sales) will take place in relation to significant landscape features, previous cuts, mature stands, roadless areas, Wildernesses, and other areas of concern. If the headquarters of your National Forest has a GIS, you can request GIS maps as public information, although a fee may be charged. If they do not have GIS capabilities, they should be encour-

* editor's note: Yes it is.

aged to either wait on land-use decisions, or speed up the acquisition process.

The U.S. Department of Interior's Bureau of Land Management (BLM) has a mission similar to that of the U.S. Department of Agriculture's Forest Service, but instead of primarily forested landscapes, they oversee mostly deserts and grassland (Oregon's forested BLM land being the big exception). BLM lands are generally managed for commodity extraction, as are Forest Service lands, but instead of timber the interests are mostly in livestock forage, minerals, oil and coal. BLM is responsible for managing mineral resources beneath most public lands, Forest Service lands included. BLM is also responsible for maintaining public land records and surveying public lands. Like the FS, BLM has been using GIS in some regions for years, but has been sluggish in putting a comprehensive program in place.

The National Park Service (NPS) has strong internal support for acquiring GIS technology. NPS Director James Ridenour endorsed a staff and budget increase for a GIS Division for the beginning of fiscal year 1991. At that time several GIS assisted projects were already under way, including Everglades National Park regional water management planning, Indiana Dunes National Lakeshore wildfire and prescribed fire management plans, Voyageurs National Park management of anthropogenic effects on mammal populations, Shenandoah National Park viewshed management project, and great gray owl and fire suppression and management studies in Yosemite National Park.

The US Fish and Wildlife Service is using GIS to assess gaps in habitat and species protection. A "Gap Analysis" in Idaho was the first

Trillium by Peggy Sue McRae

state-wide application of GIS to assess the representation of vegetation types, vertebrate species, and rare plants and animals in protected areas. The purpose of this program is to protect species and communities while they are still common, instead of waiting until they are endangered. J. Michael Scott, director of the Gap Analysis program, was also head of the program to save the California condor. He is all too familiar with the frustration of pouring millions of dollars into programs that can only hope to save a few "charismatic megafauna" individuals.

Blair Csuti, research associate with Scott at the Idaho Cooperative Fish and Wildlife Research Unit, states: "since the components of biodiversity (plants, animals, vegetation, ecosystems) are spatial resources, we feel GIS technology is ideally suited for their analysis. In contrast to mapping the distribution of the economic status of natural resources, we intend to provide a rapid assessment of the distribution of biodiversity for conservation planning purposes." Gap Analysis programs have been initiated in over 20 states, but completed only in Idaho at present. To find out if this information is available in your region contact cooperative research units located at state universities. Funding for these programs is minimal and possibly shrinking. More requests for information from these projects may put pressure on Congress to appropriate more funding. A complete Gap Analysis for the U.S. or North America will be a tremendous source of data and persuasion for the Wildlands project.

State land management agencies are likely to have GIS capabilities. Contact state wildlife and land-use agencies and ask if they have a GIS, and what databases are available.

Non-Governmental Organizations

The Nature Conservancy (TNC) was established to conserve biodiversity by purchasing and preserving natural areas. The first step was to identify priority areas. This involved gathering information on what species needed protection, where they were found, and their level of sensitivity. However, this was a huge undertaking, and funding was limited. Thus, in most states, TNC has combined efforts with wildlife and natural resource management agencies. The Natural Heritage Programs have thereby been formed, and many are equipped with, or have access to, a GIS. Every state in the US has such a data center, although some are less functional than others. Nevertheless, all wildlands groups should contact these programs. The heritage programs remain the best source of data on the status and locations of rare spcies.

ISSUES OF CONCERN

Some data on Threatened and Endangered species are currently on a GIS, or in the process of being entered onto GIS by the Forest Service, universities, or Natural Heritage Programs; but the inventories are far from complete. Moreover, funds for these projects are scarce. Conservation biologists are recommending the appropriation of funds through Congress to conduct species inventories, but Congress has shown little interest thus far.

Even if the agencies and Congress begin to cooperate more in gathering biogeographical data, this will not ensure preservation of biodiversity. GIS is a useful tool, but it has limitations. Emphasis on technical aspects may obscure ecology. We must avoid being caught up in the frenzy of mapping species instead of learning to recognize landscape patterns essential to perpetuation of biodiversity and the evolutionary process.

GIS could be a valuable tool for the Forest Service, but without a major overhaul of the agency we cannot be confident in its ability to properly manage a GIS data base. Along with the technology, the agency must have a budget increase for training individuals in GIS use, for inventorying species, and for field verification of existing information. Currently, the public process is more a placation forum for the Forest Service than it is a real opportunity for public participation. The public is asked to become involved in a project, such as a timber sale, after the work has been done to prepare it. If the Forest Service considers citizens' concerns at all, the agency tells them the changes have been made or deemed irrelevant, and thanks them for their input. The public really is not involved, just appeased. If used properly, GIS could show people what the proposed land use would look like and its potential effects on surrounding landscape elements. Then public participation would at least be informative, and might even affect agency decisions.

Another issue of concern is that GIS is only as accurate as the data entered. If funding is insufficient to allow for accurate species and habitat assessments, how can land managers and environmental activists using GIS for design of bioregional reserves be sure the information is correct? This is a question to pose of any agency or organization from which you are seeking information. Field verification is especially necessary for site-specific projects.

Beside the issue of accuracy is the question of who should have access to GIS data. At present, many states have laws that require full public access to state databases, including Natural Heritage Programs, upon request. It is important to be aware of the responsibility that accompanies such information. Location information can be used against the species that are threatened; for example, angry loggers in Washington used spotted owl survey data to locate an owl and nail her to a sign post. Information can also serve as a treasure map for rare plant collectors. If you publicize sensitive information, buffer species locations; i.e., give only a rough idea of where a sensitive species occurs. Some agencies already take this precaution with the information they release, but the buffers are not always large enough to ensure protection.

FURTHER READING

Peter Burrough has published a text book called *Principles of Geographical Information Systems For Land Resource Assessment* (Clarendon Press-Oxford). The monthly journal *GIS World* has useful articles, but be prepared to wade through ravings about technological advances and lots of cheesy advertisements.

The International Journal of Geographical Information Systems is an excellent source of technical articles pertaining to GIS and biodiversity.

For data on your National Forest, call your district and ask if they have a GIS. If they do, ask for a list of the data categories available and for a copy of the base map they use for reference. If the Forest Service can't generate these maps on mylar or acetate (clear overlays), buying some mylar and tracing the information onto it yourself may be the only way to work with GIS generated information as an "outsider."

Sandra Coveny (POB 724, Durham, NH 03824) is designing PAW's proposed reserve system for Vermont, as part of The Wildlands Project. She will soon begin conducting workshops on designing reserves, again under the auspices of Preserve Appalachian Wilderness.

SOUTHERN ROCKIES ECOSYSTEM MAPPING

by Roz McClellan

Waking up to the knowledge of how landscape ecosystems function often means waking up to the spectacle of their destruction. Faced with this conundrum, how do activists keep responding to brush fire threats, while laying the foundation for long-term ecosystem protection?

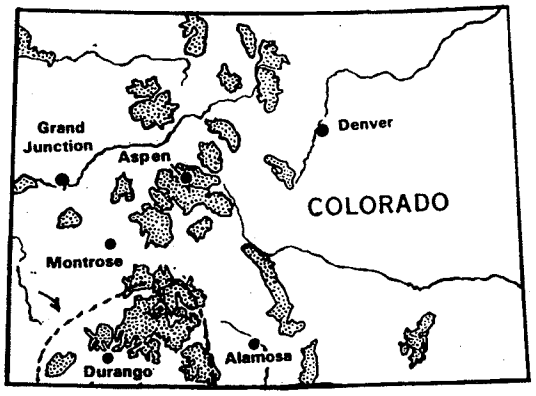
The Southern Rockies Ecosystem Project (SREP) is launching a mapping project intended to do both. The mapping will provide a first-line defense against timber sales and other immediate threats, while at the same time creating a long-term ecosystem preserve proposal in conjunction with The Wildlands Project.

Produced by students at the University of Colorado Wilderness Study Group, the maps have the immediate benefit of displaying the cumulative effects of upcoming timber sales on roadless areas, adding weight to grassroots efforts to stop these sales. Another short-term benefit of the maps is depicting graphically to decision-makers, the public, and the media the dramatic shrinking of Southern Rockies roadless areas. Right now SREP is focusing on roadless old growth forests since these are among the most biologically rich and quickly disappearing ecosystems in the region.

These maps of forested roadless areas will provide the seed for future maps of surrounding ecosystems, including grasslands, desert plateaus, alpine tundra, rivers, and riparian areas. These maps of larger ecosystems in turn will undergo a process of gradual refinement into an ecosystem preserve proposal, in consultation with local activists and conservation biologists.

SREP's maps can be produced quickly and easily by students and grassroots volunteers, and they elicit irresistible commitment in the process. They are visually compelling, and can be put to use immediately. Accordingly, a mapping format is being developed to enable locals throughout the region to make the maps with little supervision and using resources at hand.

The maps are composed of base maps at the 1/2 inch-to-the-mile scale (1:126,720) showing forest types (spruce, fir, ponderosa, aspen, etc.) and amount of disturbance; along with acetate overlays showing roadless area boundaries; boundaries of past, current, and proposed timber sales; past and future roads; and Forest Service management prescriptions (timber, grazing, recreation, etc.). Used in combination, the overlays reveal roadless areas being lost throughout the Southern Rockies, piece by piece.



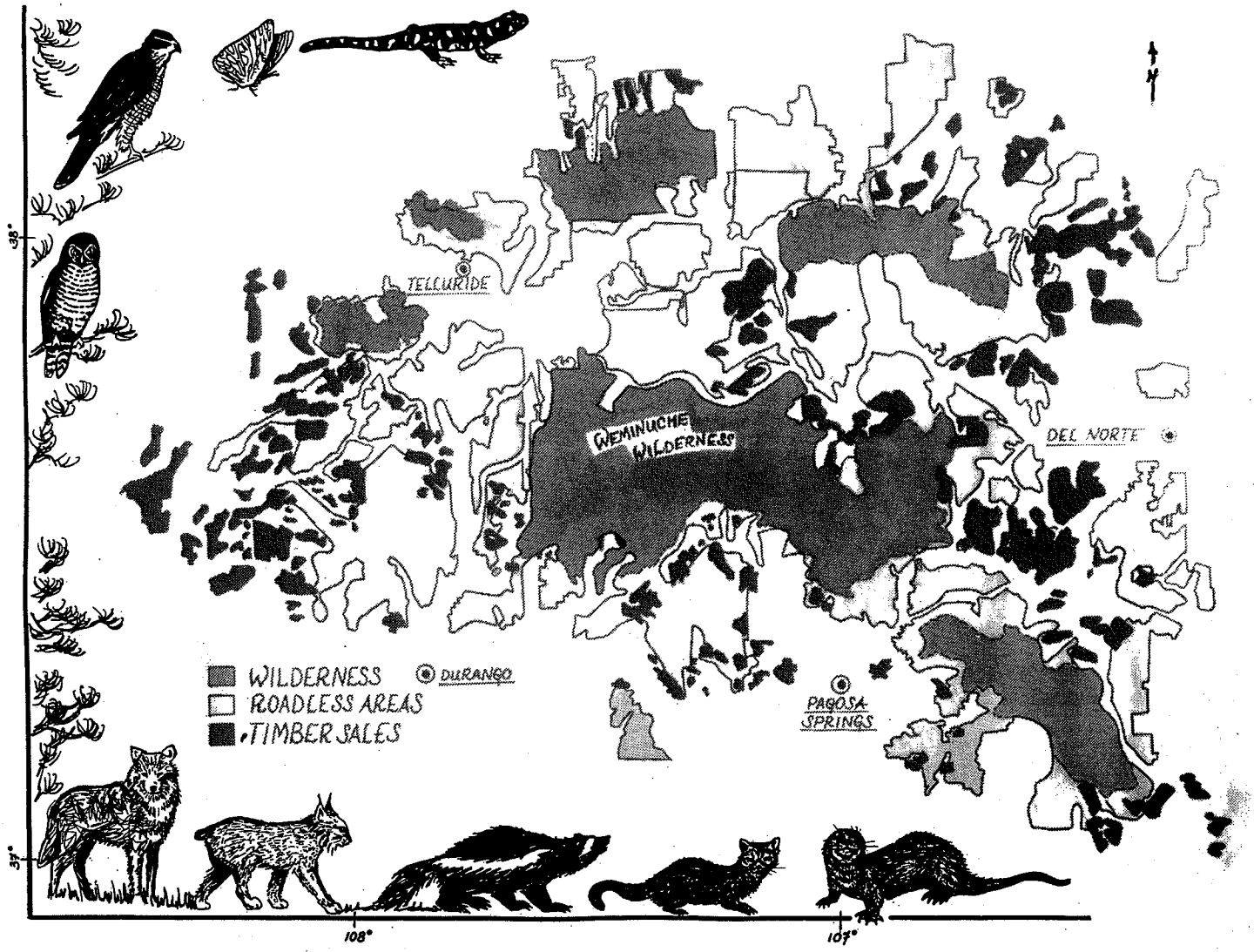
Area enlarged in Figure 1.

Mapping roadless areas of the Southern Rockies highlights one essential irony: roadless areas logically suggest themselves as core areas for ecosystem reserves, because they are the last undeveloped lands. Yet in the Southern Rockies, roadless areas don't necessarily encompass the most critical habitat. Quite the opposite in fact. Roadless areas in the region by and large encompass high elevation areas of rock and ice and alpine tundra, while the more biologically important grasslands, riparian areas, and river basins are the province of human-altered private lands, and multiply abused public lands. The Southern Rockies Ecosystem Project anxiously awaits expert guidance to overcome this unresolved paradox.

Meanwhile, SREP proceeds apace in synergistic harmony with The Biodiversity Legal Foundation whose habitat information needs it hopes to supply, with Colorado environmental organizations who have recently taken up the hue and cry of ecosystem protection, and with local dreams and schemes of a Greater San Juan Biosphere Reserve; though not, it must be confessed, with the Forest Service whose new found ecosystem advocacy appears to be a new, improved pretext for playing god with Nature, this time on no less than a landscape level.

Roz McClellan (483 Marine, Boulder, CO 80302) is a member of The Wildlands Project Board, and a founder of SREP.

Figure 1. Roadless Areas & Timber Sales in the San Juan Mountains



AN ECOSYSTEM PLAN IN THE MAKING

This map of the San Juan Mountain region of the Southern Rockies shows the first three of many overlays that will go into defining a system of core reserves for the region. Shown here are 1) boundaries of existing protected areas (designated Wilderness), 2) Forest Service RARE II roadless area boundaries as of 1977, 3) past and proposed timber sales showing the extent of encroachments on RARE II areas. Succeeding overlays will include 1) vegetation types and biotic communities, 2) roadless areas on Bureau of Land Management and private lands, 3) Natural Heritage sites of rare and sensitive species, 4) wildlife refuges and Nature Conservancy reserves, 5) proposed Wild and Scenic river segments, 6) road systems and potential road closures, 7) agency jurisdiction boundaries, and 8) land ownership. A final overlay, using all preceding data, will lay out a proposed system of core reserves, buffer, corridor, and recovery areas.

Update

Since this article was written, things have moved quickly in Colorado. Frustrated by the slow pace of the Colorado Wilderness Bill and other efforts, some members of the environmental community are looking at region-wide ecosystem protection as a new organizing principle for conservation work in Colorado. At the Colorado Environmental Coalition's annual November conference, wilderness leaders developed a plan of action for identifying reserves needed to protect the diverse ecosystems of the Southern Rockies.

The Wildands Project Board of Directors

JOHN DAVIS, Canton, NY

John is the editor of *Wild Earth*, and currently sits on the boards of The Wildlands Project, Preserve Appalachian Wilderness, and the Cenozoic Society. He edited the anthology, *The Earth First! Reader: Ten Years of Radical Environmentalism* and is a resident of the Adirondack foothills/St. Lawrence Valley ecotone.

BILL DEVALL, Arcata, CA

Bill has taught ecophilosophy and environmental studies at Humboldt State University since 1968. He is co-author (with George Sessions) of *Deep Ecology* and author of *Simple In Means, Rich In Ends*. He has authored over twenty-five articles on the deep, long-range ecology movement. Bill has worked on many wilderness issues over the past two decades, particularly in the Klamath-Siskiyou bioregion of northwestern California and southern Oregon.

JIM EATON, Davis, CA

Jim has been active in California wilderness protection for twenty-five years. While attending the University of California at Davis, capturing his degree in geology, he was president of Active Conservation Tactics. Jim was the California-Hawaii Regional Representative for The Wilderness Society from 1976 to 1980 and has been the executive director of the California Wilderness Coalition (which he founded in 1976) for the last eleven years. He is recognized as one of the most knowledgable wilderness buffs on the West Coast.

DAVE FOREMAN, Tuscon, AZ

Dave is chairperson of The Wildlands Project and executive editor of *Wild Earth*. He worked for The Wilderness Society from 1973 to 1980 as Southwest Regional Representative in New Mexico and Arizona and as lobbying coordinator in Washington, DC. A co-founder of Earth First!, he was editor of the *Earth First! Journal* from 1982 to 1988. During the 1970s, he was active as a volunteer with the Sierra Club, Nature Conservancy, and New Mexico Wilderness Study Committee. Foreman lectures widely and is the author of *Confessions of an Eco-Warrior* and co-author of *The Big Outside*.

MITCH FRIEDMAN, Bellingham, WA

Mitch is a conservation biologist and executive director of the Greater Ecosystems Alliance. His articles, book, speeches and videotapes have helped infuse conservation biology into the environmental community; and his lawsuits, protests, lobbying and other advocacy efforts have advanced biodiverstiy protection. Mitch also serves on the boards of North Cascades Conservation Council, North Cascades Audubon Society, Hells Canyon Preservation Society, and other conservation groups.

MONTE HUMMEL, Toronto, Canada

A former canoe guide from Whitedog Falls Hydro Camp, Ontario, Monte has moved south to Toronto and is now president and chief executive officer of World Wildlife Fund Canada. He holds graduate degrees in both philosophy and forestry and has served on the boards of numerous environmental organizations. He is the author of over a hundred articles and several books, including *Wild Hunters* and *Endangered Spaces*.

DAVID JOHNS, Portland, OR

David is president of TWP and a board member of the Cenozoic Society which publishes *Wild Earth*. He has been responsible for legal and organizational matters at The Wildlands Project. He teaches politics at Portland State University, has written on the politics of ecology, and is currently working on a book defending the concept of wilderness. He has worked to protect Oregon's High Desert from mining and cattle, assisted NGOs in developing an ecocentric Earth Charter, and supported Grizzly recovery. David was recently married to Carol Jones in the Eagle Cap Wilderness in a ceremony presided over by the The Wildlands Project Executive Committee.

ROZ McCLELLAN, Boulder, CO

Roz is the coordinator of the University of Colorado Wilderness Study Group Forest Mapping Project, and in that capacity is actively applying the principles of conservation biology to map the changing status of old growth and wild areas of the Southern Rockies. As the Director of the University of Colorado's Environmental Center, Roz coordinated conferences and helped student environmental groups. She is a leading activist in numerous Southern Rocky Mountain environmental groups.

ROD MONDT, Tucson, AZ

Rod is a former Park Ranger and Forest Service employee who retired early. He is the vice president, secretary, and program coordinator for The Wildlands Project. He has a graduate degree in geography and an interest in the American West and the effects of public land policy on biological diversity. He is the director of the National Off-Road Vehicle Task Force and Hunters and Fishers for Environmental Ethics. He is an unrepentant flyfisher who continues to write, research, teach and testify for numerous environmental groups.

REED F. NOSS, Corvallis, OR

Dr. Noss is a consultant in ecology and conservation biology, half time research scientist at the University of Idaho's College of Forestry, and a research associate at Stanford University's Center for Conservation Biology. He holds a Ph.D. in wildlife ecology from the University of Florida. He has worked in the environmental field for twenty years. He has over sixty technical publications in ecology and conservation biology.

ROXANNE PACHECO, Tuscon, AZ

Roxanne is treasurer of The Wildlands Project and business manager for "Books of The Big Outside." She consults on financial matters for several environmental organizations and local environmental professionals.

JAMIE SAYEN, Groveton, NH

Jamie is a former Quebec wilderness guide, newspaper reporter, founder of Preserve Appalachian Wilderness (PAW), and the author of *Einstein In America*, as well as numerous articles. He is co-editor of the new *Northern Forest Forum*. His work with PAW has made him the radical voice within the Northern Forest Alliance.

MICHAEL SOULÉ, Santa Cruz, CA

Born and raised in San Diego, Michael has returned to his home state and is presently the chair of Environmental Studies at University of California, Santa Cruz. He has done extensive field work around the world, taught at several universities and was the founder and first president of the Society for Conservation Biology. He is a fellow of the American Association for the Advancement of Science and has acted as a consultant on matters related to biological diversity for many agencies and organizations. As the co-editor of *Conservation Biology: The Science of Scarcity and Diversity*, and author of several books and numerous articles on biological diversity, Dr. Soulé has made a major contribution to the body of scientific knowledge and the advancement of conservation biology. He is fond of *Lacertilia* and dancing.

TERRY TEMPEST WILLIAMS, Salt Lake City, UT

Terry is one of the rising stars in Western literature and one of the most eloquent voices for protecting our land and our cultural heritage. She is the author of the widely acclaimed *Refuge* as well as several other books and numerous articles. A Utah native, Terry is the Naturalist in Residence at Utah's Museum of Natural History.

GEORGE WUERTHNER, Livingston, MT

George is a freelance writer, photographer, naturalist, and botanist. A former ranger and university instructor, Wuerthner is the author of thirteen books and hundreds of magazine articles on endangered species, fire ecology, wilderness management, and other wilderness topics. George has traveled thoughout the continent and has extensive knowledge of many different bioregions. In addition to serving on the board of The Wildlands Project, he is currently on the board of Rest the West and Restore the North Woods, and is president of the National Wolf Growers Association.

Speakers Bureau

Most of these Wildland Project board members, as well as many other Project participants, are available for speaking engagements and conferences. Contact TWP clearinghouse in Tucson for information.

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Buy Back The Dacks

Wild Earth magazine announces the creation of a people's fund for the Adirondacks. Only 42% of the six million acre Adirondack State Park is protected by public ownership—and of this amount, less than half is designated Wilderness. Recent legislative initiatives have failed and much of the privately owned land for sale within the park is threatened by development. Here's your opportunity to help keep the Northeast's crown jewel Forever Wild.

Buy Back The Dacks, a cooperative effort of *Wild Earth* and the Adirondack Conservancy will identify and purchase imperiled lands with a particular focus on sensitive habitats and private lands contiguous to existing Wilderness. Your contributions to **Buy Back The Dacks** go directly toward land acquisition/preservation—not to support the other important work of either organization. **Buy Back The Dacks**...working to protect wild habitat for all Adirondack natives.

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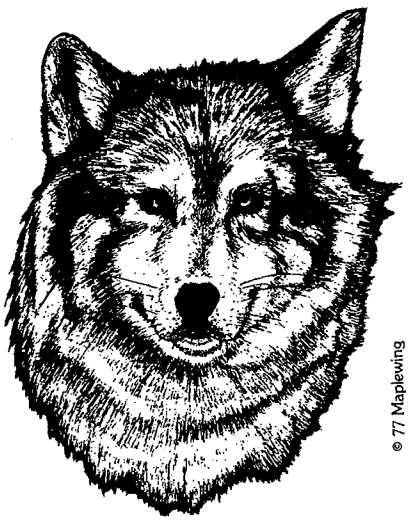

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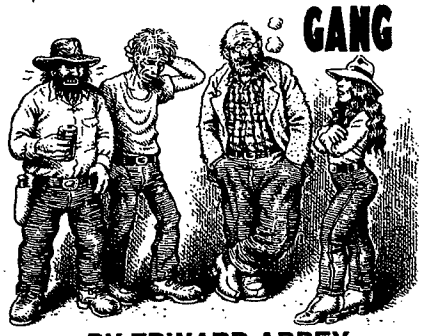

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In Wildness Is The Preservation Of The World

—Henry David Thoreau

But The Preservation Of Wildness Sometimes Requires The Greenback Dollar!

After reading this special issue of *Wild Earth*, you know what The Wildlands Project is up to. We propose nothing less than the rewilding of North America, nothing less than the renegotiation of the human covenant with the land. Instead of *re*acting to government and industry initiatives, we are acting with a new vision and a detailed plan for scientifically-based Wilderness Recovery Networks for the entire continent. In so doing, we will set a new agenda for conservation in North America, and we will reframe the conservation debate in terms of the continuation of the evolutionary process and the flourishing of all native American biological diversity.

To do this we must have your support—both active and financial. We have gone out on a limb to print and distribute 75,000 copies of this special issue of *Wild Earth* to activists throughout the continent. This is only a beginning. Now we must raise money to:

- Hire Dr. Reed Noss as staff conservation biologist for The Wildlands Project;
- Set up a clearinghouse office to provide technical, scientific, and other assistance to grassroots groups designing components of the North American Wilderness Recovery Plan across the continent. Staff includes Dave Foreman, David Johns, Rod Mondt, and Kelly Treese;
- Help regional groups organize conferences to work on Wilderness Recovery plans—priorities for 1993 include Upper Great Lakes, Southern Appalachians, the U.S. Southwest, and outreach to Central America, Mexico, and the Caribbean;
- Distribute additional copies of this special issue of *Wild Earth*.

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