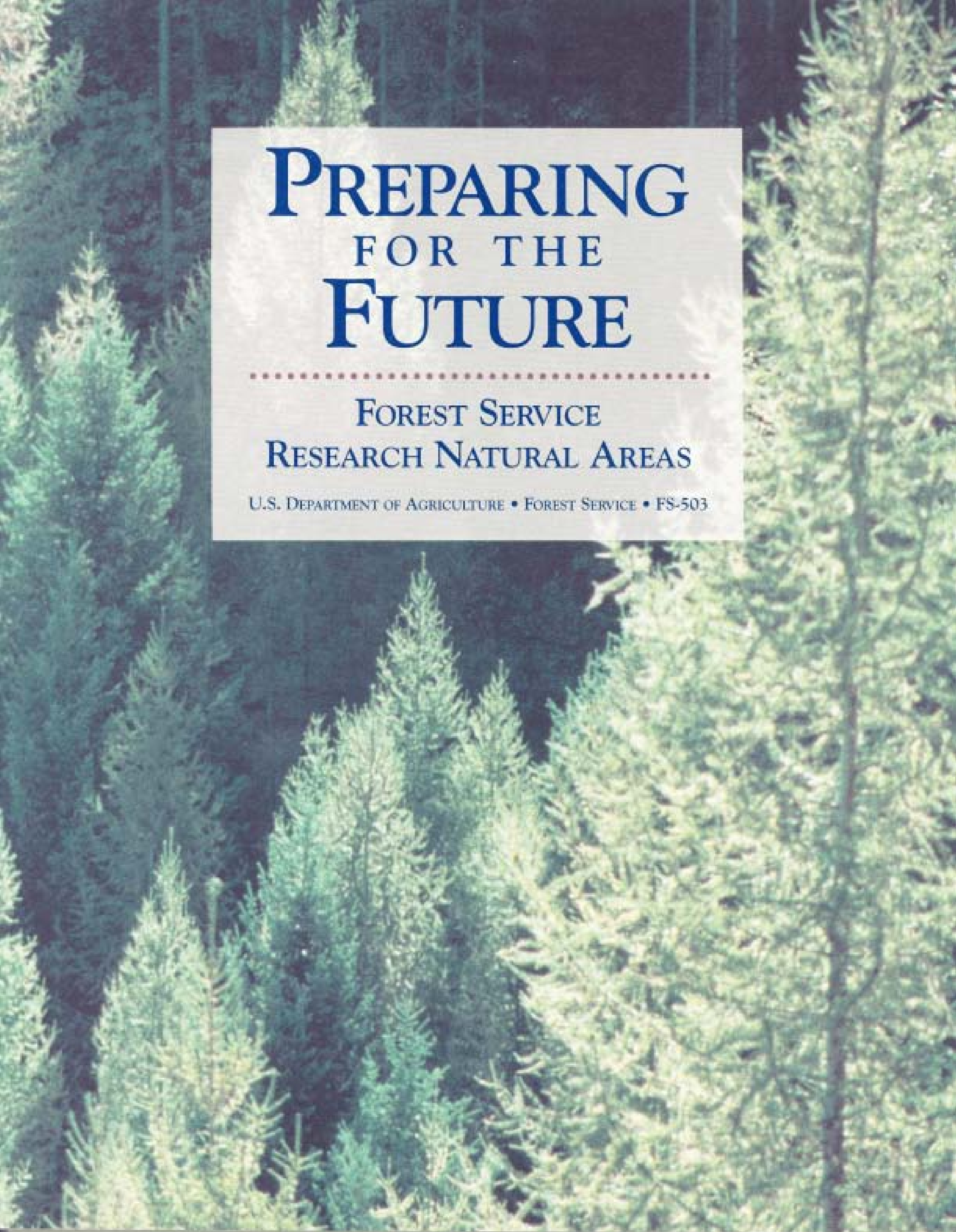
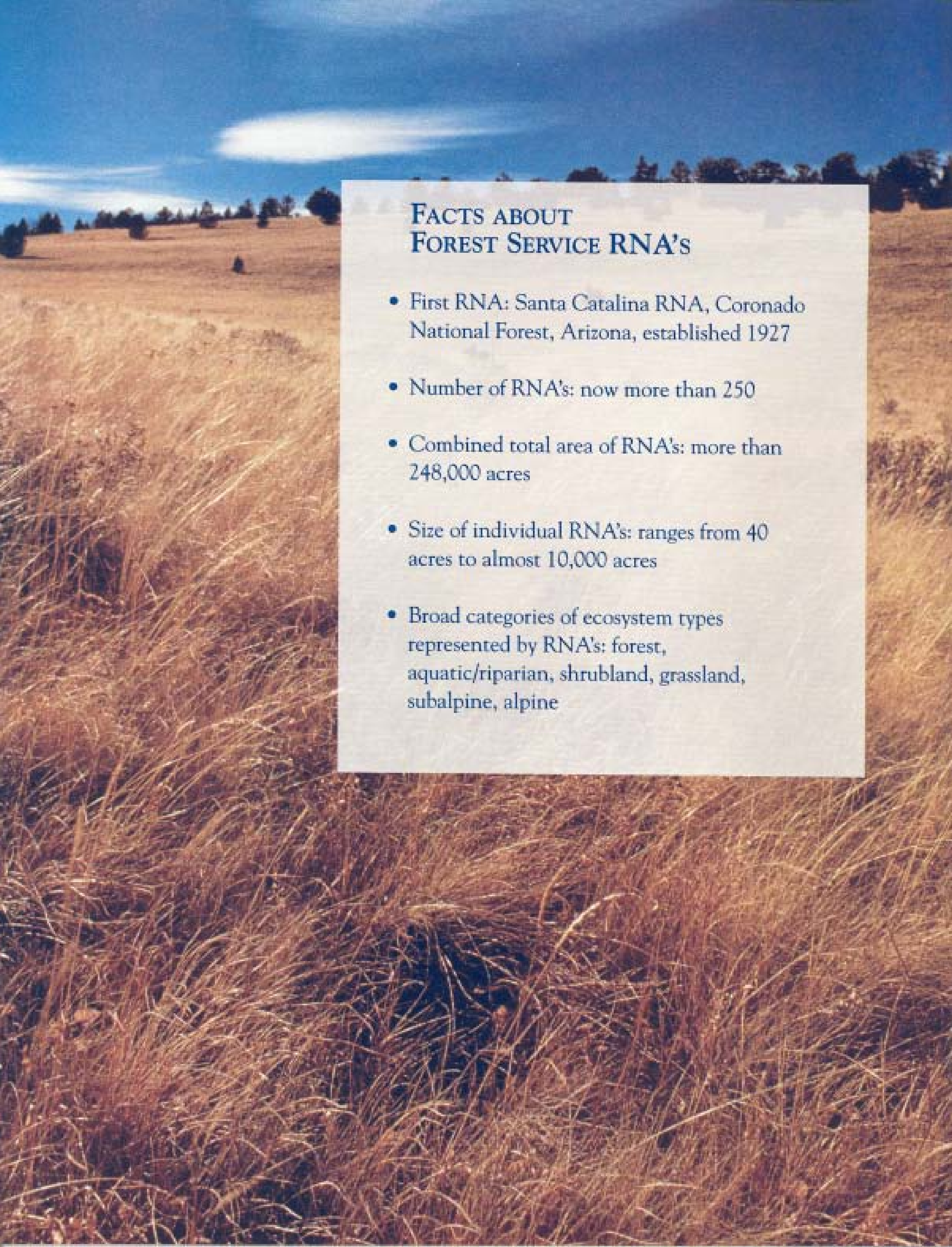


PREPARING FOR THE FUTURE

FOREST SERVICE RESEARCH NATURAL AREAS

U.S. DEPARTMENT OF AGRICULTURE • FOREST SERVICE • FS-503



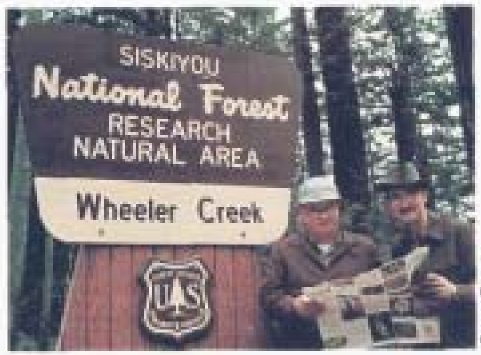
FACTS ABOUT FOREST SERVICE RNA'S

- First RNA: Santa Catalina RNA, Coronado National Forest, Arizona, established 1927
- Number of RNA's: now more than 250
- Combined total area of RNA's: more than 248,000 acres
- Size of individual RNA's: ranges from 40 acres to almost 10,000 acres
- Broad categories of ecosystem types represented by RNA's: forest, aquatic/riparian, shrubland, grassland, subalpine, alpine

Preparing for the Future

The mission of the USDA Forest Service, stated simply, is "Caring for the land and serving the people." In this era of growing environmental awareness and shrinking natural resources, living up to this mission becomes a more complex task than the founders of the Forest Service could ever have foreseen. Research natural areas (RNA's) help the Forest Service achieve that mission, by preparing today for the changing realities of tomorrow.

This brochure celebrates the establishment of the Forest Service's 250th research natural area and the increasingly important role played by the RNA network in preserving natural areas across the Nation.



Sarah Greene

Charlie Ott

Ken Hammond

Cover: Western larches, Flathead National Forest, Montana. Opposite: Grasslands, Saddle Mountain RNA, Pike National Forest, Colorado.
Above, top: Wheeler Creek RNA, Siskiyou National Forest, Oregon.
Above, bottom: Yellow ladyslipper, Wisconsin.
Left: Prescribed burning, Croatan National Forest, North Carolina.

ANGELA G. EVENDEN

KEN HAMMOND

RESEARCH NATURAL AREAS: WHAT ARE THEY?

Research natural areas (RNA's) of the Forest Service are lands that are permanently protected for the purposes of maintaining biological diversity, conducting nonmanipulative research and monitoring, and fostering education. The Forest Service's national network of more than 250 RNA's is designed to contain unique ecosystems as well as a representative array of widespread ecosystem types. In RNA's throughout the country, natural conditions are allowed to prevail, usually by eliminating or limiting human intervention. (In many ecosystems, however, human activities have interrupted natural processes for several decades or more. In these cases, prescribed management actions are used to restore the processes upon which the natural communities and species depend. RNA's prone to natural fires, for example, may need to be managed with prescribed fire; others may require fencing to exclude grazing animals.) Supporting the RNA concept is a scientific consensus that the best way—perhaps the only way—to conserve species is to protect intact ecosystems and their natural processes, few of which we completely understand.

WHY ARE THEY IMPORTANT?

At the most basic level, RNA's help preserve our Nation's natural heritage for future generations. What we do not save today may soon be gone forever. The permanent protection afforded RNA's is a critical step in maintaining a range of biological diversity of native ecosystems and species, many of them rare, sensitive, or endangered. Because they are protected in a natural state, RNA's also provide valuable opportunities for nonmanipulative research, monitoring of long-term ecological change, comparison of the effects of resource management activities against unmanaged controls, and education. For these reasons, they are fast becoming an integral part of forest land and resource management plans.

ABOVE, TOP: Contemplation at Elk Creek RNA, Nez Perce National Forest, Idaho.
ABOVE, BOTTOM: Transporting osprey nestlings, Croatan National Forest, North Carolina.
RIGHT: Pitcher plant, Florida.

KEN HAMMOND

"AT THE MOST BASIC LEVEL, RNA'S HELP PRESERVE OUR NATION'S NATURAL HERITAGE FOR FUTURE GENERATIONS." Sequoias, Sequoia National Forest, California.

BIOLOGICAL DIVERSITY

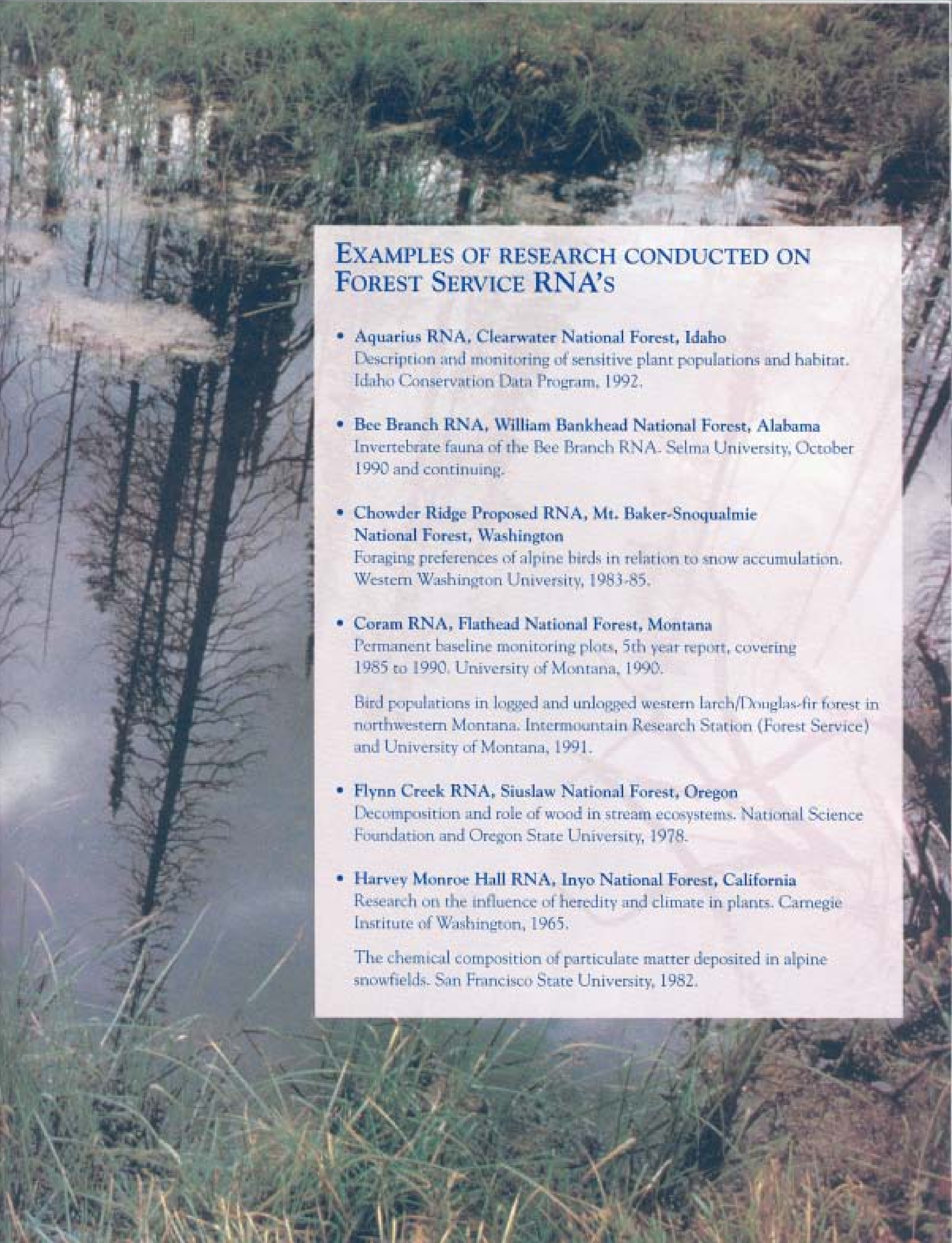
RNA's play an important role in maintaining biological diversity on National Forest System lands by conserving unique natural ecosystems and representative ecosystems. The rapidly evolving field of conservation biology has helped emphasize the importance of landscape-level relationships and processes. Recognition of this fact has led to greater cooperation between the Forest Service and nearby landowners, including individuals, conservation organizations, and other public agencies.

NONMANIPULATIVE RESEARCH

The relatively undisturbed state of RNA's provides unparalleled opportunities to advance our understanding of the structure, composition, and function of numerous native ecosystems. Researchers from the Forest Service and elsewhere use RNA's for studies that do not modify natural conditions, which are possible only in protected areas. (For example, Fern Canyon RNA, on the Angeles National Forest in California, was established specifically for the study of watersheds, an increasingly important consideration in conservation biology.) From the resulting basic ecological information, natural resource managers are able to develop better biological evaluations and prescriptions for land management practices. Of equal importance is the role of RNA's as biological repositories, safeguarding ecosystems, species, and natural processes for the future.

Trees reflected at Grand Mesa-Uncompahgre-Gunnison National Forest, Colorado.
INSET: Osprey, Croatan National Forest, North Carolina.

R. E. GROSSMAN
INSET: KEN HAMMOND



Examples of research conducted on Forest Service RNA's

- **Aquarius RNA, Clearwater National Forest, Idaho**
  Description and monitoring of sensitive plant populations and habitat. Idaho Conservation Data Program, 1992.

- **Bee Branch RNA, William Bankhead National Forest, Alabama**
  Invertebrate fauna of the Bee Branch RNA. Selma University, October 1990 and continuing.

- **Chowder Ridge Proposed RNA, Mt. Baker-Snoqualmie National Forest, Washington**
  Foraging preferences of alpine birds in relation to snow accumulation. Western Washington University, 1983-85.

- **Coram RNA, Flathead National Forest, Montana**
  Permanent baseline monitoring plots, 5th year report, covering 1985 to 1990. University of Montana, 1990.

  Bird populations in logged and unlogged western larch/Douglas-fir forest in northwestern Montana. Intermountain Research Station (Forest Service) and University of Montana, 1991.

- **Flynn Creek RNA, Siuslaw National Forest, Oregon**
  Decomposition and role of wood in stream ecosystems. National Science Foundation and Oregon State University, 1978.

- **Harvey Monroe Hall RNA, Inyo National Forest, California**
  Research on the influence of heredity and climate in plants. Carnegie Institute of Washington, 1965.

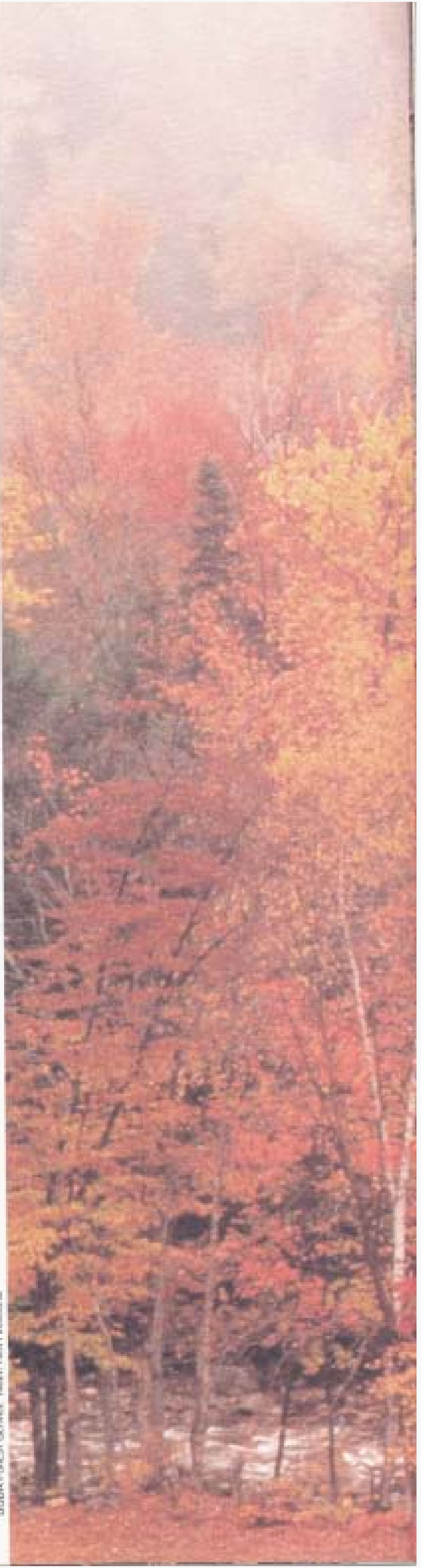
  The chemical composition of particulate matter deposited in alpine snowfields. San Francisco State University, 1982.

MONITORING LONG-TERM ECOLOGICAL CHANGE

Life is not static, and living ecosystems yield many of their most important secrets over time. One long-term study, conducted on the Thornton T. Munger RNA within the Wind River Experimental Forest, Gifford Pinchot National Forest, makes this point. The report of this study, entitled "Old-Growth Douglas-Fir and Western Hemlock: A 36-Year Record of Growth and Mortality," by scientists of the Forest Service Pacific Northwest Research Station, was published in 1987. Growth and mortality in a 1,180-acre old-growth stand in southwestern Washington were measured at 6-year intervals. The study found that from 1947 to 1983, net growth was minimal and total stand volume remained almost constant; however, characteristics of this stand changed significantly. The stand was found to be shifting gradually in upper canopy dominance from Douglas-fir to western hemlock; simultaneously, true firs and western redcedar were increasingly represented in the lower crown classes. The following conclusion underscores the value of this kind of long-term monitoring:

> *Demonstration of the ever-changing nature of old-growth stands is probably the most important contribution of this 36-year record. Although the net change in timber volumes was nil, processes and changes are as dynamic as those observed in many much younger stands. Hence, characteristics or functions of old-growth stands cannot be guaranteed in perpetuity by simply preserving existing old-growth tracts. Where desired old-growth forests' attributes are transient, long-term management strategies must include plans to re-create stands with those attributes. More information on patterns and rates of change in old-growth forests is clearly essential for identifying the nature and intensity of such problems.*

KEN HAMMOND



USDA FOREST SERVICE INSET: KEN HAMMOND

OPPOSITE AND INSET: Banding red-cockaded woodpeckers, Croatan National Forest, North Carolina.
BACKGROUND: Autumn scene, White Mountain National Forest, New Hampshire.

MONITORING RESOURCE MANAGEMENT ACTIVITIES

Without baseline data from ecosystems that are governed primarily by natural processes—data provided by the kind of long-term monitoring study cited above—we cannot understand the effects of resource management practices. Reference areas are required to assess the effects of the Forest Service's management practices on ecosystem composition, structure, and function. RNA's address this need. From RNA's nationwide come findings that are invaluable in validating the effectiveness of specific project prescriptions, standards, and guidelines in national forest land and resource management plans and in determining when such plans should be amended.

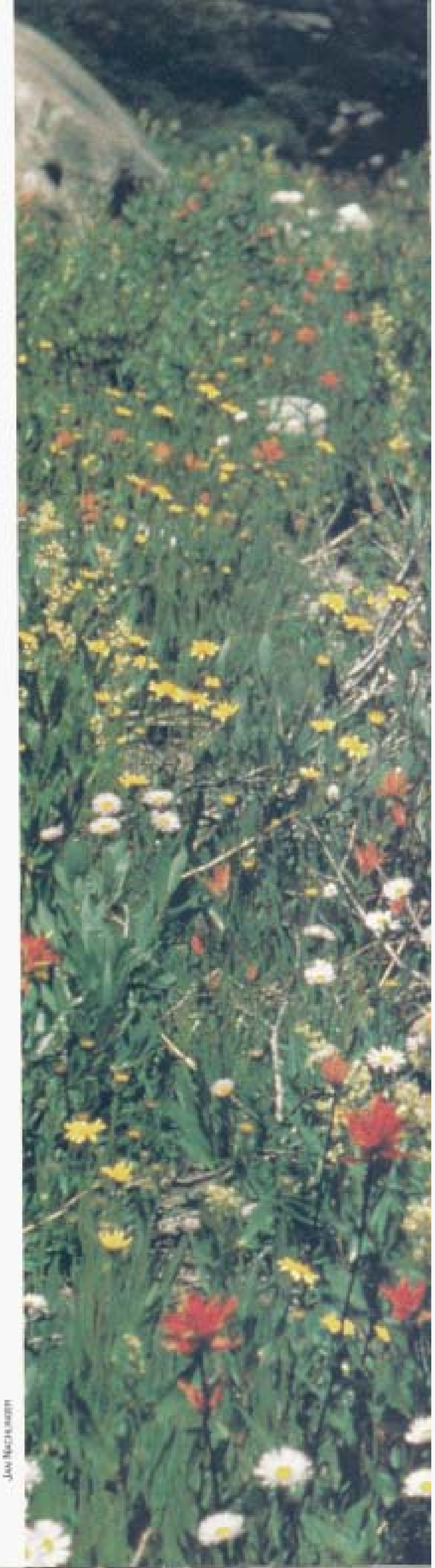
EDUCATION

RNA's provide opportunities to educate people—those who have a voice in today's decisions about wise stewardship of natural resources and those who will make tomorrow's decisions. Within some RNA's, supervised educational activities may take place, such as independent instruction, field trips for graduate-level students, and special tours for native plant societies and other responsible groups. RNA's also function as outdoor laboratories for formal education classes and graduate research projects. Such activities not only expand the body of scientific knowledge, they enlist community support and enhance awareness and goodwill, valuable commodities in themselves.

ANGELA G. EVENDEN

ABOVE: Plant monitoring, Lewis and Clark National Forest, Montana.
OPPOSITE: Flowers on Echo Lake RNA, Humboldt National Forest, California.

JAN NACHLINGER



THE 250TH FOREST SERVICE RNA

Established as the Forest Service's 250th RNA, LaRue-Pine Hills/Otter Pond in Illinois exemplifies the guiding principles of the RNA program. Diverse ecosystems are protected within its 2,585 acres on the Shawnee National Forest; research and educational opportunities abound.

The LaRue-Pine Hills/Otter Pond RNA contains more plant species than any comparable site in the Midwest, including roughly 1,300 taxa of flowering plants. It boasts 8 high-quality natural communities, 11 forest cover types identified by the Society of American Foresters, outstanding examples of Bailey limestone, and some 37 plant and animal species ranked as threatened or endangered in the State. It is also considered a prime site for reintroduction of the blue-headed shiner, a small fish that had become extinct in Illinois. In a larger context, this RNA provides an important rest stop for migratory birds along the Mississippi Flyway—a safe oasis in a sea of agriculture. Its location approximately 20 miles from the Southern Illinois University-Carbondale campus encourages responsible academicians to conduct Forest Service-approved research; the zoology, plant biology, and forestry departments take advantage of the RNA's assets, and numerous researchers from outside the area contribute to the Forest Service's store of knowledge about the RNA.

LaRue-Pine Hills/Otter Pond embodies the principles on which the first RNA was founded more than six decades ago, as well as the broader interpretation of that mandate that has guided the designation of more recent RNA's.

"RNA's help protect biological diversity and foster understanding of natural ecosystem processes."
Fenn Mountain proposed RNA, Clearwater National Forest, Idaho.

Research Natural Areas: 1927-92

An unlikely beginning

The protection of natural areas through RNA designation was triggered by a distinctly nonconservation concern: homesteading. A 1912 Act of Congress directed the Secretary of Agriculture to select, classify, and segregate lands within the national forests that were suitable for homestead entry. Complying with that act in 1926, Forest Ranger J. A. Frieborn examined a 4,464-acre tract adjacent to the Mt. Lemmon Recreational Area in Arizona's Coronado National Forest. He concluded that the land was not suitable for agriculture and therefore not subject to be set aside under the act, but he did find that it was valuable for timber production, streamflow protection, and botanical study. On March 23 of the following year, R. W. Dunlap, Acting Secretary of Agriculture, issued a Land Classification Order designating this tract as the Santa Catalina Natural Area—the Forest Service's first RNA—which was to be "so managed as to permit scientific studies of forest growth." Forest cover types were the sole focus of RNA selection for decades.

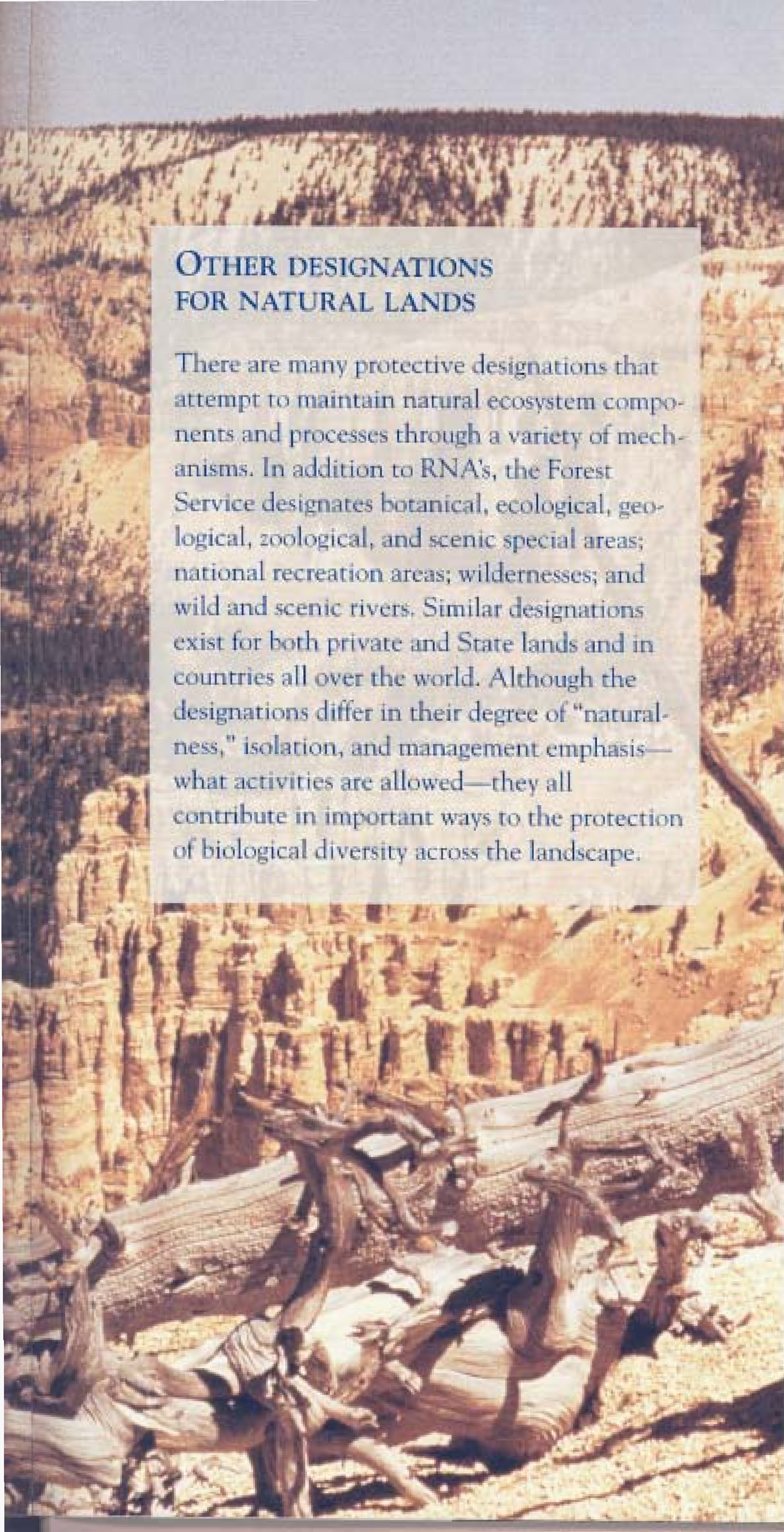
The momentum grows

Other RNA's were designated at a slow pace until 1976, when the National Forest Management Act directed the Forest Service to monitor the effects of resource management activities on site productivity, thus accelerating the process. Also contributing to this acceleration were factors such as the growth of the environmental movement and continuing loss of natural landscapes. Since then, RNA coordinators and scientists in all Forest Service regions and research stations have achieved measurable success in establishing RNA's: The landmark 250th RNA has been designated, and many more that have been proposed are on the path to official designation.

Formal establishment offers only a measure of the permanent protection promised by the RNA designation; careful monitoring and resource stewardship are critical to fulfilling that promise. Therefore, RNA's require management prescriptions developed specifically for each area.

Charles A. Wellner

Top: Alpine hulsea, Kenney Creek RNA, Salmon National Forest, Idaho.
Bottom: Research at Croatan National Forest, North Carolina.



OTHER DESIGNATIONS FOR NATURAL LANDS

There are many protective designations that attempt to maintain natural ecosystem components and processes through a variety of mechanisms. In addition to RNA's, the Forest Service designates botanical, ecological, geological, zoological, and scenic special areas; national recreation areas; wildernesses; and wild and scenic rivers. Similar designations exist for both private and State lands and in countries all over the world. Although the designations differ in their degree of "naturalness," isolation, and management emphasis—what activities are allowed—they all contribute in important ways to the protection of biological diversity across the landscape.

- To obtain, through scientific education and research, information about natural system components, inherent processes, and comparisons with representative manipulated systems.

In simpler language, these purposes translate into collection of baseline data, long-term research on ecological change, and monitoring of the effects of management activities, all of which are essential for effective natural resource management. The national forests are required by the National Forest Management Act of 1976 to monitor all resource management activities to ensure the continued productivity of managed sites and biological diversity. As such, they are obvious beneficiaries of the information gleaned from baseline data and monitoring activities on RNA's, as are many other groups and agencies involved in resource management. For this reason, RNA's—which help protect biological diversity and foster understanding of natural ecosystem processes—can become more important to the Forest Service's two-pronged mission to care for the land and serve the people. By helping to keep the land, soil, watersheds, and their species intact, RNA's help safeguard natural resources for the benefit and scientific knowledge of Americans today, and for generations to come.

THE FOCUS BROADENS

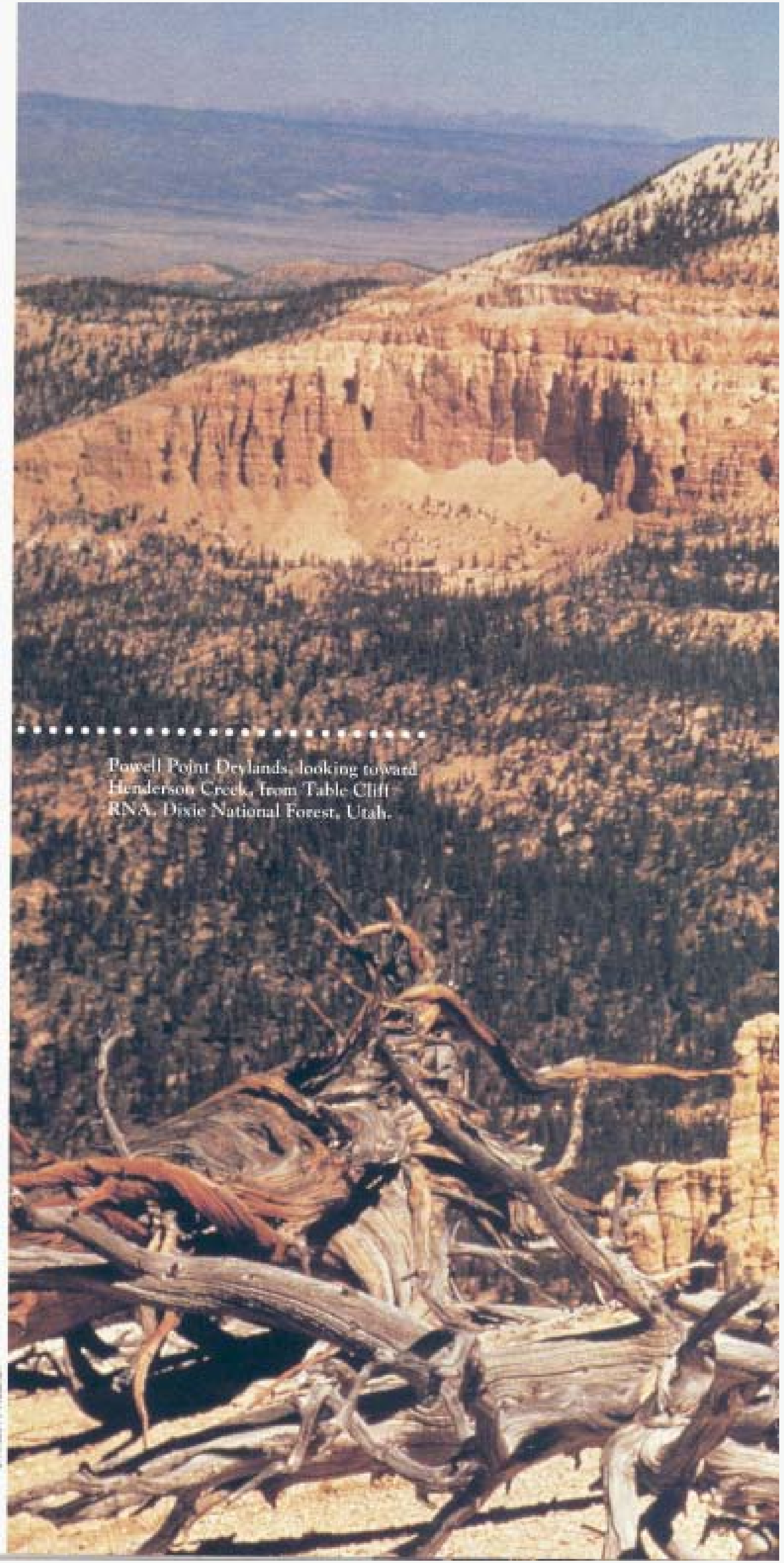
In the early days of the program, when the focus was on capturing representative areas and ecosystems before their pristine condition was lost, one RNA per major forest type was considered adequate for this purpose. As understanding of the variety and vulnerability of natural systems grew, the Forest Service RNA program changed in two significant ways:

- It recognized that ecosystems other than forested types, as well as habitats for rare plants and animals, needed special protection, and aquatic/riparian, shrubland, grassland, subalpine, and alpine ecosystems were added to the RNA network.

- It began to emphasize replication of ecosystem types already represented within the RNA network, to guard against the very real threat of permanent loss of unique natural systems.

"A Directory of Research Natural Areas on Federal Lands of the United States," published in 1977, stated two dominant purposes for developing a comprehensive system of RNA's:

- To preserve a representative array of all significant natural ecosystems and their inherent processes as baseline areas.



Powell Point Drylands, looking toward Henderson Creek, from Table Cliff RNA, Dixie National Forest, Utah.

CHARLES A. WELLNER

Charlie Ott

PARTNERS

After the Forest Service established the first RNA in 1927, other Federal agencies followed suit, among them the Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service within the Department of Interior, as well as the Department of Defense, Department of Energy, Tennessee Valley Authority, and U.S. Army Corps of Engineers. Although criteria for establishing and managing RNA's may differ among these agencies, the objectives for which RNA's are established remain the same.

As the focus of its RNA's has broadened, the Forest Service has moved to involve multiple partners in the establishment, management, and use of its RNA's. Numerous groups outside the Federal Government are interested in the preservation of natural areas, and the Forest Service enlists their aid to help maintain and extend its growing RNA system. These partners include State agencies, private organizations, universities, and interested individuals who have supported RNA's through activities such as building fences, gathering data, and setting up baseline monitoring programs. They also include conservation and professional organizations, such as The Nature Conservancy and the Natural Areas Association.

THE NATURE CONSERVANCY

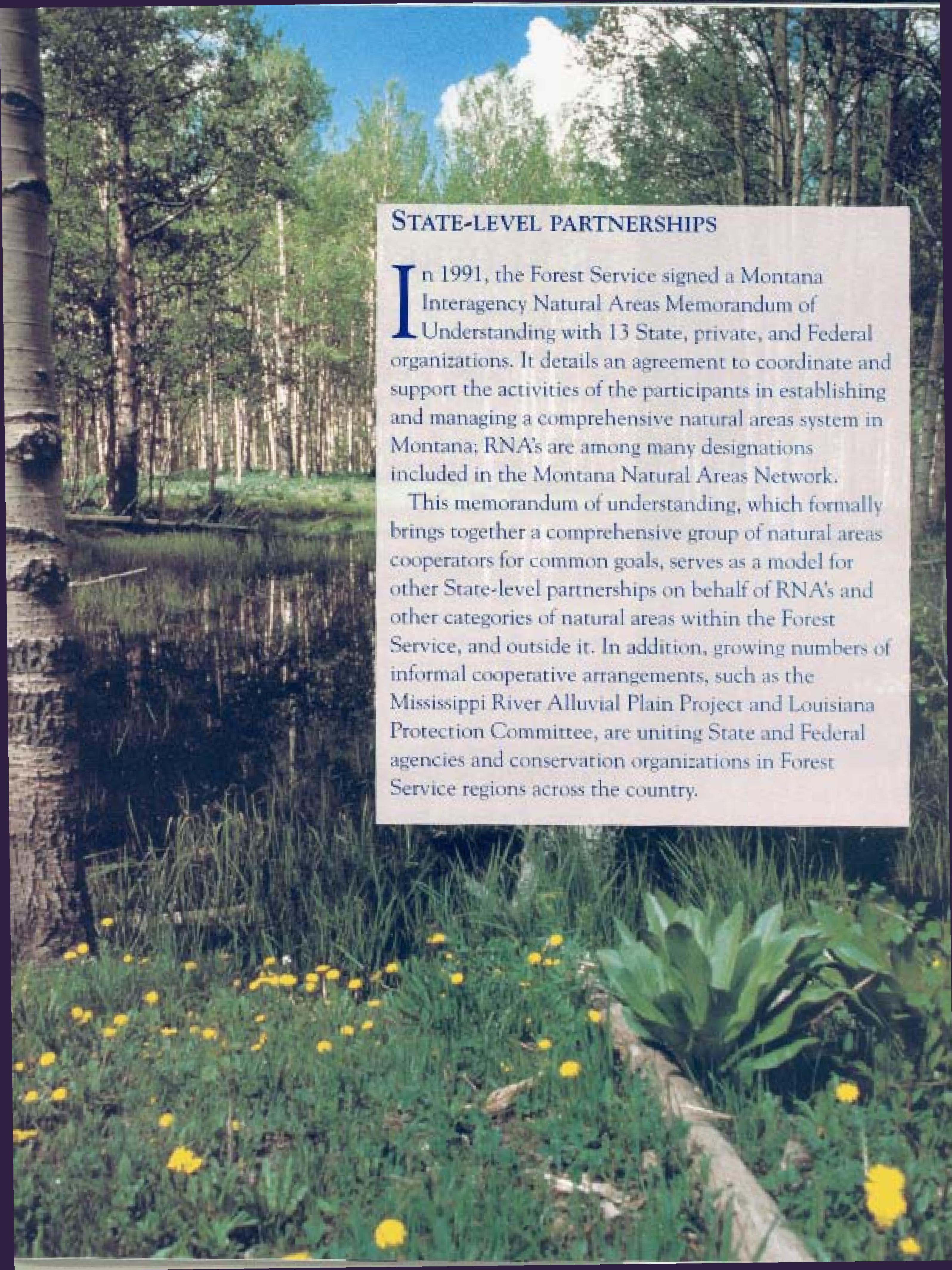
The Nature Conservancy, a nonprofit conservation organization incorporated in 1951, has been the Forest Service's most ardent cooperator in helping to identify and establish RNA's. This relationship is an obvious one, for the Conservancy's mission—to preserve plants, animals, and natural communities that represent the diversity of life on Earth—dovetails closely with the goals of the RNA program. As owner or manager of some 1,400 preserves, the Conservancy has extensive practical experience to share with the Forest Service on many stewardship issues. Additionally, the computer-linked network of 50 State natural heritage programs established by the Conservancy, which collects and maintains detailed data on the distribution of species and natural communities throughout the country, helps the Forest Service identify potential RNA's.

THE NATURAL AREAS ASSOCIATION

As the number of protected natural areas on public and private lands has grown, so has the number of natural resource professionals involved in natural area identification, management, and research activities. Bringing these professionals together is the Natural Areas Association, a nonprofit organization founded in 1978 to provide support and informational services to persons concerned with the protection and long-term stewardship of natural areas. Its mission makes the Natural Areas Association another logical cooperator for the Forest Service, and it has been an active ally in the RNA program.

THIS PAGE: Common loon, Michigan.
OPPOSITE: Aspen woods, Bridger-Teton National Forest, Wyoming.

R. E. Grossman



STATE-LEVEL PARTNERSHIPS

In 1991, the Forest Service signed a Montana Interagency Natural Areas Memorandum of Understanding with 13 State, private, and Federal organizations. It details an agreement to coordinate and support the activities of the participants in establishing and managing a comprehensive natural areas system in Montana; RNA's are among many designations included in the Montana Natural Areas Network.

This memorandum of understanding, which formally brings together a comprehensive group of natural areas cooperators for common goals, serves as a model for other State-level partnerships on behalf of RNA's and other categories of natural areas within the Forest Service, and outside it. In addition, growing numbers of informal cooperative arrangements, such as the Mississippi River Alluvial Plain Project and Louisiana Protection Committee, are uniting State and Federal agencies and conservation organizations in Forest Service regions across the country.

WHERE DO WE GO FROM HERE?

In 65 years, the RNA program has already covered a lot of ground, literally and figuratively. In 1927 there was one Forest Service RNA; beyond 1992 the number will greatly exceed 250. Human pressures on the natural landscape have increased markedly in those 65 years and can only be expected to grow. These pressures not only will affect the availability of land for future RNA's but will make it increasingly difficult to protect and maintain natural processes within RNA boundaries. Because the future of many RNA's will be determined in part by conditions beyond their borders, effective management of RNA's will require a cooperative and interdisciplinary approach.

COOPERATION AND COMPROMISE IN ACTION

The proposed William G. Telfer RNA on the Lincoln National Forest in New Mexico demonstrates this kind of cooperation and compromise. In 1982 requests to expand a nearby ski operation focused attention on the area, which is one of the southernmost ski regions and one of the southernmost spruce-fir communities in the United States, with many endemic plant and animal species. These distinctions at first seemed incompatible. The ski operators saw the land's irreplaceable commercial values; the Forest Service saw its equally irreplaceable natural values.

The campaign to reach a compromise, spearheaded by the district ranger, took several years but ultimately succeeded: the originally proposed RNA site of some 1,300 acres was reduced to 797 acres and the originally requested three new ski lifts were reduced to one. The proposed RNA and the ski operation, neighbors by unyielding geography, have come to a better understanding of each other's differences and learned the value of yielding something in the name of compromise. Thanks to that lesson, boundaries of the proposed RNA will be respected, thus affording protection for North America's largest corkbark fir trees in a unique mosaic of subalpine communities and providing an unparalleled opportunity to study successional stages and relationships among spruce-fir forest, grass meadows, and aspen groves.

ABOVE: Silver firs, Olympic National Forest, Washington.

STEPS FOR THE FUTURE

The past 65 years have brought huge leaps forward in the number of Forest Service RNA's now established or proposed, but that achievement is not enough. The window of opportunity for protecting pristine natural areas is closing. For the future of the National Forest System—both the integrity of its natural ecosystems and the health of its species and the knowledge needed to manage them wisely—more is needed. Specifically, the Forest Service plans to:

- Continue to identify RNA's to cover aquatic and terrestrial ecosystems not adequately represented in the RNA network.
- Complete establishment records for all RNA's proposed in existing forest land management plans.
- Write management and monitoring prescriptions for every RNA.
- Broaden efforts to demonstrate to Forest Service resource managers how RNA's can assist them in meeting their own management objectives and the Forest Service's dual mandate.
- Provide leadership for professional natural area advocates whose objectives support Forest Service goals.
- Develop baseline monitoring methods and standardized data management practices as references for measuring the effects of active resource management practices.
- Promote the RNA network to universities throughout the country to encourage research projects that meet Forest Service guidelines and standards.

Through success in these areas, the Forest Service will ensure that its RNA's continue to play a vital role in helping to protect our country's extraordinary biological diversity, provide sites for critical long-term research and education, and monitor ecosystem processes for maximum health far into the future.

ABOVE, TOP: Western pasque-flower, Fenn Mountain RNA, Clearwater National Forest, Idaho.
ABOVE, BOTTOM: Bald eagle, Alaska.
LEFT: Research, Aquarius RNA, Clearwater National Forest, Idaho.

SARAH GREENE

CHARLES A. WELLNER

ECOSYSTEM DIVERSITY REPRESENTED IN FOREST SERVICE RNA'S

FOREST

Baño de Oro RNA, Caribbean National Forest (Puerto Rico)—undisturbed tabonouco forest; only tropical forest in National Forest System, originally set aside by Spanish Crown in 1840

Jumpoff RNA, Uinta National Forest (Utah)—unusual quaking aspen forest and sagebrush grasslands

Mesita de los Ladrones RNA, Santa Fe National Forest (New Mexico)—minimally disturbed pinyon-juniper

Pony Meadows RNA, Payette National Forest (Idaho)—old-growth spruce and subalpine fir forest

Quinnault RNA, Olympic National Forest (Washington)—coastal old-growth forest of western hemlock, Sitka spruce, western redcedar, and Douglas-fir

Tionesta RNA, Allegheny National Forest (Pennsylvania)—climax hemlock-beech stand, presenting opportunity to study dynamics of forest succession

AQUATIC/RIPARIAN

Gap Creek RNA, Ouachita National Forest (Arkansas)—upland headwater stream featuring rare paleback darter (*Etheostoma pallididorsum*) and, on its banks, southern ladyslipper (*Cypripedium kentuckiense*), under Federal review for listing as a threatened or endangered species

McCarthy Lake Cedars RNA, Chequamegon National Forest (Wisconsin)—undisturbed shallow softwater drainage lake with several streams and a large, old-growth white cedar swamp

Sims Peak Pot Holes RNA, Ashley National Forest (Utah)—excellent example of wetlands, bogs, and riparian system within a mixed conifer forest

ABOVE, TOP: Frog, Willamette National Forest, Oregon.
ABOVE, BOTTOM: Bottle Lake RNA, Kaniksu National Forest, Idaho.

SHRUBLAND

Cliff Lake RNA, Beaverhead National Forest (Montana)—sagebrush shrub steppe within forested mosaic

Cone Peak Gradient RNA, Los Padres National Forest (California)—extremely diverse plant communities resulting from landscape of high elevation (7,000 feet) down to sea level along Big Sur coast

White Pine Peak RNA, Humboldt National Forest (Nevada)—shrublands and dry forest

Western Cross Timbers RNA, Lyndon B. Johnson National Grassland (Texas)—exceptionally interesting area embracing the interface of grand prairie and eastern deciduous forest

GRASSLAND

Dry Gulch-Forge Creek RNA, Salmon National Forest (Idaho)—waterfall and hot springs in grassland setting

Frenzel Creek RNA, Mendocino National Forest (California)—serpentine grass remnant with cypress species

Newaygo Prairie RNA, Huron-Manistee National Forest (Michigan)—various sedges and grasses, especially little and big bluestem

Two-Top Big-Top RNA, Custer National Forest (North Dakota)—high-quality mixed-grass prairie

SUBALPINE

Carlton Ridge RNA, Lolo National Forest (Montana)—excellent example of old-growth alpine larch and whitebark pine forest, with hybrids resulting from unusual overlap of western larch and alpine larch zones

Olallie Ridge RNA, Willamette National Forest (Oregon)—subalpine mosaic of mountain meadows and true fir-mountain hemlock forest on ridgetops of the western Cascades

San Francisco Peaks RNA, Coconino National Forest (Arizona)—highest spot in State, demonstrating aspects of island biogeography

ALPINE

Harvey Monroe Hall RNA, Inyo National Forest (California)—unique flattish alpine landscape, with multidecade history of research on diversity and climate change

TOP: Bristlecone pines, Carpenter Canyon RNA, Toiyabe National Forest, Nevada.
LEFT: Cypress swamp, St. Francis National Forest, Arkansas.

CHARLIE OTT

GEOLOGIC

Dismal Hollow RNA, Ozark-St. Francis National Forest (Arkansas)—beech-dominated, relict mixed mesophytic forest, enormous sandstone boulders, nearly vertical soaring bluffs (60 to 80 feet high) with caves that were inhabited by prehistoric Indians

Mt. Shasta Mudflow RNA, Shasta-Trinity National Forests (California)—Pacific ponderosa pine on volcanic mudflows; numerous small mammals

Red Canyon RNA, Dixie National Forest (Utah)—highly colorful rock formations and 13 plant taxa of varying rarity, including *Erioghonum aretioides* (buckwheat family) and other species endemic to the vivid Wasatch Limestones formations

UNIQUE/SPECIAL

Alpine Gardens RNA, White Mountain National Forest (New Hampshire)—one species that is a candidate for Federal protection; on State level, nine endangered, eight threatened, and four rare plant species, and four rare animal species

Aquarius RNA, Clearwater National Forest (Idaho)—best remaining example of coastal remnant forest in northern Rockies, containing numerous sensitive plant and animal species

Goodding RNA, Coronado National Forest (Arizona)—unique assemblage of rare and sensitive species, including *Fraxinus gooddinii* (ash), *Choisya mollis* (citrus family), *Coryphantha recurvata* (cactus), and *Dalea tentaculoides* and *Desmanthus bicornutus* (legumes)

Nordhouse Dunes RNA, Huron-Manistee National Forest (Michigan)—State's best example of windblown dunes and world's most extensive interdunal wetlands adjacent to fresh water

Pack Creek RNA, Tongass-Chatham Area (Admiralty Island, Alaska)—protection for brown bear along salmon stream

Swift Creek RNA, Bridger-Teton National Forests (Wyoming)—unusual tall forbs system producing spectacular flower garden

Thompson Clover RNA, Wenatchee National Forest (Washington)—small tract of *Trifolium thompsonii morton*, federally listed as endangered

ABOVE, TOP: Gila monster, Haufer Wash RNA, Tonto National Forest, Arizona.
ABOVE, BOTTOM: Black-tailed prairie dog pups, Montana.
OPPOSITE: Short-eared owl, Pete Dahl Slough proposed RNA, Chugach National Forest, Alaska.

STEPHEN M. MURPHY

PRODUCED IN COOPERATION WITH
THE NATURE CONSERVANCY
JANUARY 1992
REPRINTED OCTOBER 1992

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