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Research Natural Areas on National Forest System Lands in Idaho, Montana, Nevada, Utah, and Western Wyoming: A Guidebook for Scientists, Managers, and Educators

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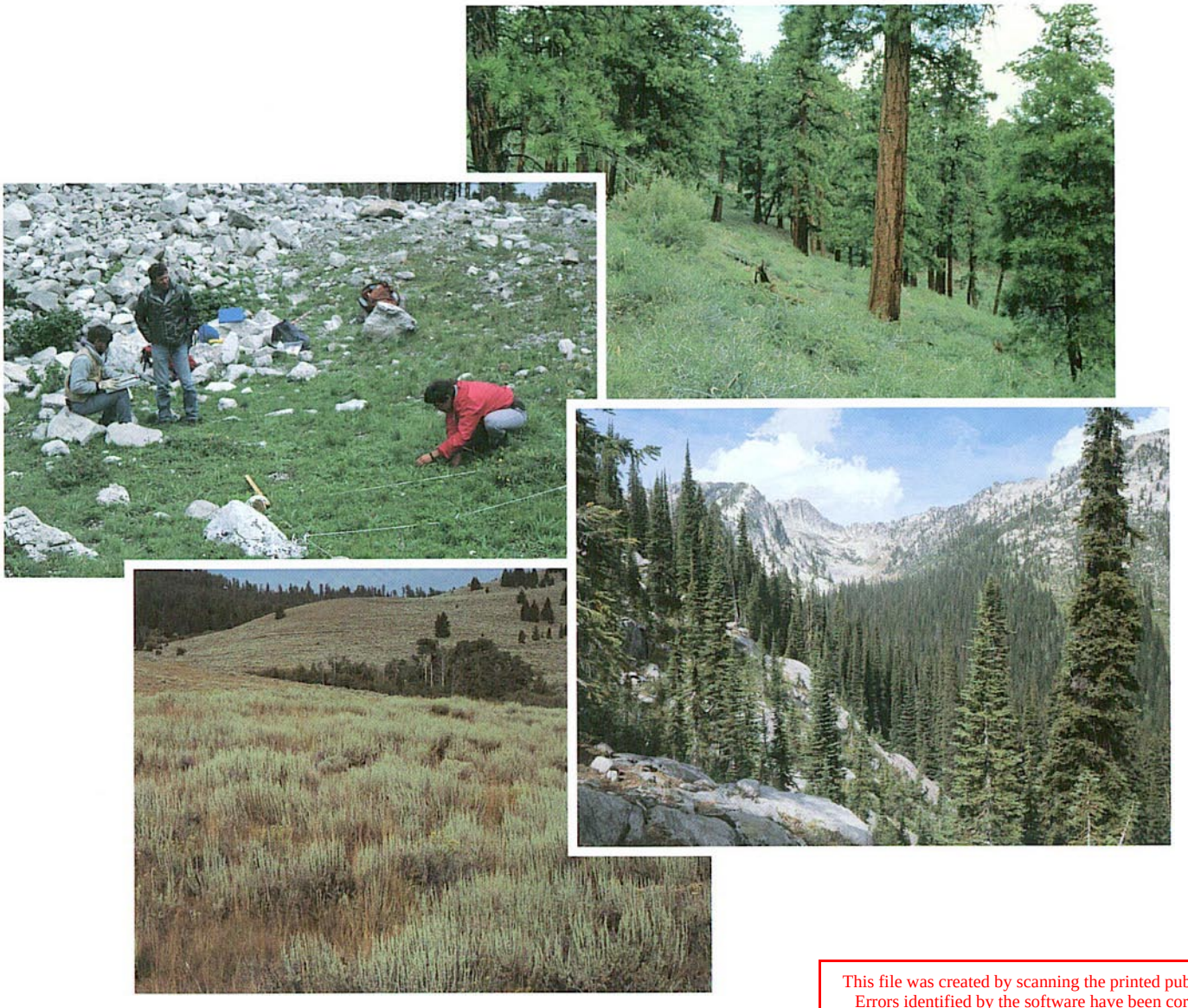

Abstract

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This guidebook is intended to familiarize land resource managers, scientists, educators, and others with Research Natural Areas (RNAs) managed by the USDA Forest Service in the Northern Rocky Mountains and Intermountain West. This guidebook facilitates broader recognition and use of these valuable natural areas by describing the RNA network, past and current research and monitoring, management, and how to use RNAs.

About The Authors

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Cover Photos:

Upper Right: A variety of ponderosa pine (*Pinus ponderosa*) forests are represented within the RNA network. This stand occurs within Upper Sand Creek RNA along the southern face of the Aquarius Plateau on the Dixie National Forest in southern Utah. The dominant understory shrub is bitterbrush (*Purshia tridentata*). Photo by Joel Tuhy.

Upper Left: Research and monitoring studies are conducted within many Forest Service Research Natural Areas. Photo by Angela Evenden.

Bottom Right: Subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) forests on granitic substrates within Bruin Mountain RNA on the Payette National Forest in Idaho. Photo by Charles Wellner.

Bottom Left: Shrub steppe communities, dominated by threetip sagebrush (*Artemisia tripartita*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), are well-represented in Horse Prairie RNA on the Beaverhead-Deerlodge National Forest in southwestern Montana. Photo by Steve Chadde.

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Research Natural Areas—An Overview

The Forest Service Research Natural Area (RNA) network permanently protects some of the finest examples of natural ecosystems for purposes of scientific study, baseline monitoring, education, and maintenance of biological diversity. These protected areas, which are maintained in natural condition and managed with minimal human intervention, are available for non-manipulative research and low-impact educational activities. The RNA network includes:

- High quality examples of widespread ecosystems in natural condition
- Unique ecosystems and ecological features
- Plants and animals of special concern and their habitat

RNAs help conserve biological diversity at the genetic, species, ecosystem and landscape scales.

RNAs representing widespread ecosystems in natural condition serve as baseline or reference areas that can be used for evaluating manipulative land management practices in comparable plant communities and ecosystems.

RNAs are managed to maintain the natural features and processes for which the areas were designated. As such, RNAs are an excellent scientific resource for natural history research, ecosystem studies, long-term ecological studies of succession and other environmental changes.

RNAs provide opportunities for low-impact educational activities. These areas are available for educational use by university and school groups, native plant societies, and other organizations interested in pursuing natural history and educational field trips (Tyrrell 1999).

A Nationwide Network

The Research Natural Area designation is used by several federal land management agencies including the Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. Of these agencies, the Forest Service has been the most recently active in designating RNAs. The Santa Catalina RNA on the Coronado National Forest in Arizona was designated in 1927 as the first RNA on National Forest System lands. "A Directory of Research Natural Areas on Federal Lands of the United States", published in 1977, described an established federal network of 389 RNAs encompassing over 4 million acres of federal lands in 46 states and one territory (USDA 1977). Of these 389 RNAs, 122 were on National Forest System land. The other 267 RNAs were administered by the U.S. Department of the Interior, including the Bureau of Land Management, Fish and Wildlife Service, and National Park Service. As of the year 2000, the network of Forest Service RNAs has grown to more than 450 areas encompassing more than 550,000 acres on 175 National Forests and Grasslands.

The RNA network is envisioned to preserve a representative array of all significant natural ecosystems

and their inherent processes as baseline reference areas (USDA Forest Service 1994). Ecosystem representation within the national RNA network is defined primarily by the use of plant communities, at the plant association, plant series, or higher plant community classification levels. The basic premise in using plant communities as targets for the RNA network is that the variation in plant communities reflects other biotic and abiotic components of these ecosystems (Daubenmire 1976; Pfister and Arno 1980). In addition to the representative values of RNAs, some RNAs are designated to protect aquatic communities, unique ecological and geological features, and habitat of rare and sensitive plants and animals.

Nationally, RNAs range from 14 acres (Two Top—Big Top RNA; Dakota Prairie Grasslands, North Dakota) to 16,935 acres (Hell Canyon RNA; Arapaho and Roosevelt National Forests, Colorado). Average size of RNAs nationally is about 1,300 acres (Hill 2000). Although relatively small, RNAs make important contributions to maintaining biological diversity, especially when considering plant communities and individual species of plants or small animals. Although some scientists are emphasizing large reserves as the most effective means for maintaining biological diversity, particularly for large carnivores (Noss and Cooperrider 1994), it is important to recognize the contributions of RNAs and other small reserves (Shafer 1995). The RNA network is designed to represent the full range of ecosystems occurring on federal lands. As a result, RNAs are commonly located within actively manipulated portions of our landscape where dedication of large reserves is not possible. The RNA network contains a broad representation of ecosystems and, in many cases, examples of plant communities, unique habitats and individual species that are not otherwise protected. The network serves to protect each ecological type at several locations within a region, as opposed to large reserves, which usually are not that well dispersed. The national RNA network is an important component of the overall suite of reserved conservation lands.

Although the RNA network has expanded significantly in recent decades, many ecosystem types remain unrepresented. Securing RNA designations in the most productive forest and rangeland ecosystems where commodity uses are concentrated is especially challenging. In the USDA Forest Service, authority to establish RNAs has been delegated by the Chief of the Forest Service to Regional Foresters, with concurrence from the Research Station Directors. New areas that are proposed to fulfill gaps in the RNA network are evaluated through ongoing National Forest and National Grassland land management planning efforts.

RNAs in the Northern Rocky Mountains and Intermountain West

This guidebook provides summary information on 210 established RNAs and 16 proposed RNAs (pRNA) on National Forests in the Northern Rocky Mountains and Intermountain West. These RNAs are managed by 26 National Forests and National Grasslands in five states and are administered by the Northern (R1) and Intermountain (R4) Regions of the Forest Service (table 1; oversize map). These established and proposed RNAs encompass greater than 300,000 acres

Table 1—Number and acres of established and proposed Forest Service Research Natural Areas in Idaho, Montana, Nevada, Utah and western Wyoming (R1 = Northern Region; R4 = Intermountain Region; RMRS = Rocky Mountain Research Station).

		Established		Proposed		Estab.+ Prop.	
State	Region	Number	Acres	Number	Acres	Number	Acres
Idaho	R1	38	49,211	6	5,842	44	55,053
Idaho	R4	68	72,279	1	805	69	73,084
Montana[1]	R1	60	67,788	9	31,181	69	98,969
Nevada	R4	12	32,993	0	0	12	32,993
Utah	R4	27	32,484	0	0	27	32,484
Utah	RMRS	1	1,846	0	0	1	1,846
western Wyoming	R4	4	14,280	0	0	4	14,280
Total	R1	98	116,999	15	37,023	113	154,022
Total	R4	111	152,036	1	805	112	152,841
Total	RMRS	1	1,846	0	0	1	1,846
Grand Total	All Regions	210	270,881	16	37,828	226	308,709

[1]Line Creek Plateau pRNA is placed in Montana (Custer National Forest), although a portion of it occurs within the Shoshone National Forest in Wyoming.

and range from 32 acres (Pole Creek Exclosure RNA, Sawtooth National Forest, Idaho) to 22,422 acres (Line Creek Plateau pRNA; Custer and Shoshone National Forests in Montana and Wyoming). Diverse ecosystems across a broad geographical area are represented: alpine tundra, subalpine and montane forests, grasslands, shrub steppe, desert shrub, chaparral, wetlands, riparian and aquatic communities.

Although the first RNA within the Northern and Intermountain Regions was established in 1935 (Tepee Creek RNA; Idaho Panhandle National Forests, Idaho), systematic planning for RNAs did not occur until passage of the National Forest Management Act in 1976 (NFMA 1976). A section of this act directs the Forest Service to establish a representative network of RNAs. Regional Guidebooks containing specific RNA guidance and targets were subsequently developed for the Northern Region (USDA Forest Service 1983) and Intermountain Region (USDA Forest Service 1984a). State-level natural areas committees and workshops held during the mid 1970's to mid 1980's were responsible for developing ecosystem and biological targets for the RNA network in Idaho (Wellner and Johnson 1974), Utah and Nevada (Van Pelt 1982) and Montana (Loop 1986). Working groups were formed in each state to focus on the following general target categories: alpine; forests and woodlands; grasslands and shrublands; aquatic and riparian; geology; rare plants; and wildlife. Existing habitat type classifications and other vegetation classification schemes were used to help define targets for forests, grasslands, shrublands and other ecosystem types (Kuchler 1964; Daubenmire and Daubenmire 1968; Pfister and others 1977; Eyre 1980; Mueggler and Stewart 1980; Steele and others 1981; Hironaka and others 1983; Steele and others 1983; Mauk and Henderson 1984; Youngblood and Mauk 1985; Cooper and others 1991). Updated assessments of RNA representation have been completed subsequently for the Forest Service Northern Region (Chadde and others 1996), and the states of Idaho (Rust 2000), Nevada (Picciani and Nachlinger 1994) and Utah (Tuhy 1998).

General descriptions of each RNA are provided in table 2, which includes RNA name, Section number from the National Hierarchical Framework of Ecological Units (McNab and Avers 1994; Bailey 1995), year established, size (acres), elevation range (feet), an indication of whether aquatic or unique features are present, codes for dominant vegetation, and a short descriptive summary of the most important features of the area. The unique features field indicates that rare species of plants or animals, or rare ecosystem types are present within an RNA. Table 2 also indicates whether an RNA occurs within a Congressionally designated Wilderness or National Recreation Area. An index to alphacodes for dominant vegetation is located in table 3. Although the National Hierarchical Framework of Ecological Units (McNab and Avers 1994) is used in this publication, classification refinements have been made and are being applied within certain geographic areas. For example, the State of Idaho is using a revised version of the national hierarchy that was developed for the Interior Columbia Basin Ecosystem Management Project (Menakis and Long 1996; Rust 2000).

The descriptive information in table 2 has been arranged alphabetically by state and National Forest. For cross-referencing, complete listings of RNAs by Section level (McNab and Avers 1994; Bailey 1995) are located in Appendix A. The oversize map shows RNA locations by state, National Forest and Regional boundaries, Ecological Section, topography, hydrology and highways.

Additional Sources of RNA Information. A variety of additional sources provide information not covered in this guidebook. They include a Forest Service RNA website, other publications, RNA Establishment Records, and State Natural Heritage Program websites and databases.

Detailed information about RNAs in 11 western states, including the five states covered in this guidebook, may be found at http://rna.nris.state.mt.us/. Additional printed information about RNAs not included in this guidebook is available for Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming (Ryan and others 1994); southwestern states (Peterson and Rasmussen 1986; USDA Forest Service 1984b); Idaho (Rabe and Savage 1977; Rabe and Savage 1979; Jankovsky-Jones and others 1999; Rust 2000); Pacific Northwest (USDA Forest Service 1975); and California (Keeler-Wolf 1990).

Research Natural Area Establishment Records contain an excellent description of biological and physical features of each area and include maps, detailed plant and animal species lists and plant community descriptions. Copies of RNA Establishment Records are available from the appropriate Regional office (contact information listed in Appendix B). These records are filed under 4060-3 and 4063 file designations.

The Forest Service Research Natural Areas Program in Idaho, Montana, Nevada, Utah, and western Wyoming has operated in partnership with the state Natural Heritage Programs. The following Natural Heritage Programs have been involved in RNA inventory and data management and serve as additional sources of information on Forest Service RNAs: Idaho Conservation Data Center (http://www2.state.id.us/fishgame/cdchome.htm), Montana Natural Heritage Program (http://nris.state.mt.us/mtnhp), Nevada Natural Heritage Program (http://www.state.nv.us/nvnhp/), Utah Natural Heritage Program (http://www.nr.state.ut.us/dwr/dwr.htm), and Wyoming Natural Diversity Database (http://uwadmnweb.uwyo.edu/wyndd/).

Table 2—Forest Service Research Natural Areas in the Northern and Intermountain Regions, by state and National Forest. The total number of RNAs by state and National Forest is listed in parentheses following the Region code. Map number corresponds to oversize map, section number from the National Hierarchical Framework of Ecological Units (McNab and Avers 1994; Bailey 1995), presence of aquatic or unique features includes rare species of plants or animals, or rare ecosystem types, and codes for dominant vegetation are indexed in (Table 3). A summary of the primary features of the natural area follows for each RNA.

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features		Dominant vegetation
						Aquatic	Unique	
IDAHO – Bitterroot National Forest (R1 - Northern Region) (1 RNA)								
1	**Salmon Mountain ❷**	M332A	1998	1923	6360-8800	✓		PIAL, ABLA, LALY
	(Whitebark pine, alpine larch, & subalpine fir forests; ribbon forests; moist snowglade meadows of green fescue & smooth woodrush; intermittent & permanent streams; cold springs; lakes; located in Idaho but administered by Bitterroot National Forest, Montana)							
IDAHO – Boise National Forest (R4 - Intermountain Region) (14 RNAs)								
2	**Back Creek**	M332A	1995	1368	6200-8922	✓	✓	PSME, PICO, ABLA
	(Forests of Douglas-fir, lodgepole pine, subalpine fir & Engelmann spruce; wetland complex with fen & graminoid meadow; entire watershed basin including low- & moderate-gradient streams & major river; spawning habitat for sensitive fish species)							
3	**Bannock Creek**	M332A	1971	438	4960-6200			PSME, PIPO, ARTR
	(Dry Douglas-fir and ponderosa pine forests; shrublands dominated by big sagebrush; much of the RNA was burned in a July 1994 wildfire)							
4	**Bear Creek**	M332A	1971	340	5040-7499			ARTR, AGSP, FEID
	(Sagebrush steppe with mountain big sagebrush, bluebunch wheatgrass & Idaho fescue; some ponderosa pine)							
5	**Chilcoot Peak ❷**	M332A	1996	1294	7250-8998	✓		ABLA, PIAL
	(Diverse assemblage of wetland & aquatic communities; uplands with dry forests of subalpine fir & whitebark pine; cliffs, talus & rock outcrops; peatlands; lake; meandering glide, riffle-pool & cascade-pool streams)							
6	**Dry Buck**	M332A	1996	693	3500-5280	✓		PSME, PIPO
	(Douglas-fir forests in a range of seral stages; old-growth grand fir & ponderosa pine; entire, small watershed basin)							
7	**Eggers Creek**	M332A	1996	325	4760-6460	✓		PSME, ABLA
	(Wide range of Douglas-fir types over elevational gradient; subalpine fir & grand fir forests; entire watershed basin; RNA burned in 1992)							
8	**Elk Creek Exclosure**	M332A	1979	108	3960-4400			ARTR, AGSP, FEID
	(Shrub-steppe communities dominated by big sagebrush; bunchgrass prairies with Idaho fescue & bluebunch wheatgrass)							
9	**Lowman**	M332A	1971	430	4080-5200			PSME, PIPO
	(Dry forests of Douglas-fir & ponderosa pine; young seral communities resulting from high to moderate intensity fire in 1988)							
10	**Monumental Creek**	M332A	1996	729	3750-6057	✓		PSME, PIPO, PUTR
	(Cool, moist Douglas-fir forests & warm, dry ponderosa pine forests; shrublands with antelope bitterbrush & bluebunch wheatgrass; two small watershed basins)							
11	**Needles**	M332A	1995	985	6750-8880	✓		ABLA, PIEN, PIAL
	(Subalpine fir, Engelmann spruce & whitebark pine forests; granite cliffs and extensive exposed bedrock; shallow cirque lake surrounded by wet sedge-dominated meadow; headwaters basin with perennial stream)							
12	**North Fork Boise River**	M332A	1995	840	3840-6398	✓		PSME, PIPO
	(Dense forests of Douglas-fir & ponderosa pine; riparian shrubland communities along corridor of major river)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date●	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
13	**Raspberry Gulch**	M332A	1996	640	3520-4880	✓		PSME, PIPO, ARTR
	(Douglas-fir & ponderosa pine forests in steep river canyons; big sagebrush & bitterbrush communities; young seral communities resulting from high to moderate intensity fire in 1992; several drainage basins and segment North Fk. Boise River)							
14	**Roaring River**	M332A	1995	414	5200-7680	✓		PSME, ARTR
	(Forests of Douglas-fir on north-facing slopes; big sagebrush shrublands on dry, south-facing slopes; entire small watershed basin)							
15	**Trinity Mountain**	M332A	1995	204	8130-9451	✓		ABLA, PIAL, ARTR
	(Open high-elevation stands of subalpine fir & whitebark pine; upland big sagebrush communities; several cirque basins with wetland communities and lake)							
IDAHO – Caribou National Forest (R4 - Intermountain Region) (6 RNAs)								
16	**Burton Canyon**	M331D	1988	1005	6020-7855	✓	✓	PSME, ABLA, ARTR, POTR1
	(Forests of Douglas-fir with aspen & subalpine fir; mixed shrubland communities dominated by big sagebrush & mountain mahogany; small entire watershed basin)							
17	**Gibson Jack Creek**	342B	1982	2210	5400-7214	✓		PSME, ABLA, ARTR
	(Forests of Douglas-fir, subalpine fir, bigtooth maple & aspen on north-facing slopes; shrublands on south-facing slopes dominated by big sagebrush, black sagebrush, Utah juniper & bluebunch wheatgrass; small drainage basin with low- to moderate-gradient streams, beaver dams & ponds)							
18	**Horse Creek**	M331D	1989	550	6680-8275	✓		PICO, PSME
	(Mature lodgepole pine & Douglas-fir forests; riparian shrubland communites dominated by willow & alder; spring-fed riffle-pool stream)							
19	**Meade Peak**	M331D	1988	305	8600-9957			PSME, PIFL, ARTR
	(Subalpine parkland with mountain big sagebrush & scattered Douglas-fir & limber pine; krummholz subalpine fir; limestone cliffs)							
20	**St. Charles Creek**	M331D	1988	410	6700-8453			CELE, PSME, ARTR, POTR1
	(Shrublands of curlleaf mountain mahogany, black sagebrush & big sagebrush; Douglas-fir woodlands; moist draws with aspen communities)							
21	**West Fork Mink Creek**	342B	1973	640	5600-7000	✓		PSME, POTR1, ARTR
	(Forests of Douglas-fir & aspen on north-facing slopes; shrublands dominated by big sagebrush & Great Basin wildrye; Utah juniper woodlands; cold springs & seeps; meandering glide & riffle-pool streams; riparian communities; the RNA occurs in two units)							
IDAHO — Clearwater National Forest (R1 - Northern Region) (12 RNAs)								
22	**Aquarius**	M333D	1991	3900	1600-3995	✓	✓	ABGR, THPL, PSME
	(Old-growth western redcedar & western hemlock forest; largest red alder stand east of Cascade Range; borders North Fork Clearwater river; endemic and coastal disjunct plants and communities; numerous rare plants)							
23	**Bald Mountain**	M332A	1991	365	5760-6526		✓	ABLA, TSME, FEVI
	(Forests of subalpine fir & mountain hemlock; native grassland balds with green fescue; southern limit of white rhododendron)							
24	**Bull Run Creek**	M333D	1988	373	2190-2940	✓	✓	THPL, ABGR
	(Forests of western redcedar, grand fir & Douglas-fir; plant communities on basalt; riffle-pool stream; permanent ponds; west coast disjunct plants)							
25	**Chateau Falls**	M333D	1991	200	2200-3880	✓		PSME, ABGR
	(Douglas-fir & grand fir forests; grassland & shrubland communities; high-gradient cascade-pool stream with waterfalls; ravines & cliffs)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
26	**Dutch Creek**	M332A	1991	303	2300-3532	✓		BEPA, THPL, ABGR
	(Extensive successional stands of northwest paper birch resulting from past fires; forests of western redcedar, grand fir & Douglas-fir; steep riffle-pool stream)							
27	**Fenn Mountain ❷**	M332A	proposed	600	6210-8021	✓		ABLA
	(Subalpine fir forest; rock cliffs & talus slopes with tall forb communities; cirque basin with two lakes & associated wetland communities)							
28	**Four-bit Creek**	M333D	1991	392	3540-4240	✓		THPL, PSME, ABGR
	(Moist, diverse forest including western redcedar, western larch, western white pine, grand fir & ponderosa pine; meandering glide & riffle-pool stream)							
29	**Grave Peak ❷**	M332A	1992	360	6850-8282	✓		ABLA, PIAL, LALY
	(Forests of subalpine fir, whitebark pine & alpine larch; barren granitic rock & talus slopes; cirque basin with five small lakes & two small wet meadows; riffle-pool streams)							
30	**Lochsa**	M332A	1977	1281	1600-3680	✓	✓	PSME, ABGR, THPL
	(Douglas-fir forests with western redcedar & grand fir; Pacific coast disjunct plants including Pacific dogwood; tributary streams; endemic rare plants)							
31	**Rhodes Peak**	M333D	proposed	310	6440-7930	✓		PIAL, ABLA
	(Stunted whitebark pine & subalpine fir stands; subalpine turf communities on slopes & in moist cirque basins; cliffs & boulder fields; meandering glide stream)							
32	**Sneakfoot Meadows**	M332A	1989	1965	5890-6616	✓		PICO, ABLA
	(Diverse graminoid & forested wetland complex with lodgepole pine and subalpine fir; meandering glide streams)							
33	**Steep Lakes**	M333D	1989	784	5750-7290	✓		ABLA, TSME
	(Forests of subalpine fir & mountain hemlock; Sitka alder communities; riffle-pool stream; permanent pond; 2 lakes with & without fish; wet meadows)							
IDAHO — Idaho Panhandle National Forest (R1 - Northern Region) (19 RNAs)								
34	**Binarch Creek**	M333A	1989	660	2660-3200	✓	✓	TSHE, PSME, ABGR
	(Moist forests of western hemlock, western redcedar, Douglas-fir & grand fir; meandering glide & riffle-pool stream; beaver dams & ponds; marshes & wet meadows; pure strain of westslope cutthroat trout)							
35	**Bottle Lake**	M333A	1982	260	2800-3368	✓	✓	TSHE, THPL, PIMO
	(Old-growth western redcedar and western hemlock; 15-acre lake with sphagnum mat; small meadow; rare plant)							
36	**Canyon Creek**	M333A	1937	982	4150-5970	✓		THPL, TSHE, ABLA
	(Moist western hemlock, western redcedar, subalpine fir forests; grassland bald with green fescue & beargrass; rockslides; springs; cascade-pool stream; RNA is within the Priest River Experimental Forest)							
37	**Five Lakes Butte**	M333D	1988	310	5700-6859	✓		TSME
	(Subalpine glaciated basin with mountain hemlock forests of subalpine fir, whitebark pine & Engelmann spruce; moderate to steep riffle-pool & cascade-pool streams; cirque lakes with & without fish; wet meadows)							
38	**Hunt Girl Creek**	M333B	1981	1505	3900-6298	✓	✓	ABLA, PICO
	(Subalpine fir, lodgepole pine, western hemlock & western redcedar forests; intact drainage basin; narrow gorge; avalanche chutes with successional communities; riffle-pool streams; marshes & wet sedge meadows; seeps)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date[1]	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
39	**Kaniksu Marsh**	M333A	1981	195	2420-2525	✓	✓	PICO, TSHE, PIPO
	(Diverse, moist forests including Douglas-fir, ponderosa pine, western hemlock, western white pine, western larch, western redcedar; 90-acre crescent-shaped marsh & sphagnum bog with floating mat; spruce-hemlock bog; beaver ponds; numerous rare plants)							
40	**Montford Creek**	M333D	1937/1985	292	3050-4400	✓		TSHE, ABGR
	(Old-growth western hemlock, grand fir, western white pine (heavy mortality), western larch, Douglas-fir & subalpine fir; perennial spring-fed stream; RNA is within the Deception Creek Experimental Forest)							
41	**Pond Peak**	M333D	1988	270	4880-6136	✓		TSHE
	(Old-growth mountain hemlock with subalpine fir & lodgepole pine; talus slopes; small pond with adjacent sedge & alder wetland)							
42	**Potholes**	M333A	1989	274	2750-3150	✓	✓	TSHE, THPL
	(Moist forests of western hemlock & western redcedar; cold spring; ponds; meandering glide, riffle-pool & cascade-pool streams; marsh, wet meadow & fen; beaver dams & ponds; rare plants)							
43	**Scotchman No. 2**	M333D	1988	1270	4320-6989	✓		ABLA
	(Subalpine fir, whitebark pine, Engelmann spruce & lodgepole pine forests; rocklands; avalanche chutes with successional communities; pond in cirque basin)							
44	**Smith Creek**	M333A	1988	1340	4700-6742	✓	✓	ABLA
	(Subalpine fir forest; sedge dominated wetlands; meandering glide, riffle-pool & cascade-pool streams; sphagnum fen, marsh & pond; rare plants & animal)							
45	**Snowy Top**	M333A	1991	835	5060-7572	✓	✓	ABLA, PIAL
	(High elevation subalpine fir & whitebark pine forests; green fescue bald; small lake in cirque basin; riffle-pool & cascade-pool streams; wet meadows in two cirque basins; avalanche chutes; rare plants)							
46	**Spion Kop**	M333D	1988	465	2755-3490	✓		TSHE, ABGR
	(Bottomland forests of black cottonwood; upland forests of western hemlock; river fed by streams with meandering sloughs; beaver ponds; marshes)							
47	**Tepee Creek**	M333A	1935	746	2450-3200	✓	✓	THPL, TSHE, PIMO
	(Old-growth western redcedar, western hemlock & western white pine; riffle-pool stream; rare plant)							
48	**Theriault Lake**	M333D	1991	120	5700-6500	✓		TSME
	(Old-growth mountain hemlock with spruce & subalpine fir; riffle-pool stream; small, shallow lake; wet sedge meadows)							
49	**Three Ponds**	M333A	1988	240	3340-3905	✓		ABLA, PSME, TSHE
	(Grand fir, Douglas-fir, western hemlock & western redcedar forests; meandering glide & riffle-pool streams; beaver ponds & dams; wet sedge meadows)							
50	**Upper Fishhook**	M333D	1971	320	4280-4880	✓		THPL
	(Old-growth western redcedar; with western white pine, western hemlock, Douglas-fir & grand fir; riffle-pool stream)							
51	**Upper Priest River**	M333A	proposed	1432	2460-2600	✓		TSHE, THPL
	(Old-growth western hemlock, western redcedar & black cottonwood floodplain communities; oxbows & river terraces; river)							
52	**Upper Shoshone Creek**	M333D	1988	1407	3618-6444	✓		TSME, ABLA, TSHE
	(Old-growth western hemlock & mountain hemlock; subalpine green fescue bald; undisturbed watershed basin with moderate- to steep-gradient stream; waterfall & cold springs)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
IDAHO — Nez Perce National Forest (R1 - Northern Region) (12 RNAs)								
53	**Alum Beds ❷❸**	M332G	proposed	600	1200-4800	✓	✓	PIPO
	(Ponderosa pine with bunchgrass; unique hydro-thermally altered rock formations; steep- to low-gradient stream; waterfalls & minor plunge pools; mineral-rich springs; located in Idaho but administered by Wallowa-Whitman National Forest, Oregon)							
54	**Bills Creek ❷❸**	M332G	proposed	300	1200-2000	✓		CERE
	(River-level terrace communities dominated by hackberry; sand dropseed & red three-awn communities; located in Idaho but administered by Wallowa-Whitman National Forest, Oregon)							
55	**Elk Creek ❷**	331A	1998	7055	2000-8371	✓	✓	PSME, ABGR, PIPO
	(Forests of ponderosa pine, Douglas-fir & grand fir over large elevational gradient; mountain mahogany; grasslands; rocklands; entire large watershed basin and subalpine lakes; steep gradient stream; rare plant)							
56	**Fish Lake ❷**	331A	1988	760	5605-6400	✓		ABLA, XETE
	(Subalpine fir forests; steep-walled glacial troughs; 29-acre lake with fish; gentle to steep gradient streams; wet meadow communities)							
57	**Lightning Creek ❷❸**	M332G	2000	2600	2000-7600	✓		PIPO, PSME
	(Forests of ponderosa pine, Douglas-fir, subalpine fir & grand fir; dry to mesic grassland communities; moderate- to steep-gradient streams, some with white alder; located in Idaho but administered by Wallowa-Whitman National Forest, Oregon)							
58	**Little Granite Creek ❷❸**	M332G	1999	6259	2000-9393	✓		ABLA, PSME, PIPO
	(Subalpine fir, Douglas-fir & ponderosa pine forests over wide elevational gradient; bluebunch wheatgrass & Idaho fescue grasslands; entire watershed basin with cirque lakes, ponds & moderate- to steep-gradient streams; located in Idaho but administered by Wallowa-Whitman National Forest, Oregon)							
59	**Moose Meadow Creek**	M332A	1982	1000	6400-7425	✓		ABLA, PICO, PIEN
	(Moist forest of subalpine fir, lodgepole pine & Engelmann spruce; riffle-pool stream system; fens & wet meadows)							
60	**No Business Creek**	331A	1988	1360	2520-7200	✓	✓	ABGR, ABLA, PSME
	(Moist forests of grand fir; subalpine fir, Douglas-fir & ponderosa pine forests; riffle & cascade-pool stream; population of tailed frog)							
61	**O'Hara Creek**	M332A	1980	7000	2080-6815	✓	✓	THPL, PSME, ABGR, ABLA
	(Diverse forests of western redcedar, Douglas-fir, subalpine fir & grand fir; meandering glide, riffle-pool & cascade-pool streams; beaver dams; streamside wet meadows; Pacific coast disjunct & rare plants)							
62	**Square Mountain Creek ❷**	331A	1998	709	6635-8000	✓	✓	ABLA, PIAL
	(Sparse stands of subalpine fir & whitebark pine; rocklands, cliffs & talus slopes; lake, moderate-gradient streams & wet meadows; rare plant)							
63	**Upper Newsome Creek**	M332A	1998	1201	4430-5720	✓	✓	ABGR, TABR
	(Old-growth grand fir with pacific yew; grand fir forests in a range of successional stages; alder shrubfields; riffle-pool streams)							
64	**Warm Springs Creek**	M332A	1989	530	3910-5320	✓	✓	ABGR, PSME, THPL
	(Forests of Douglas-fir, grand fir & western redcedar; riffle-pool stream; thermal spring-fed stream; rare plants)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
IDAHO — Payette National Forest (R4 - Intermountain Region) (14 RNAs)								
65	**Bear Creek**	M332G	1996	409	5320-6278	✓		ABGR, ABLA
	(Grand fir & subalpine fir forests; Engelmann spruce bottomland riparian communities; meandering glide & riffle-pool streams)							
66	**Belvidere Creek ❷**	M332A	1996	2920	6200-9273	✓		ABLA, VASC
	(Subalpine fir forests; with grouse whortleberry; krummholz; scree; entire watershed basin including cirque lakes & moderate-gradient streams)							
67	**Bruin Mountain**	M332A	1989	680	6350-8690	✓	✓	ABLA, PIEN, PIAL
	(Hanging valley with mixed forests of subalpine fir, Engelmann spruce; subalpine fir & whitebark pine; avalanche chutes with successional vegetation; meandering glide & riffle-pool streams; rare insect & plant; wildfire burned a portion of the RNA in 1995)							
68	**Circle End Creek**	M332A	1996	1464	3551-7769	✓		PIPO, PSME, ABLA
	(Dry forests of ponderosa pine, moist Douglas-fir & subalpine fir forests; entire, steep watershed basin)							
69	**Council Mountain**	342C	1996	111	7640-8126			ARTR, FEID, ABLA
	(High elevation mountain big sagebrush & Idaho fescue community; small islands of subalpine fir & whitebark pine at treeline)							
70	**Cuddy Mountain**	M332G	1996	1030	3700-7187			PIPO, PSME, ABLA
	(Old-growth ponderosa pine; forests of Douglas-fir, subalpine fir & grand fir; big sagebrush communities with Idaho fescue; slump & undulating topography)							
71	**Emery Creek**	M332G	1996	685	2800-5860	✓		AGSP, PSME
	(Wide range of bluebunch wheatgrass communities; Douglas-fir forest with bluebunch wheatgrass, greenbush, stiff sage & ninebark; alluvial terrace black cottonwood community bordering meandering glide gradient stream)							
72	**Lava Butte**	M332A	1996	370	7420-8328	✓		ABLA, PIAL
	(Subalpine fir & whitebark pine forests; wet meadows dominated by sedges & bluejoint reedgrass; glacial basin with several small ponds)							
73	**Lost Basin Grassland**	M332G	1996	75	4800-5560			FEID, AGSP
	(Bluebunch wheatgrass & Idaho fescue grasslands; perched tableland bordered by sheer cliffs & steep slopes)							
74	**Patrick Butte**	M332A	proposed	805	5490-8841	✓		ABLA, PIAL
	(Subalpine fir & whitebark pine forests; extensive stand of pygmy whitebark pine; granitic exposed bedrock, boulders & talus slopes; 3-acre lake with brook trout; meandering glide, riffle-pool & cascade-pool streams; pond; wet meadows)							
75	**Phoebe Meadows**	M332A	1997	1256	6100-7400	✓		PSME, PIPO, ABGR, ABLA
	(Forests of Douglas-fir, ponderosa pine, grand-fir & subalpine fir; graminoid-dominated wet meadows; sphagnum mat; riffle-pool streams; small ponds)							
76	**Pony Creek**	M332A	1997	1900	3640-8048	✓	✓	PIPO, PSME, ABLA, ARTR
	(Ponderosa pine, Douglas-fir, subalpine fir, whitebark pine & grand fir forests; big sagebrush-grassland; meandering glide, riffle-pool & cascade-pool streams; rare plant)							
77	**Pony Meadows**	M332A	1979	1460	6550-8376	✓		PIEN, ABLA, PICO, PIAL
	(Forests of subalpine fir, lodgepole pine, whitebark pine & old-growth Engelmann spruce; boulder fields & rock cliffs; cirque basin with shallow lake & wet spruce forest; streams; wet meadows; portion of the RNA burned in 1997)							
78	**Rocky Comfort Flat**	M332G	1996	996	3350-4515	✓	✓	AGSP, ARTR, PSME
	(Mosaic of bluebunch wheatgrass grassland & big sagebrush and stiff sagebrush shrubland communities; Douglas-fir & ponderosa pine on northern draws; gently undulating plateau tableland bordered by steep slopes; ephemeral seeps; rare plant)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
IDAHO — Salmon-Challis National Forest (R4 - Intermountain Region) (20 RNAs)								
79	**Allan Mountain**	M332A	1988	1650	6450-9154	✓		LALY, PIAL, ABLA
	(Extensive stand of alpine larch at SE limit of range, with whitebark pine & beargrass; high-elevation Idaho fescue grassland; small lake; ponds; meandering glide, riffle-pool & cascade-pool streams)							
80	**Bear Valley Creek**	M332E	1996	2530	6800-10116			PSME, ABLA, ARTR
	(Douglas-fir, subalpine fir & whitebark pine forests; shrublands dominated by big sagebrush & Idaho fescue; alpine meadows, successional communities in snowslides)							
81	**Cache Creek Lakes ❷**	M332F	1996	795	7500-9881	✓	✓	ABLA, PIAL
	(Forests of subalpine fir & whitebark pine; high elevation cirque on volcanic substrates; rock outcrops, cliffs & talus slopes; lakes; ponds; low- to steep-gradient streams; wetlands; bighorn sheep)							
82	**Colson Creek**	M332A	1996	280	3100-4515			ARTR, ARTRI, PIPO, CELE, PIPO
	(Sagebrush-grassland dominated by big sagebrush, three-tip sagebrush, curlleaf mountain mahogany & bluebunch wheatgrass; ponderosa pine & Douglas-fir woodlands on north-facing slopes)							
83	**Davis Canyon**	M332E	1990	1215	5700-10028	✓		PICO, PSME, ABLA
	(Lodgepole pine & Douglas-fir forests on lower slopes; alpine, subalpine tree islands & krummholz communities; avalanche chutes, boulder fields & talus slopes; riffle & cascade-pool streams)							
84	**Dome Lake ❷**	M332A	1996	1415	4700-9316	✓	✓	PSME, ABLA
	(Douglas-fir, subalpine fir & some whitebark pine forests; cliffs, talus & rock outcrops; moraine-dammed lake; several cascade-pool steep-gradient streams; rare plant; wildfire burned the area in 1986)							
85	**Dry Gulch – Forge Creek ❷**	M332A	1990	3235	4610-8120	✓	✓	PSME, ABLA, PIPO
	(Forests of Douglas-fir, subalpine fir & ponderosa pine; sagebrush-grasslands with big sagebrush & curlleaf mountain mahogany; aspen woodland; meandering glide, riffle-pool & cascade-pool streams; cold and hot springs; waterfall; endemic & rare plants)							
86	**Frog Meadows ❷**	M332A	1992	330	7200-7985	✓	✓	PICO, ABLA, VASC, CAGE
	(Aquatic and wetland communities with adjacent uplands of old-growth lodgepole pine and subalpine fir forest with grouse whortleberry & elk sedge understory; numerous springs, ponds & streams)							
87	**Gunbarrel Creek ❷**	M332A	1972	1600	2880-7192	✓		PICO
	(Early successional lodgepole pine & shrubland vegetation resulting from 1961 fire; bunchgrass communities; moderate gradient streams)							
88	**Iron Bog**	M332F	1979	434	7000-8600	✓	✓	PICO, ARTR, ABLA
	(Sphagnum bog in valley bottom surrounded by lodgepole pine; bog birch in moist zones; sagebrush steppe; mosaic of subalpine fir, Douglas-fir & quaking aspen forests)							
89	**Kenney Creek**	M332E	1990	1580	7480-9604	✓		PIAL, PICO, PSME, ABLA
	(Whitebark pine, mountain pine beetle infested lodgepole pine with Douglas-fir & subalpine fir; two glaciated basins with gentle- to steep-gradient streams; seep springs; ponds; wet meadows)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
90	**Mahogany Creek**	M332E	1991	3650	8310-11828	✓	✓	CELE, PIFL, PIAL, PSME
	(Extensive stands of curlleaf mountain mahogany, with limber pine & whitebark pine; Douglas-fir & limber pine forests with big sagebrush-Idaho fescue openings; high elevation spruce-fir forests with limber pine & whitebark pine; alpine meadows; rare plants)							
91	**Merriam Lake Basin**	M332F	1991	740	9580-12065	✓	✓	ABLA, PIEN, PIAL
	(Subalpine fir, Engelmann spruce & whitebark pine woodlands at lower elevations; folded rock strata; alpine lake in glaciated cirque basin; lakeshore meadows, braided streams; wet & dry alpine communities; rare plants)							
92	**Middle Canyon**	M332E	1991	2200	5600-10810		✓	PIFL, PSME, CELE
	(Limber pine stands at high elevations; Douglas-fir with limber pine at middle elevations, & with curlleaf mountain mahogany at lower elevations; alpine communities; shrub steppe communities with needle-and-thread grass & bluebunch wheatgrass; rare plants)							
93	**Mill Lake**	M332E	1996	720	8820-10693	✓		PIEN, ABLA, PIAL
	(Forests of Engelmann spruce, subalpine fir & whitebark pine; subalpine meadows & alpine communities; quartzite, numberous shallow lakes, cirque lakes & stream)							
94	**Mystery Lake ❷**	M332F	1996	517	8560-10329	✓		ABLA, PIAL
	(Subalpine fir & whitebark pine krummholz; cliffs, talus & scree with cushion plant communities; several lakes and rock glacier in glaciated basin; small alpine area)							
95	**Sheep Mountain**	M332E	1996	1542	9840-10865		✓	ALPINE, PIAL
	(Extensive alpine area on diversity of substrates; scattered whitebark pine; cliffs & talus slopes; a portion of this RNA occurs within the Targhee National Forest)							
96	**Smiley Mountain**	M332F	1991	3080	9440-11508	✓		ABLA, PIAL, ARTR, ALPINE
	(Subalpine fir, whitebark pine & Engelmann spruce below timberline; big sagebrush shrublands with Idaho fescue; broad ridges, cliffs & talus slopes; alpine turf & fellfield communities; small lakes, ponds, meandering streams & willow-sedge wetlands in cirque basins)							
97	**Soldier Lakes ❷**	M332F	1991	175	7900-9147	✓		ABLA, PIAL, PIEN
	(Sparse forests of krummholz subalpine fir, whitebark pine, Engelmann spruce & lodgepole pine; cliffs & talus slopes; lakes & ponds connected by moderate- to steep-gradient streams in granitic cirque basins)							
98	**Surprise Valley**	M332F	1990	1470	8800-11878	✓	✓	ABLA, PIAL, PIFL
	(Subalpine fir, whitebark pine & limber pine forests & woodlands; alpine fellfield, subalpine wet & dry meadow communities; glacially formed hanging valley; alpine lake in cirque basin; low- to steep-gradient streams; waterfall; ponds & wet meadows)							
IDAHO – Sawtooth National Forest (R4 - Intermountain Region) (7 RNAs)								
99	**Basin Gulch**	M332F	1989	1175	6650-10458	✓		PIAL, PIFL, ABLA
	(Mature, sizable whitebark pine & limber pine; subalpine fir forests; big sagebrush shrubland; alpine plant communities on scree; entire watershed basin with cirque lakes, steep-gradient cascade-pool streams & waterfalls)							
100	**Mount Harrison**	342B	1996	381	8400-9240	✓	✓	ABLA, PIFL
	(Scattered subalpine fir & limber pine forest at high elevations; alpine tundra communities; cliffs, boulder-fields & scree slopes; steep-walled cirque basin with vernal pool; rare plants)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
101	**Pole Canyon**	342B	1996	165	6640-8376	✓	✓	PSME, ABLA, ARTR
	(Forests of Douglas-fir & subalpine fir; aspen woodlands; extensive shrubland communities dominated by big sagebrush with bluebunch wheatgrass; two drainage basins; rare plant)							
102	**Pole Creek Exclosure ❸**	M332A	1996	32	7320-7360	✓		ARTR, ABLA, PICO
	(Mountain big sagebrush; forests of subalpine fir & lodgepole pine; willow & sedge bottomland riparian communities; low-gradient stream)							
103	**Redfish Lake Moraine ❸**	M332A	1996	1470	6547-7520	✓	✓	PICO, ABLA, PSME
	(Lodgepole pine forests in various successional stages, within subalpine fir & Douglas-fir habitat types; RNA encompasses part of lake supporting rare fish populations)							
104	**Sawtooth Valley Peatlands ❸**	M332A	1996	296	6640-6840	✓	✓	PICO
	(Complex of 3 peatlands (Bull Moose Fen, Huckleberry Creek & Mays Creek) located along the base of the Sawtooth Range; high community diversity within relatively small area; rare wetland community type; rare plants & mosses)							
105	**Trapper Creek**	342B	1996	453	5920-6400			JUOS, ARAR, FEID
	(Woodlands dominated by Utah juniper mixed with low sagebrush & Idaho fescue; shrublands of mountain big sagebrush & black sagebrush with bluebunch wheatgrass, Idaho fescue, & Great Basin wildrye)							
IDAHO – Targhee National Forest (R4 - Intermountain Region) (8 RNAs)								
106	**Burns Canyon**	342B	1996	490	5810-7652	✓		PSME, ABLA, ARTR
	(Forests of Douglas-fir, lodgepole & subalpine fir; seral aspen stands; shrublands dominated by big sagebrush with curlleaf mountain mahogany, bigtooth maple & bluebunch wheatgrass; riparian corridor; stabilized slump topography; low- to moderate-gradient stream with shrubby riparian communities)							
107	**Copper Mountain**	M332E	1987	550	8320-10303			ALPINE, PIFL, PIEN, CARE
	(Alpine communities on calcareous substrate, limber pine & Engelmann spruce woodlands on lower slopes; Carex-dominated alpine & subalpine meadows; rock cliffs & talus slopes)							
108	**Meadow Canyon**	M332E	1981	3880	7700-11612		✓	ALPINE, PIFL, PIEN
	(Alpine tundra on limestone and quartzite, limber pine, Douglas-fir & Engelmann spruce woodlands on lower slopes; bunchgrass community on high-elevation bench; rare plants)							
109	**Moose Creek Plateau**	M331A	1991	440	7900-8260			PICO
	(Open forests of lodgepole pine on depauperate obsidian sand; early seral communities resulting from severe fire in 1988)							
110	**Targhee Creek**	M332E	1996	2640	7420-10388	✓	✓	ALPINE, PIAL
	(Alpine barrens with krummholz whitebark pine; limestone cliffs & ridges; two glaciated basins with lakes, streams & wet meadows; rare plants)							
111	**Thurmon Creek**	342D	1991	330	6145-6745	✓		PSME, PICO, POTR1
	(Forests of Douglas-fir & lodgepole pine with aspen; shrublands dominated by mountain big sagebrush with chokecherry; cold springs; low- to moderate-gradient streams; wet sedge meadows)							
112	**Webber Creek**	M332E	1988	2435	7600-11393	✓		PIAL, PIEN, ALPINE
	(Whitebark pine & Engelmann spruce in a wide range of successional stages, climax Douglas-fir forest; alpine communities on calcareous substrate; entire watershed basin)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
113	**Willow Creek**	342D	1988	1100	5580-6165		✓	PSME, PIFL
	(Douglas-fir forest with aspen inclusions; limber pine woodland mixed with big-tooth maple, Rocky Mountain juniper & big sagebrush; remnant segment of a volcanic caldera; the RNA occurs in two units)							
MONTANA—Beaverhead-Deerlodge National Forest (R1 - Northern Region) (16 RNAs)								
114	**Basin Creek**	M332E	1996	1014	6400-7752	✓		PIEN, PICO
	(Engelmann spruce & lodgepole pine forest; riparian shrub & herbaceous communities; beaver ponds)							
115	**Bernice**	M332E	1996	451	6000-7299	✓		PICEA, PSME, ABLA, PICO
	(Forests of spruce, subalpine fir & lodgepole pine; old-growth Douglas-fir forest; aspen; subalpine grasslands; riffle-pool streams; permanent pond; unique welded volcanic spires)							
116	**Cattle Gulch**	M332E	proposed	2167	5560-7642			PSME, PIFL
	(Douglas-fir forest; pristine bunchgrass communities; limber pine, curlleaf mountain mahogany, mountain big sagebrush on limestone)							
117	**Cave Mountain**	M332E	1996	4513	8800-10281		✓	FEID, DECE, PIAL, PIEN
	(Extensive subalpine grassland on Madison limestone with Idaho fescue & tufted hairgrass; whitebark pine stands; Engelmann spruce; rough fescue; caves, rare plant)							
118	**Cliff Lake**	M332E	1951	2301	6313-7498			PICO, POTR1, PSME, ARTR, FEID
	(Lodgepole, Douglas-fir & quaking aspen forests; shrubland & grassland communities dominated by big sagebrush & Idaho fescue)							
119	**Cottonwood Creek**	M332E	1972	128	6600-7400			PSME, PIFL, ARTR, AGSP, FEID
	(Dry Douglas-fir forest; limber pine, Rocky Mountain juniper, big sagebrush, Idaho fescue & bluebunch wheatgrass communities)							
120	**Dexter Basin**	M332B	1996	1109	7800-9511	✓		LALY, PIAL, ABLA, PIEN
	(Mature & old-growth alpine larch, subalpine fir, whitebark pine, & Engelmann spruce; steep-walled cirque supporting numerous small permanent & temporary ponds & small first order stream; wet meadows)							
121	**Dry Mountain**	M332E	1996	507	5960-6994			PSME, JUOC, ARTR, FEID
	(Old-growth Douglas-fir with common juniper; shrub-steppe dominated by big sagebrush, Idaho fescue, rough fescue, bluebunch wheatgrass)							
122	**Elkhorn Lake**	M332E	proposed	1765	8100-10294	✓		ABLA, PIAL, PICO
	(Subalpine fir, healthy stands of whitebark pine and lodgepole pine forests; alpine communities; talus & boulder fields; riffle-pool and meandering glide stream; ponds; wet meadows; 10-acre lake with fish)							
123	**Goat Flat ❷**	M332B	proposed	1500	8200-9840	✓	✓	ABLA, LALY, ALPINE
	(Engelmann spruce, subalpine fir & alpine larch forests; alpine turf communities with patterned ground; avalanche chutes; glacial cirques, ponds; numerous rare plants)							
124	**Horse Prairie**	M332E	1996	196	6620-7290	✓		ARTR, ARTRI, PSME, POTR1
	(Big sagebrush & three-tip sagebrush communities; Douglas-fir and quaking aspen; riffle-pool stream; wetland shrub communities)							
125	**Lost Park**	M332E	1996	618	6800-8206	✓		PICO, ABLA
	(Forests of subalpine fir & lodgepole; willow & herbaceous subalpine wetlands; meandering glide stream)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
126	**Sapphire Divide**	M332B	1996	1399	7600-8884	✓		LALY, ABLA, PIAL
	(Extensive stand of alpine larch intermixed with whitebark pine & subalpine fir; several small perennial & ephemeral streams and pond; a portion of this RNA occurs within the Bitterroot National Forest)							
127	**Skull-Odell**	M332E	1996	2543	7400-8400	✓	✓	ABLA, PICO, PIEN
	(Forests of subalpine fir, lodgepole pine, whitebark pine & Engelmann spruce; old-growth lodgepole pine; two patterned fens (peatlands); 28-acre lake, numerous ponds & wet to moist meadows, springs, and meandering glide & riffle-pool streams; rare plants)							
128	**Thunderbolt Mountain**	M332E	1996	792	7020-8360	✓		ABLA, PIEN, PICO
	(Forests dominated by subalpine fir, lodgepole pine & Engelmann spruce; wet sedge meadow communities; cliffs & talus slopes; meandering glide & riffle-pool streams)							
129	**Windy Ridge**	M332B	1996	235	6600-7487		✓	FESC, PSME
	(Extensive rough fescue grassland bordered by subalpine fir & Douglas-fir forest; a suite of rare moonworts occurs here)							
MONTANA—Bitterroot National Forest (R1 - Northern Region) (9 RNAs)								
130	**Bass Creek ❷**	M332A	proposed	1984	4080-8411	✓		PIPO, ABLA, PSME, ABGR
	(Forests of ponderosa pine, old-growth grand fir, Douglas-fir, subalpine fir, & alpine larch; riffle-pool stream; small pond; wetland communities)							
131	**Bitterroot Mountain Snow Avalanche**	M332A	1992	1850	5200-8200		✓	ABLA, PICO, POTR1
	(Subalpine fir and lodgepole pine forest; over a dozen active avalanche tracks with successional communities of aspen, Sitka alder & Labrador tea)							
132	**Bitterroot River**	M332B	1992	40	3230-3230	✓		PIPO
	(Low-elevation cottonwood and ponderosa pine riparian forest; understory infested with non-native plants including spotted knapweed; major river; RNA burned in 1990)							
133	**Boulder Creek**	M332A	1991	1042	4600-7753	✓		PSME, PIPO
	(Douglas-fir; old-growth ponderosa pine forests; rock & scree; riffle-pool stream)							
134	**East Fork Bitterroot ❷**	M332B	proposed	298	5320-5600	✓		ABLA, PICO
	(Beaver controlled willow dominated riparian system, with Bebb's, Geyer's & Drummond's willows; Adjacent uplands support forests of subalpine fir & lodgepole pine; river oxbows & wetland complexes; beaver ponds & dams and river)							
135	**Lower Lost Horse Canyon**	M332A	1992	1601	4325-8250	✓		PIPO, ABLA, PSME
	(Forests of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, subalpine fir & whitebark pine; riffle-pool stream)							
136	**Medicine Point**	M332B	proposed	300	6600-8409			ABLA, LALY, PIAL
	(High-elevation ribbon forest – snowglade complex. Forests of stunted subalpine fir & whitebark pine; alpine larch stand; Idaho fescue & bluebunch wheatgrass grassland)							
137	**Sawmill Creek**	M332B	1992	270	4635-5440		✓	PSME, PIPO, FESC, AGSP
	(Dry ponderosa pine and Douglas-fir open forest; native bunchgrass communities with Idaho fescue, rough fescue & bluebunch wheatgrass; invasive non-native plants including spotted knapweed are present in the RNA; riffle-pool stream)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
138	**Upper Lost Horse Canyon**	M332A	1992	1720	6120-7831	✓		ABLA, LALY, PIAL
	(Subalpine fir, lodgepole pine, whitebark pine & alpine larch forests; over half of RNA burned in the 1988 Bear Creek Fire; riffle-pool stream; lake & adjacent wetland communities)							
MONTANA—Custer National Forest (R1 - Northern Region) (3 RNAs)								
139	**Line Creek Plateau**	M331A	proposed	22,422	7400-10100	✓	✓	ABLA, PIAL, ALPINE
	(Forests of subalpine fir, lodgepole pine, Douglas-fir & whitebark pine; extensive alpine tundra including turf, meadow & wetland communities; numerous endemic & disjunct plants; a portion of this RNA occurs within the Shoshone National Forest in Wyoming)							
140	**Lost Water Canyon**	M331B	1994	3645	5120-8678	✓	✓	PSME, ABLA, PIFL
	(Forests of Douglas-fir, subalpine fir & limber pine on Madison limestone; grasslands with Idaho fescue; entire watershed basin; rare plant)							
141	**Poker Jim**	331G	1974	363	3550-4075			PIPO, ARTR, AGSP
	(Eastern ponderosa pine forest; native grassland and shrubland communities dominated by big sagebrush, silver sagebrush & wheatgrasses)							
MONTANA—Flathead National Forest (R1 - Northern Region) (6 RNAs)								
142	**Coram**	M333B	1988	839	3475-4820	✓		PSME, LAOC, ABLA
	(Old-growth Douglas-fir & western larch forests; subalpine fir & western hemlock forests; 2-acre wet meadow; RNA is within the Coram Experimental Forest)							
143	**East Shore**	M333B	1991	646	3100-4042	✓		PSME, THPL, ABGR
	(Forests of Douglas-fir with inclusions of western redcedar, ponderosa pine & grand fir; talus slopes & rock out-crops; ponds)							
144	**LeBeau**	M333B	1997	5709	3200-5635	✓	✓	ABLA, PSME, TSHE
	(High diversity of forest types including subalpine fir, Douglas-fir, western hemlock, western larch, spruce, lodgepole & grand fir; lakes, several ponds & herbaceous wetlands; cliffs & rock outcrops; rare plants; a portion of this RNA occurs within the Kootenai National Forest)							
145	**Little Bitterroot**	M333B	1991	200	3520-4320	✓		PSME
	(Dry Douglas-fir forest; steep talus slopes; lakes; riffle-pool streams; wetlands)							
146	**Swan River**	M333B	1997	682	3090-3443	✓	✓	LAOC, THPL, ABGR
	(Old-growth western larch, western redcedar, grand fir, subalpine fir & spruce; Swan River; oxbows & marshes; island with wetlands & fens; raised peatland; rare plants)							
147	**Tuchuck**	M333C	1991	2062	5200-7285	✓		PSME, ABLA, LALY
	(Forests of subalpine fir, whitebark pine & alpine larch; extensive stands of whitebark pine; talus slopes; subalpine wet meadows)							
MONTANA—Gallatin National Forest (R1 - Northern Region) (7 RNAs)								
148	**Black Butte ❷**	M331A	1997	510	6860-8900			ABLA, PIEN, PICO, FEID
	(Dry subalpine forests of Engelmann spruce, subalpine fir, whitebark pine & lodgepole pine; undisturbed subalpine grassland; rock outcrops & scree slopes)							
149	**East Fork Mill Creek ❷**	M331A	1997	882	5938-8184	✓		PSME, ABLA, PICO
	(Forests of Douglas-fir, subalpine fir & lodgepole pine; steep gradient, boulder channel stream with riffle pools)							
150	**Obsidian Sands**	M331A	1997	390	6560-6598			PICO, PUTR
	(Dry forests of lodgepole pine and antelope bitterbrush on obsidian sands)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
151	**Palace Butte**	M331A	1997	1280	7200-10333	✓		ABLA, PIAL, PIEN
	(Subalpine forests of Engelmann spruce, subalpine fir & whitebark pine; rocklands; lakes, seeps, springs; riffle & cascade-pool streams; wet meadows; krummholz and alpine glaciation features)							
152	**Passage Creek ❷**	M331A	1997	1112	6400-8950	✓		ABLA, PSME, PICO
	(Douglas-fir, lodgepole pine, subalpine fir & whitebark pine forests; undisturbed subalpine meadow communities; riffle-pool stream)							
153	**Sliding Mountain ❷**	M331A	1997	1459	6280-9303	✓	✓	PICO, PIEN, PSME
	(Engelmann spruce, Douglas-fir & lodgepole pine forests; healthy stands of whitebark pine; undisturbed sagebrush-grassland community; shallow ponds & wet meadows; avalanche chutes)							
154	**Wheeler Ridge**	M331A	1997	640	7840-9160	✓	✓	PIAL, ABLA, PICO, PIEN
	(Subalpine-fir forest with lodgepole pine and spruce; extensive stand of old-growth whitebark pine; avalanche chutes in cirque basins; talus slopes; slump topography; riffle-pool streams & wet meadows)							
MONTANA—Helena National Forest (R1 - Northern Region) (4 RNAs)								
155	**Cabin Gulch**	M332D	1997	2408	4200-6469		✓	PSME, ARTR, FESC
	(Dry Douglas-fir forests with scattered ponderosa pine and rough fescue understory; shrub-grasslands with big sagebrush, bluebunch wheatgrass & rough fescue; rare plant)							
156	**Granite Butte**	M332B	proposed	408	6680-7430			FESC, ABLA, PIAL
	(Excellent condition rough fescue grasslands with associated ribbon forests of whitebark pine & subalpine fir; treeless snowglade communities)							
157	**Indian Meadows ❷**	M332B	1997	949	5550-6673	✓	✓	PICO, ABLA, PSME
	(Glaciated bench supporting a diverse assemblage of streams, ponds, quaking fen with peat mats; wet meadows within a matrix of lodgepole pine, Douglas-fir, subalpine fir & aspen forests; rare plants)							
158	**Red Mountain**	M332B	1997	1901	6000-9411	✓	✓	ABLA, PIAL, ALPINE
	(Alpine tundra with subalpine & timberline forests featuring barren fellfields, stone stripe patterning; forests of subalpine fir, Douglas-fir, whitebark pine, lodgepole pine, limber pine & alpine larch; riffle-pool streams, southern distributional limit for several plant species)							
MONTANA—Kootenai National Forest (R1 - Northern Region) (7 RNAs)								
159	**Big Creek**	M333B	1991	190	2459-2640	✓		PSME, PIPO, PICO
	(Old-growth forests of Douglas-fir & ponderosa pine; successional forests of lodgepole pine & western larch; riffle-pool streams; seeps)							
160	**Hoskins Lake**	M333B	1992	380	3180-3545	✓		PIEN, THPL, PSME
	(Forests of Engelmann spruce, western redcedar & Douglas-fir; riffle-pool stream; 33-acre lake, 9-acre pond & sedge wetland)							
161	**Lower Ross Creek**	M333D	1997	1777	2900-5190	✓		TSHE, THPL, PSME
	(Old-growth western redcedar with western hemlock, western white pine & dry Douglas-fir; riffle-pool stream)							
162	**Norman-Parmenter**	M333B	1997	1300	2660-6170	✓		PSME, THPL, TSHE, POTR2
	(Douglas-fir, subalpine fir, western redcedar & western hemlock forests; riffle-pool stream bordered by black cottonwood riparian community)							
163	**Pete Creek Meadows**	M333B	1992	155	4300-4320	✓		ABLA, PIEN, PICO
	(Forests of subalpine fir, Engelmann spruce & lodgepole pine; headwater meandering glide stream; wet sedge meadow)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
164	**Ulm Peak**	M333D	1988	690	4200-6444	✓		TSME
	(Mature mountain hemlock & western hemlock forest; whitebark pine & lodgepole forests; steep rock cliffs & talus slopes; 2 small lakes; moderate-gradient streams)							
165	**Wolf-Weigel**	M333B	1992	250	3550-4300	✓		ABLA, PSME
	(Subalpine fir, Douglas-fir, lodgepole pine & western larch forests; low- to steep-gradient streams; pond; 12-acre shrub wetlands & wet meadows; steep gorge with waterfall)							
MONTANA—Lewis & Clark National Forest (R1 - Northern Region) (8 RNAs)								
166	**Bartleson Peak**	M332D	1994	1601	5900-7770	✓	✓	PSME, PIFL, PIEN
	(Old-growth Douglas-fir, limber pine & Engelmann spruce; shrubby cinquefoil community; complete watershed basin; rare plants)							
167	**Big Snowy**	M332D	1997	3140	8000-8681			ALPINE, PIEN, ABLA, PIFL
	(Alpine plant communities with alpine avens and sedges, bordered by timberline forests of Engelmann spruce, subalpine fir and limber pine; frost patterning; calcareous substrate; RNA occurs in two units: Greathouse Unit and Old Baldy Unit)							
168	**Minerva Creek**	M332D	proposed	337	4600-5049	✓		PIPO
	(Two-needle ponderosa pine forests; native grasslands; intermittent stream)							
169	**O'Brien Creek**	M332D	1994	715	6500-7200	✓	✓	ABLA, PICO
	(Extensive riparian willow & herbaceous communities with forests of subalpine fir & lodgepole pine; riffle-pool stream; wet meadows; rare plant)							
170	**Onion Park**	M332D	1994	1209	6960-7772	✓		ABLA, PICO
	(Features subalpine mesic meadow communities in a matrix of subalpine fir & lodgepole pine; meandering glide & riffle-pool stream; beaver ponds; fen; RNA is within the Tenderfoot Experimental Forest)							
171	**Paine Gulch**	M332D	1994	2405	4680-7213	✓		PIFL, PSME, PIPO
	(Extensive forest cover of limber pine, Douglas-fir, ponderosa pine, & lodgepole pine; shrubby cinquefoil meadow; black cottonwood riparian; entire watershed in nearly pristine condition)							
172	**Wagner Basin**	M332C	1994	965	4480-7668	✓	✓	PIFL, PSME, AGSP
	(Entire small watershed featuring diversity of riparian, woodlands (limber pine & Douglas-fir) and grassland communities; limestone spires; 24-acre calcareous spring fed wetland with beaver dams; thermal/cold springs; rare plants)							
173	**Walling Reef ❷**	M332C	1994	835	5800-7800	✓		PIFL, PSME
	(Wind-deformed Douglas-fir & limber pine woodlands; scattered subalpine fir krummholz; entire watershed basin; limestone cliffs and scree; alpine fellfield; cirque lake; cascade-pool stream & cold springs)							
MONTANA—Lolo National Forest (R1 - Northern Region) (9 RNAs)								
174	**Barktable Ridge**	M333D	1997	341	5600-6240			TSME
	(Old-growth mountain hemlock at eastern extent of its range; mixed forests of lodgepole pine, grand fir, subalpine fir & western larch)							
175	**Carlton Ridge**	M332A	1987	920	5400-8361		✓	LALY, PIAL, ABLA, LAOC
	(Extensive old-growth stand of alpine larch & whitebark pine, subalpine fir; snowglades with smooth woodrush; occurrence of hybrid larch – a cross between western larch and alpine larch)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
176	**Council Grove**	M333D	1991	160	3070-3070	✓		PIPO
	(Flood terraces supporting bottomland forest of ponderosa pine & black cottonwood, shrub & herbaceous riparian communities; oxbows & sloughs)							
177	**Ferry Landing**	M333D	1997	630	2600-5596			PSME, PIPO
	(Open Douglas-fir & ponderosa pine stands with native bunchgrass on scree; riparian shrub & herbaceous community adjacent to major river)							
178	**Petty Creek**	M333D	1987	310	4030-4840	✓		PSME, ABGR
	(Forests of Douglas-fir, grand fir, lodgepole pine & western larch; riffle-pool stream)							
179	**Plant Creek**	M332B	1987	258	4250-5700	✓		LAOC, PSME, PICO
	(Old-growth western larch-300 years old; Douglas-fir, lodgepole pine & Engelmann spruce forests; riffle-pool streams)							
180	**Pyramid Peak**	M332B	1987	520	5400-8120			PSME, ABLA, PICO, LAOC
	(Overstory forests of Douglas-fir & subalpine fir with lodgepole, western larch and Douglas-fir understories; some old-growth Douglas-fir & western larch; snow avalanche track with successional communities)							
181	**Sheep Mountain Bog ❸**	M333D	1987	105	6000-7000	✓	✓	PICO
	(Lodgepole pine forests; sphagnum peatland; sedge dominated wet meadows; rare plants)							
182	**Shoofly Meadows ❸**	M333D	1997	926	5680-6720	✓	✓	PSME, PIEN, PICO
	(Forests of lodgepole pine, subalpine fir & Engelmann spruce; extensive wetland fen complex along tributary streams; paludified forest; large marsh & wet meadow complex; rare plants & animal)							
NEVADA—Humboldt–Toiyabe National Forest (R4 - Intermountain Region) (12 RNAs)								
183	**Bald Mountain Wash**	341E	1998	5779	6760-9274			JUOS, PIMO1, ARTR
	(Relict basin big sagebrush and needle-and-thread grass community; pinyon-juniper woodlands)							
184	**Carpenter Canyon ❷**	322A	1998/1973	4009	7120-11916		✓	PILO, PIPO, PIFL, PIMO1, ARTR
	(Bristlecone pine, white fir, ponderosa pine & limber pine forests; non-glaciated alpine system; single-leaf pinyon and big sagebrush; many endemic rare plants)							
185	**Fall Creek ❷**	342B	1996	4410	6600-10838	✓		ABLA, ARTR, PIAL
	(Diverse array of montane forest, sagebrush steppe and glaciated cirques supporting extensive alpine barrens; forests of subalpine fir; shrublands dominated by big sagebrush with curlleaf mountain mahogany & tobacco-brush; high elevation whitebark pine stands; talus; entire watershed basin)							
186	**Hole-in-the-Mountain ❷**	341G	1998	1676	9800-11306		✓	PIFL, ARTR, ALPINE
	(Scattered limber pine at treeline; subalpine shrublands dominated by mountain big sagebrush & Idaho fescue; extensive mosaic of alpine plant communities including dry-steppe, moist meadow, shrubland, talus & scree; glacially carved cirques, domes, aretes & hanging valleys; rare plants)							
187	**Jacks Spring Pinyon**	341D	1998	1278	6940-7840		✓	PIMO1, JUOS, ARTR
	(Old-growth and mature stands of single-leaf pinyon & Utah juniper; big sagebrush shrublands)							
188	**Mount Jefferson ❷**	M341A	1973	4953	6000-11949	✓		ALPINE, PIFL
	(Large flat alpine plateau surrounded by cirque basins with limber pine & aspen; lakes and springs)							
189	**Mount Moriah Table ❷**	M341A	1998	876	10600-11038		✓	PILO, PIEL
	(Open stands of bristlecone pine & Engelmann spruce; large, flat subalpine table with dry-steppe graminoid community; alpine talus & scree community; rare animals)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
190	**North-South Schell Peaks**	M341A	1998	4021	10335-11883			PIEL, ALPINE, POFR
	(Scattered Engelmann spruce at treeline; diverse mosaic of alpine plant communities along ridgeline, including dry-steppe, moist meadow, shrubland, talus & scree)							
191	**Pearl Peak**	M341A	1998	665	7920-10848			ARTR, PIFL, PILO
	(Shrublands dominated by mountain big sagebrush; open stands of old-growth windswept limber pine & bristlecone pine; curlleaf mountain mahogany, Gambel oak & aspen scrub vegetation; limited alpine meadows & barren)							
192	**Seitz Canyon / Echo Lake ❷**	M341A	1998	2039	8600-11387	✓	✓	ALPINE, POFR, PIAL
	(Subalpine shrublands dominated by tall willow & shrubby cinquefoil; stunted whitebark pine at treeline; alpine barrens, talus & scree communities; cirque basins, headwalls, glaciated terrain with jagged ridgelines & U-shaped valleys; cirque & moraine lakes; rare plants)							
193	**Troy Peak ❷**	M341A	1996	2500	9600-11298		✓	PILO, PIFL, ABCO
	(Extensive stands of bristlecone pine, limber pine, aspen & white fir; mountain big sagebrush steppe; rock barrens, steep talus slopes & prominent ridgelines; bighorn sheep & rare plants)							
194	**White Pine Peak ❷**	M341A	1988	787	7840-10166			ARTR, PIFL, PILO
	(Mountain big sagebrush shrublands dominated by big sagebrush with bluebunch wheatgrass; montane forests of limber pine, bristlecone pine & white fir; mountain mahogany woodlands; rock outcrops)							
UTAH—Ashley National Forest (R4 - Intermountain Region) (7 RNAs)								
195	**Ashley Gorge**	M331E	1996	1085	7440-8023	✓	✓	PIPU, PICO, POTR1, CEMO
	(Blue spruce, lodgepole pine & aspen woodlands; shrublands with mountain mahogany & snowberry; moderate-gradient perennial stream; rare plant)							
196	**Gates of Birch Creek**	M331E	1988	250	8750-9750			PSME, PICO
	(Steep slope forests of Douglas-fir & lodgepole pine; hogback & water gap landforms)							
197	**Lance Canyon**	M331D	1996	295	7640-8806			PSME, PIED, ARTR
	(Douglas-fir & pinyon pine woodlands; outstanding occurrence of Salina wildrye grassland community; big sagebrush shrubland with bluebunch wheatgrass)							
198	**Pollen Lake**	M331E	1987	1100	10180-12006	✓	✓	ABLA, PIEN, ALPINE
	(Subalpine fir & Engelmann spruce forest & krummholz; alpine turf communities on shallow, rocky soil; lake & wetlands in cirque basin; rare plants)							
199	**Sims Peak Potholes**	M331E	1991	650	9610-9970	✓	✓	PICO, ABLA, PIEN
	(Seral lodgepole pine with subalpine fir & Engelmann spruce understory; sedge dominated pothole wetlands; rare plant)							
200	**Timber-Cow Ridge**	M331D	1996	1123	7000-8872			PSME, PIPO, CELE, JUOS, PIED
	(Open Douglas-fir & ponderosa pine woodlands with abundant curlleaf mountain mahogany; juniper-pinyon pine woodlands)							
201	**Uinta Shale Creek ❷**	M331E	1996	3010	10000-12514	✓		ABLA, PIEN, ALPINE
	(Subalpine fir & Engelmann spruce forest & krummholz; alpine turf communities; cirque basins draining into moist forest-meadow complexes)							
UTAH – Caribou National Forest (R4 - Intermountain Region) (1 RNA)								
202	**Gunsight Peak**	342B	1990	550	6200-8244			PSME, POTR1, CELE
	(Mixed Douglas-fir, subalpine fir & aspen forest on moist sites; shrub steppe dominated by mountain big sagebrush & curlleaf mountain mahogany; bunchgrass communities; rock outcrops)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
UTAH—Desert Range Experiment Station (Rocky Mountain Research Station) (1 RNA)								
203	**Desert Range**	341A	1973	1846	5280-6100		✓	CELA, ATCO, ARNO
	(Desert shrub communities with winterfat, black sagebrush & shadscale communities on broad alluvial fan; rocklands with dwarf mountain mahogany; rare plants)							
UTAH—Dixie National Forest (R4 - Intermountain Region) (5 RNAs)								
204	**Browse**	M341C	1998	2180	4920-7000	✓	✓	CHAPARRAL, PIPO
	(Extensive evergreen chaparral communities; mountain brush communities of Gambel oak, birchleaf mountain mahogany & Utah serviceberry; moderate- to steep-gradient streams; rare plants)							
205	**Red Canyon**	M341C	1987	460	7250-7937	✓	✓	PSME, PIPO, PILO
	(Mixed conifer forests & stunted woodlands of Douglas-fir, ponderosa pine & bristlecone pine; small, intermittent watershed; Wasatch limestone formations; numerous regionally endemic plant species)							
206	**Table Cliff**	M341C	1991	1300	8130-10292	✓		ABLA, PIEN, PILO
	(Stands of subalpine fir & Engelmann spruce & bristlecone pine; lower elevation forests of Douglas-fir & ponderosa pine; steep cliffs; streams)							
207	**Timbered Cinder Cone**	M341C	1990	640	9500-9940			PIEN, ABLA, PIFL
	(Cinder cone forested with Engelmann spruce, subalpine fir, limber pine & aspen, surrounded by essentially barren lava flows)							
208	**Upper Sand Creek ❷**	M341C	1998	1880	7600-8562			PIPO, QUGA
	(Parklike stands of mature ponderosa pine with greenleaf manzanita, grasses, and Gambel oak, birchleaf mountain mahogany, pinyon and juniper)							
UTAH—Fishlake National Forest (R4 - Intermountain Region) (4 RNAs)								
209	**Bullion Canyon**	M341C	1987	1300	9200-11840	✓	✓	PIEN, ABLA, POTR1
	(Forests of Engelmann spruce & sublapine fir on north-facing slopes; old-growth Engelmann spruce; small stands of aspen & subalpine shrub herblands on south-facing slopes; volcanic substrates & features; alpine communities; rare plants)							
210	**Old Woman Cove**	M341C	1998	2520	6790-8675			PIPO, ABCO, PSME
	(Diverse vegetation along steep elevational gradient; ponderosa pine forests with white fir, Douglas-fir & ponderosa pine; pinyon-juniper woodlands with curlleaf mountain mahogany & Gambel oak; salt-desert shrub communities on shale; grasslands with Salina wildrye)							
211	**Partridge Mountain**	M341C	1979	1200	6400-7985			JUOS, PIMO2, ABCO
	(Single-leaf pinyon-Utah juniper woodlands; steep-slope forests of white fir; scrub woodlands dominated by Gambel oak & curlleaf mountain mahogany)							
212	**Upper Fish Creek**	M341C	1988	1720	8650-12122	✓	✓	ABLA, PIEN, ABCO
	(High elevation forests of subalpine fir, Engelmann spruce & Douglas-fir; white fir & Douglas-fir stands with greenleaf manzanita on warmer, drier slopes; rock glaciers, talus sheets, avalanche chutes; cold springs & seeps; small ponds; sphagnum fen; rare plants)							
UTAH—Manti-LaSal (R4 - Intermountain Region) (6 RNAs)								
213	**Cliff Dwellers Pasture**	341B	1991	264	6960-7760		✓	QUGA, ACGR
	(Water birch & Gambel oak-bigtooth maple bottomland communities; pinyon-juniper woodlands; Navajo sandstone cliffs; sandstone arch; packrat middens; rare plants)							
214	**Elk Knoll**	M341C	1957	40	10000-10255			ABLA, PIEN
	(Relatively level bench supporting subalpine tall forb vegetation, forests on adjacent slopes of subalpine fir & Engelmann spruce)							

(cont'd.)

Table 2 (Cont'd.)

Map#	RNA name	Section number	Estab. date❶	Size (acres)	Elevation range (feet)	Features: Aquatic	Features: Unique	Dominant vegetation
215	**Hideout Mesa**	341B	1998	360	7200-7560			PIED, JUOS
	(Two-leaf pinyon & Utah juniper woodlands at upper elevational limits; patches of mountain brush and grassland; limited areas of ponderosa pine and big sagebrush)							
216	**Mill Creek Gorge**	341B	1998	680	5780-7700	✓		PSME, JUOC, PIEN
	(Deep gorge containing the steep-gradient Mill Creek; south exposures support pinyon-juniper woodlands; north exposures support mesic mountain brush communities with Gambel oak, Utah serviceberry & birchleaf mountain mahogany; Douglas-fir is associated with moist microsites; riparian)							
217	**Mount Peale**	341B	1988	2380	10450-12721		✓	ABLA, PIEN
	(Subalpine fir & Engelmann spruce forest & krummholz; cirque basins, rock glaciers & talus; alpine turf & boulder-field communities; rare plant)							
218	**Nelson Mountain**	M341C	1988	490	8700-9070		✓	PSME, ABCO, PIPO
	(Diverse assemblage of woodland & shrublands including forests of white fir & Douglas-fir, and shrublands of curlleaf mountain mahogany, mountain big sagebrush & black sagebrush; rare plant)							
UTAH—Uinta National Forest (R4 - Intermountain Region) (1 RNA)								
219	**Jumpoff**	M331E	1988	290	7500-9100	✓		ABLA, POTR1, ARTR
	(Subalpine fir & aspen woodlands; shrublands dominated by big sagebrush; entire small, intermittent watershed)							
UTAH—Wasatch-Cache National Forest (R4 - Intermountain Region) (3 RNAs)								
220	**Mollens Hollow**	M331D	1988	1180	6040-8360	✓	✓	PSME, CELE, ABLA, ARTR
	(Open stands of Douglas-fir & curlleaf mountain mahogany; subalpine fir, bigtooth maple, big sagebrush & low sagebrush communities; vernal stream; rare plant and bird)							
221	**Morris Creek**	M331D	1973	167	6120-8307	✓		ABCO, ABLA, POTR1, QUGA
	(White fir woodlands mixed with Gambel oak, ceanothus, snowberry, subalpine fir & aspen; small drainage basin)							
222	**Red Butte Canyon**	341A	1971	5370	5200-8235	✓		ACGR, ARTR, QUGA
	(Shrublands with curlleaf mountain mahogany, big sagebrush, Gambel oak & bigtooth maple; diverse mixed forb-grasslands; riparian shrubland; coniferous woodland communities; steep-gradient riffle-pool stream)							
western WYOMING—Bridger-Teton National Forest (R4 - Intermountain Region) (4 RNAs)								
223	**Afton Front**	M331D	1999	715	6920-8960			PSME, ABLA, ARTR
	(Forests of Douglas-fir & subalpine fir; mosaic of grassland & shrubland communities with mountain big sagebrush, bluebunch wheatgrass & mountain snowberry)							
224	**Gros Ventre**	M331D	1999	6565	6400-11180	✓		PIEN, ABLA, PSME, ALPINE
	(Diverse assemblage of riparian, forest, forbland & alpine communities; Douglas-fir, subalpine fir, Engelmann spruce & aspen; avalanche tracks)							
225	**Osborn Mountain ❷**	M331J	1999	2830	9600-11880	✓		ALPINE
	(Alpine meadows & fellfield communities; several regionally rare alpine-arctic disjunct plant species)							
226	**Swift Creek**	M331D	1999	4170	7080-10907			PIEN, ABLA
	(Forests of subalpine fir & Engelmann spruce; rich mosaic of tall forb, riparian & upland shrub communites)							

❶ Proposed RNAs are indicated by "p" in the establishment year field
❷ RNA occurs wholly or partially within a Congressionally designated Wilderness
❸ RNA occurs wholly or partially within a National Recreation Area

Table 3—Index of scientific and common names of dominant vegetation in Table 2.

Key code	Scientific name	Common name
Trees		
ABCO	*Abies concolor*	White fir
ABGR	*Abies grandis*	Grand fir
ABLA	*Abies lasiocarpa*	Subalpine fir
ACGR	*Acer grandidentatum*	Big-toothed maple
BEOC	*Betula occidentalis*	Water birch
BEPA	*Betula papyrifera*	Paper birch
LALY	*Larix lyallii*	Alpine larch
LAOC	*Larix occidentalis*	Western larch
PIAL	*Pinus albicaulis*	Whitebark pine
PICO	*Pinus contorta*	Lodgepole pine
PIEN	*Picea engelmannii*	Engelmann spruce
PIFL	*Pinus flexilis*	Limber pine
PILO	*Pinus longaeva*	Bristlecone pine
PIPO	*Pinus ponderosa*	Ponderosa pine
PICEA	*Picea* spp.	Spruce
PIPU	*Picea pungens*	Blue spruce
PIED	*Pinus edulis*	Two-leaf pinyon pine
PIMO1	*Pinus monophylla*	Single-leaf pinyon pine
PIMO2	*Pinus monticola*	Western white pine
POTR1	*Populus tremuloides*	Quaking aspen
POTR2	*Populus trichocarpa*	Black cottonwood
PSME	*Pseudotsuga menziesii*	Douglas-fir
TSHE	*Tsuga heterophylla*	Western hemlock
TSME	*Tsuga mertensiana*	Mountain hemlock
THPL	*Thuja plicata*	Western red cedar
Shrubs		
ARAR	*Artemisia arbuscula*	Low sagebrush
ARNO	*Artemisia nova*	Black sagebrush
ARTR	*Artemisia tridentata*	Big sagebrush
ARTRI	*Artemisia tripartita*	Three-tip sagebrush
ATCO	*Atriplex confertifolia*	Shadscale
CELA	*Ceratoides lanata*	Winterfat
CELE	*Cercocarpus ledifolius*	Curl-leaf mountain mahogany
CEMO	*Cercocarpus montanus*	Birch-leaf mountain mahogany
CERE	*Celtis reticulata*	Hackberry
JUOC	*Juniperus occidentalis*	Common juniper
JUOS	*Juniperus osteosperma*	Utah juniper
POFR	*Potentilla fruticosa*	Shrubby cinquefoil
PUTR	*Purshia tridentata*	Antelope bitterbrush
QUGA	*Quercus gambelii*	Gambel's oak
SALI	*Salix* spp.	Willow
TABR	*Taxus brevifolia*	Pacific yew
VASC	*Vaccinium scoparium*	Grouse whortleberry
XETE	*Xerophyllum tenax*	Beargrass
Graminoids		
AGSP	*Agropyron spicatum*	Bluebunch wheatgrass
CAGE	*Carex geyeri*	Elk sedge
DECE	*Deschampsia cespitosa*	Tufted hairgrass
FEID	*Festuca idahoensis*	Idaho fescue
FESC	*Festuca scabrella*	Rough fescue
FEVI	*Festuca viridula*	Green fescue
Miscellaneous		
ALPINE		Alpine Barrens

The Role of RNAs in National Forest Management

A valuable use for RNAs is their integration into stewardship of the National Forests. Potential contributions of RNAs toward this objective historically have been overlooked. Specifically, RNAs can be used more fully for monitoring adaptive ecosystem management at landscape, community or ecosystem, population or species, and genetic levels (Gaines et al. 1999).

Benchmark Reference Areas

The RNA network in the Northern Rocky Mountains and Intermountain West contains a diverse representation of ecosystem types that are actively managed on a broad scale by the National Forests. This network is afforded long-term protection, and the Areas are available for researchers and managers to use as ecological reference areas. A primary emphasis of ecosystem management has been to base management practices on a better understanding of ecological relationships at all scales, from landscape to genetic levels. This understanding may be obtained through the traditional research approaches, and also by direct involvement of land managers in resource monitoring. As discussed, RNAs can be used as benchmark areas for evaluating the effects of manipulative land management practices in comparable ecosystems. Using this approach, RNAs indicate how habitats or ecosystems function without deliberate manipulation. This is an important perspective to add to any evaluation of the effects of management treatments. This "baseline" value of undisturbed reference areas has long been recognized, and takes on added significance when considering the "monitoring and evaluation" activities that are outlined in the National Forest Management Act guidelines (section 219.11 (d) and other parts of the NFMA regulations) (NFMA 1976; Van Pelt 1980).

Inventory and Monitoring

Managers of National Forests are actively conducting inventories of biological resources and monitoring the effectiveness of management activities. Over the past decade or more, national efforts have also focused increasingly on inventory and monitoring, including the National Inventory and Monitoring Program, the Forest Health Monitoring (FHM) Program, and the Forest Inventory and Analysis (FIA) Program. The National Inventory and Monitoring Program provides broad guidance for meeting agency inventory and monitoring needs, so that the Forest Service can most effectively gather the data needed to carry out its natural resource management mission (Powell 2000). The FHM Program is a multi-agency effort to cooperatively monitor, assess, and report long-term status, changes, and trends in the health of the nation's forest ecosystems (USDA Forest Service 1999a). FHM compiles data from ground plots and surveys, aerial surveys, and other biotic and abiotic data sources, and develops analytical approaches to address forest health issues that affect the sustainability of forest ecosystems. The closely related FIA Program is the Forest Service's national program for collecting and reporting plot-based information on status and trends in forested ecosystems across all land ownerships (Gillespie and Smith 1999).

Forest Service Regions are developing individual approaches to ecosystem management, inventory, and monitoring, including the Properly Functioning Condition Rapid Assessment process in the Intermountain Region (USDA Forest Service 1997), the Northern Region Overview (USDA Forest Service 1998a) and the Integrated Inventory and Monitoring Program (USDA Forest Service 1998b). Many ecosystem assessment and monitoring efforts involve the establishment of permanent reference plots, and some of these programs include RNAs. However, a systematic attempt to include the RNA network in inventory and monitoring programs has been lacking (Scott and others 1999). Perhaps limiting has been ready accessibility to information on the locations, features and conditions of individual RNAs. This publication and the companion Forest Service RNA web page (http://rna.nris.state.mt.us/) should help fill information gaps and promote use of the RNA network for inventory and monitoring objectives and implementation of ecosystem management. In turn, active research use of the RNA network will provide valuable data that is critical to fostering the support of National Forest System administrators for the Natural Areas Program.

An objective of the USDA Forest Service Draft Strategic Plan (USDA Forest Service 1999b; http://www.srs.fs.fed.us/strategicplan/draft_sp.pdf) is to improve the capability of wilderness and protected areas to sustain a desired range of benefits and values. Such protected areas specifically include RNAs. Most significantly, the draft plan includes a requirement that baseline information be established for all National Forest System wilderness and other protected areas by the year 2006. Meeting this milestone objective will likely require more intensive inventory and monitoring of RNAs.

Biodiversity Conservation

National Forest managers are charged with maintaining biological diversity on National Forest lands. Many tools and approaches are available to accomplish biodiversity conservation goals, from active management to designation of reserves. RNA establishment may provide long-term protection for biological

elements of special concern, especially those with limited distributions such as rare plants and plant communities. RNAs can and do play an important role in conservation strategies for sensitive plant species. For example, peatlands that provide habitat for numerous rare plant species and communities are represented in 12 RNAs in Idaho and Montana; these areas are part of a recently completed conservation assessment and strategy for such habitats (Chadde et al. 1998). In Idaho, the conservation strategy for the Clearwater Refugium (an area that contains many disjunct and endemic rare plant species and uncommon plant communities) includes RNAs that provide habitat for such species and communities (Lichthardt and Moseley 1994). RNAs in the extreme northern portion of Idaho contain some of the only remaining unharvested stands of old-growth western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) forests. RNAs also maintain biodiversity by protecting excellent representative arrays of biotic communities and ecosystem types (Hunter 1991).

Stewardship and Management Opportunities

Over the last 100 years, the human alteration of ecological processes that influence vegetation has changed many ecosystems. This is especially true in the western United States, where disturbances have perpetuated certain plant communities, such as fire in old-growth ponderosa pine (*Pinus ponderosa*). Although maintaining natural processes such as fire in RNAs has been a goal, the reality is that fire has been actively suppressed in natural areas, as well as across the landscape as a whole. In cases where RNAs have been established to represent fire- or disturbance-related vegetation types, there is an increasing need to actively restore these processes in order to maintain examples of such types. Exponential spread of invasive native and exotic plant species and increased recreational use also pose new challenges to RNA management. Despite these ecological circumstances and stated RNA management goals, until recently the primary course of action has been to leave RNAs alone (except for fire suppression), thereby exacerbating the problems. However, recent emphasis on ecosystem management has brought more attention to restoration of natural processes that affect the composition, structure and function of plant communities. This restoration work should be extended, as appropriate, to the stewardship of RNAs.

Active stewardship in RNAs is consistent with the overall goal of RNA management, which is to maintain the full suite of ecological processes associated with the natural features and conditions for which the RNA was originally designed to protect. Scientists and land managers are currently working to restore the natural fire regime to several RNAs in the Northern Rocky Mountains and other areas. In some cases, the restoration of an ecological process such as fire may even require pre-burn vegetation management. For example, in the Sawmill Creek RNA on the Bitterroot National Forest in Montana, the return of fire to the old-growth ponderosa pine stands in the natural area had to be preceded by understory thinning of younger, shade-tolerant Douglas-fir (Kearns 2000). These younger trees, which had encroached as a result of lack of fire over the last 80 years, represented not only a competitive stress factor for the old pines, but also a significant risk as ladder fuels that could cause an overstory stand-replacing fire during subsequent burning. Aggressive control of invasive alien plant species was also needed in the native bunchgrass communities in the Sawmill Creek RNA; this required application of herbicides and other tools to accomplish control and eradication (Rice 2000). In this case, non-manipulative "protection" alone was not sufficient to restore the native flora in the RNA because the extremely competitive noxious weed species, especially spotted knapweed (*Centaurea maculosa*), had so greatly altered the desired bunchgrass vegetation types.

Responsibility for management of the RNAs covered in this guidebook is shared between the National Forest System (Northern and Intermountain Regions) and Forest Service Research (Rocky Mountain Research Station). The Rocky Mountain Research Station Director, in consultation with National Forest Supervisors and District Rangers, has the authority to approve research, monitoring projects, and management plans for most of these RNAs. However, if the RNA is located within a Wilderness or a National Recreation Area, the Regional Forester has responsibility for approving research, monitoring, and management activities. Routine administration of RNAs is the responsibility of the District Ranger and Forest Supervisor where the RNA is located. General management direction for RNAs is incorporated into the respective National Forest and Grasslands Land and Resource Management Plans. More specific RNA management direction may also be found in establishment records, and occasionally in site-specific RNA management plans. These unpublished establishment records and management plans are on file with the respective Regional and National Forest offices (contact information listed in Appendix B). The Forest Service Manual (Section 4063, USDA Forest Service 1994) contains further policy information regarding administration and management of RNAs; this direction is accessible online at http://www.fs.fed.us/im/directives/fsm/4000/4060.txt.

National Forest personnel interested in conducting manipulative management in RNAs for restoration and habitat maintenance purposes, such as prescribed

fire, invasive plant control, or understory thinning, must obtain approval from the Research Station Director and National Forest Supervisor. Proposals for such stewardship activities should be coordinated with the Regional RNA Coordinators and the Research Station. Forest Plans and RNA establishment records should be consulted first for any management prescriptions they may contain because such direction may suffice for supporting a proposal. If no management direction is currently available, a management proposal (preferably supported by a detailed management plan) should be developed and used to propose manipulative RNA stewardship activities. National Environmental Policy Act (NEPA) analysis also would be required in these cases. The proposal should also include a monitoring plan that outlines implementation and validation monitoring methods.

The Forest Service Natural Areas Program developed a stewardship monitoring module (USDA Forest Service 1995), to provide a quick and standardized means of assessing current conditions and management needs in Research Natural Areas. This module helps RNA stewards document current uses of an RNA, identify and document current or anticipated threats, and identify management and monitoring needs, including the identification of management activities that may be necessary to restore or maintain historical conditions to the RNA. Stewardship monitoring provides a way for individuals and organizations to participate in the RNA program and to become acquainted with individual RNAs. The module has been conducted for approximately 30 RNAs in Utah, Montana and Idaho. The stewardship monitoring module can be viewed and downloaded at http://rna.nris.state.mt.us/rna_involved.html.

Research, Monitoring, and Educational Opportunities

Research Natural Areas are designated areas to be permanently protected for maintaining biological diversity, conducting non-manipulative research and monitoring, and promoting education (USDA Forest Service 1992). Through research in RNAs, scientists, managers, and educators can seek to better understand natural dynamics of ecosystem composition, structure, and function. RNAs may provide reference areas for comparison with actively manipulated lands, by serving as control sites for assessing the effectiveness of management. Permanent plots may be used to measure long-term change in ecosystem or biophysical components. RNAs that include sensitive species may provide an opportunity to gain knowledge of the population dynamics of such species. This information can be used to help protect and manage these species elsewhere in their range, as well.

The concept of preserving samples of natural ecosystems as living laboratories is not new. As early as 1922, the Society of American Foresters was concerned that intensive harvesting would soon leave no natural forests from which to reference life history processes, and thus to guide successful management of remaining forests (Ashe 1922). The Society formed a Committee on Natural Areas in 1947 that recommended the acquisition and maintenance of natural areas for research and educational purposes (Buell and others 1952), to be used for addressing questions about ecosystem development uninfluenced by humans. These questions concerned site quality and productivity, competition as influenced by environmental factors and species composition, rare species refugia, growth and yield, natural disturbances, successional development, and general ecology of flora, fauna, soil, and water. It is now recognized that humans have had some influence on most North American ecosystems for thousands of years, and it is not possible to prevent or remove all human influences on RNAs. Nonetheless, natural areas can provide relatively intact "reference sites" for addressing many research questions.

Plant communities are often the most conspicuous features of an RNA, and many research studies in RNAs have focused on vegetation succession, demographic studies, and comparison of natural with managed conditions. Forested ecosystems have often been emphasized in past and current research in RNAs. Other biotic and abiotic components of these ecosystems should not be overlooked for study (Andrews 1993):

- **Non-forest plant communities** (examples include shrublands and grasslands),
- **Animals** (examples include featured, threatened, or endangered wildlife species; habitat relationships; natural insect communities; and territory and migration patterns),
- **Aquatic systems** (examples include controls for measuring natural streamflows and sediment rates compared with managed units containing harvest activities and road construction; composition, structure, and function of coarse woody debris in stream channel geomorphology, influence on the benthic community, and as fish habitat; nutrient cycling and vegetation succession in development of peat bogs; and survey and classification of wetlands, riparian areas, streams, rivers, and lakes),
- **Biogeochemical processes and nutrient cycling** (examples include physical and biological relationships influenced by patterns of natural disturbance, geomorphic processes, and climate change; relationship between decay organisms, coarse woody debris, and decay rates),

- **Below-ground organisms** (examples include the ecology and natural occurrence of fungi and other soil microorganisms, both pathological and beneficial), and the
- **Function** of RNAs as components of larger landscapes (for example, as protected whole ecosystems with corresponding level of biodiversity preservation, refugia for sensitive or threatened species, gene pools for wild species, travel corridors for mobile species, and reference sites for ecological land classification).

The nature of studies conducted in RNAs falls into several broad categories of monitoring and basic research. The research may be designed to address specific management questions or questions about the basic biology and ecology of natural systems.

Monitoring encompasses a range of activities from benchmark monitoring, to ecological monitoring, to stewardship monitoring. Monitoring can have either an applied or basic research focus.

Benchmark Monitoring of natural areas as reference sites for comparison with manipulated ecosystems has been a primary research emphasis (Anderson 1983). Benchmark monitoring is the collection of control information for comparison with disturbed ecosystems. Such monitoring usually addresses specific management questions, and is commonly conducted to provide information necessary for the management of National Forest System lands and other wildlands. Questions for benchmark monitoring might include: How do native grasses fare in grazed versus ungrazed rangelands, or under varying livestock grazing regimes as compared to grazing only by wildlife? What are the effects of timber harvest or road building on sedimentation in streams? How does manipulating forest structure through timber harvest affect breeding bird populations and behavior? What are the implications of planting commercially bred trees compared with ancestral populations? By using RNAs as reference areas, the responses of ecosystem components to management activities can be compared with similar natural ecosystems that have been left untreated. In some cases, replicated side-by-side comparisons of treated and control areas may not be possible within and adjacent to a single RNA, which could limit such research. Nonetheless, RNAs can serve as excellent locations for the collection of control information.

Long-term Ecological Monitoring generally is used to characterize long-term ecological change or variability in natural ecosystems. Questions addressed by ecological monitoring commonly focus on fundamental ecosystem composition, structure, and process. For example, ecological monitoring research may seek to better understand the long-term dynamics of natural communities, to document the rates and types of changes that occur in response to natural processes such as succession and disturbance, or to quantify ranges of natural variability (Elzinga and Evenden 1994). Ecological monitoring also has direct application to understanding and implementing management practices that attempt to mimic natural processes (ecosystem management). Using natural areas to understand historical ranges of variability may help determine management strategies that maintain ecological sustainability on manipulated lands (Jenkins and Bedford 1973). Examples of ecological monitoring research include: Surveying aquatic and terrestrial communities; Documenting rare or disjunct species; Documenting disturbance processes, such as fire return intervals or climate change, and their relationship to historic vegetation patterns; or Tracking changes in population size, community composition, community structure, and area occupied. Often, ecological monitoring is accomplished by installing and re-measuring permanent monitoring plots. Many references for long-term monitoring approaches and methods are given by Elzinga and Evenden (1997).

Stewardship Monitoring is designed to assess whether an RNA is maintained in compliance with the natural processes and/or features for which the area was designated to protect. Stewardship monitoring may be performed in order to prepare long-term RNA management plans. Another focus may be on assessing the need for restoration treatments or intervention activities (for example, re-introducing fire or controlling invasive exotic species). Stewardship monitoring is integral to the RNA system concept, because it can help insure the integrity of natural areas. Stewardship monitoring, like benchmark and ecological monitoring, has direct application to ecosystem management, where learning how to maintain and/or restore natural processes is an important management need.

Basic Ecosystem Research focuses on understanding the basic biology and ecology of natural systems and their biophysical settings. In many cases, ecological monitoring may be considered basic ecosystem research. The small scale and extent typical of most RNAs makes them particularly appropriate as sites for basic research related to the biology of organisms, the study of certain ecosystem processes, and to some extent, landscape interactions. Conversely, the limited size and extent of most RNAs and the prohibitions on manipulative activities may restrict other kinds of basic research. Examples of some basic ecosystem research topics potentially appropriate for RNAs follow:

Population/Demographic Studies may take the form of biological surveys for natural community associations, flora and fauna, and change elements (much like ecological monitoring). Population studies may target specific rare species and habitats or focus on unique environmental conditions. Some demographic studies may measure and compare the response of populations in manipulated ecosystems with undisturbed populations in RNAs to help answer management questions or to understand methods for maintaining or restoring species or communities.

Ecological Processes/Ecosystem Functions. Examples of ecological process research include studying relationships between climate and vegetation, understanding the dynamics of riparian and wetland ecosystems, reconstructing the history of natural disturbances or historic vegetation patterns, tracking carbon assimilation and allocation, water and nutrient cycling, studying the dynamics of below-ground organisms, such as fungi and their role in productivity and pathology (for example, see National Research Council 1990), studying terrestrial and aquatic animal habitat relationships, and developing classification systems for terrestrial and aquatic ecosystem components.

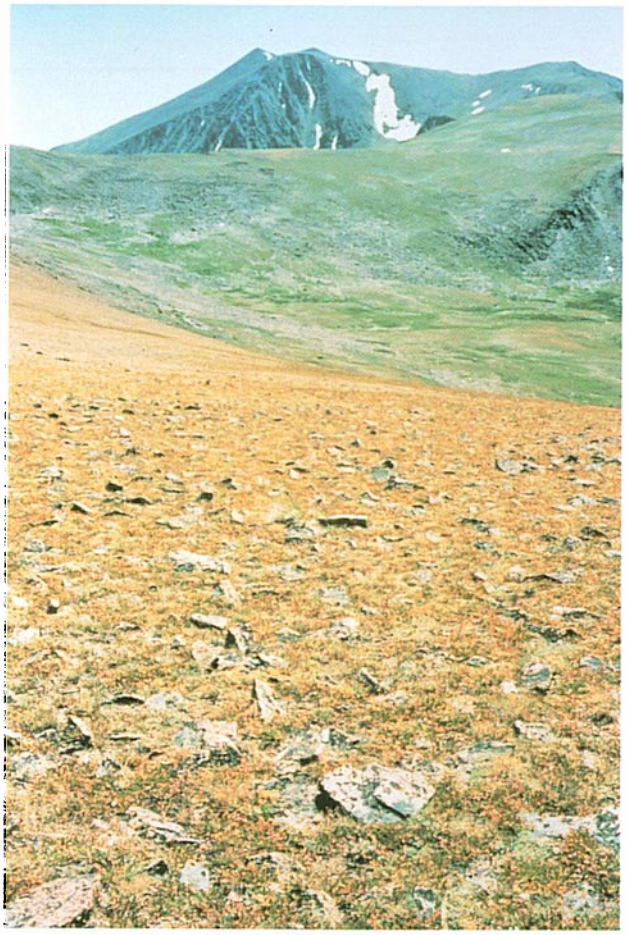
Genetic Research and Conservation. RNAs can function as gene reservoirs of rare or endangered species, as well as of ordinary wild species (Franklin and others 1972). Because they preserve in-place natural populations, RNAs may play an important function in genetics research and gene conservation programs by providing ancestral check populations for comparison with propagated plant materials used on actively managed lands.

Landscape Ecology. RNAs are one component of a larger protected area network that includes land-use designations such as wilderness, Long Term Ecological Reserves, botanical areas, and Bureau of Land Management Areas of Critical Environmental Concern. RNAs may be incorporated in research that addresses the representativeness of biological reserves, their role in biodiversity preservation, connectivity, and habitat fragmentation.

Alpine/Subalpine

A diversity of alpine ecosystems are represented within the RNA system including this alpine plateau within Goat Flat proposed RNA (Beaverhead-Deerlodge National Forest) in the Anaconda-Pintlar Range in Montana. Photo by Angela Evenden.

Ancient bristlecone pine (*Pinus longaeva*) forests are featured in several RNAs in Nevada including this stand within Mt. Moriah Table RNA (Humboldt-Toiyabe National Forest) in the Snake Range of eastern Nevada. Photo by Jan Nachlinger.



Alpine plant communities dominated by Gordon's Ivesia (*Ivesia gordonii*) and sedges (*Carex* spp.) within Smiley Mountain RNA on the Salmon-Challis National Forest in central Idaho. Photo by Charles Wellner.

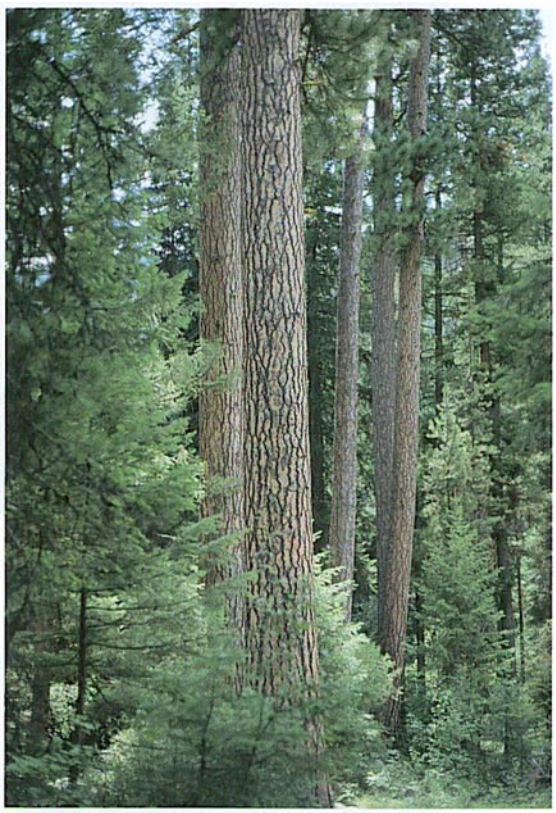
Wet meadows and small lakes surrounded by subalpine forests within Lava Butte RNA on the Payette National Forest in Idaho. Photo by Charles Wellner.

Subalpine plant communities dominated by a diversity of tall forbs occur within the Seitz Canyon/Echo Lake RNA in the Ruby Mountains of Nevada (Humboldt-Toiyabe National Forest). Photo by Jan Nachlinger.

Passage Creek RNA lies along the edge of the Absaroka Mountains within the Gallatin National Forest in central Montana and contains extensive forests of lodgepole pine (*Pinus contorta*) and subalpine fir (*Abies lasiocarpa*). Photo by Earle Layser.

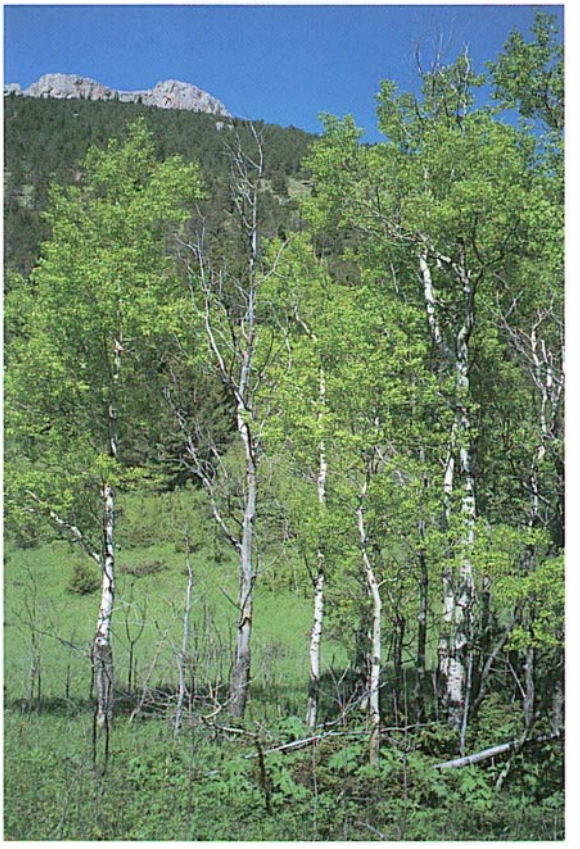
Montane old-growth stands of Douglas-fir (*Pseudotsuga menziesii*) occur within Bernice RNA on the Beaverhead-Deerlodge National Forest. These stands are estimated to be between 500 and 600 years old. Photo by James Habeck.

Highly diverse wetland plant communities occur within Swan River RNA on the Flathead National Forest in northwestern Montana. Photo by Janet Johnson.



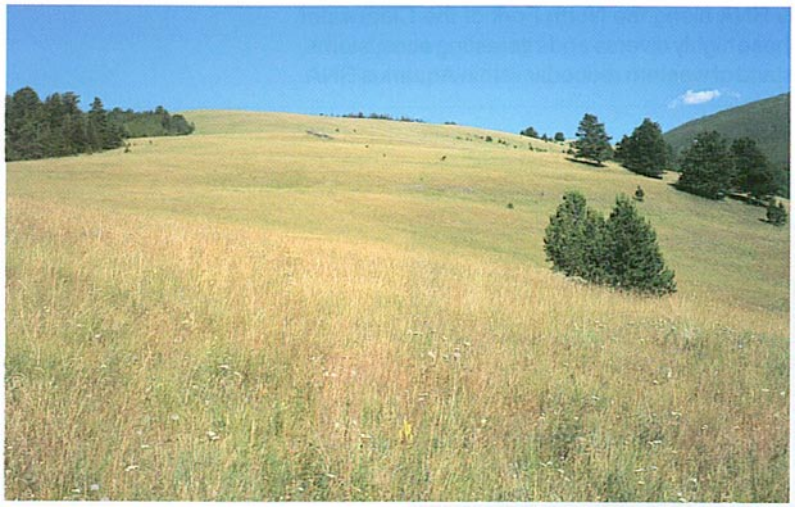
Ponderosa pine (*Pinus ponderosa*) forests such as this one in Lower Lost Horse Canyon RNA on the Bitterroot National Forest in western Montana are characterized by dense understories of Douglas-fir (*Pseudotsuga menziesii*). Succession of these once open park-like stands of ponderosa pine to dense thickets of Douglas-fir has resulted from exclusion of natural and Native American-induced fire regimes. Restoration of these ecosystems is needed. Photo by James Habeck.

Low-elevation remnant coastal forests dominated by western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) occur in secluded river systems in northern Idaho and feature a number of coastal disjunct plant and animal species. Aquarius RNA along the North Fork of the Clearwater River is a premier example of these highly diverse and interesting ecosystems. Shown here is an old-growth stand of western redcedar within Aquarius RNA. Photo by Charles Wellner.



Aspen (*Populus tremuloides*) community within Paine Gulch RNA on the Lewis & Clark National Forest in central Montana. Photo by Angela Evenden.

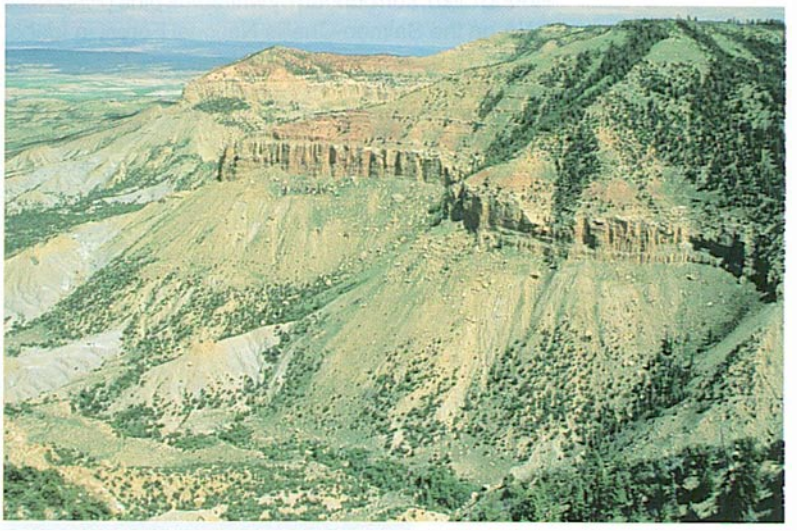
Grasslands in excellent condition, dominated by bluebunch wheatgrass (*Agropyron spicatum*), occur on steep basalt slopes within Emery Creek RNA on the Payette National Forest in Idaho. Photo by Charles Wellner.



High-quality rough fescue (*Festuca scabrella*) grasslands occur within Windy Ridge RNA at an elevation of 7400 feet on the Beaverhead-Deerlodge National Forest in southwestern Montana. Photo by Steve Chadde.

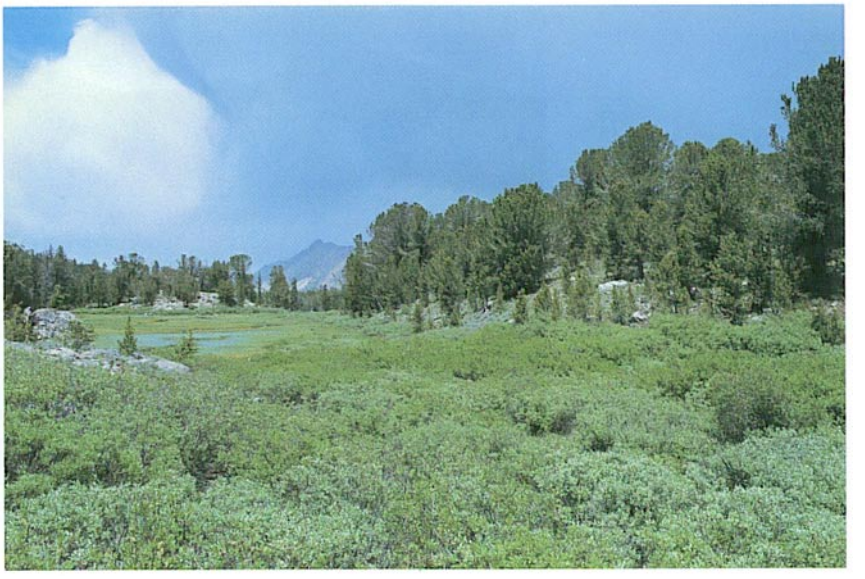
Rocky Comfort Flat RNA occurs along the western edge of Idaho on the Payette National Forest and features a variety of shrub-steppe plant communities, including an interesting stiff sage (*Artemisia rigida*) community on shallow soils. Photo by Charles Wellner.

Tall mountain brush communities (chaparral) are featured within Browse RNA in the Pine Valley Mountains of southwestern Utah. These unique communities are dominated by gambel oak (*Quercus gambelii*), birchleaf mountain mahogany (*Cercocarpus montanus*) and Utah serviceberry (*Amelanchier utahensis*). Photo by Joel Tuhy.

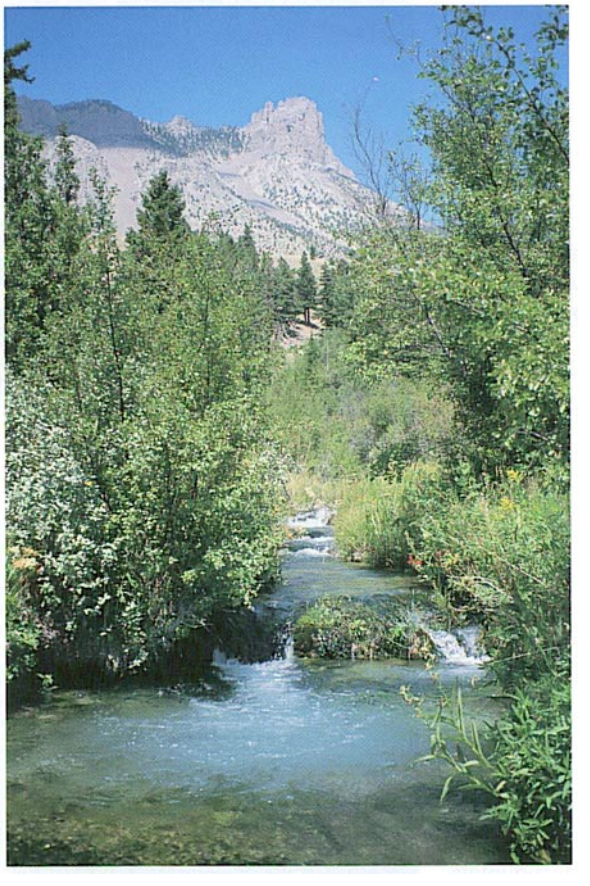


Old Woman Cove RNA on the Fishlake National Forest in central Utah encompasses several isolated mesa tops and high ridges supporting a diversity of vegetation types. The cliff band of Star Point Sandstone (shown in this photo) is a prominent feature in the RNA. Photo by Joel Tuhy.

Communities dominated by various species of sagebrush (*Artemisia* spp.) are common throughout the west and are represented within the RNA system. Shown here is a community dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Idaho fescue (*Festuca idahoensis*) in Raspberry Gulch RNA on the Boise National Forest in Idaho. Photo by Charles Wellner.



Round Lake, surrounded by whitebark pine (*Pinus albicaulis*) within Smiley Mountain RNA on the Salmon-Challis National Forest in Idaho. Photo by Charles Wellner.



Wagner Basin RNA along the Rocky Mountain Front on the Lewis & Clark National Forest in Montana features a unique calcareous spring-fed wetland system. Photo by Steve Chadde.

A high representation of subalpine ecosystems occurs within the RNA system, including Mystery Lake RNA on the Salmon-Challis National Forest in central Idaho. Photo by Charles Wellner.

Aquatic plant communities, including raised ponds dominated by water lily (*Nuphar polysepalum*), are represented within Chilcoot Peak RNA on the Boise National Forest in Idaho. Photo by Charles Wellner.

One of a series of unique wetlands embedded within a lodgepole pine (*Pinus contorta*) forest in Indian Meadows RNA on the Helena National Forest in Montana. Photo by Angela Evenden.

Patterned ground, formed by frost-heaving, is one of several unique physical features in the alpine zone. This photo was taken in Goat Flat proposed RNA (Beaverhead-Deerlodge National Forest, Montana). Photo by Angela Evenden.

Research Natural Areas contain many unique features, including rare plants and animals and unusual plant communities. Shown here is linear-leaved sundew (*Drosera linearis*), a carnivorous plant found primarily in boreal regions of Canada, but occurring peripherally, and rarely, in northwestern Montana. This species occurs on peat mats adjacent to ponds in Indian Meadows RNA on the Helena National Forest in western Montana. Photo by Maria Mantas.

Avalanche chutes dominated by shrubs and low trees are unique features found within the subalpine zone of western mountain ranges. This photo shows one of a series of chutes within Bitterroot Mountain Snow Avalanche RNA on the Bitterroot National Forest in western Montana. Photo by Angela Evenden.

Iron Bog RNA on the Salmon-Challis National Forest features a sphagnum bog within a relatively dry high elevation sagebrush-steppe ecosystem. Lodgepole pine (*Pinus contorta*) stands are adjacent to the bog. Photo by Charles Wellner.

Peatlands are unique habitat features in the Northern Rocky Mountains. A diverse array of these special communities are represented within the RNA system, including the patterned fen shown in this photo of Skull-Odell RNA on the Beaverhead-Deerlodge National Forest in southwestern Montana. Photo by Angela Evenden.

Educational activities are actively encouraged. Research natural areas provide a special suite of outdoor laboratories for students and others to study and understand natural ecosystems. Photo by Angela Evenden.

To the extent possible, natural processes are allowed to operate within RNAs. This photo of Upper Lost Horse Canyon RNA on the Bitterroot National Forest shows the extent of a 1988 wildfire in the subalpine forests surrounding Bailey Lake. These types of natural events in RNAs provide scientists an opportunity to study succession of these plant communities. Photo by Angela Evenden.

Research Natural Areas provide important sites for the study of natural ecosystems. Ecological research and monitoring studies are encouraged. Photo credit unknown.

Sawmill Creek RNA on the Bitterroot National Forest features a mosaic of low-elevation native grasslands and forest types. These once excellent-condition grasslands are now threatened by rapid expansion of exotic Eurasian plant species that outcompete the native grasses. An active restoration program is being implemented in this RNA to control the invasive plants and reintroduce fire into the forest communities. Photo by Angela Evenden.

Mapping understory plants to establish a baseline in Tepee Creek RNA in northern Idaho (Idaho Panhandle National Forest). Remeasurement of permanent plots is used to understand the relationships between natural regeneration and canopy gaps in old-growth western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) forests. Photo by Melinda Moeur.

Long-term climatic trends can be reconstructed using analysis of tree ring chronologies. The use of such sampling methods in RNAs requires specific approval in a research permit. Ecologists have been conducting these studies in several RNAs in the northern Rocky Mountains, including Carlton Ridge RNA on the Lolo National Forest in western Montana. Photo by Steve Shelly.

Examples of RNA Monitoring and Research

Research has been and is being conducted in many RNAs in the Northern Rocky Mountains and Intermountain West. In general, the use of RNAs for research and education is actively encouraged as long as the activity does not compromise the RNA values and objectives (Pacific Northwest Interagency Natural Area Committee 1990). Scientists seeking to conduct research in RNAs should contact a USDA Forest Service Regional Office or Research Station RNA Coordinator (Appendix B, also online at http://rna.nris.state.mt.us/rna_contacts.html), who can help identify research that is appropriate in the RNA network, suggest resource questions posed by managers that could be answered by research on RNAs, and provide information about specific RNAs. Following are only a few examples suggesting the wide scope of research topics and monitoring applications. Appendices C and D are complete bibliographies of research and monitoring studies conducted in RNAs covered by this guidebook. Appendix C is arranged alphabetically by author, with each bibliographical citation followed by the RNA(s) in which the study was conducted. References in Appendix D are arranged alphabetically by RNA within state and National Forest.

Benchmark Monitoring

Species of Special Management Concern: Examining Effects of Forest Fragmentation—Impacts of timber harvest practices on breeding birds have been studied on Tepee Creek RNA and Bottle Lake RNA in the Idaho Panhandle National Forest, Idaho (Hejl and Paige 1994). Information on bird populations in continuous old-growth forest on the RNAs contrasted with that on harvested areas will help managers consider the effect of habitat fragmentation when planning timber harvests in the region.

Sensitive Plant Management: Using Natural Areas as Reference Sites—Permanent plots have been established in three drainages on the Idaho Panhandle National Forest, Idaho, to study effects of timber harvest and road building on populations of salmonberry (*Rubus spectabilis*), a sensitive coastal disjunct plant species (Lichthardt and Mancuso 1996). Salmonberry appears to be found only in mature to old-growth western redcedar and western hemlock in semi-open riparian corridors. The undisturbed salmonberry population in the Tepee Creek RNA serves as a control in the study. Plots will be remeasured in future years to determine the influence of disturbance and also what canopy levels are compatible with maintaining viable populations of this species.

Paired plots established in Aquarius RNA (Clearwater National Forest, Idaho) and in adjacent timber harvest units are being used to assess the impact of timber harvest activities on rare plant populations endemic to the Clearwater Canyon (Lichthardt 1992a, 1998). Results from this study will enable local forest managers to make informed decisions when assessing the potential impact of future proposed management practices.

Vegetation Monitoring: Reference Value of Natural Areas—Samples were collected from pinyon-juniper (*Pinus edulis—Juniperus osteosperma*) stands within 12 natural areas on lands administered by either the USDA Forest Service or the USDI Bureau of Land Management in the northern Great Basin (Rust 1999). Data on woodland stand composition and structure will assist with the evaluation of livestock grazing effects and provide a baseline for the restoration of pre-settlement stand structures and disturbance regimes.

Long-Term Ecological Monitoring

Conservation of Wetland Communities in Northern Idaho: The Effects of Livestock Grazing—As part of an overall conservation and monitoring plan for peatlands and wetlands in northern Idaho, permanent plots in the ungrazed Smith Creek RNA (on the Idaho Panhandle National Forest) are paired with similar communities on the grazed Cow Creek Meadows proposed Botanical Area. Data on species composition and abundance will, over time, allow managers to determine changes in grazed and ungrazed plant communities and sensitive plant populations. The work is the result of a partnership between the USDA Forest Service, Idaho Conservation Data Center, National Audubon Society, and the Idaho Native Plant Society (Bursik 1993).

Long-Term Studies: Dynamics of Old-Growth Forest Ecosystems—Permanent forest vegetation plots in Tepee Creek RNA, Canyon Creek RNA, and Montford Creek RNA (Idaho Panhandle National Forest, Idaho) are used to understand the relationships between natural regeneration and canopy gaps in old-growth western hemlock-western redcedar forests (Moeur 1992). The plots are scheduled for remeasurement on 10-year cycles to provide data on successional dynamics of old-growth forests. Similar long-term studies of old-growth forests are being conducted in Coram RNA (Flathead National Forest) and Plant Creek RNA (Lolo National Forest) in western Montana (Elzinga and Shearer 1997; Elzinga 1993).

Detecting Environmental Change: Monitoring Lichens and Bryophytes—Baseline inventories using permanent plots installed in six RNAs in Idaho (on

the Salmon-Challis and Bitterroot National Forests) provide for monitoring lichens and bryophytes (St. Clair and Newberry 2000). Elemental analysis of atmospheric pollutants in the lichen species will contribute to understanding of atmospheric chemistry and global change. Lichen biomonitoring is one component of a Baseline Air Quality Biomonitoring Program. The RNAs are Iron Bog, Middle Canyon, Smiley Mountain, Surprise Valley, Soldier Lake, Mill Lake, and Salmon Mountain.

Understanding Pinyon-Juniper Ecosystems: Establishing Vegetation Baseline—Very few areas of undisturbed pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) woodlands exist today because of historic grazing, firewood cutting, and recreational use. Consequently, little is known about population and community dynamics in this type. The Jacks Spring Pinyon RNA on the Humboldt-Toiyabe National Forest in Nevada is very isolated, and has not been grazed for over 40 years. Baseline vegetation studies have been initiated to track long-term successional relationships and possible responses to environmental change. This work is being conducted by the Rocky Mountain Research Station in cooperation with the University of Nevada at Reno (Tausch and Nowak 1997).

Stewardship Monitoring

Restoring Natural Processes: Fire—A draft management plan for the Sawmill Creek RNA on the Bitterroot National Forest, Montana, identifies the need for controlling weeds and returning fire to the ponderosa pine and bunchgrass ecosystem (Johnson and Stewart 1998). In preparation for eventual reintroduction of fire, inventory, study, and control of aggressive weeds was initiated in 1994, and forest monitoring followed by removal of conifer understory fuels was conducted in the summer and fall of 1999 (Kearns 2000; Rice 2000). With these steps completed, understory burning of the forest and grassland communities in the RNA will be conducted in spring of 2001.

Restoration work is also occurring on the Dry Mountain RNA on the Beaverhead-Deerlodge National Forest, Montana, where a fire history analysis showed the need to reduce the encroachment of Douglas-fir (*Pseudotsuga menziesii*) and sagebrush (*Artemisia tridentata*) in the native bunchgrass communities (Habeck 1992). Researchers are prescribing burns and monitoring the response of the grassland community to fire (Evenden and Joy 1994).

Population/Demographic Studies

Effects of Introduced Pathogens: Decline of a Disjunct Population of Pacific Dogwood—In the late-1980's scientists began to observe declining health of the pacific dogwood (*Cornus nuttallii*) population in northern Idaho. It has since been documented that an introduced pathogen, anthracnose, is present in this population and has adversely impacted pacific dogwood's ability to reproduce and survive. Permanent plots were established in 1992 within the Lochsa RNA (Clearwater National Forest, Idaho) along the Selway River corridor to document long-term trends in the population (Lichthardt 1992b, 1994, 1996).

Adding to our Knowledge of Breeding Birds: Winter Wrens—A study cited above on the effects of timber harvest on breeding bird populations yielded very detailed data on winter wren (*Troglodytes troglodytes*) status in western redcedar and western hemlock forests. Breeding bird survey data indicate population declines for winter wren throughout the west. Research in Tepee Creek RNA and Bottle Lake RNA on the Idaho Panhandle National Forest, Idaho has significantly advanced knowledge of the ecology of this bird species, including population levels, reproductive success, and foraging behavior (Hejl 1992; Hejl and Woods 1991; Hejl and Paige 1994).

Studying the Effects of Fire Disturbance: Post-Fire Invasion of Non-Native Plants—A wildfire that burned a portion of Elk Creek Exclosure RNA (Boise National Forest, Idaho) provided a natural experiment for monitoring post-fire recovery of native plants and invasion by non-natives in grazed and ungrazed grass communities. Information from this study within bunchgrass/antelope bitterbrush (*Purshia tridentata*) communities has contributed to understanding the spread of aggressive weeds such as cheatgrass (*Bromus tectorum*) and skeletonweed (*Chondrilla juncea*), and successional patterns following disturbance by fire (Liao 1996; Monson and Anderson 1993; Monsen and Shaw 1995, 1997).

Studying Aquatic Ecosystems: Using the RNA Network—The overall health of aquatic ecosystems is being studied in several RNAs in Montana and Idaho through baseline studies of aquatic macroinvertebrates and biophysical features (Apfelbeck 1999; Rabe and others 1990).

Subalpine Ecosystems: Examining Naturally Occurring Hybrid Larches—Western larch (*Larix occidentalis*) and subalpine larch (*Larix lyallii*), which typically exhibit separate distributions, co-occur in a few unique settings in the Bitterroot Mountains of Montana. Scientists have conducted in-depth genetic and morphology studies of natural hybrids of these two tree species within Carlton Ridge RNA on the Lolo National Forest (Carlson and others 1990; Carlson and Theroux 1993). This work has potential application to development of tree breeding stock for harsher environments in need of restoration.

Ecological Processes/Ecosystem Functions

Great Basin Desert Shrub Ecosystems: Soil Disturbance Associated with Rodent Colonization—Soil disturbances associated with rodent colonization on the Desert Range RNA (Utah) may be responsible for the conversion of shrub communities to annual vegetation. Understanding the interactions of grazing, rodent colonization, and soil disturbance on vegetation change will be useful in management of similar rangelands. The work is being conducted by the Rocky Mountain Research Station and Brigham Young University (Kitchen and Jorgensen 1999).

Northern Rocky Mountain Forest Ecosystems: Understanding the Role of Pathogens—Root, heart, and butt rots in old-growth forests are being surveyed in 16 RNAs in Montana, Idaho, Washington, and Oregon. Baseline data about productivity, nitrogen and carbon pools, and local environment relates the pathogens to ecosystem structure, function, and process. The objective is to assess the role of these pathological organisms in the natural life span of forests, in order to help predict long term productivity and sustainability of long rotation natural and managed forests (McDonald 1995).

Ecosystem Recovery: Vegetation Response Following Livestock Grazing—Ecological studies were established as early as 1912 at the Great Basin Experimental Range, including Elk Knoll RNA (Manti-LaSal National Forest, Utah) to evaluate recovery of plant communities that were heavily disturbed by grazing. These plots were abandoned in 1947-1948. Resurrection of these plots, accompanied by installation of additional plots, mapping and photography, is being used to track long-term successional dynamics in a tall forb subalpine community type, and to define appropriate management and restoration practices on similar sites in southern Utah (Monsen 2000).

Reconstructing Historic Fire Regimes: Forest Ecosystems of the Bitterroot Mountains—Dendrochronology and pollen analysis work in Salmon Mountain RNA (Bitterroot National Forest, Idaho) and other sites is being used to reconstruct vegetation site histories and fire return intervals (Kipfmueller 1999). This information helps further the understanding of the role of fire and vegetation changes in northern Rocky Mountain forest types and for developing effective fire management prescriptions.

Understanding Natural Processes: Studying the Effects of Wind Disturbance—Natural succession following a stand-replacing blowdown in the Aquarius RNA on the Clearwater National Forest, Idaho, is being monitored using permanent plots in the disturbed area and adjacent recovered forest (Alaback and others 2000). The study is examining the role of wind disturbance (including frequency and intensity) in influencing vegetation patterns in the Clearwater River Canyons.

Conserving Special Places: Peatland Habitats of the Northern Rocky Mountains—Detailed floristic and ecological analyses of peatlands, and identification and analysis of associated rare plants and plant communities, has been conducted throughout the northern Rocky Mountains in Idaho and Montana. The work has contributed significantly to our understanding of peatlands, and survey sites have encompassed numerous RNAs, including the Sawtooth Valley Peatlands RNA (Sawtooth National Forest, Idaho; Moseley and others 1994), Shoofly Meadows RNA (Lolo National Forest, Montana; Murray 1995), several RNAs in northern Idaho (Bursik and Moseley 1995; Chadde and others 1998), and five RNAs in Montana (Chadde and others 1998).

Aquatic Ecosystems Surveys and Classification: Using the RNA Network—Several on-going studies are gathering valuable information for use in classifying aquatic features—streams, lakes, wetlands, and peatlands. Broad-based classification systems for open water and wetland communities have been developed for Idaho and western Montana (Rabe and Chadde 1994), and for different types of stream ecosystems in Idaho (Rabe and others 1990; Rabe and others 1994; Savage and Rabe 1979). Reference streams in several RNAs have been assessed for geomorphology, water quality, habitat, and macroinvertebrates (Rabe and Catts 1995; Rabe and Cazier 1993). High mountain lakes in 26 RNAs in Idaho have been surveyed and described (Rabe, in preparation). Data for each lake includes a description of lake type and structure, geological formation, topography, substrate, water chemistry, and plant and faunal occurrences.

Genetic Research and Conservation

Gene Bank: Using Research Natural Areas For Studying Tree Ancestry—The Northern Region and Inland Empire Tree Improvement Cooperative conduct research to support National Forests' Tree Improvement Program. Seed collected from individual western larch, ponderosa pine, Douglas-fir, and lodgepole pine (*Pinus contorta*) trees in RNAs provides a source of material for ancestral genetic tests. These collections are used as controls to measure changes in genetic variation or performance in selectively bred material compared with unmanaged, native gene pools. Seed from some 240 individual trees in 40 RNAs will represent the ancestral gene pool. Having the ancestral control populations will facilitate the ability to address and meet the objectives of monitoring and management of genetic diversity (Mahalovich 1999a, 1999b).

Landscape Ecology

Viewing Natural Areas at the Landscape Scale: Contributions to Biodiversity Conservation—The Swan River RNA on the Flathead National Forest in Montana and other protected areas were used in developing a landscape analysis of biodiversity represented in natural areas, and for identifying gaps in the network. A focus on habitat for 20 wildlife species, defined by a combination of vegetation, topographic, and other conditions has demonstrated the historic effect of timber harvest on fragmentation of the landscape, and resulting impact on regional biodiversity. Results of the study demonstrated a need for increasing the representation of low-elevation old-growth forests in the natural areas network. The work was conducted by researchers at the University of Montana Gap Analysis Project, in cooperation with the Forest Service (Hart 1994).

Educational Activities in Research Natural Areas

Research natural areas are available for educational purposes. These areas provide valuable outdoor laboratories for students and others to examine examples of natural environments and native plant communities (Franklin and others 1972). Some organizations such as state-level Native Plant Societies have taken an interest in 'adopting' individual RNAs with the purpose of learning more about these areas, including activities such as compiling more complete plant species lists. Individuals and organizations interested in adopting an RNA for such purposes should contact Region or Research Station RNA Coordinators (Appendix B, also online at http://rna.nris.state.mt.us/rna_contacts.html).

Accessing and Using the RNA Network for Research, Monitoring, and Education Activities

The Forest Service Research Natural Areas network represents a valuable ecological resource for scientists, managers and educators. The Forest Service encourages scientific and educational use of RNAs. These activities are coordinated by the Rocky Mountain Research Station RNA Coordinators and the Regional RNA Coordinators in Forest Service Regions 1 and 4. Proposed studies in most RNAs require the approval of the Rocky Mountain Research Station Director (see section, Stewardship and Management Opportunities).

Scientists and managers planning research in Forest Service RNAs are encouraged to discuss their research program with the Station or Regional RNA Coordinators (Appendix B, also online at http://rna.nris.state.mt.us/rna_contacts.html). These coordinators can often provide more detailed information on individual RNAs, including copies of vascular plant species lists, research reports, and establishment records. The Establishment Records for RNAs are an excellent source of detailed descriptive information on biological and physical features of each area. In addition, an interactive RNA database is available online at http://rna.nris.state.mt.us/. This RNA web page provides potential investigators with more detailed information on individual RNAs in 11 western states (Forest Service Regions 1, 2, 3, and 4), and also contains an updated contact list of local National Forest and Station RNA coordinators.

Requesting Approval to Use Research Natural Areas

The USDA Forest Service, Rocky Mountain Research Station has developed a process for requesting permission to use RNAs. The purposes of this approval process for research and monitoring on RNAs are as follows (Andrews 1999):

- Provide information to scientists about other research occurring on the RNA so that potential collaborations may be fostered and conflicts avoided,
- Insure that the ecological integrity of the RNA or other purposes for which the RNA was designated are not damaged by research or related activities,
- Insure that protection and site integrity for the individual scientific study, especially permanent plots, are maintained,
- Maintain records of research activities and research results to benefit the National Forest System and future researchers, and
- Meet Forest Service regulations as specified in the Forest Service Manual (FSM 4063.04 and FSM 4063.33, USDA Forest Service 1994)

In general, non-manipulative research that does not significantly impact the ecological composition, structure, or function of the area is appropriate for RNAs. The level of acceptable use varies by RNA, depending on the rarity of taxa, fragility or resilience of the ecosystems, and cumulative impacts of use.

In order to secure approval for a research or monitoring project, please complete and submit the RNA research approval request form attached in Appendix E. This form is also available for downloading on the Forest Service RNA web page at http://rna.nris.state.mt.us/rna_using.html.

Educational Activities and Field Trips

Individuals or small groups who wish to make a short visit (one day or less) to an RNA, and who will not be conducting research activities or collecting samples, do not need to complete the approval request form, nor is permission required to enter RNAs. However, educational users of RNAs are requested to inform National Forest coordinators of planned visits. Local District Ranger or National Forest RNA Coordinators can provide site access information.

Concluding Remarks

In closing, we hope that this publication, together with the RNA web page (http://rna.nris.state.mt.us/) will improve communication about Research Natural Areas among scientists, educators, managers, and the public. It is also our hope through the description and discussion of RNAs in this publication that the unique network of Forest Service RNAs will be more widely recognized and utilized by scientists, managers, and educators alike.

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Appendix A

Research Natural Areas on National Forest System lands in Idaho, Montana, Nevada, Utah and western Wyoming by National Hierarchical Framework Ecological Units

Province / *Section* MAP#	RNA Name	State	National Forest
American Semidesert & Desert Province (322)			
Mohave Desert Section (322A) – Southern Nevada			
184	Carpenter Canyon RNA	NV	Humboldt-Toiyabe
Great Plains-Palouse Dry Steppe Province (331)			
Palouse Prairie Section (331A) – Northern Idaho			
55	Elk Creek RNA	ID	Nez Perce
56	Fish Lake RNA	ID	Nez Perce
60	No Business Creek RNA	ID	Nez Perce
62	Square Mountain Creek RNA	ID	Nez Perce
Powder River Basin Section (331G) – Eastern Montana			
141	Poker Jim RNA	MT	Custer
Intermountain Semidesert & Desert Province (341)			
Bonneville Basin Section (341A) – Western Utah			
203	Desert Range RNA	UT	Desert Range Experiment Station
222	Red Butte Canyon RNA	UT	Wasatch-Cache
Northern Canyon Lands Section (341B) – Eastern Utah			
213	Cliff Dwellers Pasture RNA	UT	Manti-LaSal
215	Hideout Mesa RNA	UT	Manti-LaSal
216	Mill Creek Gorge RNA	UT	Manti-LaSal
217	Mount Peale RNA	UT	Manti-LaSal
Mono Section (341D) – Western Nevada			
187	Jacks Spring Pinyon RNA	NV	Humboldt-Toiyabe
Lahontan Basin Section (341E) – Western Nevada			
183	Bald Mountain Wash RNA	NV	Humboldt-Toiyabe
Northeastern Great Basin Section (341G) – Northeastern Nevada			
186	Hole-in-the-Mountain RNA	NV	Humboldt-Toiyabe
Intermountain Semidesert Province (342)			
Northwestern Basin & Range Section (342B) – Southern Idaho/ Northern Utah / Northern Nevada			
106	Burns Canyon RNA	ID	Targhee
185	Fall Creek RNA	NV	Humboldt-Toiyabe
17	Gibson Jack Creek RNA	ID	Caribou
202	Gunsight Peak RNA	UT	Caribou
100	Mount Harrison RNA	ID	Sawtooth
101	Pole Canyon RNA	ID	Sawtooth
105	Trapper Creek RNA	ID	Sawtooth
21	West Fork Mink Creek RNA	ID	Caribou
Owyhee Uplands Section (342C) – Western Idaho			
69	Council Mountain RNA	ID	Payette
Snake River Basalts Section (342D) – Central Idaho			
111	Thurmon Creek RNA	ID	Targhee
113	Willow Creek RNA	ID	Targhee
Southern Rocky Mountains Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province (M331)			
Yellowstone Highlands Section (M331A) – South-central Montana / Northwestern Wyoming / Eastern Idaho			
148	Black Butte RNA	MT	Gallatin
149	East Fork Mill Creek RNA	MT	Gallatin

(cont'd.)

Appendix A (Cont'd.)

MAP#	RNA Name	State	National Forest
Province			
Section			
139	Line Creek Plateau pRNA	MT/WY	Custer/Shoshone
109	Moose Creek Plateau RNA	ID	Targhee
150	Obsidian Sands RNA	MT	Gallatin
151	Palace Butte RNA	MT	Gallatin
152	Passage Creek RNA	MT	Gallatin
153	Sliding Mountain RNA	MT	Gallatin
154	Wheeler Ridge RNA	MT	Gallatin
Bighorn Mountains Section (M331B) – South-central Montana / North-central Wyoming			
140	Lost Water Canyon RNA	MT	Custer
Overthrust Mountains Section (M331D) – Southeastern Idaho / Western Wyoming / North-central Utah			
223	Afton Front RNA	WY	Bridger-Teton
16	Burton Canyon RNA	ID	Caribou
224	Gros Ventre RNA	WY	Bridger-Teton
18	Horse Creek RNA	ID	Caribou
197	Lance Canyon RNA	UT	Ashley
19	Meade Peak RNA	ID	Caribou
220	Mollens Hollow RNA	UT	Wasatch-Cache
221	Morris Creek RNA	UT	Wasatch-Cache
20	St. Charles Creek RNA	ID	Caribou
226	Swift Creek RNA	WY	Bridger-Teton
200	Timber-Cow Ridge RNA	UT	Ashley
Uinta Mountains Section (M331E) – Northeastern Utah / Southwestern Wyoming			
195	Ashley Gorge RNA	UT	Ashley
196	Gates of Birch Creek RNA	UT	Ashley
219	Jumpoff RNA	UT	Uinta
198	Pollen Lake RNA	UT	Ashley
199	Sims Peak Potholes RNA	UT	Ashley
201	Uinta Shale Creek RNA	UT	Ashley
Wind River Mountain Section (M331J) – Western Wyoming			
225	Osborn Mountain RNA	WY	Bridger-Teton
Middle Rocky Mountains Steppe – Coniferous Forest – Alpine Meadow Province (M332)			
Idaho Batholith Section (M332A) – Central Idaho / Western Montana			
79	Allan Mountain RNA	ID	Salmon-Challis
2	Back Creek RNA	ID	Boise
23	Bald Mountain RNA	ID	Clearwater
3	Bannock Creek RNA	ID	Boise
130	Bass Creek pRNA	MT	Bitterroot
4	Bear Creek RNA	ID	Boise
66	Belvidere Creek RNA	ID	Payette
131	Bitterroot Mountain Snow Avalanche RNA	MT	Bitterroot
133	Boulder Creek RNA	MT	Bitterroot
67	Bruin Mountain RNA	ID	Payette
175	Carlton Ridge RNA	MT	Lolo
5	Chilcoot Peak RNA	ID	Boise
68	Circle End Creek RNA	ID	Payette
82	Colson Creek RNA	ID	Salmon-Challis
84	Dome Lake RNA	ID	Salmon-Challis
6	Dry Buck RNA	ID	Boise
85	Dry Gulch - Forge Creek RNA	ID	Salmon-Challis
26	Dutch Creek RNA	ID	Clearwater
7	Eggers Creek RNA	ID	Boise
8	Elk Creek Exclosure RNA	ID	Boise
27	Fenn Mountain pRNA	ID	Clearwater

(cont'd.)

Appendix A (Cont'd.)

MAP#	RNA Name	State	National Forest
Province			
Section			
86	Frog Meadows RNA	ID	Salmon-Challis
29	Grave Peak RNA	ID	Clearwater
87	Gunbarrel Creek RNA	ID	Salmon-Challis
72	Lava Butte RNA	ID	Payette
30	Lochsa RNA	ID	Clearwater
135	Lower Lost Horse Canyon RNA	MT	Bitterroot
9	Lowman RNA	ID	Boise
10	Monumental Creek RNA	ID	Boise
59	Moose Meadow Creek RNA	ID	Nez Perce
11	Needles RNA	ID	Boise
12	North Fork Boise River RNA	ID	Boise
61	O'Hara Creek RNA	ID	Nez Perce
74	Patrick Butte pRNA	ID	Payette
75	Phoebe Meadows	ID	Payette
102	Pole Creek Exclosure RNA	ID	Sawtooth
76	Pony Creek RNA	ID	Payette
77	Pony Meadows RNA	ID	Payette
13	Raspberry Gulch RNA	ID	Boise
103	Redfish Lake Moraine RNA	ID	Sawtooth
14	Roaring River RNA	ID	Boise
1	Salmon Mountain RNA	ID	Bitterroot
104	Sawtooth Valley Peatlands RNA	ID	Sawtooth
32	Sneakfoot Meadows RNA	ID	Clearwater
15	Trinity Mountain RNA	ID	Boise
138	Upper Lost Horse Canyon RNA	MT	Bitterroot
63	Upper Newsome Creek RNA	ID	Nez Perce
64	Warm Springs Creek RNA	ID	Nez Perce
Bitterroot Valley Section (M332B) – Western Montana			
132	Bitterroot River RNA	MT	Bitterroot
120	Dexter Basin RNA	MT	Beaverhead-Deerlodge
134	East Fork Bitterroot pRNA	MT	Bitterroot
123	Goat Flat pRNA	MT	Beaverhead-Deerlodge
156	Granite Butte pRNA	MT	Helena
157	Indian Meadows RNA	MT	Helena
136	Medicine Point pRNA	MT	Bitterroot
179	Plant Creek RNA	MT	Lolo
180	Pyramid Peak RNA	MT	Lolo
158	Red Mountain RNA	MT	Helena
126	Sapphire Divide RNA	MT	Beaverhead-Deerlodge/Bitterroot
137	Sawmill Creek RNA	MT	Bitterroot
129	Windy Ridge RNA	MT	Beaverhead-Deerlodge
Rocky Mountain Front Section (M332C) – Northwestern Montana			
172	Wagner Basin RNA	MT	Lewis & Clark
173	Walling Reef RNA	MT	Lewis & Clark
Belt Mountains Section (M332D) – Central Montana			
166	Bartleson Peak RNA	MT	Lewis & Clark
167	Big Snowy RNA	MT	Lewis & Clark
155	Cabin Gulch RNA	MT	Helena
168	Minerva Creek pRNA	MT	Lewis & Clark
169	O'Brien Creek RNA	MT	Lewis & Clark
170	Onion Park RNA	MT	Lewis & Clark
171	Paine Gulch RNA	MT	Lewis & Clark
Beaverhead Mountains Section (M332E) – Southwestern Montana / Eastern Idaho			
114	Basin Creek RNA	MT	Beaverhead-Deerlodge
80	Bear Valley Creek RNA	ID	Salmon-Challis
115	Bernice RNA	MT	Beaverhead-Deerlodge
116	Cattle Gulch pRNA	MT	Beaverhead-Deerlodge
117	Cave Mountain RNA	MT	Beaverhead-Deerlodge
118	Cliff Lake RNA	MT	Beaverhead-Deerlodge
107	Copper Mountain RNA	ID	Targhee

(cont'd.)

Appendix A (Cont'd.)

MAP#	RNA Name	State	National Forest
Province			
Section			
119	Cottonwood Creek RNA	MT	Beaverhead-Deerlodge
83	Davis Canyon RNA	ID	Salmon-Challis
121	Dry Mountain RNA	MT	Beaverhead-Deerlodge
122	Elkhorn Lake pRNA	MT	Beaverhead-Deerlodge
124	Horse Prairie RNA	MT	Beaverhead-Deerlodge
89	Kenney Creek RNA	ID	Salmon-Challis
125	Lost Park RNA	MT	Beaverhead-Deerlodge
90	Mahogany Creek RNA	ID	Salmon-Challis
108	Meadow Canyon RNA	ID	Targhee
92	Middle Canyon RNA	ID	Salmon-Challis
93	Mill Lake RNA	ID	Salmon-Challis
95	Sheep Mountain RNA	ID	Salmon-Challis/Targhee
127	Skull-Odell RNA	MT	Beaverhead-Deerlodge
110	Targhee Creek RNA	ID	Targhee
128	Thunderbolt Mountain RNA	MT	Beaverhead-Deerlodge
112	Webber Creek RNA	ID	Targhee
Challis Volcanics Section (M332F) – Central Idaho			
99	Basin Gulch RNA	ID	Sawtooth
81	Cache Creek Lakes RNA	ID	Salmon-Challis
88	Iron Bog RNA	ID	Salmon-Challis
91	Merriam Lake Basin RNA	ID	Salmon-Challis
94	Mystery Lake RNA	ID	Salmon-Challis
96	Smiley Mountain RNA	ID	Salmon-Challis
97	Soldier Lakes RNA	ID	Salmon-Challis
98	Surprise Valley RNA	ID	Salmon-Challis
Blue Mountains Section (M332G) – Western Idaho			
53	Alum Beds pRNA	ID	Nez Perce
65	Bear Creek RNA	ID	Payette
54	Bills Creek pRNA	ID	Nez Perce
70	Cuddy Mountain RNA	ID	Payette
71	Emery Creek RNA	ID	Payette
57	Lightning Creek pRNA	ID	Nez Perce
58	Little Granite Creek RNA	ID	Nez Perce
73	Lost Basin Grassland RNA	ID	Payette
78	Rocky Comfort Flat RNA	ID	Payette
Northern Rocky Mountains Forest-Steppe—Coniferous Forest—Alpine Meadow Province (M333)			
Okanogan Highlands Section (M333A) – Northern Idaho / Northeastern Washington			
34	Binarch Creek RNA	ID	Idaho Panhandle
35	Bottle Lake RNA	ID	Idaho Panhandle
36	Canyon Creek RNA	ID	Idaho Panhandle
39	Kaniksu Marsh RNA	ID	Idaho Panhandle
42	Potholes RNA	ID	Idaho Panhandle
44	Smith Creek RNA	ID	Idaho Panhandle
45	Snowy Top RNA	ID	Idaho Panhandle
47	Tepee Creek RNA	ID	Idaho Panhandle
49	Three Ponds RNA	ID	Idaho Panhandle
51	Upper Priest River pRNA	ID	Idaho Panhandle
Flathead Valley Section (M333B) – Northwestern Montana			
159	Big Creek RNA	MT	Kootenai
142	Coram RNA	MT	Flathead
143	East Shore RNA	MT	Flathead
160	Hoskins Lake RNA	MT	Kootenai
38	Hunt Girl Creek RNA	ID	Idaho Panhandle
144	LeBeau RNA	MT	Flathead/Kootenai

(cont'd.)

Appendix A (Cont'd.)

MAP#	RNA Name	State	National Forest
Province			
Section			
145	Little Bitterroot RNA	MT	Flathead
162	Norman-Parmenter RNA	MT	Kootenai
163	Pete Creek Meadows RNA	MT	Kootenai
146	Swan River RNA	MT	Flathead
165	Wolf-Weigel RNA	MT	Kootenai
Northern Rockies Section (M333C) – Northwestern Montana			
147	Tuchuck RNA	MT	Flathead
Bitterroot Mountain Section (M333D) – Northern Idaho/ Northwestern Montana			
22	Aquarius RNA	ID	Clearwater
174	Barktable Ridge RNA	MT	Lolo
24	Bull Run Creek RNA	ID	Clearwater
25	Chateau Falls RNA	ID	Clearwater
176	Council Grove RNA	MT	Lolo
177	Ferry Landing RNA	MT	Lolo
37	Five Lakes Butte RNA	ID	Idaho Panhandle
28	Four-bit Creek RNA	ID	Clearwater
161	Lower Ross Creek RNA	MT	Kootenai
40	Montford Creek RNA	ID	Idaho Panhandle
178	Petty Creek RNA	MT	Lolo
41	Pond Peak RNA	ID	Idaho Panhandle
31	Rhodes Peak pRNA	ID	Clearwater
43	Scotchman No. 2 RNA	ID	Idaho Panhandle
181	Sheep Mountain Bog RNA	MT	Lolo
182	Shoofly Meadows RNA	MT	Lolo
46	Spion Kop RNA	ID	Idaho Panhandle
33	Steep Lakes RNA	ID	Clearwater
48	Theriault Lake RNA	ID	Idaho Panhandle
164	Ulm Peak RNA	MT	Kootenai
50	Upper Fishhook RNA	ID	Idaho Panhandle
52	Upper Shoshone Creek RNA	ID	Idaho Panhandle
Nevada–Utah Mountains Semidesert – Coniferous Forest – Alpine Meadow Province (M341)			
Central Great Basin Mountains Section (M341A) – Central & Eastern Nevada			
188	Mount Jefferson RNA	NV	Humboldt-Toiyabe
189	Mount Moriah Table RNA	NV	Humboldt-Toiyabe
190	North-South Schell Peaks RNA	NV	Humboldt-Toiyabe
191	Pearl Peak RNA	NV	Humboldt-Toiyabe
192	Seitz Canyon / Echo Lake RNA	NV	Humboldt-Toiyabe
193	Troy Peak RNA	NV	Humboldt-Toiyabe
194	White Pine Peak RNA	NV	Humboldt-Toiyabe
Utah High Plateaus & Mountains Section (M341C) – Southern Utah			
204	Browse RNA	UT	Dixie
209	Bullion Canyon RNA	UT	Fishlake
214	Elk Knoll RNA	UT	Manti-LaSal
218	Nelson Mountain RNA	UT	Manti-LaSal
210	Old Woman Cove RNA	UT	Fishlake
211	Partridge Mountain RNA	UT	Fishlake
205	Red Canyon RNA	UT	Dixie
206	Table Cliff RNA	UT	Dixie
207	Timbered Cinder Cone RNA	UT	Dixie
212	Upper Fish Creek RNA	UT	Fishlake
208	Upper Sand Creek RNA	UT	Dixie

Appendix B

Addresses and phone numbers of Forest Service offices in Idaho, Montana, Nevada, Utah and western Wyoming, with contact information for Region and Station RNA Coordinators.

For current RNA Coordinators in each National Forest office, visit the RNA website at http://rna.nris.state.mt.us/rna_contacts.html

RNA Coordinators for Northern Region

Steve Shelly
Region 1 RNA Coordinator
Northern Region, USDA Forest Service
Regional Office
P.O. Box 7669
Missoula, MT 59807
Phone: (406) 329-3041
Email: sshelly@fs.fed.us

Melinda Moeur
RMRS RNA Coordinator for Region 1
Rocky Mountain Research Station
Forestry Sciences Laboratory
1221 South Main Street
Moscow, Idaho 83843
Phone: (208) 883-2316
Email: mmoeur@fs.fed.us

RNA Coordinators for Intermountain Region

Alma Winward
Region 4 RNA Coordinator
Intermountain Region, USDA Forest Service
Regional Office
324 25th Street
Ogden, UT 84401
Phone: (801) 625-5596
Email: awinward@fs.fed.us

Stanley Kitchen
RMRS RNA Coordinator for Region 4
Rocky Mountain Research Station
Provo Shrub Sciences Lab
735 North 500 East
Provo, UT 84606
Phone: (801) 342-5140
Email: skitchen@fs.fed.us

Forest Service offices

Rocky Mountain Research Station

USDA Forest Service, Rocky Mountain Research Station; 240 West Prospect Road; Fort Collins, CO 80526-2098; Phone:(970)498-1100; Email: mailroom_rocky_mountain_research_station@fs.fed.us

Region 1—Northern Region Headquarters

USDA Forest Service, Northern Region; Federal Building; 200 Broadway, PO Box 7669; Missoula, MT 59807-7669; Phone:(406)329-3511; Email:mailroom_r1@fs.fed.us

Northern Region National Forests—Idaho

Clearwater National Forest 12730 Highway 12; Orofino, Idaho, 83544; Phone:(208)476-4541; Email:mailroom_r1_clearwater@fs.fed.us

Idaho Panhandle National Forests 3815 Schreiber Way; Coeur d'Alene, ID 83815-8363; *Phone:(208)765-7223;* Email:mailroom_r1_idaho_panhandle@fs.fed.us

Nez Perce National Forest Route 2, Box 475; Grangeville, ID 83530; Phone:(208)983-1950; Email:mailroom_r1_nez_perce@fs.fed.us

Northern Region National Forests—Montana

Beaverhead-Deerlodge National Forest 420 Barrett Street; Dillon, MT 59725-3572; Phone:(406)683-3900; Email:mailroom_r1_beaverhead_deerlodge@fs.fed.us

Bitterroot National Forest 1801 North 1st Street; Hamilton, MT 59840; Phone:(406)363-7117; Email:mailroom_r1_bitterroot@fs.fed.us

Custer National Forest 1310 Main Street; P.O. Box 50760; Billings, MT 59105; Phone:(406)248-9885; Email:mailroom_r1_custer@fs.fed.us

Flathead National Forest 1935 Third Avenue East; Kalispell, MT 59901; Phone:(406)755-5401; Email:mailroom_r1_flathead@fs.fed.us

Gallatin National Forest Federal Building; 10 East Babcock Ave.; P.O. Box 130; Bozeman, MT 59771; Phone:(406)587-6701; Email:mailroom_r1_gallatin@fs.fed.us

Helena National Forest 2880 Skyway Drive; Helena, MT 59601; Phone:(406)449-5201; Email:mailroom_r1_helena@fs.fed.us

Kootenai National Forest 1101 U.S. Highway 2 West; Libby, MT 59923; Phone:(406)293-6211; Email:mailroom_r1_kootenai@fs.fed.us

Lewis & Clark National Forest 1101 15th St. North; Box 869; Great Falls, MT 59403; Phone:(406)791-7700; Email:mailroom_r1_lewis_and_clark@fs.fed.us

Lolo National Forest Building 24, Fort Missoula; Missoula, MT 59804; Phone:(406)329-3750; Email:mailroom_r1_lolo@fs.fed.us

Region 4 – Intermountain Region Headquarters

USDA Forest Service, Intermountain Region Headquarters; Federal Building; 324 25th Street; Ogden, UT 84401-2310; Phone:(801)625-5352; Email:mailroom_r4@fs.fed.us

Intermountain Region National Forests—Idaho

Boise National Forest 1249 South Vinnell Way; Boise, ID 83709; Phone:(208)373-4100; Email:mailroom_r4_boise@fs.fed.us

Caribou-Targhee National Forest Caribou Office; 250 S. Fourth Avenue; Suite 172, Federal Building; Pocatello, ID 83201; Phone:(208)236-7500; Email:mailroom_r4_caribou_targhee@fs.fed.us

Caribou-Targhee National Forest Targhee Office; P.O. Box 208; 420 N. Bridge Street; St. Anthony, ID 83445; Phone:(208)624-3151; Email:mailroom_r4_caribou_targhee@fs.fed.us

Payette National Forest P.O. Box 1026; 800 West Lakeside Avenue; McCall, Idaho 83638; Phone:(208)634-0700; Email:mailroom_r4_payette@fs.fed.us

Salmon-Challis National Forest RR2, Box 600; Salmon, Idaho 83467; Phone:(208)756-5100; Email:mailroom_r4_salmon_challis@fs.fed.us

Sawtooth National Forest 2647 Kimberly Road East; Twin Falls, ID 83301-7976; Phone:(208)737-3200; Email:mailroom_r4_sawtooth@fs.fed.us

Intermountain Region National Forests—Nevada

Humboldt-Toiyabe National Forests 1200 Franklin Way; Sparks, NV 89431; Phone:(775)331-6444; Email:mailroom_r4_humboldt_toiyabe@fs.fed.us

Intermountain Region National Forests—Utah

Ashley National Forest 355 North Vernal Ave.; Vernal, UT 84078 ; Phone:(435)789-1181; Email:mailroom_r4_ashley@fs.fed.us

Dixie National Forest 82 North 100 East; Cedar City, UT 84720-2686; Phone:(435)865-3700; Email:mailroom_r4_dixie@fs.fed.us

Fishlake National Forest 115 East 900 North; Richfield, UT 84701; Phone:(435)896-9233; Email:mailroom_r4_fishlake@fs.fed.us

Manti-La Sal National Forest 599 West Price River Drive; Price, Utah 84501; Phone:(435)637-2817; Email:mailroom_r4_manti_lasal@fs.fed.us

Uinta National Forest 88 West 100 North; Provo, UT 84601; Phone:(801)342-5100; Email:mailroom_r4_uinta@fs.fed.us

Wasatch-Cache National Forest 8236 Federal Building; 125 South State Street; Salt Lake City, UT 84138; Phone:(801)524-3900; Email:mailroom_r4_wasatch_cache@fs.fed.us

Intermountain Region National Forests —western Wyoming

Bridger-Teton National Forest Box 1888; 340 N. Cache; Jackson, WY 83001; Phone:(307)739-5500; Email:mailroom_r4_bridger_teton@fs.fed.us

Appendix C

Bibliography of research and monitoring studies conducted in Forest Service Research Natural Areas in Idaho, Montana, Nevada, Utah and western Wyoming.

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Appendix D

Bibliography of research and monitoring studies conducted between 1925 and 2000 in Forest Service Research Natural Areas in Idaho, Montana, Nevada, Utah and western Wyoming.

Citations are arranged alphabetically by RNA within state and National Forest. If an RNA is not included in this appendix, this indicates that research and monitoring studies from these areas are not known

IDAHO - BITTERROOT NATIONAL FOREST - Salmon Mountain RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Montford Creek RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Scotchman No. 2 RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Smith Creek RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Snowy Top RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Spion Kop RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Tepee Creek RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Theriault Lake RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Three Ponds RNA

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Upper Fishhook RNA

Jankovsky-Jones, M. 1999. Conservation strategy for Spokane River Basin wetlands. Unpublished report prepared for the United States Environmental Protection Agency through Section 104(b)(3) of the Clean Water Act on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 26 p. plus appendices.

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Upper Priest River pRNA

Rabe, F. W.; Bursik, R. J.; Cantor, E. B. 1990. Classification and monitoring of wetlands in selected areas of the Pacific Northwest. Unpublished report on file at: U.S. Department of Agriculture, Forest Service, Northern Region Headquarters, Missoula, MT. 209 p.

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IDAHO - IDAHO PANHANDLE NATIONAL FORESTS - Upper Shoshone Creek RNA

Jankovsky-Jones, M. 1999. Conservation strategy for Spokane River Basin wetlands. Unpublished report prepared for the United States Environmental Protection Agency through Section 104(b)(3) of the Clean Water Act on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 26 p. plus appendices.

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IDAHO - NEZ PERCE NATIONAL FOREST - Fish Lake RNA

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IDAHO - NEZ PERCE NATIONAL FOREST - Little Granite Creek RNA

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IDAHO - NEZ PERCE NATIONAL FOREST - O'Hara Creek RNA

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IDAHO - NEZ PERCE NATIONAL FOREST - Square Mountain Creek RNA

Moseley, R. K. 1989. Field investigations of *Allium validum* (tall swamp onion) and *Douglasia idahoensis* (Idaho douglasia), Region 1 Sensitive Species on the Nez Perce National Forest. Unpublished challenge cost-share report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 16 p. plus appendices.

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IDAHO - NEZ PERCE NATIONAL FOREST - Upper Newsome Creek RNA

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IDAHO - PAYETTE NATIONAL FOREST - Belvidere Creek RNA

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IDAHO - PAYETTE NATIONAL FOREST - Bruin Mountain RNA

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IDAHO - PAYETTE NATIONAL FOREST - Circle End Creek RNA

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IDAHO - PAYETTE NATIONAL FOREST - Cuddy Mountain RNA

Rust, S. K.; Mancuso, M.; Murphy, C. J. 1999. A vegetation map of the Rockin M Ranch Wildlife Conservation Easement, Washington County, Idaho. Unpublished report prepared for the U.S. Department of the Interior, Bureau of Land Management, Boise District, Cascade Resource Area on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

IDAHO - PAYETTE NATIONAL FOREST - Lava Butte RNA

Rabe, F. W. [In preparation]. High Mountain Lake Research Natural Areas in Idaho. Gen. Tech. Rep. RMRS-GTR-xxWWW. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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IDAHO - PAYETTE NATIONAL FOREST - Lost Basin Grassland RNA

Rust, S. K.; Mancuso, M.; Murphy, C. J. 1999. A vegetation map of the Rockin M Ranch Wildlife Conservation Easement, Washington County, Idaho. Unpublished report prepared for the U.S. Department of the Interior, Bureau of Land Management, Boise District, Cascade Resource Area on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

IDAHO - PAYETTE NATIONAL FOREST - Patrick Butte pRNA

Rabe, F. W. [In preparation]. High Mountain Lake Research Natural Areas in Idaho. Gen. Tech. Rep. RMRS-GTR-xxWWW. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

IDAHO - PAYETTE NATIONAL FOREST - Pony Meadows RNA

Rabe, F. W. [In preparation]. High Mountain Lake Research Natural Areas in Idaho. Gen. Tech. Rep. RMRS-GTR-xxWWW. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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IDAHO - PAYETTE NATIONAL FOREST - Rocky Comfort Flat RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Bear Valley Creek RNA

Jankovsky-Jones, M. 1999. Conservation strategy for wetlands in east-central Idaho. Unpublished report prepared for the United States Environmental Protection Agency through Section 104(b)(3) of the Clean Water Act on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 26 p. plus appendices.

IDAHO - SALMON-CHALLIS NATIONAL FOREST - Cache Creek Lakes RNA

Rabe, F. W. [In preparation]. High Mountain Lake Research Natural Areas in Idaho. Gen. Tech. Rep. RMRS-GTR-xxWWW. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

IDAHO - SALMON-CHALLIS NATIONAL FOREST - Dome Lake RNA

Rabe, F. W. [In preparation]. High Mountain Lake Research Natural Areas in Idaho. Gen. Tech. Rep. RMRS-GTR-xxWWW. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

IDAHO - SALMON-CHALLIS NATIONAL FOREST - Iron Bog RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Kenney Creek RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Merriam Lake Basin RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Middle Canyon RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Mill Lake RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Smiley Mountain RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Soldier Lakes RNA

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IDAHO - SALMON-CHALLIS NATIONAL FOREST - Surprise Valley RNA

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IDAHO - SAWTOOTH NATIONAL FOREST - Mount Harrison RNA

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IDAHO - TARGHEE NATIONAL FOREST - Burns Canyon RNA

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IDAHO - TARGHEE NATIONAL FOREST - Thurmon Creek RNA

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MONTANA – BEAVERHEAD-DEERLODGE NATIONAL FOREST – Bernice RNA

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MONTANA – BEAVERHEAD-DEERLODGE NATIONAL FOREST – Cliff Lake RNA

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MONTANA – BEAVERHEAD-DEERLODGE NATIONAL FOREST – Skull-Odell RNA

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MONTANA - BITTERROOT NATIONAL FOREST - Bass Creek pRNA

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MONTANA - BITTERROOT NATIONAL FOREST - Bitterroot Mountain Snow Avalanche RNA

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MONTANA - BITTERROOT NATIONAL FOREST - East Fork Bitterroot pRNA

Hitt, N. P.; Shelly, J. S.; Frissell, C. A. 1999. Towards aquatic system functionality in reserve design: an evaluation of aquatic representation goals within Research Natural Areas of western Montana. Paper presented at Natural Areas Association Conference, October 13-16, 1999, Tucson, AZ.

MONTANA - BITTERROOT NATIONAL FOREST - Lower Lost Horse Canyon RNA

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MONTANA - BITTERROOT NATIONAL FOREST - Medicine Point pRNA

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MONTANA - BITTERROOT NATIONAL FOREST - Sawmill Creek RNA

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MONTANA - CUSTER NATIONAL FOREST - Line Creek Plateau pRNA

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MONTANA - CUSTER NATIONAL FOREST - Lost Water Canyon RNA

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MONTANA - CUSTER NATIONAL FOREST - Poker Jim RNA

Mahalovich, M. F. 1999. Breeding, seed orchard and restoration plan for the development of ponderosa pine in the Northern Rockies. Unpublished report on file at: U.S. Department of Agriculture, Forest Service Northern Region, Inland Empire Tree Improvement Cooperative, Forestry Sciences Laboratory, Moscow, ID.

MONTANA - FLATHEAD NATIONAL FOREST - Coram RNA

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MONTANA - FLATHEAD NATIONAL FOREST - East Shore RNA

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MONTANA - FLATHEAD NATIONAL FOREST - LeBeau RNA

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MONTANA - FLATHEAD NATIONAL FOREST - Little Bitterroot RNA

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MONTANA - FLATHEAD NATIONAL FOREST - Swan River RNA

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MONTANA - FLATHEAD NATIONAL FOREST - Tuchuck RNA

Hitt, N. P.; Shelly, J. S.; Frissell, C. A. 1999. Towards aquatic system functionality in reserve design: an evaluation of aquatic representation goals within Research Natural Areas of western Montana. Paper presented at Natural Areas Association Conference, October 13-16, 1999, Tucson, AZ.

MONTANA - GALLATIN NATIONAL FOREST - Obsidian Sands RNA

Cooper, S. V. 1975. Forest habitat types of northwestern Wyoming and contiguous portions of Montana and Idaho. Pullman, WA: Washington State University. 190 p. Dissertation.

MONTANA - HELENA NATIONAL FOREST - Indian Meadows RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Big Creek RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Hoskins Lake RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Lower Ross Creek RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Norman-Parmenter RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Pete Creek Meadows RNA

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MONTANA - KOOTENAI NATIONAL FOREST - Wolf-Weigel RNA

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MONTANA - LEWIS & CLARK NATIONAL FOREST - Onion Park RNA

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MONTANA - LOLO NATIONAL FOREST - Carlton Ridge RNA

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MONTANA - LOLO NATIONAL FOREST - Council Grove RNA

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MONTANA - LOLO NATIONAL FOREST - Ferry Landing RNA

Mahalovich, M. F. 1999. Breeding, seed orchard and restoration plan for the development of ponderosa pine in the Northern Rockies. Unpublished report on file at: U.S. Department of Agriculture, Forest Service Northern Region, Inland Empire Tree Improvement Cooperative, Forestry Sciences Laboratory, Moscow, ID.

MONTANA - LOLO NATIONAL FOREST - Petty Creek RNA

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MONTANA - LOLO NATIONAL FOREST - Plant Creek RNA

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MONTANA - LOLO NATIONAL FOREST - Sheep Mountain Bog RNA

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MONTANA - LOLO NATIONAL FOREST - Shoofly Meadows RNA

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NEVADA - HUMBOLDT-TOIYABE NATIONAL FOREST - Carpenter Canyon RNA

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NEVADA - HUMBOLDT-TOIYABE NATIONAL FOREST - Jacks Spring Pinyon RNA

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UTAH - ASHLEY NATIONAL FOREST - Pollen Lake RNA

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UTAH - ROCKY MOUNTAIN RESEARCH STATION - DESERT EXPERIMENTAL RANGE - Desert Range RNA

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UTAH – DIXIE NATIONAL FOREST – Red Canyon RNA

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UTAH – DIXIE NATIONAL FOREST – Table Cliff RNA

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UTAH – MANTI-LASAL NATIONAL FOREST – Cliff Dwellers Pasture RNA

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Appendix E

Research Use Request Form for Forest Service Research Natural Areas in Idaho, Montana, Nevada, Utah and western Wyoming.

This form may also be downloaded from the Forest Service RNA web page at http://rna.nris.state.mt.us/rna_using.html.

RESEARCH NATURAL AREA (RNA) PROGRAM
USDA FOREST SERVICE

Rocky Mountain Research Station (RMRS)
Northern Region (R1) **Rocky Mountain Region (R2)**
Southwestern Region (R3) **Intermountain Region (R4)**

RNA RESEARCH APPROVAL REQUEST FORM

Information and Instructions

Research Natural Areas (RNAs) are established by the USDA Forest Service as representative examples of minimally disturbed natural ecosystems for non-manipulative research activities, monitoring, and the protection of biological diversity. The Forest Service encourages research in RNAs. Research on RNAs has the potential for improving the understanding of ecosystems and the management of public lands. The Rocky Mountain Research Station is willing to assist scientists with the approval process and, in some cases, other aspects of their research program. The purposes of an approval process for research on RNAs are:

- To insure that the ecological integrity of the RNA or other purposes for which the RNA was designated are not damaged by research or related activities.
- To provide information to scientists about other research occurring on the RNA so that potential collaborations may be fostered and conflicts avoided.
- To insure that protection and site integrity for the individual scientific study, especially permanent plots, are maintained.
- To maintain records of research activities and research results to benefit the National Forest System and future researchers.
- To meet Forest Service regulations as specified in the Forest Service Manual (FSM 4063.04 and FSM 4063.33).

In general, non-manipulative research that does not significantly impact the ecological composition, structure, or function of the area is appropriate for RNAs. The level of acceptable use varies by RNA, depending on the rarity of taxa, fragility or resilience of the ecosystems, and cumulative impacts of use.

All research use (including research by Forest Service scientists) of RNAs on National Forest System land in Regions 1, 2, 3, and 4 requires approval by the Director of the Rocky Mountain Research Station (RMRS). This includes all Forest Service RNAs within Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Idaho, South Dakota, Utah, and Wyoming. Applications for most small-scale studies will be approved by the Station Director. Where appropriate, a Station scientist may be assigned as liaison. When proposed research will involve several Research Natural Areas, only one research request form is required with an attached list with the name and location of each RNA.

In addition to Station Director approval, all proposed research on RNAs requires approval by the District Ranger from the Ranger District on which the RNA is located. Special Use Permits may be required by Ranger Districts. For RNAs within Wilderness or other Congressionally designated areas, Regional Foresters have authority for approving research projects in coordination with Station Directors. In some Regions this authority has been delegated to National Forests or Ranger Districts (check with Ranger District).

As part of this research approval, the researcher agrees to notify the appropriate Ranger District office when field work is being conducted. In addition, plant and animal specimens collected during the course of study will be deposited in a herbarium or museum approved by the Station Director. Special permits are required for collection of any threatened, endangered, or sensitive species.

All research users of RNAs are expected to file a brief summary report with the Rocky Mountain Research Station and the Ranger District when work is completed. This report may be in the form of a letter that outlines findings. To assist the Forest Service in compiling research information from RNAs, we also require copies of any publications or reports derived from research on RNAs for our files. It is important for the Forest Service to maintain cumulative records of all research activities on RNAs. These records help insure that the values for which the RNA was designated are being maintained, as well as providing the Forest Service with research results that are important for understanding ecosystem processes, long-term ecological change, and the sustainable management of public lands. In addition, scientific publications increase the value of RNAs and the commitment made to maintain them.

Please send this application and any other correspondence regarding research use of RNAs in Regions 1, 2, 3 and 4 to the Station RNA coordinator in the appropriate Region (a list of current RNA Coordinators in each National Forest Regional office and National Forest office is posted on the RNA website at http://rna.nris.state.mt.us/rna_contacts.html):

Melinda Moeur
Station RNA Coordinator for Region 1
RMRS, Forestry Sciences Laboratory
1221 South Main Street
Moscow, Idaho 83843
(208) 883-2316
mmoeur@fs.fed.us

Will Moir
Station RNA Coordinator for Region 3
RMRS, Forestry Sciences Laboratory
Southwest Forest Sciences Complex
2500 S. Pine Knoll
Flagstaff, AZ 86001
(520) 556-2077
whmoir@fs.fed.us

Merrill Kaufmann
Station RNA Coordinator for Region 2
RMRS Headquarters
240 W. Prospect Road
Fort Collins, CO 80526-2098
(970) 498-1256
mkaufmann@fs.fed.us

Stanley Kitchen
Station RNA Coordinator for Region 4
RMRS, Provo Shrub Sciences Laboratory
735 North 500 East
Provo, UT 84606
(801) 342-5140 or (801) 377-5717
skitchen@fs.fed.us

Ray Shearer
Station RNA Coordinator for Coram RNA
RMRS, Forestry Sciences Laboratory
800 Block East Beckwith
Missoula, MT 59807
(406)542-4170
rshearer@fs.fed.us

The appropriate sequence of approvals is a recommendation for approval from the Station Director's representative (RNA coordinator and RNA ecologist at RMRS) and approval by the District Ranger, then the Station Director's approval. In some cases additional Station scientists may be consulted for recommendations. Recommendations to the Station Director may also be made by a review team of Station scientists in the future. The District Ranger's approval can be obtained prior to the recommendation from the Station Director's representative if this is more convenient. If the RNA is in Wilderness or other Congressionally designated area, approval may also be required from the Regional Forester or from the person to whom that authority has been delegated.

The approval process can potentially be expedited, if needed, by contacting one of the Station or National Forest RNA coordinators.

RNA Research Approval Request Form

The Rocky Mountain Research Station appreciates your interest in the Forest Service's Research Natural Area system, which includes more than 450 RNAs nationwide. Information about individual RNAs available at the RNA web site (http://rna.nris.state.mt.us/) may be useful in completing the following RNA Research Approval Request Form:

RNA NAME: _____.

STUDY TITLE: _____.
_____.

RNA LOCATION:
National Forest: _____ Ranger District: _____.
State: _____ County: _____.
Is RNA in: Wilderness _____ Wild and Scenic River_____ Nat. Rec. Area_____?

PRINCIPAL INVESTIGATOR:
Name: _____ Title: _____.
Affiliation: _____.
Business address: _____.
_____.
E-Mail address: _____.
Phone_____.

STUDY SUMMARY:
Objectives:

Research Approach. Include a description of methods and equipment, sample collection required, deposition of specimens, season of use & number of days, crew size, etc. A separate proposal may be attached or use extra pages as needed:

Study location within RNA (attach map if necessary):

Will this study require experimental manipulation or extensive sampling?__ If yes, please describe and indicate any impacts to the RNA that are anticipated or that are a potential risk from this research. List taxa specifically targeted or affected by study:

Proposed starting date of research: _____ Duration: _____.

Signature of PI: _____ Date: _____.

Work on Threatened, Endangered, or Sensitive species requires additional Federal or State permits

RNA NAME: _____.

STUDY TITLE: _____.
_____.

RMRS REVIEWER RECOMMENDATIONS (attach additional pages or suggest additional reviewers as necessary.)

RMRS reviewers:
Comments:

Approval: recommended [ ] not recommended [ ]

Signature: _____ Date: _____.
Title:

Signature: _____ Date: _____.
Title:

DISTRICT RANGER APPROVAL

Approved [ ] Not Approved [ ]

Signature: _____ Date: _____.
Title:

If the RNA is within Wilderness or other Congressionally designated area, additional approval may be required from the Regional Forester or Forest Supervisor and signed below:

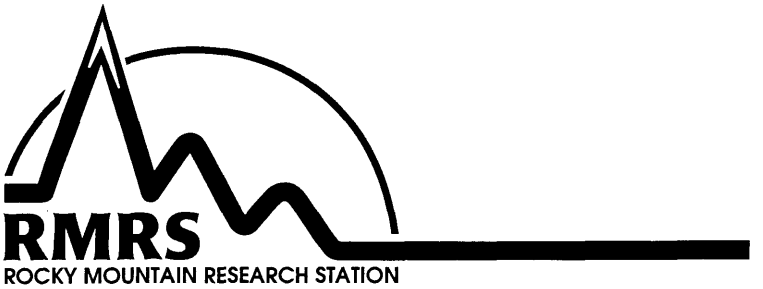
Approved [ ] Not Approved [ ]

Signature: _____ Date: _____.
Title:

STATION DIRECTOR APPROVAL

Approved [ ] Not Approved [ ]

Signature: _____ Date: _____.
Title:



The Rocky Mountain Research Station develops scientific information and technology to improve management, protection, and use of the forests and rangelands. Research is designed to meet the needs of National Forest managers, Federal and State agencies, public and private organizations, academic institutions, industry, and individuals.

Studies accelerate solutions to problems involving ecosystems, range, forests, water, recreation, fire, resource inventory, land reclamation, community sustainability, forest engineering technology, multiple use economics, wildlife and fish habitat, and forest insects and diseases. Studies are conducted cooperatively, and applications may be found worldwide.

Research Locations

Flagstaff, Arizona
Fort Collins, Colorado*
Boise, Idaho
Moscow, Idaho
Bozeman, Montana
Missoula, Montana
Lincoln, Nebraska
Reno, Nevada
Albuquerque, New Mexico
Rapid City, South Dakota
Logan, Utah
Ogden, Utah
Provo, Utah
Laramie, Wyoming

*Station Headquarters, Natural Resources Research Center,
2150 Centre Avenue, Building A, Fort Collins, CO 80526

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