2 Biological Characterization and Status

2.1 Species of Ecological Importance within the Subbasin

2.1.1 Species Designated as Federally Threatened or Endangered

Federal protection of native animal species in the United States was initiated by Congress in 1966 with the passage of the Endangered Species Preservation Act. In 1969, protection was extended to species worldwide by the Endangered Species Conservation Act. In 1973, international commerce of plant and animal species was restricted by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). These conservation efforts were synthesized in 1973 by the Endangered Species Act (ESA), which provided protection for U.S. and foreign species of animals, plants, and invertebrates. Amendments to the ESA were made in 1978, 1982, and 1988 but did not change the overall structure of the original act. Compliance under the ESA as amended is regulated by the Interior Department's U.S. Fish and Wildlife Service (USFWS) and Oceanic and Atmospheric Fisheries Service (NOAA Fisheries). FWS administers fish, wildlife, plants, and their habitats, while NOAA Fisheries manages marine and coastal resources.

The ESA provides a means for conserving the ecosystems upon which endangered and threatened species depend. The ESA defines an "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range" and a "threatened species" as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (section 3 of the act). "Candidate" species are plants and animals for which the FWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a listing regulation is substituted by other higher priority listing activities (June 13, 2002, 67 CFR 40657). Federal agencies are required to consult with the USFWS upon any proposed action that may "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such a species" (section 7). Conservation of endangered species at the state level is encouraged by federal financial incentives and cooperative agreements (section 6).

Two endangered snail species, one threatened fish species, three threatened wildlife species, and two wildlife candidate species for listing occur or potentially occur within the Bruneau subbasin (Table 18).

Table 18. Aquatic and terrestrial species that are listed as endangered, threatened, or candidate under the ESA and that are confirmed present or with potential habitat in the Bruneau subbasin (IBIS 2003, USFWS 2003).

Federal Status	Common Name	Scientific Name
Endangered	Bruneau hot springsnail	*Pyrgulopsis bruneauensis*
Endangered	Idaho springsnail	*Pyrgulopsis idahoensis*
Threatened	Bull trout	*Salvelinus confluentus*
Threatened	Bald eagle	*Haliaeetus leucocephalus*
Threatened	Snowy plover	*Charadrius alexandrinus*
Threatened	Lynx	*Lynx canadensis*
Candidate	Yellow-billed cuckoo	*Coccyzus americanus occidentalis*
Candidate	Columbia spotted frog	*Rana luteiventris*

2.1.2 Special Status Species

2.1.2.1 State

Idaho

The IDFG is mandated under Idaho Code § 36-103 to "preserve, protect, perpetuate and manage all wildlife." The agency classifies wildlife into game, furbearing, migratory birds, threatened or endangered, protected nongame, or unprotected species. In addition, a species of special concern list is maintained by the state for "native species which are either low in numbers, limited in distribution, or have suffered significant habitat losses" (IDFG 2003b). The Idaho Conservation Data Center (CDC) is the central repository for information pertaining to native species status and provides the most current information on Idaho's rare, threatened, and endangered animals (ICDC 2003). In the Bruneau subbasin, there are 77 birds, 10 mammals, 3 amphibians, and 3 reptiles that are identified by the state of Idaho as protected or species of special concern (Appendix A).

The CDC maintains native plant data with major input provided by the Idaho Native Plant Society, a nonprofit organization "dedicated to promoting interest in native plants and plant communities, and collecting and sharing information on all phases of the botany of native plants in Idaho." There are 13 plant species classified as sensitive (S), which are taxa having small populations or localized distributions within Idaho but aren't presently in danger of becoming extinct or extirpated from Idaho (IDCDC 2003) (Appendix B). An additional 4 plant species have been targeted for continued monitoring (M) (Appendix B). These species are common within a limited range or uncommon without foreseeable threats (IDCDC 2003).

Nevada

In Nevada, hunting and animal protection measures of the Department of Conservation and Natural Resources are delineated by Nevada's code of state regulations (NAC), which are defined under State law (NRS 233B.038) to outline procedure requirements of the agency. The Nevada Department of Wildlife (NDOW) is responsible for the management and restoration of Nevada's fish and wildlife resources. Animal species are classified as game, furbearing, unprotected, endangered, threatened, or protected (NAC 503). State regulations define an endangered species as one facing the threat of extinction throughout all or a significant portion of its range. A species or subspecies is considered threatened if it is likely to become an endangered species in the near future. Protected status is assigned to a species that meets any or all of the following criteria: it is found only in the state and has a limited distribution; its population may experience significant declines from human or natural causes; deterioration and loss of habitat threatens the population; the species' value (i.e., ecological, scientific, educational) justifies protection; there is inadequate data available to determine the status of a population that is suspected to be limited in habitat, distribution, or other factors; or the species is listed under the federal ESA (NAC 503.103). There is no open season on fish and wildlife classified as protected in Nevada. For protected plant species in Nevada, "no member of its kind may be removed or destroyed at any time by any means except under special permit issued by the state forester firewarden" (N.R.S. 527.270). Species that are classified by Nevada as endangered, threatened, or protected and that are present or with potential habitat in the Bruneau subbasin include 29 birds and 2 mammals (Appendix A). One plant species of the Bruneau subbasin, mud flat milkvetch (*Astragalus yoder-williamsii*), is classified by the State of Nevada as critically endangered (NNHP 2003).

2.1.2.2 Federal

Bureau of Land Management

The BLM in Idaho, in accordance with national policy (BLM Manual 6840), maintains a special status species list of plants and animals (BLM 2003b). This list is used by Idaho BLM offices for guiding priorities in conservation and management. The current list was approved by the State Director in May 2003 and will be updated in December 2005. Special status species are ranked based on rarity and endangerment and classified into one of the five following categories: Type 1 (federally threatened, endangered, proposed, and candidate species), Type 2 (rangewide/globally imperiled species), Type 3 (regional/state imperiled species), Type 4 (peripheral species), and Type 5 (watch list). Currently, there are 43 birds, 16 mammals, 2 amphibians, and 6 reptiles that are classified by the Idaho BLM as special status species, Types 2 through 5, and that are known to be present or have potential habitat in the Bruneau subbasin (Appendix A). Definitions for special status plants differ from animals only in the Type 3 (rangewide/globally imperiled plant species—moderate endangerment) and Type 4 (plant species of concern) descriptions. There are 49 plant species of the Owyhee Resource Area and 18 plant species of the Jarbidge Resource Area that are classified by the Idaho BLM as special status species, Types 2 through 5, and that occur or potentially have habitat in the Bruneau subbasin (Appendix B). Species listed as candidate, threatened, or endangered under the ESA (Type 1) were previously presented in Table 18.

U.S. Forest Service

The threatened, endangered, and sensitive species program of the U.S. Forest Service (USFS) is guided by the ESA, National Forest Management Act (1976), and the Secretary of Agriculture's Policy on Fish and Wildlife (9500-4). In addition to compliance with conservation legislation and policy, the USFS sensitive species policy (FSM 2670.32) calls for National Forests to "assist states in achieving conservation goals; to complete biological evaluations of programs and activities; avoid and minimize impacts to species with viability concerns; analyze significance of adverse effects on populations or habitat; and coordinate with states, the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service" (NMFS). Plant and animal species identified by the Regional Forester as "sensitive" are those in which viability is of concern and adverse effects of management are avoided or mitigated to prevent federal listing. USFS (Region 4) wildlife sensitive species that are present or have potential habitat in the Bruneau subbasin include 10 birds, 3 mammals, and 1 reptile (Appendix A). There are 3 plant species classified as sensitive in Region 4 and that may occur in the Bruneau subbasin (Appendix B).

2.1.3 Terrestrial Species Recognized as Rare or Significant to Local Area

The Natural Heritage Network (NatureServe) consists of programs in all 50 states and extends into Canada and Latin America. The Natural Heritage Programs/Conservation Data Centers of this network adhere to high scientific standards and provide a repository of data on rare and endangered species in a standardized format. The IDCDC is part of the NatureServe network, and its mission is to "collect, analyze, maintain, and disseminate scientific information necessary for the management and conservation of Idaho's biological diversity." Nevada's Natural Heritage Program is also a contributing member of NatureServe and helps coordinate resource needs of Nevada's biological heritage.

State (S) status of animals and plants are ranked on a scale of 1 to 5. The scale and key for ranking symbols for a species is defined as follows (ICDC 2003, NNHP 2003):

1 = Critically imperiled because of extreme rarity or because some factor of its biology makes it especially vulnerable to extinction (typically 5 or fewer occurrences)

2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (typically 6 to 20 occurrences)

3 = Rare or uncommon but not imperiled (typically 21 to100 occurrences)

4 = Not rare and apparently secure, but with cause for long-term concern (usually more than 100 occurrences)

5 = Demonstrably widespread, abundant, and secure

H = Historical occurrence

? = Uncertainty exists about the stated rank

B = Breeding population (long distance migrants, *e.g.*, bats and birds)

N = Nonbreeding population (long distance migrants, *e.g.*, bats and birds)

Example of use: S2S3 = Uncertainty exists as to whether the species or subspecies should be ranked S2 or S3.

The IDCDC lists 48 bird, 19 mammal, 4 amphibian, 3 reptile (Appendix C), and 45 plant species (Appendix B) that are present or with potential habitat in the Bruneau subbasin as critically imperiled (S1), imperiled (S2), or rare (S3). The Nevada Natural Heritage Program records for S1, S2, and S3 species include 25 bird, 12 mammal, 1 amphibian, and 6 plant species that occur or have potential habitat in the Bruneau subbasin (see Appendix C for animals, Appendix B for plants). Six bird, 3 mammal, 1 amphibian, and 1 plant species classified as federally listed or a focal species of the Bruneau subbasin are considered rare or significant to the local area (Table 19).

For plants, the Idaho Native Plant Society maintains a list of plants for the state, including globally rare (or global priority, GP1, GP2, GP3), state rare (or state priority, 1 and 2), and review species (IDCDC 2003). State priority 1 species are "taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate; these are taxa whose populations are present only at critically low levels or whose habitats have been degraded or depleted to a significant degree". State priority 2 species will likely be classified as priority 1 if factors contributing to their decline continue to persist. The Bruneau subbasin potentially contains 1 GP1, 7 GP2, and 9 GP3, 7 state priority 1, and 5 priority 2 plant species (Appendix B).

Table 19. Terrestrial species that are recognized as rare or significant to the local area and that are federally listed (T or E)/candidate (C) species under the ESA and/or are Bruneau subbasin focal species (F) (ICDC 2003, NNHP 2003).

Common Name	Scientific Name	ICDC	NNHP	ESA or Focal Species Status
Birds				
Bald eagle	*Haliaeetus leucocephalus*	S3B,S4N	S1B	T
Northern goshawk	*Accipiter gentilis*		S3	F
Mountain willow flycatcher	*Empidonax traillii adastus*		S2?	F
White-faced ibis	*Plegadis chihi*	S2B	S3B	F
Yellow warbler	*Dendroica petechia*		S3B	F
Yellow-billed cuckoo	*Coccyzus americanus occidentalis*	S1B	S1B	C, F
Mammals				
Pygmy rabbit	*Brachylagus idahoensis*	S3	S3?	F
Spotted bat	*Euderma maculatum*	S2	S1S2	F
California bighorn sheep	*Ovis canadensis californiana*	S3		F
Amphibian				
Columbia spotted frog	*Rana luteiventris*	S2S3	S2S3	C, F
Plants				
Slickspot peppergrass	*Lepidium papilliferum*	S2		F

2.1.4 Managed Wildlife Species

The Bruneau subbasin contains all or part of three Idaho game management units (GMUs): 41, 46, and 47. The Nevada portion of the subbasin contains portions of four hunt units: 061, 071, 072, and 073 (Figure 23). Five of the focal species selected for the Bruneau subbasin are managed as game species by Idaho and Nevada.

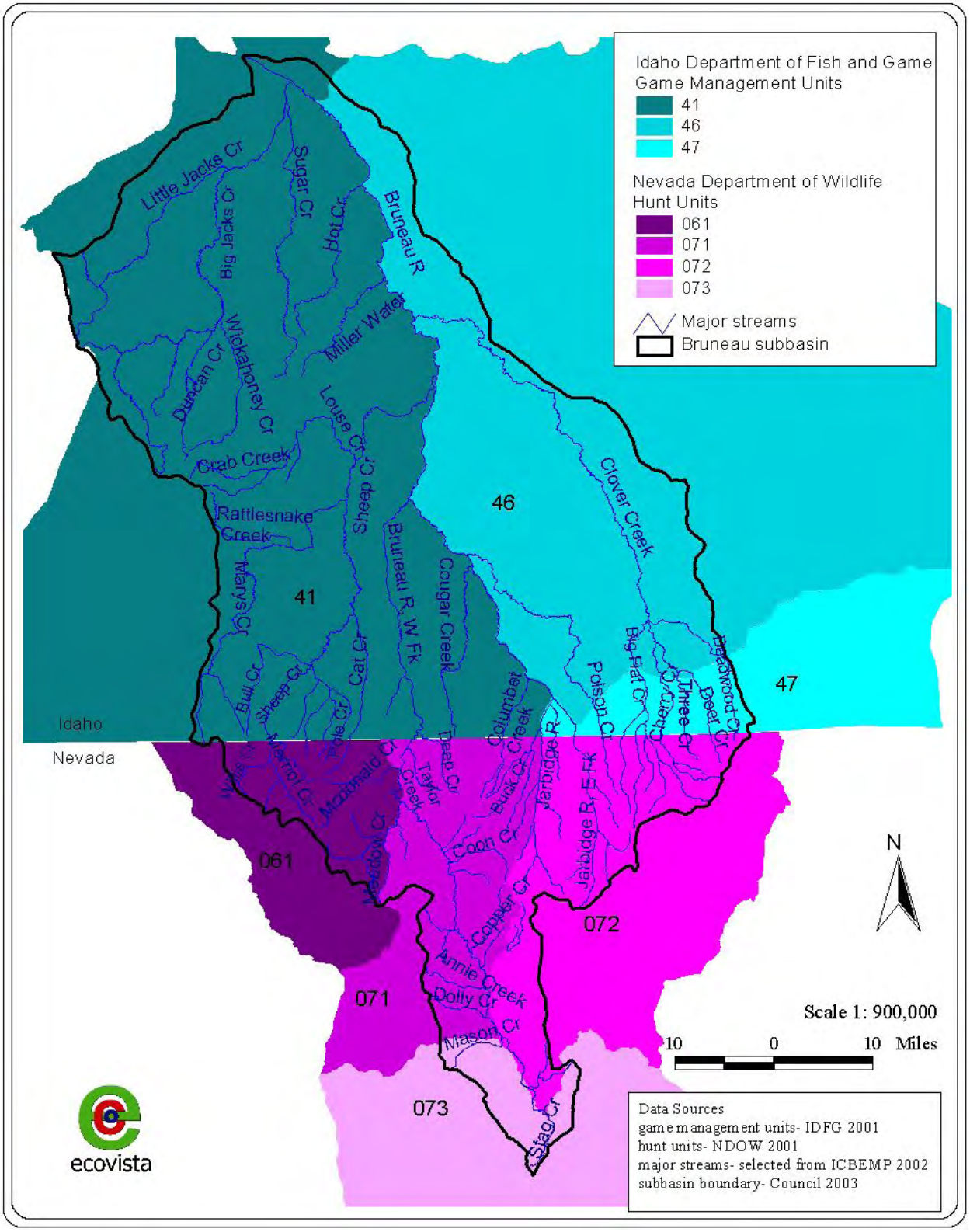

Figure 23. Idaho Department of Fish and Game GMUs and Nevada hunt units in the Bruneau subbasin.

Idaho

Hunting, trapping, and fishing are valued activities for reasons that include recreation, pest control, and subsistence. State license sales for these activities generate funding that aids in supporting fish and wildlife programs. Idaho's Fish and Game Commission designates animal classifications for wild animals that include game and furbearing animals (Idaho statute 36-201). Game animals are managed by the state in a manner that facilitates continued supplies for hunting, fishing, and trapping (Idaho statute 36-103a). The Idaho Fish and Game Commission administers and carries out state policy in accordance with Idaho Fish and Game code (Idaho statute 36-103b). Forty birds and 16 mammals are managed as game species by Idaho in the Bruneau subbasin (Appendix D).

Nevada

The regulatory code of the state of Nevada (NAC 503) classifies wild animals into categories that include game (birds and mammals) and furbearing species. Enforcement of laws pertaining to fish and wildlife is under the jurisdiction of the Nevada Department of Wildlife (NRS 501). Within the Department, the Game Bureau is responsible for the management, protection, research, and monitoring of game and furbearing species. Within the Bruneau subbasin, the Nevada Department of Wildlife manages 41 game birds, 11 game mammals, and 7 furbearing animals (Appendix D).

2.1.5 HEP Species

A Habitat Evaluation Procedure (HEP) study was conducted by CH2M HILL on behalf of Idaho Power Company as part of its relicensing process for the C.J. Strike Hydroelectric Project (Blair 1997). The procedure outlined by the USFWS (1980) was modified slightly for the C.J. Strike study (Blair 1997). The objectives of the study were to assess the current habitat conditions and values for wildlife, develop resource goals and potential future management actions (Table 20), and assess the effects of actions on future wildlife habitat values (habitat value = habitat unit = area × HIS). Habitat quality is defined by a HSI (habitat suitability index), and, for the C.J. Strike project, the index was calculated for target year zero (TY0). Results are presented in terms of existing habitat units (HU) and future average annualized habitat units (AAHU) for cover types within the analysis area as well as for the wildlife species. Evaluation species were selected to represent the resource goals and cover types present within the C.J. Strike Wildlife Management Area (WMA, Table 20).

Table 20. Evaluation species used to assess management actions, C.J. Strike HEP study (Blair 1997).

Management Action	Evaluation Species							
	Mallard	**Mink**	**Marsh Wren**	**Western Grebe**	**Yellow Warbler**	**Great Blue Heron**	**Brewer's Sparrow**	**Pronghorn**
No change	X	X	X	X	X	X	X	X
Reduced management funding	X	X	X	—	X	—	—	X
Upland planting	—	—	—	—	—	—	X	X
Emergent wetland development	X	X	X	—	—	—	—	—
Cottonwood development	—	X	—	—	—	X	—	—
Gold Island habitat development	X	X	X	—	X	X	X	X
Downstream operational impacts	X	X	X	—	X	X	—	—
Acquire Simplot property	X	X	X	—	X	X	—	—
Improved water management	—	—	X	—	—	—	—	—
Downstream wetland/ riparian habitat	X	X	X	—	X	X	—	—
Fence springs	X	—	X	—	—	—	—	—
Acquire Prow property	X	X	X	—	X	—	X	X
BLM trade	X	X	X	—	—	—	—	—
Island loss/ peninsula development	X	X	X	X	X	—	X	X
Purple loosestrife control	—	—	X	—	—	—	—	—
Trespass grazing	X	X	X	—	X	—	X	X

2.1.6 Partners in Flight High Priority Bird Species Used for Monitoring

Partners in Flight (PIF) is a cooperative effort between federal, state, and local government agencies; philanthropic foundations; professional organizations; conservation groups; industry; the academic community; and private individuals. Its formation in 1990 was a response to growing concern about population declines in landbird species. One goal of PIF is to improve "monitoring and inventory, research, management, and education programs involving birds and their habitats" through collaborative partnerships and a combination of resources (PIF 2003).

Scientifically based bird conservation plans (BCPs) based on physiographic regions outline PIF's long-term strategy for bird conservation. For each region, the BCP outlines focal habitats and priority bird species. The Bruneau subbasin lies within the Columbia Plateau physiographic region, which contains three focal habitats and 24 priority bird species (Table 21). The states of Idaho and Nevada also have individual plans that outline priority and focal species (Appendix E).

2.1.7 Critical Functionally Linked Species from IBIS

Critical functionally linked species represent the only species performing a few functions or filling a critical functional role in a particular wildlife habitat. Critical functionally linked species present or with potential habitat in the Bruneau subbasin, along with the Key Ecological Function (KEF) code, KEF description, and wildlife-habitat type are listed in Appendix F (IBIS 2003).

Table 21. Partners in Flight focal habitats and priority bird populations identified for the Columbia Plateau physiographic region (* = Bruneau subbasin focal species) (PIF 2003).

Focal Habitat	Common Name	Scientific Name
Shrub-steppe	Swainson's hawk	*Buteo swainsoni*
	Prairie falcon	*Falco mexicanus*
	Greater sage grouse*	*Centrocercus urophasianus*
	California quail	*Callipepla californica*
	Long-billed curlew	*Numenius americanus*
	Black-chinned hummingbird	*Archilochus alexandri*
	Gray flycatcher	*Empidonax wrightii*
	Sage thrasher	*Oreoscoptes montanus*
	Brewer's sparrow	*Spizella breweri*
	Sage sparrow	*Amphispiza belli*
Wetlands/grasslands	Western grebe	*Aechmophorus occidentalis*
	Trumpeter swan	*Cygnus buccinator*
	Sandhill crane	*Grus canadensis*
	Franklin's gull	*Larus pipixcan*
	Tricolored blackbird	*Agelaius tricolor*
Coniferous forest	Mountain quail	*Oreortyx pictus*
	Flammulated owl	*Otus flammeolus*
	Black swift	*Cypseloides niger*
	Calliope hummingbird	*Stellula calliope*
	Lewis's woodpecker	*Melanerpes lewis*
	Williamson's sapsucker	*Sphyrapicus thyroideus*
	White-headed woodpecker	*Picoides albolarvatus*
	Black-backed woodpecker	*Picoides arcticus*
	Hermit warbler	*Dendroica occidentalis*

2.1.8 Extirpated Species

2.1.8.1 Aquatic

Chinook salmon (spring and fall), possibly coho salmon, and summer steelhead (*O. mykiss* spp.) historically occupied the Bruneau subbasin, but were extirpated following construction of Swan Falls Dam in 1901 on the Snake River. The earliest documentation is qualitative and describes the Bruneau River as a great producer of salmon and steelhead. The only salmon species mentioned by name is chinook, and most observers do not separate steelhead from salmon in

their comments. This lack of distinction makes it difficult to describe species or productivity for the subbasin. Pratt (et al. 2001) provides a chronology of anadromous fish use in the Bruneau River Basin, including the following anecdotes of chinook and steelhead:

Chinook

1800 pre	Bruneau R, mainstem: Traditionally, fall chinook entered the lower ten miles of the Bruneau
1800 pre	Jarbidge R., Deer Ck: Twenty-four bones, representing at least two chinook salmon were recovered from the site which is located on Deer Ck., a tributary of the Jarbidge River. One of the fish was probably 28 inches long and about 8 pounds. The confluence of Deer Ck. (near the cave) and the Jarbidge is at RM 38.5 on the Jarbidge
1869	Bruneau R, mainstem: Speaking of the Shoshone and Paiutes: "In the fall salmon was dried and packed away like bales of hay."
1900-1901	"Salmon and ... were plentiful in the Bruneau R and its tributaries prior to the construction of the Swan Falls Dam on the Snake River in 1901. I remember that during the annual spawning runs, Indians took these fish in traps made of willows. On occasion, my Indian friend with the broken jaw would bring our family a salmon and we'd invite him to supper. In 1990, we moved to what is now the Mink Ranch on the Bruneau R."

Steelhead

1860s	Major Marshall visited the Bruneau ... and reported that the Indians ... were "nearly destitute of everything except what they obtain by fishing". [When] Governor Ballard ... [visited] in October, they [Indians] shared with him all the food they had, "salmon trout fried on a stick." [are the salmon trout steelhead or bull trout?]
1897	Bruneau R, upper: "Calenta Waters ten or twelve miles away to the north on the Bruneau the springs are in a sheltered place between mountains ... the writer saw a fish cooked there, a good sized salmon trout had strayed in from the river and lost its life ... The Bruneau is not large at that point and can be easily forded"
1897	Jarbidge R: Gold Creek News, October 1, 1897: ... the trout fishing there is the finest in the world. ... I caught one trout, exactly the length of my forearm to the end of my little finger, just seventeen inches ... I had captured a fine salmon trout [are these steelhead or bull trout?] when I returned. ... I landed two more in quick succession. ... I had caught only 17 fish but the boys thought I had 15 or 20 pounds. ...
1900-1901	"... steelhead trout were plentiful in the Bruneau R and its tributaries prior to the construction of the Swan Falls Dam on the Snake River in 1901. I remember that during the annual spawning runs, Indians took these fish in traps made of willows. On occasion, my Indian friend with the broken jaw would bring our family a salmon and we'd invite him to supper. In 1990, we moved to what is now the Mink Ranch on the Bruneau R."

In a letter written in 1863, R.F. Maury describes the Bruneau River as having the "greatest abundance of salmon," greater than any other river entering the Snake River that he knew of (Vigg and Company 2000). In 1901, anadromous fish runs were blocked from the Bruneau River when Swan Falls Dam was built on the Snake River (Bureau of Outdoor Recreation 1977). In general, the impacts from the resulting loss of anadromous fish on the aquatic system have included a decrease in available nutrients and a loss of prey base for bull trout, large resident redband trout, raptors, and other wildlife.

2.1.8.2 Terrestrial

Several species that once occurred in the Bruneau subbasin are suspected of being extirpated. Table 18 lists these species and provides information about their current status.

Table 22. Terrestrial species extirpated from the Bruneau subbasin (IDCDC 2003).

Common Name	Scientific Name	Status
American bison	*Bos bison*	Extirpated in Idaho
Bighorn sheep	*Ovis canadensis*	Reintroduced into subbasin
Gray wolf	*Canis lupus*	Reintroduced into Idaho
Grizzly bear	*Ursus arctos*	Present in Idaho
Passenger pigeon	*Ectopistes migratorius*	Extinct

2.2 Method for Selecting Focal Species

2.2.1 Aquatic

Focal species were chosen according to guidelines provided in NWPC (2001). These guidelines suggested inclusion of species that met the following criteria in order of importance: 1) designation as a Federal endangered or threatened species; 2) ecological significance; 3) cultural significance; and, 4) local significance.

Using these guidelines, the Bruneau Aquatics Technical Team (BATT) identified a total of five focal species (Table 23), including 1) redband trout, the most widely distributed salmonid in the subbasin, 2) bull trout, the only federally listed threatened salmonid in the subbasin, 3) mountain whitefish, a culturally and ecologically important species, 4) the Bruneau hot springs snail, and 5) the Idaho springsnail, both of which are federally listed as threatened.

Ecological considerations in the selection of the focal species were largely based on the unique habitat types occupied by the respective species. The two snail species were considered to be representative of the low-elevation geothermal habitats; redband trout represented a low-elevation desert stream species adapted to extremes in temperature and flow; mountain whitefish were considered a thermally flexible species representative of mid-elevation reaches; while Jarbidge River bull trout were considered important due to their status of being the southern-most distributed population in the world, and were representative of headwater habitats.

2.2.2 Terrestrial

The Bruneau Subbasin Terrestrial Technical Team (BSTTT) selected focal habitats to serve as coarse filters (Hunter et al. 1988) that represent the needs of terrestrial species in the subbasin and are amenable to future monitoring efforts. Focal species (Lambeck 1997) were selected for each focal habitat to represent different attributes that must be present if the Bruneau subbasin is to meet the needs of its constituent flora and fauna.

For terrestrial species, the selection criteria included species status under the following possible designations: threatened, endangered, and state sensitive species; species listed by the PIF

program; species used to model impacts from adjacent hydro-development under the USFWS Habitat Evaluation Procedure (HEP) species; managed species (i.e., game species); functional specialist and critically linked species; species with cultural significance; and species with an association to salmonids. Susceptibility to current and historical management, data availability, and monitoring potential were also factors considered during the selection process.

Because of the rarity of some of the species listed under the Endangered Species Act that potentially occur within the Bruneau subbasin, they were reviewed in this assessment but not necessarily chosen as focal species by the BSTTT. Monitoring programs that are currently in place for these species should contribute to the ongoing management decision processes within the Bruneau subbasin.

Five aquatic and 13 terrestrial species represented in seven habitat types were selected for the Bruneau subbasin (Table 23).

Table 23. Focal habitats and species of the Bruneau subbasin[a].

Assessment Section	Focal Habitat	Focal Species	ESA	ID	NV	BLM	USFS
Aquatic	Hotsprings	Bruneau hot springsnail	E			T1	
	Snake River, Bruneau River and tributaries	Idaho springsnail	E			T1	
		Redband trout		G	G	T2	
		Bull trout	T	G	G	T1	
		Whitefish		G	G		
Terrestrial	Upland aspen forest	Northern goshawk		SC	P	T3	S
	Shrub-steppe	Sage grouse		G	PG	T2	
		Pygmy rabbit		GSC	G	T2	
		Slick spot peppergrass	PC			T1	S
		Spotted bat		SC	T	T3	S
		Bighorn sheep		G	G	T3	
	Riparian and wetlands	Columbia spotted frog	C	SC	P	T1	S
		Yellow warbler					
		Willow flycatcher		P		T3	
		White-faced ibis		P	P	T4	
	Western juniper and mountain mahogany woodlands	Mule deer		G	G		
	Desert playa and salt scrub shrublands	Pronghorn		G	G		
		Fourwing saltbush					

[a] Table includes corresponding federal (ESA: candidate, past candidate, threatened, endangered), state (ID: game, protected, special concern and NV: threatened, protected, game), and federal agency (BLM: Type 1 = federally threatened, endangered, proposed, and candidate species; Type 2 = rangewide/globally imperiled species; Type 3 =regional/state imperiled species; Type 4 = peripheral species; Type 5 = watch list. USFS: sensitive) status.

2.3 Aquatic Focal Species Population Delineation and Characterization

Distribution and status information for focal species was compiled using multiple data sources, including regional, state, and localized databases; recent agency publications and assessments; and personal interviews with regional biologists. For the purpose of starting with consistent and subbasinwide distribution and status information for each species, GIS layers were obtained from the most recent updates to the ICBEMP (2002) database.

Information is also provided for the historic anadromous fishery and additional species of interest for which only limited data exist. Although species status is discussed, data limitations prohibit substantial discussion.

2.3.1 Redband Trout

2.3.1.1 Redband Trout Population Data and Status

Interior redband trout (*Oncorhynchus mykiss gairdneri*) are currently designated a species of special concern by the American Fisheries Society and the states of Idaho and Nevada. Prior to 1997, redband were classified by the USFWS as a C2 (one of the groups of candidates for threatened/endangered) species. Redband subgroups and other C2 species have since been dropped from the candidate list. Currently, both the USFS and BLM classify the redband trout as a sensitive species (Quigley and Arbelbide 1997).

Abundance

Recent redband inventories of the Bruneau subbasin were conducted by the IDFG in 2003. Upon preliminary review of the data, the highest densities of redband were 1.2 fish/meter at sample sites occurring in the upper portions of Little Jacks Creek (sample sites occurring within 6th field HUCs 4101–4102); 1.1 fish/meter in the Deer Creek HUC (sample sites occurring within 6th field HUC 1003) and 0.8 fish/meter in upper Big Jacks Creek (sample sites occurring within 6th field HUC 3902) (Figure 24). Fish in the 100- to 200-mm size class dominated these collections, while those measuring less than 100 mm were present but less common. Redband densities measured at other sites were <0.6 fish/meter.

Kevin Meyer and Dan Schill with IDFG will have collected fish abundance data from nearly 500 study sites in the Owyhee desert from 1999 to 2004 (work is being wrapped up in summer 2004), including much of the Bruneau drainage. Summaries of distribution and abundance from this work will be made available by winter 2004 (K. Meyer, personal communication, April 29, 2004).

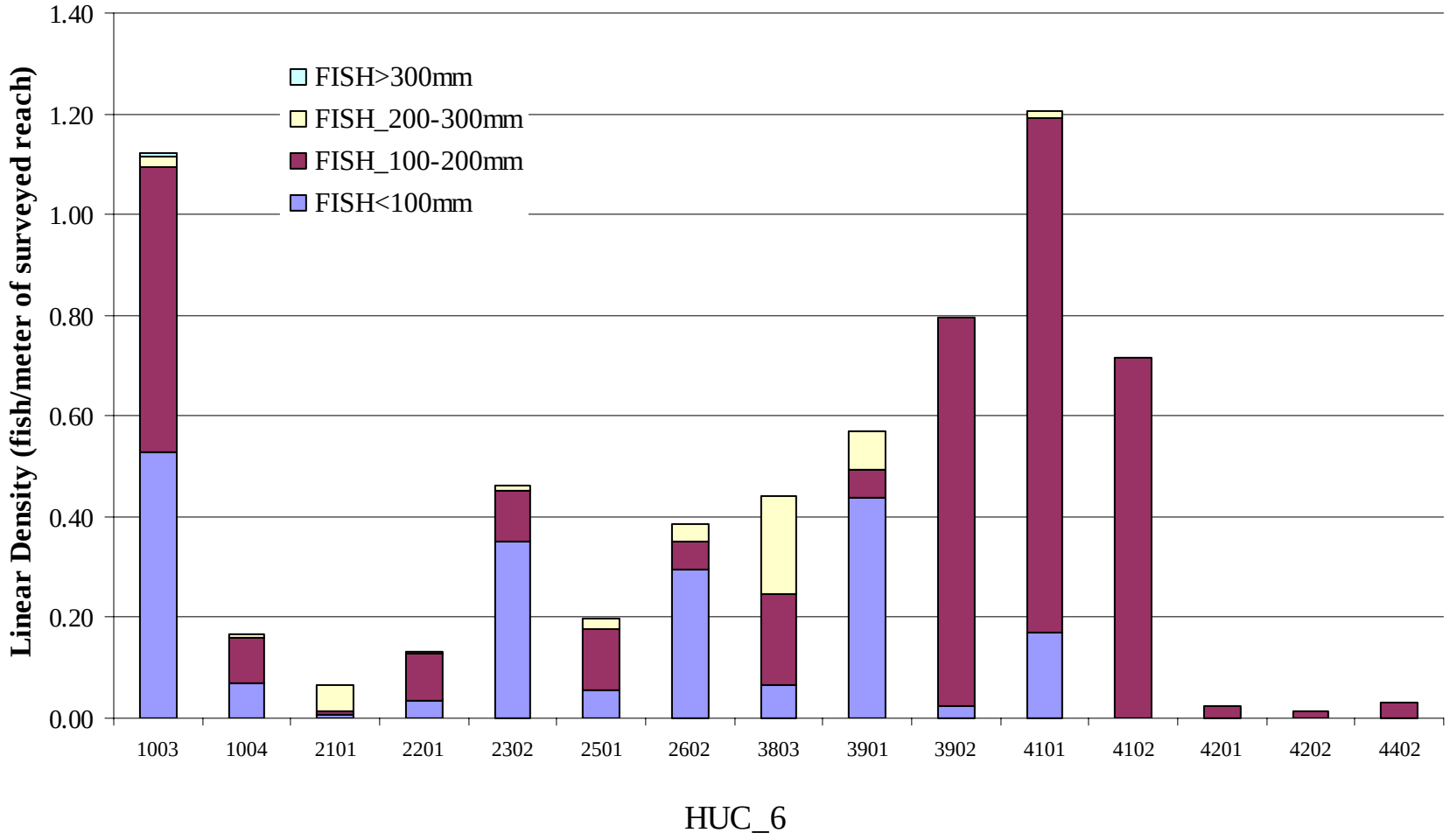

Figure 24. Estimated redband trout densities (number/meter) for sample sites throughout the Bruneau subbasin. Sampling efforts conducted by IDFG during summer 2003.

Surveys conducted in 1980 in Little Jacks Creek estimated an average density of 0.68 adult (>100 mm) fish per square meter (BLM 1999). Resurveys of the same reaches in 1995–1996 estimated average densities to be 0.76 fish per square meter, which did not differ significantly from the 1980 densities (P = 0.82) (BLM 1999). Total densities of adult and juvenile redband in upstream and downstream portions of Little Jacks Creek from the 1980 surveys were 135 and 94 fish per 100 square meters, respectively (Figure 25).

In 1980, the estimated densities of adult and juvenile redband in upstream and downstream reaches of Big Jacks Creek were 68 and 2 fish per 100 square meters, respectively (Figure 25). Following subsequent survey efforts (1995–1998), estimates of adult redband densities in Big Jacks Creek (0.14 fish/m^2) did not differ significantly from densities measured in 1980 (BLM 2000b). Population densities of trout in Big Jacks Creek declined significantly with distance from cold headwater springs as stream temperatures increased and habitat conditions declined (BLM 2000b).

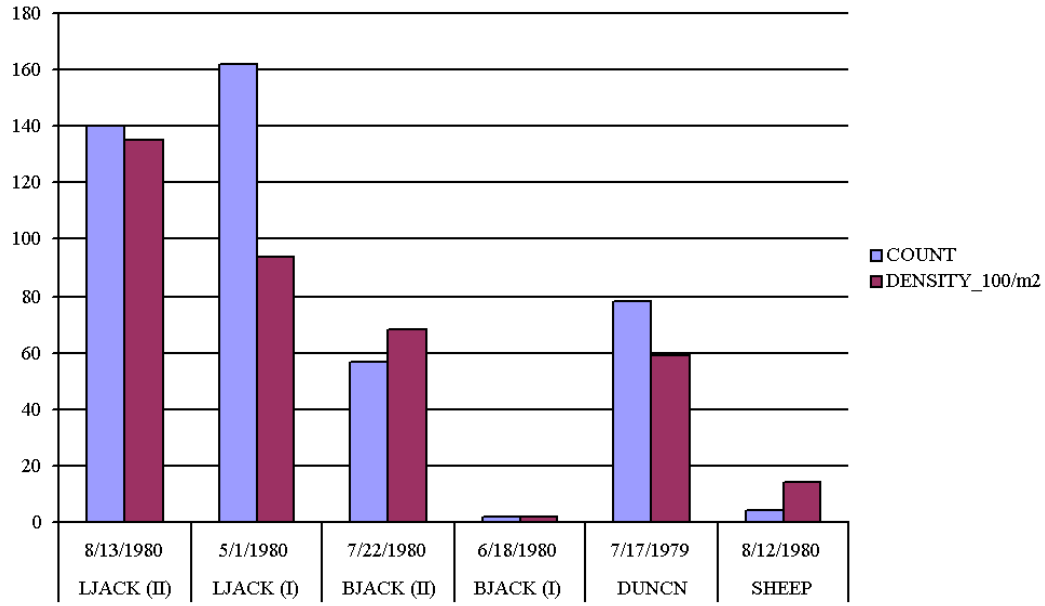

Figure 25. BLM redband survey data for streams in the Bruneau subbasin (1979–1980). Roman numerals I and II represent downstream and upstream (respectively) sample locations.

Surveys conducted by the BLM on the West Fork Bruneau River at two sites near its confluence with the Jarbidge River and at three upstream locations documented redband at all five sample sites, but at low densities (Allen et al. 1996). Estimated population densities ranged from 0.08 to 0.84 trout per square meter for all size classes. Absence of age 0 or age 1 fish was also documented, indicating a possible year class failure. Surveys conducted by the Humboldt-Toiyabe National Forest in the West Fork Bruneau River identified redband trout in 91.4 miles of the 113.7 miles of fishable stream length. Trout densities were low and distributions limited (USFS 1995). In 2000, Idaho Department of Environmental Quality electrofishing surveys documented multiple age classes of redband trout in upper Clover Creek, including several large "rainbow" trout (Lay and IDEQ 2000). The same reach of river was reported as dry in 2001.

In a 1992 sampling effort of the Idaho portion of the Jarbidge, Warren and Partridge (1993) documented redband presence at all sites surveyed. Redband trout densities were estimated in six of the seven electrofishing sites on the East and West Forks of the Jarbidge River and ranged from 1.7 to 16.2 trout per100 square meters. At snorkeling transects, fish densities in the East Fork Jarbidge and mainstem Jarbidge rivers ranged from 0 to 8.3 trout per100 square meters. When the same sampling sites were resurveyed in 1994 and 1995, generally lower trout densities were observed (Zoellick et al. 1996). Allen et al. (1996) found redband trout slightly upstream from the confluence with the Bruneau River, with sampling densities for all size classes at 1.82 trout per100 square meters. Variations in flow levels and sampling protocols could have accounted for the differences. Trapping efforts in 1998 documented four times as many redband trout in the East Fork (211) as in the West Fork (48) Jarbidge River (Partridge and Warren 1998). Trapping efforts in 1999 suggested that redband trout movement downstream in the Jarbidge River increased as water temperatures dropped during the fall (Partridge and Warren 2000).

Productivity

Quantitative estimates of redband trout productivity are not available due to incomplete data sets, sporadic inventories, and a general poor understanding of recruitment dynamics. The current status of redband trout has been mapped through the ICBEMP and inferred from agency surveys. ICBEMP data identifies redband "stronghold" areas in the Jacks Creek subwatershed, central portions of the West Fork Bruneau River, and the Jarbidge watershed (Figure 26).

Redband trout occurring in Sheep Creek are currently considered to be present but depressed (ICBEMP 2002). In the late 1980s, the BLM considered the Sheep Creek population to be "healthy" (BLM 1989). Resurveys of Sheep Creek in 1994 and 1995, however, did not identify any redband in tributary or mainstem reaches (Allen et al. 1995). Investigators considered lack of flow to be the primary limiting factor.

Stronghold redband populations exist throughout portions of the mainstem Bruneau River (West Fork Bruneau River) above the confluence with the Jarbidge River and are commonly associated with tributary watersheds (Figure 26). Redband populations in the lower three-quarters of the subwatershed are considered present but depressed or absent during certain times of the year (Figure 26). Stronghold designations have been made in headwater tributaries to Clover Creek, which occur on Elk Mountain, including Caudle, and Flat creeks. Following surveys in 1994, NDOW was unable to document redband trout in Raker Creek, also an Elk Mountain headwater tributary (G. Johnson, NDOW, personal communication, April, 2004).

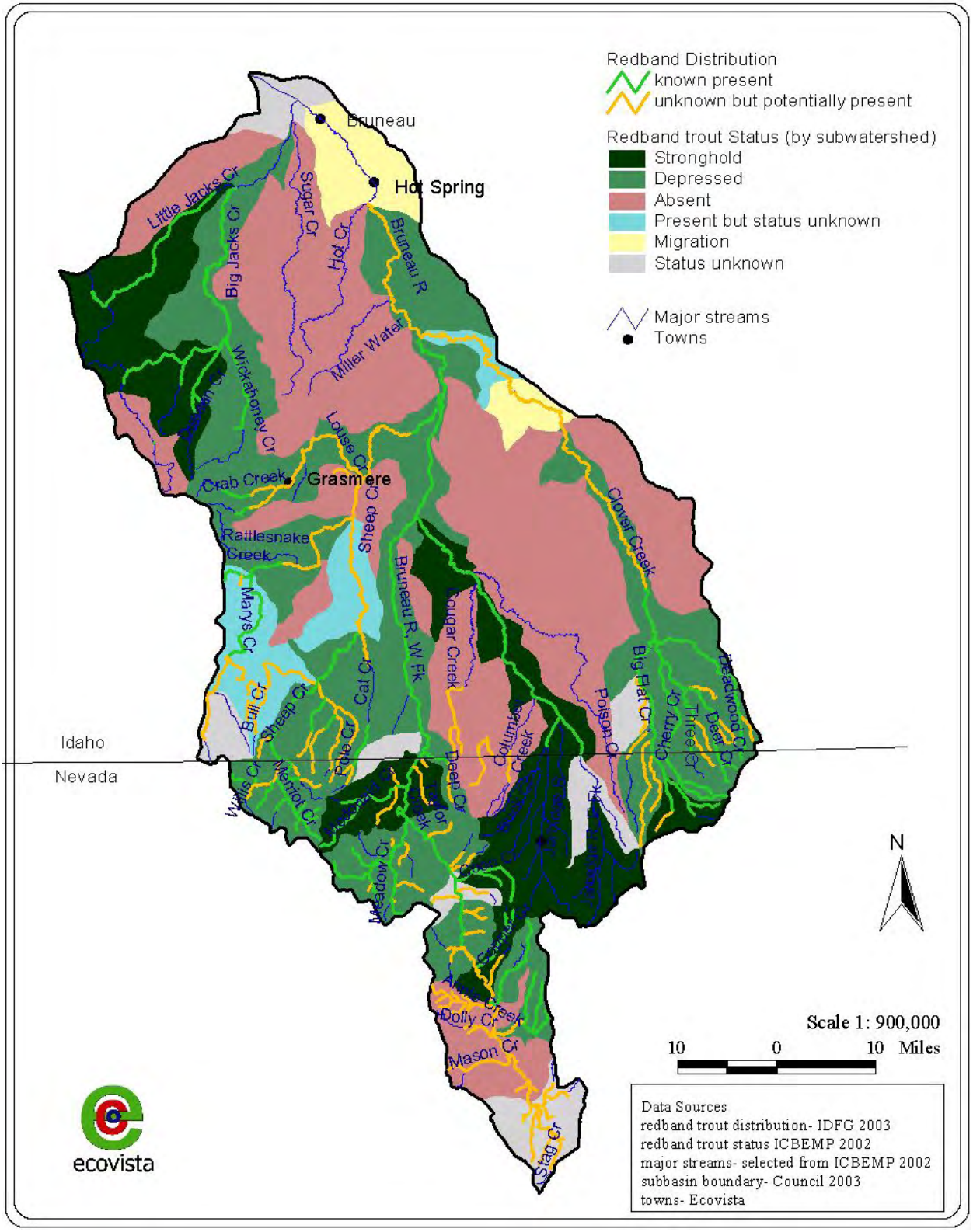

Figure 26. Redband trout distribution and status.

Redband populations occurring below the confluence with the Jarbidge River are currently listed as "present depressed" (Figure 26). Based on anecdotal evidence cited in Lay and IDEQ (2000), redband are present only in the lower reaches during spring runoff. Lay and IDEQ (2000) describe how fish are forced out of the system following the runoff period due to elevated water temperatures caused by geothermal spring discharge. The fish remain in either headwater portions of the subbasin or C.J. Strike Reservoir until the following year's runoff (Lay and IDEQ 2000). The absence of redband trout in the lower Bruneau River also occurs during nonirrigation periods, "…supporting the hypothesis that the system may function as a warm water fishery during certain times of the year" (Lay and IDEQ 2000).

The Jarbidge watershed represents one of the primary stronghold areas for redband trout in the subbasin. This area includes the entire length of the mainstem and the majority of the headwater watersheds (i.e., Buck, Deer, Bear, Pine, Jack, and Rattlesnake creeks and East and West Forks of the Jarbidge River) (Figure 26).

Life History Diversity

The *O. mykiss* is one of the most taxonomically complicated species in Idaho. Forms that have adopted, or have been forced into, a non-anadromous strategy and which occur in interior areas of the CRB such as the Bruneau subbasin are commonly referred to as inland Columbia River redband trout, *O. mykiss gairdneri* (Busby et al. 1996).

The redband trout is defined in the IDFG fish management plans (IDFG 1996, 2000) as the native rainbow trout in southwest and south-central Idaho (including the Snake River basin upstream to Shoshone Falls). Behnke (1992) identified three distinct subspecies of rainbow/redband trout, one being the native rainbow trout, including steelhead, found in the Columbia River basin east of the Cascade Range to barrier falls on the Kootenai, Spokane, and Snake rivers (to Shoshone Falls).

The *O. mykiss gairdneri* subspecies is distinct from coastal varieties (*O. mykiss irideus*) in that they appear to be selectively adapted to the severe climatic and environmental conditions common to desert areas of southern Idaho, Nevada, and eastern Oregon (Behnke 1992; Wallace 1981, cited in Schnitzspahn et al. [2000]).

Redband trout tend to spawn in rivers and streams during the spring months of March, April and May. Cool, clean, well-oxygenated water is necessary for the eggs to survive. Redband trout fry emerge from the gravel in June and July. For the most part, they live near where they were spawned. Redband trout are three years old at maturity, with size varying depending on the productivity of individual waters.

Redband trout require four basic habitat types to accommodate life history requirements: spawning, rearing, adult and overwintering (Behnke 1992). Redband trout fry emerge from the gravel in June and July. Redband trout eggs typically hatch in four to six weeks and alevins take about three to seven days to absorb the yolk sac before emergence. Bjornn and Reiser (1991) documented rainbow trout embryo survival as it related to the proportion of substrate composed of fines less than ¼ inch: 90% embryo survival with fines at 10%, 75% embryo survival with

fines at 20%, and 50% embryo survival with fines at 30%. Spawning is adversely affected when substrate fines (< ¼ inch) exceed 25% (Bjornn and Reiser 1991).

Upon emergence, redband will rear in low velocity areas associated with stream margin habitats, high cover areas and interstitial spaces. Adults require habitat for resting and feeding and thus are generally found in areas of abundant cover associated with deep pools, large organic material, undercut stream banks and overhanging vegetation. Diet consists primarily of aquatic insects, although individuals are opportunistic and will eat what is available to them. Large individuals may consume small fish of any species in addition to aquatic invertebrates.

Redband trout are adapted to fluctuations in stream flow and water temperature typical of desert streams (Behnke 1992) and are more tolerant of modifications in streamflow and temperature than other salmonids (Lay and IDEQ 2000). Zoellick (1999) identified populations in Castle, Shoofly Little Jacks, and Big Jacks creeks that tolerated temperatures above 26 °C, actively foraged at 26.2 °C, and tolerated a maximum temperature of 29 °C. Wallace (1981, cited in Schnitzspahn et al. 2000) states that redband trout "should be recognized and managed as unique populations of native trout specifically adapted to harsh desert environments."

Even though redband trout can live in naturally higher water temperatures, there is little flexibility regarding further degradation of substrate and temperature conditions. The loss of desert riparian habitat that cools stream temperatures and filters surface runoff is a factor in determining the population dynamics of the redband trout populations. Over-winter sites, characterized by low velocity areas with cover, including large woody debris, are important to all age classes (Bjornn and Reiser 1991).

Genetic Integrity of Populations

Genetic analysis conducted by Leary et al. (1983) established that fish sampled from Little Jacks Creek contained a rare phosphoglucomutase genetic variant that may provide a physiological advantage in converting energy into biomass under adverse conditions. Other taxonomic and genetic analyses indicate that Bruneau River redband populations appear to be predominantly native interior rainbow, showing minimal evidence of hybridization with hatchery rainbow trout (Williams et al. 1991).

The Little Jacks Creek population (see discussion on current distribution below) is isolated from other populations during low flow periods, but may potentially have genetic interchange with redband from the Big Jacks watershed when connectivity is reestablished during storm events in the winter and during early spring runoff (BLM 1999).

Kevin Meyer and Dan Schill with IDFG collected over 500 fin clips from 33 stream locations throughout the Bruneau River drainage in 2002 and 2003, in an effort to evaluate hybridization with stocked rainbow trout, and assist in delineation of population boundaries; samples will be run in 2004 (K. Meyer, personal communication, January 22, 2004).

2.3.1.2 Redband Trout Distribution

Current Distribution/Spatial Diversity

Currently, the redband trout is the most widely distributed and abundant salmonid in the Bruneau subbasin. Major subwatersheds supporting redband include Jacks Creek, Sheep Creek, portions of the mainstem Bruneau River, the Jarbidge River, and Clover Creek (Figure 26). The Jacks Creek population appears to be most robust near the western boundary of the subwatershed, occupying the entire Little Jacks watershed and headwater portions of Big Jacks and Duncan creeks.

Redband also occur in the lower sections of Wickahoney Creek, a tributary to Big Jacks Creek, but are limited in distribution due to an upstream barrier (culvert) at Wickahoney Crossing and a downstream low flow barrier created by a stock watering pond (Lay and IDEQ 2000). During periods of low flow, the Wickahoney Creek redband trout are thought to rely on a spring that discharges into the creek near the old Wickahoney town site. Lay and IDEQ (2000) proposed that the Wickahoney fish will disperse downstream as much as 3 to 5 km during more favorable conditions and could presumably migrate past the downstream barrier.

Kevin Meyer and Dan Schill with IDFG will have collected fish abundance data from nearly 500 study sites in the Owyhee desert from 1999 to 2004 (work is being wrapped up in summer 2004), including much of the Bruneau drainage. Summaries of distribution and abundance from this work will be made available by winter 2004 (K. Meyer, personal communication, April 29, 2004).

Historic Distribution

Redband trout are thought to represent the resident form of steelhead trout in areas where they coexisted historically, although the subspecies also exists in areas outside the historic range of anadromy (Behnke 1992). Despite a lack of historic documentation, the range of Snake River steelhead undoubtedly extended into the Bruneau subbasin (*e.g.*, Vigg and Company 2000). Their influence on redband populations is unknown; however, it is probable that their elimination from the Bruneau subbasin represented an impact to population connectivity, genetic diversity, and/or refounding capacity.

Current In-Basin Harvest Levels

Although trend data is lacking, rainbow trout were managed for harvest in the Jarbidge River. Harvest regulations from 1945 to 1998 reflect declines in relative abundance of trout and the accordant shifts in management strategies (Table 24).

Based on Nevada 2004-05 special regulations from the NDOW, anglers may harvest up to ten redband trout a day from the Bruneau River and five redband per day from the Jarbidge watershed (http://ndow.org/about/pubs/pdf/04fishregs/fishreg_p26_31.pdf). Historic harvest data was unavailable.

Table 24. Management history for fisheries harvest in the Jarbidge River (1945–1988).

Year	Season	Rules
1945	May 21–November 15	20 trout or 15 pounds and 1 trout/day not more than 5 trout less than 6 inches
1946	May 21–November 15	20 trout or 10 pounds and 1 trout/day not more than 5 trout less than 6 inches
1947–1949	June 4–October 31	20 trout or 10 pounds and 1 trout/day not more than 5 trout less than 6 inches
1950–1954	June 4–October 31	20 trout or 7 pounds and 1 trout/day not more than 5 trout less than 6 inches fishing hours 4 A.M. to 10 P.M.
1955–1956	June 4–October 31	15 trout or 7 pounds and 1 trout/day not more than 5 trout less than 6 inches fishing hours 4 A.M. to 10 P.M.
1957–1962	June 4–October 31	15 trout or 7 pounds and 1 trout/day fishing hours 4 A.M. to 10 P.M.
1963–1968	Saturday near June 1–October 31	15 trout or 7 pounds and 1 trout/day fishing hours 4 A.M. to 10 P.M.
1969–1971	Saturday near June 1–November 30	15 trout or 7 pounds and 1 trout/day
1972–1975	Open year round	10 trout or 7 pounds and 1 trout/day
1976 (5?)	Open year round	10 trout not more than 5 trout greater than 12 inches
1977–1989	Open year round	6 trout not more than 2 greater than 16 inches
1990–1991	Open year round	6 trout
1992–1993	Saturday of Memorial weekend–November 30	2 trout
1994–1998	Saturday of Memorial weekend–November 30	2 trout closed to the harvest of bull trout

2.3.2 Bull Trout

2.3.2.1 Bull Trout Population Data and Status

Conservation Status

The only known population of bull trout in the Bruneau subbasin occurs in the Jarbidge River in southern Idaho and northern Nevada. This group represents the southern-most remaining population of bull trout in the world (USFS 1998) and has been designated as a Distinct Population Segment (DPS) by the FWS (DPS Designation Rule–Federal Register, February 7, 1996).

Bull trout in the Jarbidge River DPS were proposed for listing as threatened in June 1998 (Vol. 61; Federal Register, June 10, 1998, Vol. 63, No. 111). In August 1998, this bull trout DPS was emergency listed as endangered due to river realignment and channel alterations on the West Fork Jarbidge River (Federal Register, November 1, 1999, Vol. 64, No. 210; *refer also to* Section 4.1.2.3: Habitat Simplification). The FWS published a final listing as threatened in April 1999 (Federal Register, April 8, 1999, Vol. 67, No. 67). Bull trout are considered a species of special concern in the State of Idaho (Parrish 1998). Nevada considers bull trout a coldwater game fish (Nevada Administrative Code 503.060). It is currently illegal to harvest bull trout from the Jarbidge River DPS in both Idaho and Nevada. The Inland Native Fish Strategy identified the Jarbidge River as a "priority watershed" for bull trout recovery (USFS 1998).

A Recovery Unit Team has been established to develop a recovery plan specifically for the Jarbidge River population and to identify specific delisting criteria. This local recovery team includes representatives from the States (including NDOW and Idaho Department of Fish and Game); Tribes (Duck Valley Paiute-Shoshone Tribes' Habitat, Parks, Fish and Game Division); and Federal agencies (Bureau of Land Management, U.S. Forest Service , and USFWS).

Abundance

Historical and recent collections of bull trout in the Bruneau subbasin have been limited. Sampling efforts have consisted of periodic presence and absence-type surveys occurring years or decades apart, each reflecting a single point-in-time (USFWS 1999). Regular, standardized, quantitative surveys designed to detect population trends of bull trout over a period of time, with statistical testing to qualify data accuracy, have not occurred (USFWS 1999).

In Idaho, 19 bull trout have been collected in 13 separate sampling efforts between 1954 and 1998, indicating a very low population density in the Idaho portion of the subwatershed (Parrish 1998). During a 1992 survey effort, no bull trout were identified in the Idaho portion of either forks of the Jarbidge River or in the mainstem of the Jarbidge River (Warren and Partridge 1993). However, 1992 marked the close of an extended period of below normal precipitation and above normal temperatures throughout southern Idaho (Parrish 1998). In 1994 and 1995 survey efforts, bull trout were sampled in the West Fork Jarbidge River 2.4 km downstream of the Idaho–Nevada border (1 bull trout) and in Jack Creek at its confluence with the West Fork Jarbidge River (6 bull trout) (Zoellick et al. 1996).

In Nevada, bull trout were found at all sample sites within and at 2 of 14 sample sites outside the Jarbidge Wilderness Area (Johnson 1999). Mean bull trout linear density within the wilderness area was estimated at 258.7 fish per mile (Johnson 1999). The minimum population size for this group of fish was estimated at 492. Age I, II, and IV fish were present, with the dominant year class being age II fish (57%). In nonwilderness samples, average bull trout density was estimated to be 7 fish per mile (Johnson 1999). The minimum population size for this group of fish was estimated at 87 fish. Although fewer fish occupied nonwilderness areas in the Nevada portion of the Jarbidge, those fish that were encountered were slightly larger than the wilderness fish (188 mm vs. 128 mm). The largest bull trout caught in the Jarbidge River in Nevada was 550 mm long (Gary Johnson, NDOW, personal communication, cited in Zoellick et al. 1996).

Relative abundance of bull trout has declined due to a number of factors, both environmental and human induced. Potential threats to population abundance include habitat degradation from past and ongoing activities including mining, road construction and maintenance, grazing, angling, competition with stocked fish, and unpredictable natural events.

Productivity

Quantitative estimates of productivity are not available for bull trout in the Jarbidge DPS. Based on Interior Columbia Basin Ecosystem Management Project data (2002), bull trout core areas exist in the mainstem and East Fork Jarbidge (sixth field HUCs 1601, 1602, 1701 & 1702). These areas represent habitats that sustain multiple life history stages (*e.g.*, spawning/incubation, summer rearing, winter rearing, migration), and assumedly are those that support the highest population productivity in the subbasin. Other areas within which bull trout occur are primarily used only for migration.

Life History Diversity

Bull trout have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, substrate for spawning and rearing, and migratory corridors (USFWS 2004). Strong bull trout populations are associated with a high degree of channel complexity, including woody debris and substrate with clear interstitial spaces (Batt 1996). Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning (USFWS 2004). Bull trout may experience considerable stress when temperatures exceed 15 °C (59 °F) (Pratt 1992; Batt 1996). Optimum temperatures for incubation and rearing have been cited between 2 and 4 °C (35.6–39.2 °F) and 7 and 8 °C (44.6–46.4 °F), respectively (Rieman and McIntyre 1993).

Spawning and rearing areas are often associated with coldwater springs, groundwater infiltration, and/or the coldest streams in a watershed. Throughout their lives, bull trout require complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Alterations in channel form and reductions in channel stability result in habitat degradation and reduced survival of bull trout eggs and juveniles. Channel alterations may reduce the abundance and quality of side channels, stream margins, and pools, which are areas bull trout frequently inhabit. For spawning and early rearing, bull trout require loose, clean gravel that is relatively free of fine sediments. Because bull trout have a relatively long incubation and development period within

spawning gravel (greater than 200 days), transport of bedload in unstable channels may kill young bull trout. Bull trout use migratory corridors to move from spawning and rearing habitats to foraging and overwintering habitats and back. Different habitats provide bull trout with diverse resources, and migratory corridors allow local populations to connect, which may increase the potential for gene flow and support or refounding of populations (USFWS 2004).

See Pratt 1992, Ratliff 1992, and Ratliff et al. 1996 for additional details regarding bull trout life history characteristics.

Population Trend and Risk Assessment

The USFS (1998) determined that bull trout populations in the Jarbidge River may be depressed and at risk to management-induced or random extinction mechanisms. Available data is not sufficient to make a valid projection of population viability, although it is premature to suggest that the Jarbidge population is stable (USFS 1998). Habitat modification and mining-related pollution may have reduced bull trout numbers between 1865 and 1945 (USFS 1998).

Parrish (1998) was unable to project bull trout population viability in the Jarbidge due to insufficient data. Genetic evaluations of the Jarbidge population completed in 1998 suggested that the DPS was comprised of at least three distinct subpopulations, each of which demonstrated adequate genetic diversity and metapopulation potential to counter the threat of stochasticism (Johnson 1999), however this and other genetics information is currently being reevaluated, making it too premature to make definitive statements as to population security from threats (Selena Werdon, Nevada Department of Wildlife, personal communication, January 2004).

Unique Population Units

As discussed above, bull trout occurring in the Jarbidge watershed currently represent a distinct population segment (DPS), as defined by the USFWS. However, recent genetic evaluations of bull trout from the Jarbidge suggest that the DPS designation should be reconsidered due to similarities with populations from the Snake River (Spruell et al. 2003). According to Spruell et al. (2003), the USFWS DPS designation of the Jarbidge population was largely based upon the watershed's unusual setting and geographical separation from populations occurring in the Snake River (USFWS 1999), rather than upon genetic differences, thereby necessitating a reevaluation of the watershed's DPS status.

Life History Characteristics of Unique Populations

Life history forms present in the DPS included both fluvial and resident fish present in low densities in the East Fork, West Fork, and mainstem Jarbidge River, as well as six headwater tributaries (Cougar, Dave, Fall, Pine, Sawmill, and Slide creeks) (Johnson 1999). The USFWS is currently in the process of preparing a Bull Trout Recovery Plan for the Jarbidge Unit (*refer to* USFWS 2004).

Genetic Integrity of Unique Populations

Genetic sampling in 1998 indicated that three separate resident populations remain in the upper Jarbidge River watershed in Nevada and that there is very little evidence of genetic mixing (Spruell, personal communication, cited in Parrish 1998).

Subsequent genetic analysis of samples collected from bull trout in Dave Creek and the West Fork Jarbidge River are presented in Spruell et al. (2003). Results from analysis of microsatellite data and mtDNA data of Taylor et al. (1999, cited in Spruell 2003) suggest that bull trout in the Jarbidge system are not genetically distinct from other bull trout populations in the upper Snake River Basin, and therefore should not constitute a separate and unique distinct population segment from other Snake River populations.

Estimate of Historic Status

Although accounts of bull trout in the Jarbidge River basin date to the 1930s, both sampling and actual collections of bull trout were infrequent (USFWS 1999). Therefore, historical status data are limited.

2.3.2.2 Bull Trout Distribution

Current Distribution/Spatial Diversity

The Jarbidge population is small and isolated and at the fringe of the bull trout range (USFS 1998) (Figure 27). During an intensive survey effort conducted in late summer and fall of 1998, Johnson (1999) found bull trout in the Nevada portion of the Jarbidge River in all suitable habitats. Bull trout have been documented in Dave, Slide, Fall (Klott 1996), Jack, Pine, and Cougar (G. Johnson, NDOW, personal communication, April, 2004) creeks and headwater tributaries that are physically linked by the mainstem Jarbidge River (USFS 1998). Bull trout may overwinter in habitat downstream of the confluence of the East and West Forks of the Jarbidge River, but they have not been documented in this area during summer months (Klott 1996). Occurrence in Meadow and Telephone Creeks is unknown, but not suspected to be likely (B. Zoellick, BLM, personal communication, March, 2004).

Historic Distribution

Historically, bull trout were found only in the anadromous streams and rivers of Idaho and Nevada (Parrish 1998). Anecdotal accounts describe a fluvial form of bull trout that migrated with anadromous salmonids from the mainstem Snake River to portions of the Jarbidge River. Although these historic accounts are largely unsubstantiated, the current distribution and life history strategies of the Jarbidge bull trout population, which consists of migratory forms in Idaho reaches (Parrish 1998) and resident/migratory forms in Nevada reaches (Zoellick et al. 1996), may represent a historical relic of fluvial fish from the Snake River (Parrish 1998). This population is physically barred from other populations by dams on the Snake River (Klott 1996). The remaining Jarbidge River population is now isolated and located over 150 river miles from other bull trout populations.

Surveys conducted in 1998 indicate that bull trout have likely been extirpated from Jack Creek, a historically occupied tributary, (USFWS 1999). Migration of bull trout into Jack Creek was limited due to a impassable culvert, however, upon its removal in 1997, subsequent surveys failed to detect bull trout presence (USFWS 1999).

Pratt et al. (2003) provides an annotated chronology of resident and anadromous fish species in the Bruneau subbasin. Anecdotal evidence relating to bull trout in the Bruneau subbasin include,

> 1934 August 27, 1934, while making a survey of the waters of Humboldt National Forest S.D. Durrant collected two Dolly Varden in Dave Ck, 4 miles above its junction with the East Fork of Jarbidge River T47N R9E Sec 25 ... The larger specimen (deposited at the University of Michigan) is a mature male with swollen testes and is about 169 mm in standard length, and the smaller one (at University of Utah) is an immature fish 105 mm long ... Professor Durrant of the University of Utah
>
> 1951 Three additional specimens of S. malma, all males, are in the collection of the Department of Biology, University of Nevada ... collected by Earl Dudley, a warden of the Nevada Fish and Game Commission, on July 5, 1951, on the East Fork of the Jarbidge River. Their standard lengths in mm are 168, 190, 193.

Harvest in the Subbasin

It is currently illegal to harvest bull trout from the Jarbidge River DPS in both Idaho and Nevada. In Idaho, all sport-fishing harvest of bull trout was eliminated in 1994.

The Jarbidge River system has been heavily fished, dating back to the 1930s. Decades of non-native trout stocking by both Idaho and Nevada encouraged increased angling pressure in bull trout habitat. Idaho stopped stocking trout in 1990, and Nevada's last stocking was in 1998 (Williams 2002). A 1990 NDOW report specifically stated concerns for the bull trout population because of angling pressure and the removal of larger bull trout (6-12 inches) from the system, possibly before they were old enough to reproduce for the first time. Angler harvest was considered by NDOW to be a likely "primary factor in the low densities of bull trout in the East and West forks of the Jarbidge River" (Williams 2002).

Harvest is considered a threat to both resident and migratory forms of bull trout. Migratory fish are at greater risk because of their lower numbers, desirable larger size and higher visibility to anglers. Anglers are known to have difficulty identifying bull trout, so unintentional harvest of bull trout is likely still occurring despite angler education efforts. Nevada bull trout fishing regulations were changed in 1998, and it is now a catch and release program (Williams 2002). Limits on other trout (native redbands and residual stocked rainbows) and mountain whitefish are now 5 and 10 fish, respectively, which still allows for substantial fishing pressure and potential repeated bull trout captures (Williams 2002). To date, bull trout monitoring has not been conducted long enough to allow for detection of improvements in the population. Idaho established a two trout limit for the Jarbidge River watershed in 1992, and prohibited harvest of bull trout entirely in 1995.

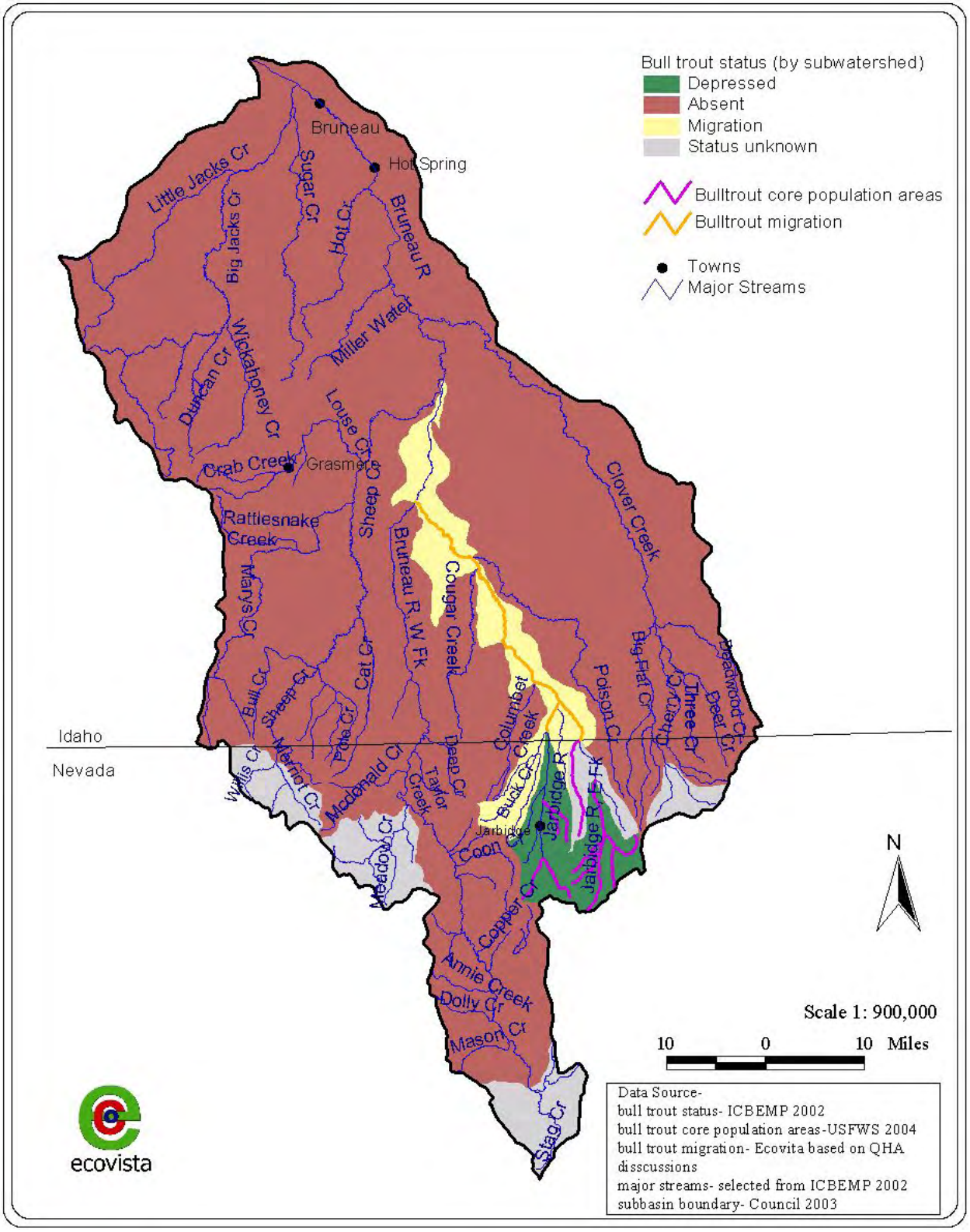

Figure 27. Distribution and status of bull trout in the Bruneau subbasin.

2.3.3 Mountain Whitefish

2.3.3.1 Mountain Whitefish Population Data and Status

Relative Abundance

Besides redband and bull trout, the mountain whitefish (*Prosopium williamsoni*) is the only other native salmonid in the Bruneau subbasin. Second only to dace in numbers, the mountain whitefish was the most common fish trapped in the East and West Forks of the Jarbidge River between September and December 1999 (Partridge and Warren 2000).

Mountain whitefish have been documented at low densities in the West Fork Bruneau River within the Humboldt-Toiyabe National Forest (USFS 1995). They were detected in upper Clover Creek during IDEQ electrofishing efforts in 2000 (Lay and IDEQ 2000).

Similar to other salmonid species, mountain whitefish will occupy a given reach only when temperature conditions are suitable. In their 1999 study, Partridge and Warren (2000) found that mountain whitefish movement appeared to be related to changes in temperature. The number of fish sampled increased later in the fall as water temperatures dropped (Partridge and Warren 2000). Habitat conditions in the East Fork Jarbidge River appear to be more suitable than those in the West Fork Jarbidge River as Partridge and Warren (2000) found nearly 10 times more whitefish in the East Fork than in the West Fork.

During recent redband inventories of the Bruneau subbasin, IDFG collected data on the number of mountain whitefish sampled (Table 25). Density information was not available.

Table 25. Number of mountain whitefish sampled during IDFG electrofishing efforts in 2003

Sixth Field HUC	HUC Name	Number of Fish Sampled
0402	Bruneau 3 above Hot Creek	2
1802	Jarbidge 3 (Dorsey to East Fork)	4
2101	Bruneau 11 (meadow to Wickiup)	7
2801	Jarbidge 1 (mouth to Poison)	7
3501	Bruneau 6 Sheep to Jarbidge	2

Life History Diversity

The preferred habitat of the mountain whitefish is cold mountain streams (Simpson and Wallace 1982) where the species is found predominantly in riffle areas during summer and deep pools during winter (Wydoski and Whitney 1979), however the species has similarly been documented in stream reaches characterized by warm water temperatures. Mountain whitefish mature at about 3 years of age. They are fall spawners, typically spawning in riffle areas during late October or early November when water temperatures range between 40 and 45 °F; in some instances, spawning is known to occur along gravel shores in lakes or reservoirs. Eggs are adhesive and stick to the substrate following spawning. Hatching occurs in March (Simpson and Wallace 1982).

Mountain whitefish spend much of their time near the bottom of streams and feed mainly on aquatic insect larvae. Mountain whitefish will also feed on terrestrial insects on the surface and on fish eggs (Simpson and Wallace 1982). Although growth is variable, most mountain whitefish in Idaho are typically 3 to 4 inches long at the end of the first year and 6 to 7 inches after two years (Simpson and Wallace 1982).

2.3.3.2 Mountain Whitefish Distribution

Current Distribution/Spatial Diversity

As mentioned previously, mountain whitefish are most abundant in habitats with cooler water temperatures (*e.g.*, stream reaches >7,000 ft.), but may also occur in lower elevation reaches characterized by warmer temperatures (for example, in lower Deep Creek, in the neighboring Owyhee subbasin, IDFG documented the presence of mountain whitefish and the absence of redband trout; K. Myer, IDFG, personal communication, April, 2004). The species are well distributed throughout the mainstem, East Fork and West Fork (below Pine Creek) Jarbidge Rivers, occur in lower densities in the West Fork Bruneau, and have been documented in headwater reaches of Clover Creek (a.k.a. East Fork Bruneau River; Figure 28).

Historic Distribution

The historic distribution of mountain whitefish was likely similar to current distribution (Figure 28). Pratt et al. (2003) provides an annotated chronology of resident and anadromous fish species in the Bruneau subbasin. Anecdotal evidence relating to mountain whitefish in the Bruneau subbasin include,

1800s pre	Pre-historically, non-migratory fishes including whitefish occurred in Jarbidge River.

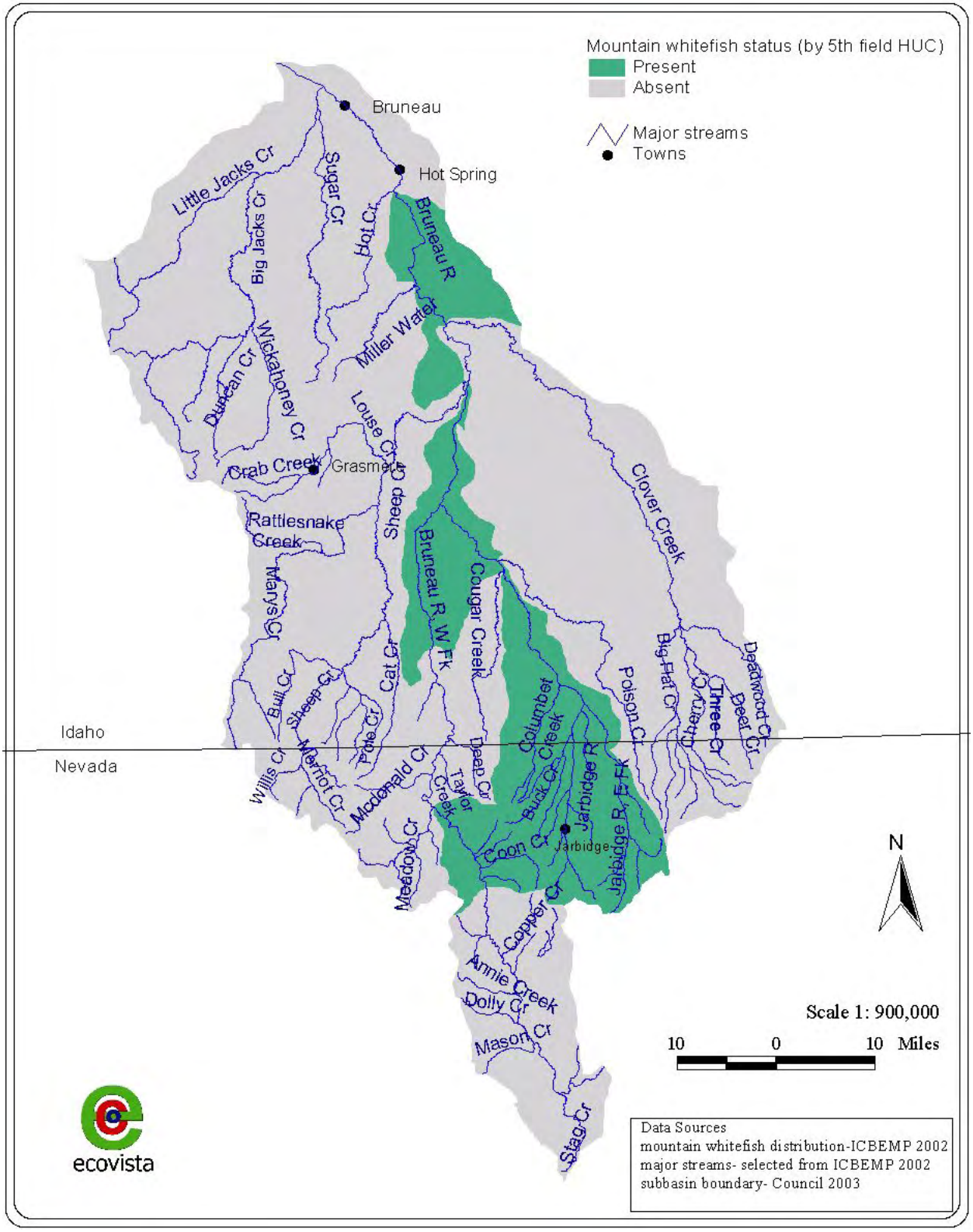

Figure 28. Mountain whitefish distribution in the Bruneau subbasin.

2.3.4 Bruneau Hot Springsnail

2.3.4.1 Bruneau Hot Springsnail Population Data and Status

Conservation Status

The Bruneau hot springsnail (*Pyrgulopsis bruneauensis*) was listed as endangered by the USFWS in 1993. The species was later taken off the list and then relisted in 1998.

Relative Abundance

Abundance of springsnails is thought to fluctuate seasonally and be primarily influenced by water temperature, spring discharge, food availability and food quality (Mladenka 1992, Varricchione and Minshall 1997). A survey in 1996 found the springsnail in 116 of 204 (54%) seeps and springs along the Bruneau River (Mladenka and Minshall 1996) (Table 30). Wood (2000) revised this estimate to 89 of 155 geothermal springs and seeps along a 4.3-mile reach of the Bruneau River and Hot Creek, based on a 1999 rangewide survey. In 2002, 68 geothermal springs were identified along a 1-kilometer stretch of Hot Creek from the confluence with the Bruneau River upstream. Of these, 38 were occupied by Bruneau hot springsnails (Lysne 2003).

Flood events in 1991 and 1992 deposited high quantities of silt, sand, and gravel into Hot Creek. The Indian Bathtub area habitat was reduced to less than one-half of its size, and the springsnail population was apparently decimated (Varricchione et al. 1998). An intensive search along the length of Hot Creek found no springsnails (Varricchione et al. 1998). A rock face seep refuge located 1.8 meters from Hot Creek contained a relict population of approximately 238,660 snails. The density of snails decreased with distance from the seep. Research conducted in 1998 identified several barriers to springsnail recolonization in Hot Creek. Protruding substrate was added to the creek, a thermal barrier was bypassed, and a fish exclosure was erected, all of which enabled the springsnail to recolonize the area. As of November 1999, the total springsnail population in Hot Creek was estimated at 300 to 400 individuals (Myler and Minshall 2000).

Life History Diversity

Bruneau hot springsnails are an endemic species inhabiting a related community of geothermal springs near the Bruneau River south of Mountain Home, Idaho (Varricchone and Minshall 1995). Adult springsnails have a small, short, wide shell measuring .22 inches long with 3.75–4.25 whorls (USFWS 2002b). Fresh shells are thin and transparent. This species occurs on exposed surfaces of various substrates including rocks, sand, gravel, and algal film. During the winter, springsnails are associated with habitats least exposed to cold-water temperatures. Distribution does not appear to be affected by water velocity as individuals have been observed across nearly the full range of flow regimes (Mladenka 1992).

Bruneau hot springsnails are grazers, taking primarily algae and diatoms (USFWS 2002b). The highest densities of springsnails appear to be associated with locations where periphyton is dominated by diatoms and the lowest densities in areas supporting algal mats (Mladenka 1992). Abundance and recruitment are thought to be affected primarily by water temperature (Mladenka 1992).

Reproduction can occur throughout the year but may be seasonal in areas affected by temperature extremes (Mladenka 1992). Sexual maturity can occur at 2 months, with offspring approximating a 1:1 sex ratio. Eggs are deposited on hard surfaces such as rocks.

Population Trend and Risk Assessment

Annual monitoring of springsnail populations was initiated in 1990 at 3 sites (Mladenka 1992). Subsequent to the 1993 survey, a fourth site was included in future monitoring efforts (Royer and Minshall 1993). Of these 4 sites, one is located on Hot Creek at the Indian Bathtub area and the other three are located on the Bruneau River. The Hot Creek population was reduced to approximately zero individuals following a flood event in 1991 and remained absent from the site until 1999. Annual population trends at the other sites have remained fairly stable from 1990–2000 (Rugenski and Minshall 2003), although population size differs among sites and density of springsnails apparently fluctuates seasonally. Range-wide, the springsnail population may have declined by 50% from earlier estimates of abundance (Mladenka 1992).

Surveys of available and occupied spring seeps suggest geothermal spring habitat continues to decline (Lysne 2003). This decline represents a 22% decrease in the number of springs from 2000, and a 54% decrease from 1991. Furthermore, there was a 41% decrease in occupied seeps from the 2000 survey and a 65% reduction in occupied sites from the original 1991 survey (Lysne 2003).

The USFWS (2002) ranked the recovery priority of the Bruneau hot springsnail based on 4 criteria, indicating that it is: 1) taxonomically, a species; 2) facing a high degree of threat; 3) rated high in recovery potential; and 4) may be in conflict with construction, development, and other forms of economic activity. Primary threats to their conservation include groundwater withdrawal, introduced predators, and susceptibility to stochastic environmental events.

2.3.4.2 Bruneau Hot Springsnail Distribution

Current Distribution/Spatial Diversity

The springsnail occurs only in springs and seeps that arise from a thermal aquifer along a 5.5-mile reach of the lower Bruneau River (Figure 29; Klott 1996). Mladenka (1992) found temperature to be the most important factor affecting distribution of the springsnail. The thermal tolerance range of the species is 15.7 to 36.9 °C. They are found in the highest densities at temperatures ranging from 22.8 to 36.6 °C (Wood 2000). Springsnails survive on all types of substrate, but large substrate is thought to be the most suitable because it provides surfaces conducive to egg laying (Mladenka 1992).

Current distribution and population status of springsnails may be underestimated due to limited survey extent. Subsequent to 1996, surveys were restricted to the confluence of Hot Creek and the Bruneau River upstream for approximately 1 kilometer (Lysne 2003). Surveys downstream of the Hot Creek and Bruneau River confluence were discontinued due to private land concerns and lack of quality spring seeps.

The aquatic community associated with the Bruneau hot springsnail includes three rare species: an endemic snail (*Ambrysus mormon minor*) that has been found in Hot Creek and a few adjacent

springs; the skiff beetle (*Hydroscapha natans*), historically present but not identified in 1991 surveys; and the giant helleborine (*Epipactis gigantea*), a rare orchid that has been found in Hot Creek and along the Bruneau River in association with geothermal spring outflows (Wood 2000).

Historic Distribution

The Bruneau Hot Springsnail was first collected in 1952 in upper Hot Creek, a tributary to the Bruneau River (Hershler 1990). Little is known about its historical distribution and abundance. Surveys for occupied seeps were initiated in 1991, thus distribution prior to this date is unknown. Based on documented fluctuations in population numbers due to flood events, this species historic distribution likely varied due to environmental stochasticity. Since monitoring began, the number of spring seeps as well as the number of springs occupied by springsnails has declined.

Identification of Differences in Distribution Due to Human Disturbance

Natural recharge to the regional geothermal aquifer was estimated to be approximately 57,000 acre-feet of water annually, with approximately 10,100 acre-feet of water being discharged by spring-flow (Berenbrock 1993). Currently, there are more than 50 private wells within 12 kilometers of the Hot Creek/Indian Bathtub site using geothermal groundwater for irrigation (USFWS 2002b). Well withdrawals have increased form zero to a high of approximately 66,200 acre-feet of water per year from 1890 to 1999 (Berenbrock 1993). Based on measurements from several monitoring wells, geothermal groundwater levels have declined by approximately 4 feet from 1991 to 2000; groundwater levels are approximately 5 feet below the level identified necessary for recovery (USFWS 2002b). In accord with declining water levels, discharge from many of the geothermal springs along Hot Creek and the Bruneau River has decreased greatly or ceased flowing during the last 40 years (Mladenka 1992, USFWS 2002b). For example, discharge from Hot Creek/Indian Bathtub spring declined from an estimated 9,300 liters per minute in 1964 to zero in 1990 (Berenbrock 1993). Today, water from the spring continues below the surface and emerges about 450 meters below the traditional outlet (Rugenski and Minshall 2002). Reductions in spring flow restrict and degrade springsnail habitat by limiting the extent and quality of wetted surface areas (Mladenka 1992, USFWS 2002b, Lysne 2003).

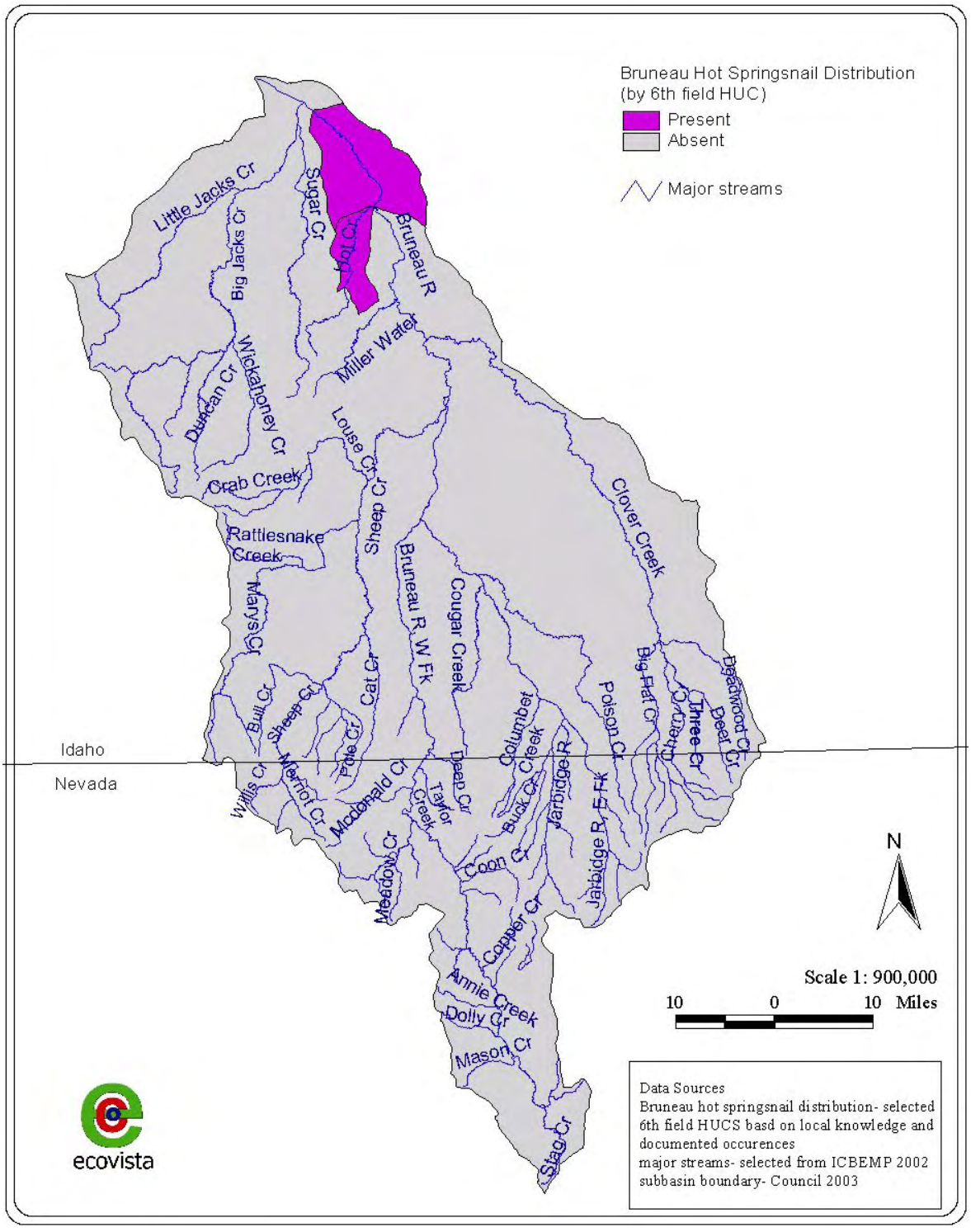

Figure 29. Bruneau hot springsnail distribution.

Bruneau hot springsnails are vulnerable to several introduced predators (Mladenka 1992). The presence of two introduced predator fish species may restrict the springsnails ability to repopulate currently unoccupied spring sites (USFWS 2002b). Both fish species are currently present in Hot Creek and are known to move in to the Bruneau River during warm summer months. This facilitates access to other spring sites as well as influences the springsnails ability to successfully disperse. As quality habitat continues to be reduced in extent, springsnails may be vulnerable to greater predation pressure.

2.3.5 Idaho Springsnail

Conservation Status

The Idaho springsnail (*Pyrgulopsis idahoensis*) was listed as endangered under the Endangered Species Act by the USFWS in 1992. Suggested causes of decline stem from alterations to the free-flowing, cold-water environment required by the snail in the form of hydropower development and operation, water withdrawal and diversion, water pollution, and competition from introduced, nonnative species. A recent study of taxonomy based on morphological and genetic data suggests *P. idahoensis* should not be recognized as a unique species (Hershler and Liu 2004).

Relative Abundance

Little data are available to assess density or abundance of Idaho springsnails. Distribution is patchy and occurrence is limited to small portion of mainstem Snake River (USFWS 1995a). In 2003, 165 locations were surveyed along a 3.5-mile stretch of the mainstem Snake River upstream of C.J. Strike reservoir (Steve Lysne, U. S. Fish and Wildlife Service, personal communication April 2004). Relative abundance of snails was reported as high at one site, medium at 37 sites, low at 77 sites and absent from 50 sites.

Life History Diversity

Little information is available on specific life history requirements of Idaho springsnails. Adult springsnails have slender, elongate shells (height 5–7 millimeters, length .2–.25 inches) with up to 6 whorls. In the mainstem Snake River, this species is readily distinguishable from other snails based on external anatomy (Lysne 2003). However, morphological characteristics may offer a potentially misleading identification tool when comparing species occurring outside the Middle Snake drainage (Hershler and Liu 2004).

The life span of *P. idahoensis* is assumed to be 1 year, although maximum life span estimated at 717 days in captivity (Lysne 2003). Idaho springsnails lay round or oval egg masses containing one offspring on vegetation, smooth, hard surfaces, and shells of other snails. Based on limited observational study, Idaho springsnails are suggested to feed nocturnally as well as hibernate during the winter months (Lysne 2003).

The Idaho springsnail is found in free-flowing reaches of the mainstem Snake River, excluding tributaries and coldwater springs (USFWS 1995a). This species is thought to require cold, clear, well oxygenated and rapidly flowing water. Springsnails occur on sand or mud between gravel to boulder-sized substrate (USFWS 1995a). Deterioration of water quality due to pollution,

oxygen depletion, siltation, and increased water temperature would likely extirpate these snails from affected sites.

Laboratory examination of thermal thresholds suggests minimum and maximum temperature limits are 9º C and 33º C, respectively (Lysne 2003). Unfortunately, an attempt to identify optimal temperature range for growth and survival proved inconclusive. Idaho springsnails are suggested to have low tolerance to desiccation and pollutants (i.e. organic enrichment, metal exposure) as well as limited dispersal ability (Lysne 2003). While this makes them a useful indicator of environmental quality, it also predisposes the species to stochastic events.

Population Trend and Risk Assessment

Although available data are limited, this species has reportedly declined in numbers and remaining populations are small and isolated (USFWS 1995a). Population surveys are limited to occurrence and lack adequate replication (Lysne 2003). Estimates of abundance and density are limited. Furthermore, there are no data available to assess productivity or estimate demographic parameters. Thus, a determination of population stability would be speculative.

2.3.5.1 Idaho Springsnail Distribution

Current Distribution/Spatial Diversity

Currently, occurrence is limited to a few locations near C. J. Strike Reservoir (RM 518) upstream to Bancroft Springs (RM 553), representing a reduction of approximately 80% from its historic distribution (Figure 30; USFWS 1995a). Current populations are small and thought to be isolated.

Historic Distribution

Based on fossil records, the springsnail was endemic to Pliocene Lake Idaho (c.a. 3.5 m.y.a.) being found from Homedale (RM 416) to Bancroft Springs (RM 553) on the mainstem of the Snake River (USFWS 1995a). Historic distribution is thought to be contiguous.

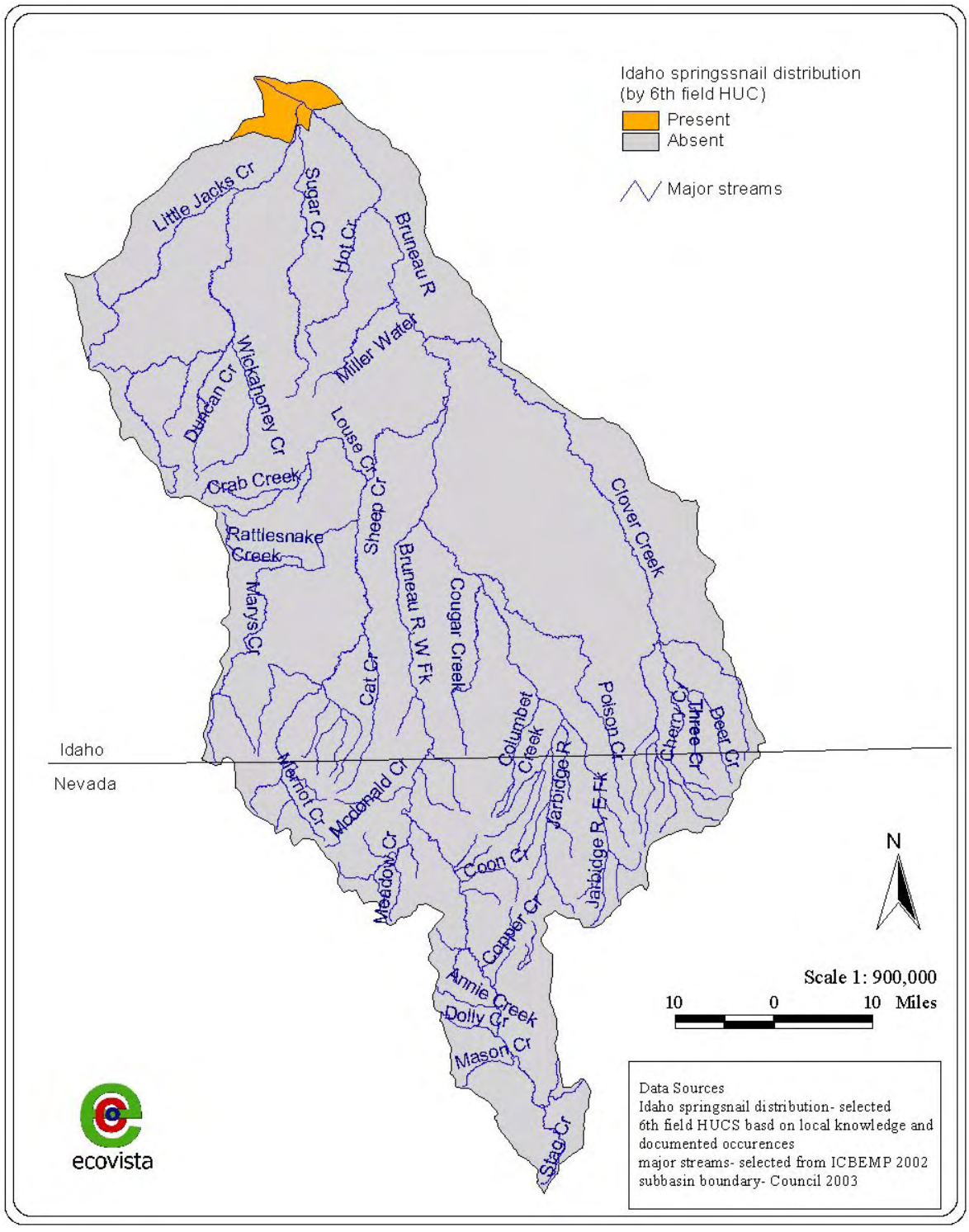

Figure 30. Idaho springsnail distribution in the Bruneau subbasin

2.4 Terrestrial Focal Habitats and Focal Species Characterization

2.4.1 Terrestrial Focal Habitats

Terrestrial focal habitats of the Bruneau subbasin are based upon the current wildlife habitat types (WHTs) delineated in the subbasin (Table 26) (Figure 31). Wildlife habitat types are groupings of vegetative cover types, based on similarity of wildlife use, that have been delineated across the Columbia Basin by the Northwest Habitat Institute (2003). Johnson and O'Neil define a wildlife habitat as "an area with the combination of the necessary resources (e.g., food, cover, water) and environmental conditions (temperature, precipitation, presence or absence of predators and competitors) that promotes occupancy by individuals of a given species (or population) and allows those individuals to survive and reproduce" (2001). Wildlife habitats are viewed as hierarchical in nature with vegetative type being the coarsest element selected for by a species, vegetative structure the next, and unique habitat elements (e.g., snags) the finest (Johnson and O'Neil 2001).

Shrub-steppe and dwarf shrub steppe were combined as a focal habitat group as well as all riparian and wetland wildlife habitat types. The resulting terrestrial focal habitats in the Bruneau subbasin are upland aspen forest, shrub-steppe/dwarf shrub-steppe, riparian/wetland, western juniper/mountain mahogany, and desert playa/salt desert scrub.

Table 26. Acres of current wildlife habitat types in the Bruneau subbasin (NHI 2003).

Habitat Type	Acres in Bruneau
Shrub-steppe	1,517,336
Agriculture, pasture, and mixed environs	228,010
Dwarf shrub-steppe	198,330
Desert playa and salt scrub	79,026
Upland aspen forest	57,051
Montane mixed conifer forest	15,056
Western juniper and mountain mahogany woodlands	7,666
Herbaceous wetlands	6,297
Alpine grasslands and shrublands	3,483
Lakes, rivers, ponds, and reservoirs	2,664
Eastside (interior) riparian wetlands	2,001
Eastside (interior) grasslands	1,052
Eastside (interior) mixed conifer forest	455
Montane coniferous wetlands	319
Urban and mixed environs	121

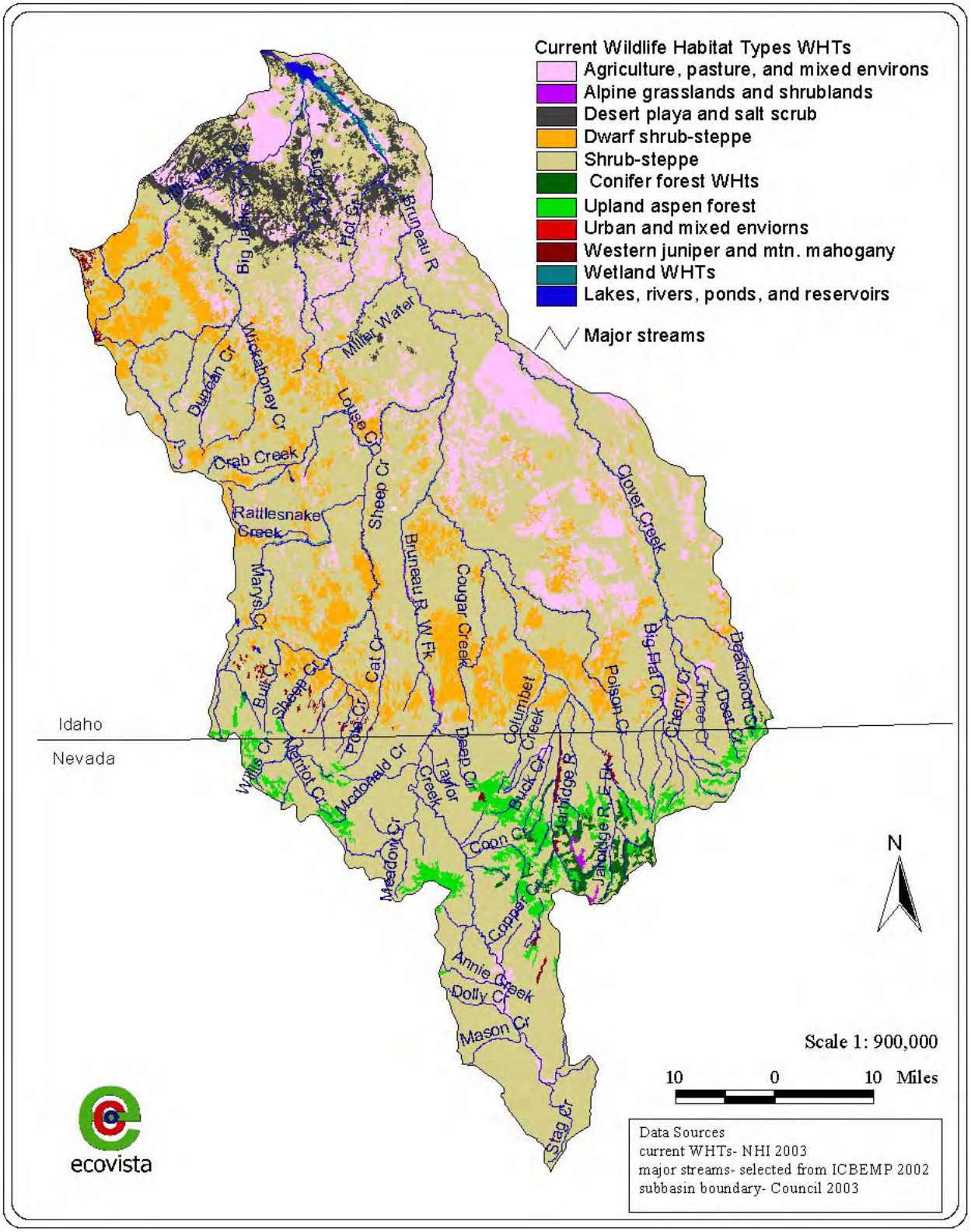

Figure 31. Current wildlife habitat types in the Bruneau subbasin.

2.4.1.1 Upland Aspen Forest

Aspen habitat usually occurs on well-drained mountain slopes or canyon walls that retain some moisture and can be found from 2,000 to 9,500 feet (210 to 2,896 m). Deciduous, shade-intolerant aspen trees dominate the forest type and grow over a forb-, grass-, or low shrub-dominated undergrowth, and relatively simple two-tiered stands typify the vertical structure of this habitat. Fire is an important process for the maintenance of aspen habitat, with rapid recolonization of sites occurring after fires. Aspen groves are widespread across North America but are a minor type in the Bruneau subbasin, found in the uplands in the Humboldt-Toiyabe National Forest in Nevada (Figure 11; Figure 31; Crawford and Kagan 2001a). Approximately 2% of the land cover of the Bruneau subbasin is represented by upland aspen forest (Reid et al. 2002). The primary land use for aspen stands is livestock grazing (Crawford and Kagan 2001a). Although the cover type produces wood fiber in abundance, it has been underutilized for this resource. Aspen stands are ecologically important because they provide food and cover for wildlife species, as well as high-quality water. Aspen stands can act as living firebreaks for the more flammable coniferous types and provide fire protection for the surrounding landscape (DeByle and Winokur 1985).

Growth and regeneration of aspen stands can be negatively impacted by heavy livestock browsing, and domestic sheep have been reported to consume four times more of this type than cattle do. Regeneration of aspen stands has been greatly reduced since about 1900 due to fire suppression and alteration of fine fuel levels. Conifer encroachment and dominance of aspen stands are widespread, and extensive stands of young aspen are uncommon (Crawford and Kagan 2001a).

2.4.1.2 Shrub-steppe

Shrub-steppe habitat is characteristically associated with dry, hot environments and found across the Columbia Plateau of Washington, Oregon, Idaho, and adjacent Wyoming, Utah, and Nevada. Most shrub-steppe habitat occurs between 2,000 and 6,000 feet (610–1,830 m) on deep alluvial, loess, silty or sandy-silty soils, stony flats, ridges, mountain slopes, and slopes of lake beds having ash or pumice soils. Shrub-steppe habitat in good ecological condition will contain a bunchgrass steppe layer, and forbs may be present in some areas depending on site potential and disturbance history. Prior to European settlement, shrub-steppe habitat lacked extensive herds of large grazing and browsing animals, and burrowing animals likely played important roles in the habitat patch dynamics. Land uses of shrub-steppe habitat include livestock grazing, irrigation, and dry land agriculture (Crawford and Kagan 2001b).

Shrub-steppe habitat is widely variable across the Bruneau subbasin. Remnant high-quality patches occur in some areas, but broad expanses of highly degraded and fragmented habitat are also present, particularly east of the Bruneau River. Shrub-steppe habitat in the Bruneau subbasin sits below western juniper and mountain mahogany woodland habitats and forms a mosaic across the landscape with grasslands, dwarf shrub-steppe, and desert playa and salt scrub habitats (Reid et al. 2002, IBIS 2003). Shrub-steppe habitat covers approximately 78% of the land in the subbasin and is comprised primarily of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) (Reid et al. 2002; Figure 11).

Shrub-steppe habitat in the Big Jacks and Little Jacks creeks areas is used year around by pronghorn and provides important winter/spring habitat. Big Jacks Creek has 16,000+ acres of relict sagebrush-steppe, and its tributary, Duncan Creek, contains another 4,500 acres. Little Jacks Creek has 9,000 acres that are rated in excellent condition and 1,000 acres (Jacks Creek Research Natural Area) in near-pristine condition. The Sheep Creek area has some of the best summer habitat in the region in the Bruneau Wilderness Study Area west of the mainstem Bruneau River. This area has the highest diversity of plant communities in the BLM's Boise District. In the upper West Fork of the Bruneau River, mule deer use the low-elevation sagebrush communities for winter habitat (BLM 1989). Approximately 24,000 acres of the Humboldt-Toiyabe National Forest Study Area provide critical mule deer winter range.

Biological soil crusts are an important component of the shrub-steppe and grassland ecosystems because they moderate surface temperature extremes, enhance seedling establishment, and improve soil stability, productivity, and moisture retention (Wisdom et al. 2000). These crusts have been damaged or destroyed by grazing, humans, off-road vehicles, exotic plant invasion, and fire (USFS 1999), which has facilitated the invasion of exotic weeds and increased erosion in many areas. The BLM identifies biological crust restoration as a priority for the area (Schnitzspahn et al. [2000]).

Altered fire regimes, habitat fragmentation, exotic plant species, and livestock grazing all modify shrub-steppe habitat. Extensive livestock use results in a decrease in the bunchgrass layer and an increase in both shrub density and cover of annual species. When there is repeated or intense disturbance, cheatgrass replaces and dominates native bunchgrasses (Crawford and Kagan 2001b).

2.4.1.3 Riparian and Wetlands

Riparian habitats occur along perennial and intermittent rivers and streams that flow from high to low gradients. Riparian and wetland habitats contain shrublands, woodlands, and forests, or, classically, a mosaic of these communities. Riparian and wetland habitats follow a corridor along montane or valley streams and usually do not extend 100 to 200 feet (31–61 m) beyond the stream. These habitats are strongly associated with stream dynamics and hydrology, and flood cycles occur within 20 to 30 years in most riparian shrublands. Habitat structure can be influenced by flood, fire, beavers, grazing, and trampling (Crawford and Kagan 2001c).

Although not documented throughout the entire subbasin, riparian and wetland areas are generally in poor condition and should be considered a limiting factor to fish and wildlife resources. For example, of the 85,238 acres of uplands located in the Bruneau–Jarbidge–Sheep Creek BLM management unit in Idaho, only 10,716 acres (12.6%) were considered to be in "excellent" or "good" condition. The majority of uplands was considered to be in "fair" or "poor" condition (Parrish 1998). Many of the upland wet meadows, springs, and intermittent stream areas in the Humboldt-Toiyabe National Forest Bruneau River Study Area have been significantly impacted by grazing. Incised drainages, headcuts, and lost or reduced large woody overstory are evidence of these impacts (USFS 1995).

Vegetation removal in riparian and wetland habitats for dam construction, roads, and logging are conspicuous human influences in riparian and wetland habitats. Other activities that may

adversely affect these habitats include interference with natural processes (*e.g.*, elimination of beavers, removal of large woody debris). Excessive use livestock and native ungulates may lead to a decrease in woody cover and an increase in undesirable forb species (Crawford and Kagan 2001c).

2.4.1.4 Western Juniper and Mountain Mahogany Woodlands

Western juniper and mountain mahogany woodlands are widespread, variable habitats that can be found on high topography adjacent to shrub communities common to depressions and steep slopes. Savannahs, woodlands, and open forests can characterize these habitats, with canopy cover ranging from 10 to 60%. Western juniper and/or mountain mahogany woodlands may have bunchgrass or shrub-steppe undergrowth, but some areas lacking the shrub layer may be dominated by native bunchgrasses. Cheatgrass is common in disturbed sites. Because of the fire intolerance of juniper and mountain mahogany woodlands, the amount of this habitat type has increased over the past 100 years. However, the benefits of the type's increase may be offset by degraded habitat condition due to exotic plants outnumbering native bunchgrasses (Crawford and Kagan 2001d). Western juniper and mountain mahogany woodlands are found around the Idaho–Nevada border in the Bruneau subbasin (Figure 31) but make up a relatively small portion (<1%) of the Bruneau subbasin (Reid et al. 2002). The primary land use of this habitat type is livestock grazing (Crawford and Kagan 2001d).

Fire suppression and overgrazing are the primary threats to the western juniper and mountain mahogany habitat type. Increased juniper densities coupled with a decrease in fine fuels through shading and grazing can result in high-severity fires altering habitat structure. A decrease in native bunchgrasses through overgrazing facilitates encroachment of exotic annual grasses and forbs. Shade-seeking animals can also contribute to the increase of cheatgrass cover (Crawford and Kagan 2001d).

2.4.1.5 Desert Playa and Salt Scrub Shrublands

Desert playa and salt scrub shrubland habitats center on the Great Basin of Nevada and Utah and are represented in low-elevation basins in the driest regions of the Pacific Northwest, Columbia Plateau, Basin and Range, and Owyhee provinces. Changes in salinity and fluctuations in the water table influence structural and compositional variation of these habitats. The desert playa and salt scrub shrublands are typically surrounded by shrub-steppe habitat forming a mosaic of playas, salt grass meadows, salt desert shrublands, and sagebrush shrublands (Crawford and Kagan 2001e). Less than 5% of the landcover of the Bruneau subbasin is represented by desert playa and salt scrub shrublands (Reid et al. 2002). These habitats provide rangeland for livestock, particularly in winter. Because of sparse vegetation and lack of fuel, fire plays a minor role in the natural disturbance regime (Crawford and Kagan 2001e).

Grazing facilitates the invasion of toxic and nontoxic exotic plant species into these areas, changing the structure of the native habitat. Because agricultural development is generally not feasible in these habitats, little of this habitat has been subjected to land use conversion (Crawford and Kagan 2001e).

2.4.2 Terrestrial ESA Listed and Focal Species Population Data and Status

2.4.2.1 Federal Endangered, Threatened, or Candidate Terrestrial Species

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is the second largest North American bird of prey, next to the California condor (*Gymnogyps californianus*). Two subspecies are tentatively recognized: a larger, northern subspecies (*H. leucocephalus alascanus*) and a smaller, southern subspecies (*H. leucocephalus leucocephalus*). The adult has a distinctive white head and tail, which contrast with dark brown body and wings. The bald eagle breeding range extends across Alaska, Canada, and all contiguous states of the United States, except for Rhode Island and Vermont. Winter range in the lower 48 states is typically associated with aquatic areas having some open water for foraging. Migration patterns are complex and depend on the age of the individual, location of breeding site, severity of climate at the breeding site, and year-round food availability. Northern birds leave the breeding areas between August and October and usually return between January and March, depending on weather conditions and food availability. High-quality winter habitat is defined by adequate food availability, presence of roost sites that provide protection from inclement weather, and absence of human disturbance. Native Americans valued bald eagles and used their feathers for ceremonial purposes. For the people of the United States, the bald eagle serves as a symbol of freedom associated with democracy, wilderness, and the environmental ethic (Buehler 2000).

Bald eagles typically nest in forested areas adjacent to large bodies of water. Nests are usually in mature forests with some habitat edge (eases nest access) in close proximity to water (usually < 2 km) with suitable foraging opportunities. The nest tree is usually one of the largest trees available, with accessible limbs capable of holding a nest, and the nest is placed in the tree's top quarter, just below the crown. Only one brood per season is produced unless eggs are taken or destroyed during incubation, in which case, a second brood might be attempted. Incubation is long, approximately 35 days. Clutches are generally one to three, with two being the most common. Nest success and reproduction data are variable across different regions, and no data are available that would be pertinent to birds nesting in the Bruneau subbasin vicinity (no nests occur within or near the subbasin). Lifetime reproductive success has been documented for one female that produced a total of 23 fledged young in 13 years of nesting (Buehler 2000).

Eggs, nestlings, and fledglings are the life stages most susceptible to predation. Potential predators include the black-billed magpies (*Pica pica*), gulls, ravens (*Corvu* spp.), crows (*Corvus* spp.), black bears (*Ursus americanus*), raccoons, hawks and owls, bobcats, and wolverines (*Gulo gulo*). The maximum recorded age for a wild bald eagle is 28 years, but good survival data are still lacking for most populations. It is speculated that bald eagles may have similar survival patterns of other raptors, with first-year survival being the lowest, followed by increasing survival with age. Because bald eagles have low reproductive rates, factors affecting survival likely regulate populations. Bald eagles are optimal foragers, and food is obtained by direct capture, scavenging, and usurping from other bald eagles, birds, and mammals. Diet composition varies by site and prey species availability. Bald eagles eat a wide variety of fish, birds, mammals, reptiles, amphibians, and crustaceans. Food is obtained by direct capture, scavenging, and usurping from other bald eagles, birds, and mammals. Fish typically comprise a greater proportion of the diet, followed by birds, mammals, and other food items (Buehler 2000).

There are no known bald eagle nests within 15 miles of the Bruneau area, but bald eagles are known to winter in the C.J. Strike area along the Snake River. Most wintering birds are single or pairs of adults, and there is no known communal roost in the area. Fish and waterfowl are more abundant along the Snake River than they are inland in the Jarbidge Resource Area. Other potential prey within the subbasin are either hibernating in the winter (ground squirrels and other rodents) or low in numbers due to the loss of range habitat (jackrabbits). Since numbers of big game, mule deer, and antelope in this area are low, these animals would not be major food sources for wintering eagles (Klott 1996).

The bald eagle is listed as threatened under the ESA. It is classified by the BLM as a Type 1 sensitive species and by Idaho as endangered (IDCDC 2003). The species is considered globally secure (G4); in Idaho, it is rare as a breeder, but the nonbreeding population is apparently secure (S3BS4) (IDCDC 2003). No bald eagle data are available from the Bruneau subbasin Breeding Bird Survey (BBS) routes, but in Idaho and the western BBS region, increasing trends (1966–2002) of 1.3% (n = 5 routes, P = 0.65) and 5.4% (n = 88 routes, $P < 0.001$) per year are promising for these populations (Sauer et al. 2003). The USGS Forest and Rangeland Ecosystem Science Center's Snake River Field Station coordinates the Midwinter Bald Eagle Survey, in which standard, nonoverlapping routes are surveyed by several hundred individuals (http://ocid.nacse.org/qml/nbii/eagles/). No midwinter count routes occur within the Bruneau subbasin, and the closest routes are approximately 15 km northwest of the subbasin in Grand View (Middle Snake subbasin) and approximately 50 km east in King Hill (Middle Snake subbasin). Data from 1986 through 2000 from survey routes in both of these areas show annual increases in wintering bald eagles.

The greatest threats to bald eagles are from human activities. Direct threats are shooting, trapping, or poisoning; indirect threats include developments of powerlines and other structures. In addition, environmental contaminants are a significant source of mortality (Buehler 2000).

Snowy Plover

The snowy plover (*Charadrius alexandrinus*) is a small shorebird with a breast band restricted to lateral patches, pale brown upperparts, and dark gray to black. At least three races are recognized outside of the Americas, and up to three subspecies have been reported for the Americas: *C. a. occidentalis*, *C. a. tenuirostris*, and *C. a. nivosus*. Pacific Coast, Atlantic Coast, and inland birds all are classified as *C. a. nivosus*. In North America, snowy plovers breed inland and along the Pacific, Gulf, and Atlantic coasts. The Bruneau subbasin does not lie within the known breeding range of inland plovers, but breeding is known to occur in western and central Nevada and south-central Oregon. The extent of the inland breeding range west of the Rocky Mountains has only been documented since the late 1970s, and it's plausible that the breeding range has contracted in some areas with the loss of lakes used as breeding areas. Inland populations migrate to wintering grounds in coastal California and on the west coast of Baja California. They also reportedly winter in interior Mexico south to the central volcanic belt. Snowy plovers in the western Great Basin arrive on the breeding grounds in April and may leave as soon as early July, with most birds leaving by the beginning of September. Snowy plovers winter primarily in coastal areas at beaches, tidal flats, lagoon margins, and salt-evaporation ponds. They exhibit fidelity to breeding sites and winter ranges, although some dispersal has been seen among breeding sites within and between years (Page et al. 1995).

Inland snowy plovers breed on barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, and ponds; on riverine sand bars; and occasionally at sewage, salt-evaporation, and agricultural wastewater ponds. Nesting has not been documented on salt flats lacking water, but it can occur where the only apparent surface water is a distant small seep. Snowy plovers are facultatively polyandrous and polygynous, particularly in areas with long breeding seasons and a surplus of males. Males rear broods, while females obtain new mates and initiate new nests. Nests are scrapes on the ground, usually located near objects but still often exposed to environmental conditions. Clutches are usually three eggs, and for 70 interior Oregon and Nevada nests, the average was 2.92 (SD = 0.27, range = 2–3). Single-egg clutches are usually deserted by the adults, who probably initiate a new nesting attempt. The young are precocial and first leave the nest within one to three hours of hatching. Most young breed during the first nesting season following their birth. In snowy plover populations for which the breeding season is long and the clutch loss is high, birds have been documented attempting six clutches in a season. Birds that successfully produce clutches generally produce two to three in a breeding season. The proportion of broods producing at least one flying young (data from four studies) averaged 61% (SD = 10.9, range 48–71%). Other studies have estimated the number of flying young per successful brood (producing at least one flying young) at 1.6 (SD = 0.21, range 1.4–1.9). At a coastal and an interior California site, the number of young reaching flying age per female was 0.8 to 0.9 and 0.5, respectively (Page et al. 1995).

Adults, chicks, and eggs of snowy plovers are subject to predation by a number of avian and mammalian predators. The maximum age for a male snowy plover in the wild is at least 15 years, which is considered out of the ordinary. One estimate of life span is 2.7 years for adults. Survival analysis of birds at Great Salt Lake, Utah, resulted in annual survival rates from 0.578 to 0.880, with no significant differences detected between sexes.

Snowy plovers feed on terrestrial and aquatic invertebrates. Most feeding at inland habitats is in shallow (1–2 cm deep) water or on wet mud or sand. Some foraging occurs on dry flats on playas. In osmotically stressful environments, water intake may be reduced to insectivorous diet (Page et al. 1995).

The breeding population of snowy plovers along the Pacific Coast of the United States as well as Baja California is listed as threatened under the ESA. Current estimates of U.S. breeding populations are about 21,000 snowy plovers, with most (87%) occurring west of the Rocky Mountains and more than half (50%) concentrated at Great Salt Lake, Utah. A 20% decline in size of the breeding population between the late 1970s and 1980s was observed for California, Oregon, Washington, and Nevada combined (Page et al. 1995). Nevada's Natural Heritage Program lists the snowy plover as globally secure (G4) but extremely rare and critically imperiled as a breeder in Nevada (S1B) (NNHP 2003). The Lahontan Valley, northwest of Fallon, Nevada, has been identified as the single most important area for snowy plovers in that state (Herman et al. 1988). No BBS data for snowy plovers are available in the database for Idaho or the western region (Sauer et al. 2003).

Limiting factors for snowy plover habitat are diversions for irrigation, high water conditions, and lowered water tables (Herman et al. 1988). Major threats to snowy plovers include disturbance or destruction of nests by cattle (Herman et al. 1988), clutch destruction by predators, reduction in suitable breeding habitat, and human disturbance at nests (Page et al. 1995).

Lynx

A medium-sized forest carnivore, the lynx (*Lynx canadensis*) is characterized by long black ear tufts, large feet, and a black tip that completely encircles the tail. The range of lynx in North America extends across the boreal forests of Canada and Alaska to tree line, northern New England, portions of the Lake States, the Pacific Northwest, and the Rocky Mountains (Tumlison 1987). The primary habitats include boreal and sub-boreal forests with openings, rugged outcrops, bogs, and thickets (Tumlison 1987, Aubry et al. 2000). In the western mountains, lynx are associated with coniferous forests and upper elevations but mixed coniferous-deciduous forests comprise lynx habitat in the Northeast. Lynx utilize early successional forest stands for foraging and mature forest stands containing large woody debris for denning. Southern populations of lynx have large home ranges and are found in lower densities than their northern counterparts (Aubry et al. 2000). Because of the value of lynx as a furbearer, there are over 200 years of trapping records from the Hudson Bay Company. These records show approximately 10-year fluctuations in lynx harvests that are synchronized with the populations of the lynx's primary prey, snowshoe hares (*Lepus americanus*) (Tumlison 1987).

Female lynx are capable of breeding at 10 months but may wait until their second breeding season (22–23 months) if sexual maturity is delayed. Males typically do not breed until their second year. Reduced prey may affect reproductive success, particularly in yearling females, and lynx may reproduce in alternate years if limited by food availability. Litter size ranges from one to six but is usually three to four in North America. Twenty-two years is the maximum life span in captivity, but lynx will seldom live beyond 15 years in the wild. The main sources of mortality are starvation and human harvest (Tumlison 1987), but recently introduced lynx in Colorado have also suffered from plague (Tanya Shenk, Colorado Division of Wildlife, personal communication).

Snowshoe hares can comprise up to 83% of the lynx diet, which may also include alternate prey such as squirrels, small mammals, beaver, deer, moose, muskrats, and birds (Tumlison 1987). Alternate prey are believed to be important constituents of lynx diets in southern boreal forests (Aubry et al. 2000).

On March 24, 2000, lynx were listed as threatened under the ESA. Although the USFWS considers Idaho a state where lynx are known to occur, viable populations have not been documented in the Bruneau subbasin. Therefore, there can be no discussion of trends for this species within the subbasin. Historical records indicate that this area may be regarded as dispersal habitat for lynx. Two museum specimens collected in 1916 in Elko County, Nevada (north-central Nevada near the Oregon border) are the southernmost records of lynx occurrence west of the Rocky Mountains and the only verified records of lynx in Nevada. Because of records collected in other southern locales and high pelt returns from British Columbia and southern Alberta, it is thought that lynx in 1916 were dispersing south of their primary range (McKelvey 2000).

Primary threats to lynx include prey scarcity and lynx harvest (Tumlison 1987). It is also speculated that habitat fragmentation facilitating access by interspecific competitors may affect the structure and function of lynx populations (Buskirk et al. 2000).

Yellow-billed Cuckoo

A slender, long-tailed bird, the yellow-billed cuckoo (*Coccyzus americanus*) migrates from its winter range in South America to breed throughout temperate North America south to Mexico and Greater Antilles. It has been nicknamed the "raincrow" because it appears to call more often on cloudy days (Hughes 1999). Currently, with some debate, two subspecies are recognized, *C. a. occidentalis* (western) and *C. a. americanus* (eastern). Pecos River, Texas, is the dividing line between the two subspecies, although there appears to be an intergrade along that boundary (AOU 1957).

Western cuckoos arrive on the breeding grounds in mid- to late May, which is one to two months later than their eastern counterparts do at the same latitude. By early to mid-June, considerable numbers may be present, but transients continue to be recorded in late June to mid-July. Western cuckoos depart in the fall, starting in late August, two to three weeks earlier than eastern cuckoos do, with most birds departing by mid-September. Breeding habitat is typically open woodland with clearings and low, dense scrubby vegetation. In arid environments of the West, the birds are often associated with riparian areas. Yellow-billed cuckoos are usually absent from heavily forested areas and large urban centers. Two to three weeks prior to breeding, yellow-billed cuckoos may occupy upland areas before moving into riparian areas to breed. Habitat on their winter range is similar to that of breeding areas; they prefer woody vegetation bordering fresh water, lowlands to 1,500 meters, dense scrub, deciduous broad-leaf forest, gallery forest, and secondary forest. Western populations nest in willow, Fremont cottonwood, and mesquite; they may also nest in hackberry, soapberry, alder, and cultivated fruit trees. The nest is typically placed 0.3 to 1.0 meter from the end of a horizontal branch or in a vertical fork of a tree or large shrub, usually 1 to 6 meters above the ground. The nest may be 2 to 4 meters from the main tree trunk and is well concealed, particularly from above, by surrounding foliage. Because of the shortened breeding season, only a single brood is thought to be produced by western cuckoos, with the onset of breeding determined by food availability. Clutch size can be one to five eggs but is usually two or three. Large clutches (*e.g.*, >6) are attributed to more than one female laying eggs in a single nest (Hughes 1999). No data of nest success or young survival are available for Idaho. In the Sacramento Valley, California, the mean number of eggs per nest was 3.5 (± 1.0 SD), with 1.5 (± 0.56 SD) young surviving per nest (Laymon 1980). No information is available about lifetime reproductive success. Four years is the maximum recorded lifespan (Hughes 1999).

In addition to being an intraspecific brood parasite, the yellow-billed cuckoo is known to parasitize at least 11 other bird species. Evidence suggests that the yellow-billed cuckoo selects hosts that have similarly colored eggs. Brown-headed cowbirds may parasitize yellow-billed cuckoo nests but are probably rarely successful due to longer nesting requirements (11 days versus 7–9 days, respectively). Fatigued, migrating adult yellow-billed cuckoos are susceptible to predation by raptors. Nestlings may be taken by avian predators, snakes, and mammals. Yellow-billed cuckoos feed primarily on large insects, including caterpillars, katydids, cicadas, grasshoppers, and crickets. Other occasional food items are small frogs, arboreal lizards, eggs and young of birds, or fruits and seeds. Yellow-billed cuckoos most frequently forage by gleaning insects from leaves and stems while perching in open areas, woodlands, orchards, or adjacent streams (Hughes 1999).

Abundance of yellow-billed cuckoos can be highly variable, with large localized influxes occurring during times of insect abundance or outbreaks. It is difficult to determine population trends from conventional observation, mist netting, or listening-post techniques due to the quiet demeanor and skulking behavior of yellow-billed cuckoos. These methods should be considered inadequate for determining densities. The preferred and recommended method is counting responses to playback (Hughes 1999). Because of these limitations, interpretation of BBS data should be made with caution. No yellow-billed cuckoo BBS data are available for Idaho, but trend estimates for the western region indicate declines from 1966 through 2002 but not at a statistically significant level (–2.6% per year, $P = 0.31$, $n = 20$) (Sauer et al. 2003). In 2003, a survey was conducted for yellow-billed cuckoo in recorded historic and other likely locations in Idaho. The purpose of this study was to compile historic records for yellow-billed cuckoos in the state, develop and implement sampling methodology, and establish a long-term monitoring protocol that could be used to monitor this species. Fifty-five percent (35 of 64 total historic sightings) of the historical yellow-billed cuckoo records in Idaho are from southeast Idaho, with most being from the Snake River corridor. No yellow-billed cuckoos were detected in southwest Idaho during the 2003 surveys, and one verified sighting in 2002 is on record at 26 km northwest of the town of Bruneau, near the confluence of the Snake River and Bennet Creek (TREC, Inc. 2003).

Yellow-billed cuckoos are extremely rare in the western United States and western Canada. Western yellow-billed cuckoos were given candidate status for listing under the ESA in July 2001 (Federal Register, Vol. 66, No. 143). The yellow-billed cuckoo is also listed for the Great Basin in *Birds of Conservation Concern 2002* (USFWS 2002) and deemed a priority for conservation actions. The IDCDC (2003) reports that the yellow-billed cuckoo is globally secure (G5) but ranks it as critically imperiled as a breeder in Idaho because of its rarity and vulnerability to extinction (S1B). The bird has the same state status (S1B) in Nevada (NNHP 2003).

Limiting factors for yellow-billed cuckoos include habitat loss and fragmentation, inundation from water management projects, lowering of water tables, land clearing, cattle grazing, and pesticide use (Hughes 1999).

Columbia Spotted Frog

The Columbia spotted frog (*Rana luteiventris*) belongs to the Class Amphibia and Family Ranidae (True Frogs). It was long considered the same species as the Oregon spotted frog (*R. pretiosa*), but genetic studies have differentiated the two as separate species. The two species are morphologically indistinguishable but have nonoverlapping ranges, a characteristic that facilitates field identification (Green et al. 1997). Oregon spotted frogs are found in south-central Washington, the Cascade Mountains of Oregon, and extreme southwestern British Columbia (Reaser 2000). The range of Columbia spotted frogs extends northward from scattered, isolated populations in Nevada and Utah through parts of eastern Oregon, central and northern Idaho, northwestern Wyoming, eastern Washington, western Montana, and much of British Columbia to its northernmost extent in southwestern Yukon (Green et al. 1997, Reaser 2000). Spotted frogs have been delineated into four “populations” (Bos and Sites 2001), and the Bruneau subbasin is within the Great Basin population, comprised of eastern Oregon, southwestern Idaho, and Nevada.

Spotted frogs were detected on the BLM's Bruneau Resource Area (Upper Owyhee subbasin) during surveys in 1993. These surveys were conducted to assess the abundance and distribution of spotted frogs in the southern portion of the resource area (Munger et al. 1994). Spotted frog surveys were conducted on the BLM Jarbidge Resource Area in 1994 (McDonald and Marsh 1995) and both the Jarbidge and Snake River Resource Areas in 1995 (McDonald 1996). Only one site of seven surveyed during 1994 was located in the Bruneau subbasin, at the East Fork Jarbidge River at Murphy Hot Springs (McDonald and Marsh 1995). The survey site included two 1-km stretches of river and adjacent wetlands above and below the town. The three sites of the Jarbidge Resource Area were east of the Bruneau subbasin (Middle Snake subbasin). Despite sightings in northeastern Nevada around the same time of the surveys, no spotted frogs were detected in these survey efforts. For the Bruneau subbasin, the IDCDC has one record of a Columbia spotted frog occurrence in the headwaters of Marys Creek (IDCDC 2001). Surveys conducted by the BLM in Nevada documented the species in the headwaters of Sheep, Meadow, Corral, and Copper creeks (Figure 32) (BLM, Elko Resource Area unpublished GIS data).

Two adult Columbia spotted frogs were present in Salmon Falls Creek in 1994, and other observations of spotted frog in Idaho south of the Snake River were from southwestern Owyhee County. Habitat of the Owyhee Mountain subpopulation tends to be near permanent, slow-moving water that has little vegetation and that has warmer water temperatures than non-frog sites do (Munger et al. 1997). During this investigation, a modest negative association was detected between recent grazing and spotted frog presence. Movement between habitats during spring breeding, summer foraging, or winter hibernation is likely along riparian corridors (Engle and Munger 1998). Although spotted frogs are capable of long movements (*e.g.*, 676 m), most resightings of a population in the Owyhee Mountains were within 10 meters of the original capture site (Engle and Munger 1998). Females have exhibited site fidelity to their natal ponds in the Owyhee Mountains (Engle and Munger 2003). Survival is largely influenced by environmental factors, predators (*e.g.*, exotic trout), and cattle (Reaser 2000). Heavy fall grazing resulted in decreased survival for migrating subadult and female spotted frogs in the Owyhee Mountains due to the lack of vegetative cover and the reduced water corridor (Engle and Munger 2003). Numerous researchers have asserted that amphibian populations worldwide are undergoing population declines (see Munger et al. 1996). No long-term data are available on population numbers of spotted frogs in the Bruneau subbasin, but studies and field surveys have been underway to establish presence or absence and long-term monitoring of spotted frogs in the Owyhee Mountains (Gerber et al. 1997, Engle and Munger 2003). An assessment of population structure of spotted frogs in the Owyhee Mountains revealed a downward trend in population numbers from 1997 through 1999 (Engle and Munger 2003). In Nevada, surveys from 1994 through 1996 indicated that 54% of the sites known to have spotted frogs before 1993 no longer supported spotted frogs (Reaser 1997).

The Great Basin population of the Columbia spotted frog is a candidate for listing under the ESA. As of February 2002, publication of a proposal to list had been precluded by other higher-priority listing actions. The CDC has classified the spotted frog as S2S3, because it is considered rare or uncommon in the state and uncertainty exists concerning its imperilment (IDCDC 2003). A conservation agreement between multiple partners has been signed in Nevada and covers this northeast Nevada (Elko County) subpopulation of Columbia spotted frogs (September 2003).

Threats to Columbia spotted frogs include grazing, spring development, road and trail construction, water diversion, fire in riparian corridors, pesticides, disease, and non-native fish.

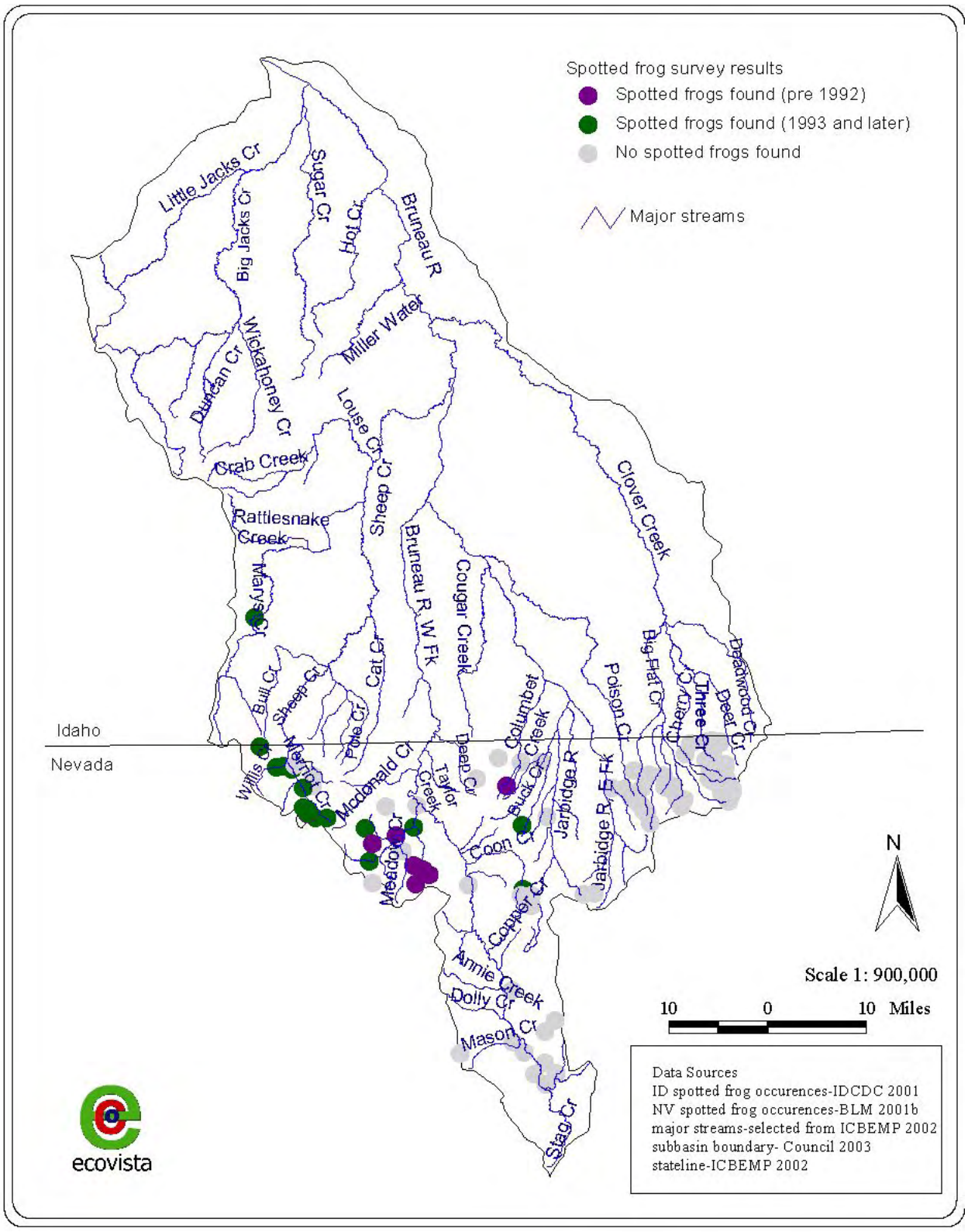

Figure 32. Spotted frog survey records for the southern portion of the Bruneau subbasin.

2.4.2.2 Terrestrial Focal Species by Habitat Type

Upland Aspen Forest

Northern Goshawk

The northern goshawk is a forest raptor found in boreal and temperate habitats of North America. Although southwest Idaho is not included in the bird's western United States breeding range, the goshawk does occupy insular mountain ranges of Nevada (Squires and Reynolds 1997). Populations have also been documented on the Sawtooth National Forest just east of the Bruneau River vicinity (Marilyn Hemker, USFWS, personal communication, January 2004). Some birds will remain residents in their breeding range throughout the winter, but others have been documented moving outside of these areas. Wintering habitat preferences may be dictated by prey abundance (Squires and Reynolds 1997). Two subspecies, *A. g. atricapillus* and *A. g. laingi*, are recognized in North America by the American Ornithologists' Union (1957), with *A. g. atricapillus* breeding in Idaho and Nevada. Interest in falconry has spread across North America since World War II, and goshawks are valued by modern-day falconers because they are aggressive and will hunt a variety of prey (Squires and Reynolds 1997).

Goshawks nest in most forest types found throughout their geographic range, and habitat characteristics vary from territory to territory, depending on availability. At large spatial scales, the goshawk is considered a habitat generalist, but nest structures are usually found in mature forest stands having high (60–90%) canopy closure near the bottom of moderate hill slopes with sparse ground cover (Squires and Reynolds 1997). In Nevada, goshawks nest in high-elevation, shrub-steppe habitat in small, scattered mature aspen stands along drainages (Younk and Bechard 1994). The mean elevation of nest stands was 2119 m (range 1975–2386 m) and averaged 60 years of age based on core samples. Nests in this area are usually in large forked aspen trees (mean dbh = 29 ± 3.8 [SE] cm) (Younk and Bechard 1994) and constructed at the lower one-third of the tree or just below the forest canopy (Squires and Reynolds 1997). The proportion of subadult and young adult nesting females varies among populations, but a high frequency of nesting subadults is believed to indicate an increasing population and vice versa (Squires and Reynolds 1997). Egg laying usually begins by early May (Younk and Bechard 1994), and typically only one brood per season is produced (Squires and Reynolds 1997). Replacement clutches for lost eggs have been documented but are considered uncommon. Clutches are usually two to four eggs, rarely one or five. The average clutch size for North America is 2.7 eggs (± 0.88 SD). Nest success is variable (usually between 80 and 94%), and most populations usually produce between 2.0 and 2.8 fledglings per successful nest. Lifetime reproductive success is unknown and difficult to estimate due to the secretive nature of adults and their sometimes extensive movements to alternate nests (Squires and Reynolds 1997).

Goshawks have few natural predators, and the maximum documented lifespan is 11 years. Mortality risk is believed to be highest during the first year after dispersal. Exposure to cold and rain contributes to egg and chick mortality. Goshawks will feed on a variety of prey and are considered opportunists. Prey items include squirrels, rabbits and hares, large passerines, woodpeckers, game birds, and corvids, along with occasional reptiles and insects. Prey selection and switching may be influenced by season and availability (Squires and Reynolds 1997). For instance, in Nevada, more birds were consumed when Belding's ground squirrels began estivation. Foraging habitat ranges from open sagebrush-steppe to dense forests. Goshawks in

Nevada were documented foraging in open sagebrush and perching along edges of aspen groves (Younk and Bechard 1994).

Densities of breeding pairs are low because goshawks are top-level predators, and extensive nest searching hampers the ability to calculate accurate population estimates (Squires and Reynolds 1997). Goshawks have been observed in the southern portion of the Jarbidge Resource Area in stands of aspen (Klott 1996). Nesting goshawks have been found in small isolated aspen/conifer stands throughout the West Fork Bruneau River in the Humboldt-Toiyabe National Forest (USFS 1995). Geographic and temporal trends are poorly understood, but interpretations are probably confounded by prey availability and severe weather. No BBS trend data are available for goshawks in Idaho or Nevada (Sauer et al. 2003). BBS western regional data show a population change of 1.5% per year ($P = 0.5$, $n = 44$ routes) from 1966 to 2002. Goshawks are classified as a species of special concern in Idaho, protected in Nevada, sensitive type 3 by the BLM, and sensitive by the USFS Region 4 (IDCDC 2003). The Natural Heritage Network ranking of G5S4 for the species indicates that populations are secure rangewide but that there is cause for concern over the long term in Idaho.

Timber harvest is a primary threat to nesting populations, but responses of goshawks to these practices are unknown (Squires and Reynolds 1997). Understory cover is decreased through grazing and shading by livestock during the hot summer months (Younk and Bechard 1994). Furthermore, grazing has been identified as a factor jeopardizing the northern goshawk in the Southwest (Fleischner 1994).

Shrub-steppe

Sage Grouse

The sage grouse (*Centrocercus urophasianus*) was originally distributed across 16 western states in the United States and 3 provinces in southwestern Canada. Reductions of populations have occurred throughout the bird's range, and it is currently found in 2 Canadian provinces and 11 western states (Storch 2000). Sage grouse populations are sympatric with sagebrush (*Artemisia* spp.) habitats (Connelly et al. 2000). In Idaho, sage grouse are present in the southern half of the state. Sage grouse habitat and potential restoration areas have been identified in the Bruneau subbasin (Figure 33). The sage grouse was an important game species for Native Americans and European settlers and continues to be valued for hunting and food. Because of the stunning display of sage grouse on their strutting grounds, they have become popular with naturalists and bird watchers (Storch 2000).

Sage grouse populations may display differing annual migratory patterns that range from moving seasonally between distinct areas to being completely nonmigratory. There is large variability in seasonal and annual movements, depending on the migratory patterns of the population, but all sage grouse have high fidelity to seasonal ranges, with females being philopatric or reproducing at the site of their birth. Sage grouse feed exclusively on sagebrush during the winter and also forage on insects and herbs in the summer (Connelly et al. 2000). Insects are an important dietary component for young chicks. Compared with other grouse species, sage grouse typically have higher survival rates and lower productivity. Sage grouse perform breeding behavior displays on traditional grounds, or leks, which are open but adjacent to sagebrush habitats

(Storch 2000). Characteristics of sagebrush rangeland needed for productive sage grouse populations were outlined by Connelly et al. (2000) (Table 27).

Table 27. Vegetation characteristics required for productive sage grouse populations.

	Breeding		Brood rearing		Winter	
	Height (cm)	**Canopy (%)**	**Height (cm)**	**Canopy (%)**	**Height (cm)**	**Canopy (%)**
Mesic sites[a]						
Sagebrush	40-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18[c]	≥25[d]	variable	>15	N/A	N/A
Arid sites[a]						
Sagebrush	30-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18[c]	≥15	variable	>15	N/A	N/A
Area[b]	>80		>40		>80	

[a] Mesic and arid sites should be defined on a local basis; annual precipitation, herbaceous understory, and soils should be considered

[b] Percentage of seasonal habitat needed with indicated conditions

[c] Measured as "droop height"; the highest naturally growing portion of the plant

[d] Coverage should exceed 15% for perennial grasses and 10% for forbs; values should be substantially greater if most sagebrush has a growth form that provides little lateral cover

[e] Values for height and canopy coverage are for shrubs exposed above snow

Sage grouse numbers have been declining throughout the 20th century. Between 1985 and 1994, populations declined by an average of 33%. Annual harvests during the late 1970s were reported at approximately 280,000 birds, and by 1998, the rangewide breeding population was estimated at 140,000 birds (Storch 2000). In Idaho, BBS data show populations declining at 28.3% per year (P = 0.01, n = 4 routes) from 1980 to 2002 (Sauer et al. 2003). Lek counts have been conducted in the Bruneau subbasin and documented active leks (1995–2003) are presented in Figure 34. Counts in the Jarbidge Resource Area indicate a decline in the number of males per lek since 1980 (JSGWG 2002). By 1997, fewer than one-third of the recorded lek locations (n = 120) were still active, and harvest records from a check station near Salmon Falls Creek Dam showed a decline in harvest by more than 80% since the 1950s (Klott 1997). A radio-telemetry study conducted in south-central Owyhee County and extreme north-central Elko County from 1999 through 2001 assessed sage grouse survival, productivity, habitat use, and the efficacy of population monitoring by utilizing fecal dropping counts. The 300,000-ha study area was mostly within the Bruneau subbasin (Wik 2002). Annual survival rates of males (0.54, 1999–2000; 0.67, 2000–2001) (Wik 2002) were similar to those of previous studies in Idaho (0.60, Connelly et al. 1994). Seasonal rates of male survival did not differ between seasons, indicating that lek displays and hunting didn't increase mortality pressure for males during the study. Adult female annual survival (0.58, 1999–2000; 0.42, 2000–2001) (Wik 2002) was within the range previously reported by Connelly et al. (1994). Many of the adult females and juveniles concentrated their habitat use near moist meadows and springs or irrigated croplands, which is

where many hunters focused their efforts. As a result, 2.1 to 3.8 times more adult females than adult males were harvested during this study (Wik 2002). Connelly et al. (2000) recommended that no more than 10% of the fall population be hunted and that no hunting should occur in populations with a breeding population of less than or equal to 300. Although no population estimates were calculated in the Owyhee County study, harvest estimates ranged from 2 to 16%. Mean clutch size was 6.5 (Wik 2002), which was at the low end of averages (6.6–9.1) reported from other studies of sage grouse (Schroeder et al. 1999).

Productivity at seven weeks was measured in the Owyhee County study by visual and flush counts (0.43 chicks/hen, 2000; 0.66 chicks/hen, 2001) (Wik 2002) and wing barrel counts from hunter returns (0.91 juveniles/hen, 2000; 1.12 juveniles/hen, 2001) (IDFG unpublished data from Wik [2002]). Long-term harvest data on the Jarbidge Resource Area provided an average of 1.96 chicks/hen from 1961 through 2000 (JSGWG 2002). Estimates from both areas and methodologies are below the 2.25 chicks/hen considered necessary to maintain a stable or increasing population (Connelly et al. 2000). Intensive winter habitat use by sage grouse during the Owyhee County study was not evaluated, but birds were observed moving between distinct spring and summer ranges, and a few birds exhibited nonmigratory behavior or remained in the same area during both spring and summer (Wik 2002). A second study was initiated in 2000 by the BLM and IDFG to determine sage grouse use of fragmented habitats. The study area lies between Clover Creek and the Jarbidge River and from Clover Butte to the Nevada state line. A PhD student will examine sagebrush patch size selection, nest site selection, seasonal movements, and seasonal habitat use in fragmented versus continuous habitat. The study is expected to be complete in 2004 (Commons 2001).

Currently, the sage grouse is managed as a game species and is not afforded federal protection under the ESA, but seven petitions have been submitted to the USFWS requesting listing of distinct populations and of the entire species collectively (NDOW 2003b). Because research has concluded that there is no genetic evidence to support the delineation of “eastern” and “western” subspecies of sage grouse (Benedict et al. 2003), the “eastern” subspecies was not eligible for listing as endangered under the ESA (January 5, 2004). In a recent 90-day finding for petitions to list the sage grouse as threatened or endangered, the U. S. Fish and Wildlife Service found that the petitions and additional information they have in their files suggest the listing of sage grouse may be warranted (Federal Register Vol. 69, No. 77, April 21, 2004), and a status review is being initiated. Great Basin populations of sage grouse are included in *Birds of Conservation Concern 2002* (USFWS 2002) as a priority for conservation actions. The Idaho BLM classifies sage grouse as a type 2 sensitive species (BLM 2002).

Principle threats to sage grouse include small population size, lack of genetic diversity, habitat degredation, habitat loss, weather, and pesticides and herbicides (Connelly et al. 2000, Storch 2000).

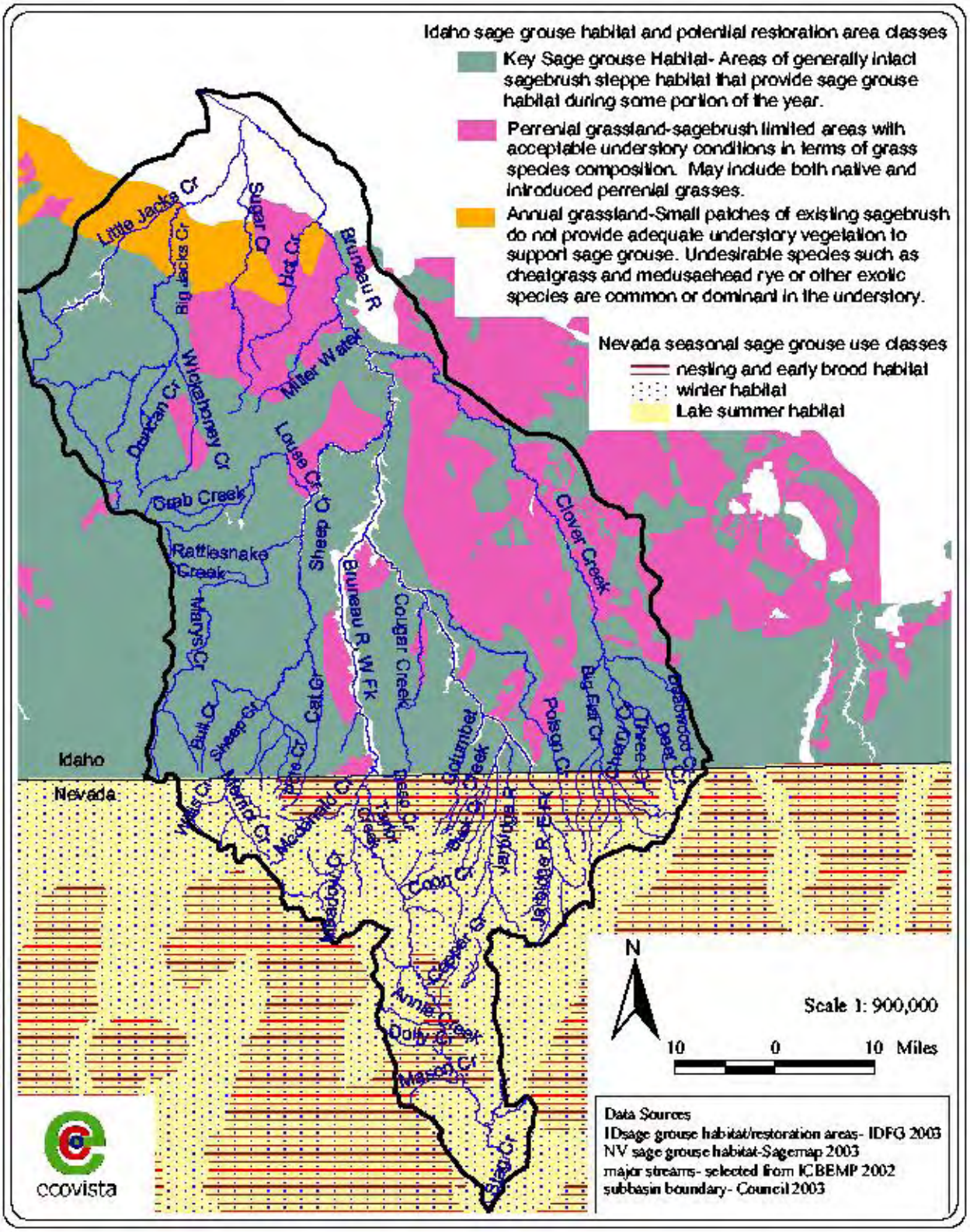

Figure 33. Idaho sage grouse habitat and potential restoration classes.

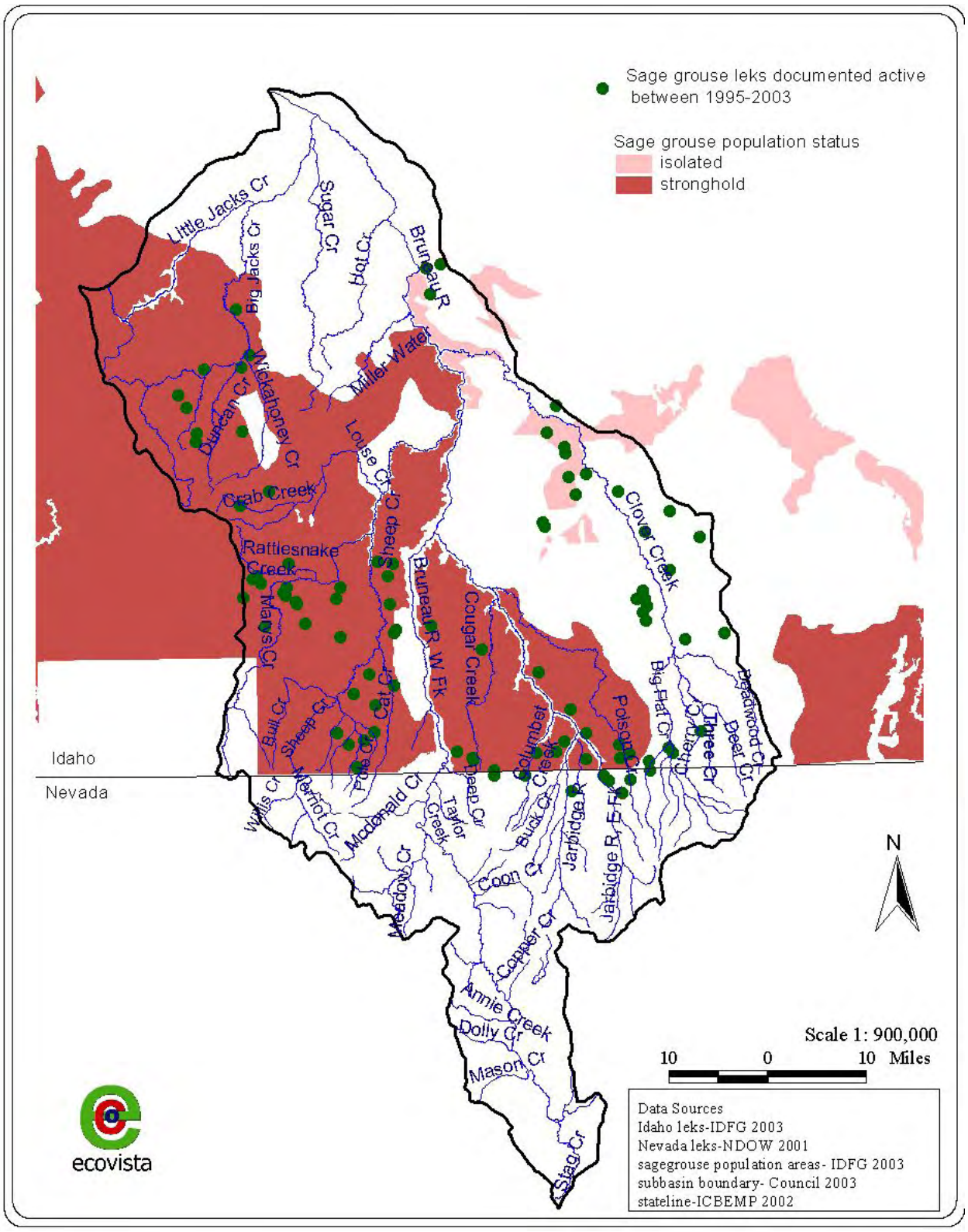

Figure 34. Documented active sage grouse leks in Idaho from 1995–2003.

Pygmy Rabbit

The pygmy rabbit (*Brachylagus idahoensis*) is in the order Lagomorpha and with jackrabbits and hares (*Lepus* spp.) plus nine other rabbit genera forms the family Leporidae. Lagomorphs serve as the base of many predator–prey systems and can support communities of small to medium-sized predators (Chapman and Flux 1990). The pygmy rabbit has the smallest body size of any North American rabbit species (Dobler and Dixon 1990). The range of the pygmy rabbit includes most of the Great Basin and some adjacent intermountain areas of the western United States, plus an isolated population in southeastern Washington. Within the outlined range, the rabbit is found primarily on plains dominated by big sagebrush (*Artemisia tridentata*) and on alluvial fans with tall, dense clumps of plants (Green and Flinders 1980). Green and Flinders (1980) speculated that dense stands of big sagebrush along riparian areas, fence lines, and borrow ditches next to roadways might serve as dispersal corridors for the rabbits. Klott (1996) reported that, for the Jarbidge Resource Area, the pygmy rabbit had been observed only northwest of Signal Butte and added that much of the suitable habitat has been lost to land conversion to crested wheatgrass or annual grassland resulting from wildfire.

Pygmy rabbits are unique among North American rabbits for constructing and using extensive burrow systems (Green and Flinders 1980). Burrows are usually located under big sagebrush and may have multiple entrances (Green and Flinders 1980, Dobler and Dixon 1990). Soil structure and topography are thought to be key components of burrow site selection. Rabbit movements as far as 2.6 km have been documented, but it is thought that pygmy rabbits retract their movements and stay closer to their burrow system during the winter. Pygmy rabbits feed primarily on big sagebrush, which may make up to 99% of their winter diet (Dobler and Dixon 1990). Grasses become a larger part (30–40%) of the diet in mid to late summer (Green and Flinders 1980). A study in eastern Idaho found that annual mortality for adults was as high as 88% (Wilde 1978). Predators of pygmy rabbits include weasels (*Mustela spp.*), coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), owls (*Bubo spp.*), northern harriers (*Circus cyaneus*), bobcats (*Felis rufus*), and badgers (*Taxidea taxus*) (Green and Flinders 1980). In 2002, Roberts (2003) included the BLM's Owyhee and Jarbidge FO areas in an extensive survey for pygmy rabbits. Prior to this study, the IDCDC database contained seven old pygmy rabbit records from the Owyhee and Jarbidge FO areas. Roberts (2003) found three additional burrow sites in the Bruneau River drainage, Owyhee FO, and one near Salmon Falls Reservoir, Jarbidge FO, and stated that the most likely place to find more rabbits of this "subpopulation" is in the remote areas adjacent to the Nevada border. An additional site that was recently active within the last year or two was located within the Owyhee FO area. Roberts contends that the Owyhee and Jarbidge FO areas still contain suitable pygmy rabbit habitat and connectivity is still rated as fair to good. This area should be considered the second major subpopulation of Idaho pygmy rabbits (Roberts 2003). In a habitat modeling exercise (Figure 35), much of the southern two-thirds of the BLM Jarbidge FO area contained habitat mapped as higher priority for surveys, with some of the largest tracts of highest priority habitat in the southern region being along the Nevada border. Several high priority areas were also identified in the southwest portion of the BLM Owyhee FO area, and areas west of the Bruneau River, southeast of Grasmere Reservoir, and along the Nevada and Oregon borders were included in the survey recommendations for this area (Rachlow and Svancara 2003). This model is coarse grain and since pygmy rabbits likely select habitat on a finer scale, it over-predicts potential habitat (Janet Rachlow, UI, personal communication February 2004). With this caveat in mind, this model should serve as a guide in

survey efforts but not as an explicit source of pygmy rabbit habitat in the Bruneau subbasin. Pygmy rabbits appear to have a very patchy distribution across their remaining range (Janet Rachlow, UI, personal communication February 2004), and will probably exhibit the same pattern of distribution across the Bruneau subbasin.

The isolated population of pygmy rabbits in Washington is considered a DPS by the USFWS. It is federally protected under the ESA and was designated as endangered on March 5, 2003 (USFWS 2003). On April 1, 2003, there was a petition filed to list the remaining pygmy rabbit populations that occur in the coterminous Intermountain and Great Basin region as threatened or endangered under the ESA. As of December 2003, no determination has been made by the USFWS. Nevada classifies the pygmy rabbit as a game species (NDOW 2003b), and Idaho has managed the pygmy rabbit as a game species but also classifies it as a species of concern (IDCDC 2003). The rabbit is considered globally secure but with cause for concern over the long term (G4); it is uncommon but not imperiled in Idaho (S3) (IDCDC 2003).

Threats to pygmy rabbits include overgrazing and habitat fragmentation, resulting in small populations. Pygmy rabbits were believed to have a continuous distribution in the past, but many populations have now been isolated as a result of human activities (Dobler and Dixon 1990).

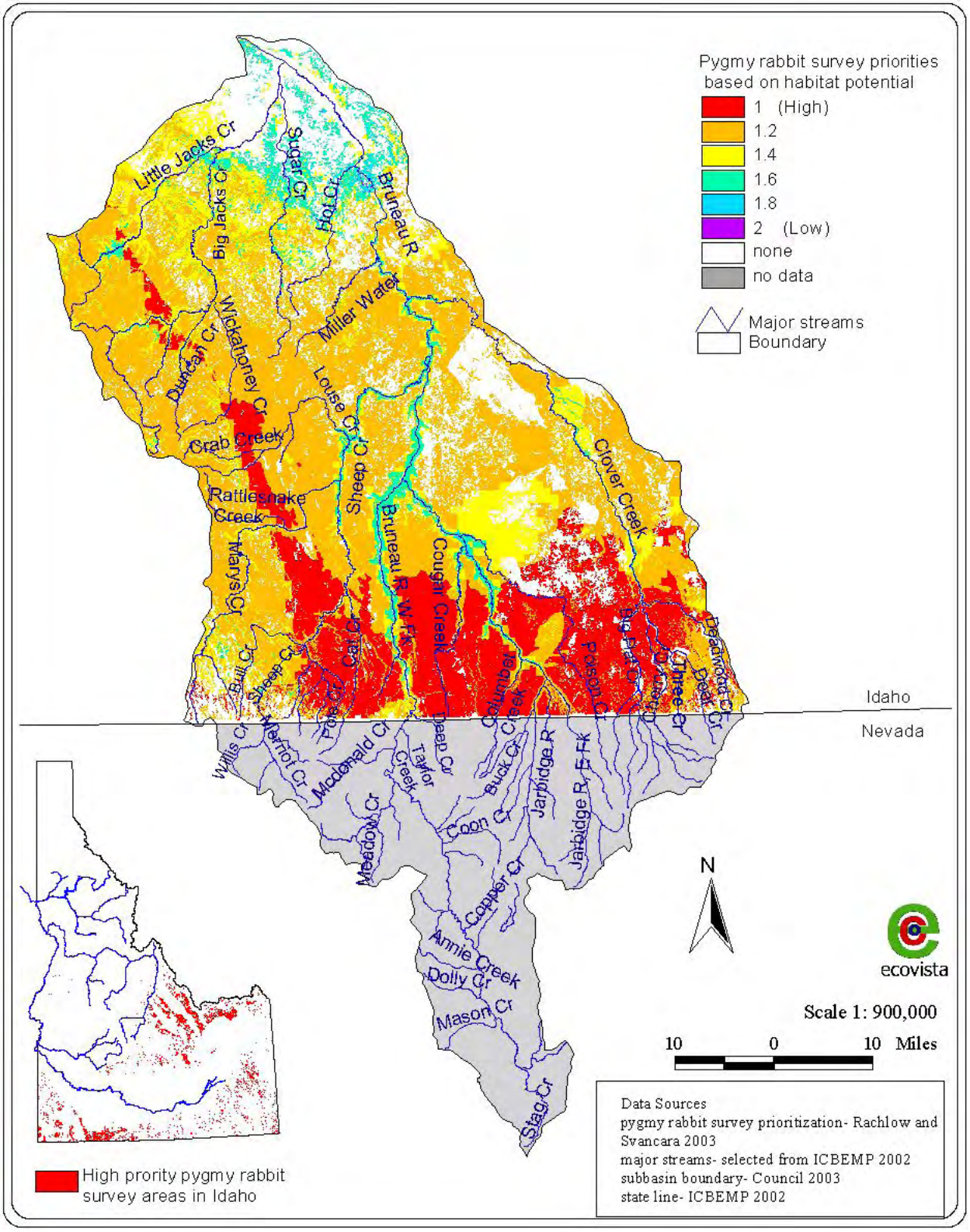

Figure 35. High priority survey areas for pygmy rabbits in the Bruneau subbasin.

Spotted Bat

The spotted bat (*Euderma maculatum*) belongs to the family Vespertilionidae and is the single species of the genus *Euderma*, which is known only from western North America. Spotted bats have been recorded in a variety of habitats, but most collections have been in desert terrain. Spotted bats are distributed across central western North America from southern British Columbia to northern Mexico (Watkins 1977). The spotted bat is a rare bat species in the United States (Barbour and Davis 1969), and populations are believed to be concentrated in a few areas across the bat's range, including the Big Bend area of Texas, northern New Mexico, southwestern Utah, and southern British Columbia (Fenton et al. 1987).

Analyses of spotted bat stomachs and scats revealed noctuid moths as the primary food source, and some researchers have found evidence that spotted bats will take June beetles. Avian predators include kestrels, peregrine falcons, and red-tailed hawks. Typically, spotted bats seek refuge in crevices along cliffs, loose rocks, or boulders. Spotted bats are notoriously difficult to capture because they roost solitarily within cracks high on cliff faces and forage high in the air column (usually > 10 m) (Watkins 1977). Spotted bats will travel long distances, if necessary, between high-cliff roost sites to meadows to forage. On several occasions, a radio-marked lactating female on the North Kaibab Ranger District in Arizona was documented traveling 38.5 km (each way) from her day roost site to a meadow in which she foraged (Rabe et al. 1998).

A survey of bat species of the Bruneau/Jarbidge river area recorded spotted bats throughout the study area, with the highest numbers detected in the Marys Creek vicinity, which is west-centrally located within the Bruneau subbasin. This study found spotted bats flying over all habitat types, with heavy foraging over sagebrush uplands adjacent to riparian areas (Doering and Keller 1998). Although the study did not address population demographics, the results point to the Bruneau/Jarbidge river area as another important population center for the species; Doering and Keller detected spotted bats at 5 of their 11 sampling localities (1998), a site percentage comparable to the highest detection rates reported elsewhere in the literature (Fenton et al. 1987). Perkins and Peterson (1997) conducted other surveys for bats in southwest Idaho in the juniper forests of the Owyhee uplands, northwest of the Bruneau subbasin. The study area was on BLM lands in Owyhee County, and efforts concentrated on the water sources of the Owyhee Uplands Byway. Perkins and Peterson concluded that bat populations in general in the areas surveyed were not numerous and species diversity was low. They detected no spotted bats during their sampling efforts (1997), a result that may reemphasize the importance of the Bruneau/Jarbidge river area as a population center for spotted bats.

The spotted bat is ranked as apparently secure but with cause for concern over the long term (G4); it is classified as imperiled in Idaho because of its rarity (S2), as sensitive by the USFS Region 4, and as moderately endangered by the BLM (IDCDC 2003). Although little is known about the spotted bat, some researchers believe that this situation more likely reflects the bat's elusive nature than the bat's actual status (Bat Conservation International, Inc. 2003).

Limiting factors for spotted bats are probably availability of prey (large moths) and roosting habitats (cliffs).

Bighorn Sheep

There are two recognized species of North American mountain sheep: the bighorn (*Ovis canadensis*) and the thinhorn (*Ovis dalli*). The bighorn sheep comprises six extant subspecies that include four desert races (*O. c. nelsoni, O. c. mexicana, O. c. weemsi,* and *O. c. cremnobates*), the Rocky Mountain bighorn (*O. c. canadensis*), and the California bighorn (*O. c. californiana*) (Shackleton 1985, Valdez and Krausman 1999). Bighorns inhabit grasslands (Cowan 1940) having accessible cliffs and rock bluffs, and these areas are typically associated with mountains, foothills, or major river canyons (Shackleton 1985). Native Americans valued bighorn sheep for food and clothing; early settlers valued them for food. Today they are considered a major big game trophy species (Shackleton 1985). Bighorn sheep hunting permits are coveted as the most desirable permits offered by the state (Crenshaw et al. 2003).

The range of California bighorns was originally from British Columbia to California and extended eastward into Idaho and Nevada (Cowan 1940, Hall 1946). By the early 20th centuray, they were considered extirpated from Oregon, Nevada, and Idaho (Bailey 1936, Cowan 1940, Hall 1946). The last confirmed sighting of a native bighorn sheep in Owyhee County was in 1927 (Hanna and Rath 1976). The Bruneau subbasin now supports a reintroduced population of the California bighorn subspecies, with sheep distributed throughout the Jarbidge and West Fork Bruneau river canyons upstream from their confluence. Observations of sheep have been made as far north in the Bruneau Canyon as Cave Draw, with occasional sightings in Sheep Creek and Marys Creek drainages. The IDFG initiated a program to reestablish bighorn sheep populations in Owyhee County in 1963 (Crenshaw et al. 2003). Twelve sheep from British Columbia were released into Rattlesnake Creek, a tributary of Little Jacks Creek in 1967 (Hanna and Rath 1976). A second release occurred in 1988 into Big Jacks Creek (Bodie et al. 1990), and transplants have continued since these initial efforts (Toweill 2001). From 1982 through 1993, Nevada (NDOW) and Idaho (IDFG) released 93 bighorn sheep into portions of the Jarbidge and Bruneau river drainages. The sheep released by Nevada in 1982 and 1984 dispersed north to the Jarbidge River canyon in Idaho. Other IDFG release sites include near the confluence of the Jarbidge and West Fork Bruneau rivers, Dorsey Creek, and near Black Rock Pocket on the West Fork Bruneau River (Crenshaw et al. 2003).

A 1994 BLM helicopter survey found that the best bighorn sheep habitat along the Bruneau and Jarbidge rivers in Idaho occurred near the Nevada state line (Taylor et al. 1998). Bighorn sheep occupied the eight best habitats in this area. Taylor et al. (1998) found several adjacent habitat blocks near the Bruneau/Jarbidge river confluence, areas that separately did not score well for quality sheep habitat but that together complemented each other to provide necessary habitat components. Together, habitat blocks at the confluence of the Bruneau and Jarbidge rivers, Long Draw Creek, Cedar Tree Creek, Lookout Creek, and Cougar/Poison creeks make up approximately 24,000 acres of suitable habitat, enough to support a population of 400 bighorn sheep.

California bighorn sheep occupy approximately 29,000 acres of habitat in the Little Jacks/Shoofly creek areas in the northwest portion of the subbasin. The steep rocky slopes and cliffs provide escape, bedding, and lambing habitats, and the plateaus provide forage. Little Jacks Creek is considered suitable to maintain a population of 125 animals and is supplemented in habitat by the adjacent Shoofly drainage. Human disturbance limits the use of the northern portion of the Little Jacks Creek Wilderness Study Area. Big Jacks Creek contains an additional

30,000 acres of potential habitat. Duncan Creek, a tributary to Big Jacks Creek, contains about 4,500 acres of potential bighorn habitat, including important relic areas of relatively undisturbed sagebrush-steppe vegetation.

Sheep may move between seasonal ranges, using lower elevations in the fall or winter and higher areas during spring and summer. Yearly habitat use and movements may vary between populations, with distances up to 48 km reported in the literature (Shackleton 1985). California bighorns in Owyhee County were documented consuming shrubs and grasses during the winter and adding forbs to the diet in summer (Drewek 1970). Although California bighorns live in groups, ewes and rams are typically segregated and interact only during the breeding season (Valdez and Krausman 1999). Predators of bighorns include coyotes (*C. latrans*), eagles (*Aquila chrysaetos*), bobcats (*Felis canadensis*), cougars (*F. concolor*), and wolverines (*Gulo gulo*) (Shackleton 1985). The main predator of bighorn sheep documented in the Bruneau subbasin has been the cougar (Crenshaw et al. 2003; Regan Berkely, University of Idaho, personal communication, September 2003).

The California bighorn sheep is managed as a game species, and permits to hunt bighorn in the Idaho portion of the subbasin were first issued in 1975. The Heritage Network ranks the California bighorn sheep as globally secure but with cause for long-term concern because this subspecies may be vulnerable to extinction (G4T1). In Idaho, California bighorns are rare but not considered imperiled (S3) (IDCDC 2003). From 1980 through 1992, Idaho's California bighorn sheep populations provided a source for numerous reintroduction projects, with 413 sheep being trapped and relocated to other locations in Idaho, Nevada, Oregon, and North Dakota. Due to precipitous declines of the populations in the East Fork Owyhee River and Jacks Creek drainages, annual trapping and transplanting operations were discontinued in 1994. Surveys from 1996 through 2002 indicated that sheep numbers have not increased to pre-1994 levels. Surveys in 1998 and 2000 indicated a downturn in the Jarbidge/Bruneau river population, and the hunting season was thereafter closed for 2001 and 2002. In 2002 and 2003, aerial surveys indicated a promising upward trend, resulting in the authorization of two permits for 2003 and 2004 (Crenshaw et al. 2003).

Limiting factors for bighorn sheep include habitat degredation, disease, predation, and competition with domestic sheep (Klott 1996).

Slickspot Peppergrass

A member of the mustard family, slickspot peppergrass (*Lepidium papilliferum*) is endemic to the lower Snake River Plain and the foothill ridges adjacent to the plain in southern Idaho. It is a small herbaceous plant that produces white flowers and has two life cycle morphs: annuals and biennials (Moseley 1994). Slickspot peppergrass grows in low-lying patches of big sagebrush habitats with native bunchgrasses, several kinds of wildflowers, soil mosses, and lichens in the surrounding habitat. Typically, nonnative weeds are uncommon in slickspot peppergrass habitat that is considered to be in good condition. Soils on slickspot peppergrass microsites have higher salt and clay concentrations (natric) than surrounding sagebrush habitat, a characteristic that facilitates moisture retention (Quinney 1998). Slickspot peppergrass plants are restricted to these "slick spot" habitats, suggesting that soil edaphic factors determine the species' distribution on the landscape (Fisher et al. 1996).

Spring precipitation is an important factor determining how many slickspot peppergrass plants are present in an area. Because the seeds can remain "dormant," but viable, in the soil for years (≥ 4), protection of known sites is important for maintaining populations, even if individuals are not present at the time of survey or planned activity (Quinney 1998). A study of three geographically distinct populations of slickspot peppergrass determined that several soil series found in the plant's habitat were natric or occurred near to natric soil series. Because slick spots are too small to be delineated on soil survey maps, mapped natric areas can be used to delineate potential slickspot peppergrass habitat (Fisher et al. 1996).

The IDCDC collaborated with the Idaho Army National Guard to develop a Habitat Integrity Index (HII) to facilite assessment and long-term monitoring of slickspot peppergrass across its range (Mancuso et al. 1998). This program was designed to monitor transects of known occurrences. The Inside Desert area is considered to be part of the Juniper Butte metapopulation and, by the end of the field season in 1999, contained six land unit areas being monitored for HII (Mancuso 2000). Rangewide, most known locations and unsurveyed suitable habitat of slickspot peppergrass are on BLM lands. Surveys by the BLM within the Bruneau subbasin include an effort between the BLM's Lower Snake River District and the IDCDC to conduct a systematic field investigation for slickspot peppergrass in the Bruneau Desert area (Mancuso and Cooke 2001) (Figure 36). Survey routes covered approximately 1,945 acres (54% of total effort) within the northeast portion of the subbasin. Although many of the areas surveyed in 2001 contained suitable-appearing habitat for slickspot peppergrass, none was found during the survey. Mancuso and Cooke recommended that remnant stands of sagebrush-steppe habitat deserve consideration as conservation targets. To facilitate management of slickspot peppergrass across its range, 12 management areas were outlined in a Candidate Conservation Agreement. Conservation measures for each management area were designated to "eliminate, reduce or mitigate the impacts of site specific activities and threats and to maintain or restore the sagebrush-steppe habitat" (Caswell et al. 2003). The Bruneau subbasin contains two of these areas: the Jarbidge Management Area and Jarbidge/Juniper Butte Management Area.

The rate of population loss for slickspot peppergrass is highest of any plant species in Idaho (Moseley 1994). Moseley (1994) estimated a minimum rate of extirpation of two populations per decade from when it was first discovererd in 1892 but speculates that the undocumented rate has probably been much higher during the past century. Slickspot peppergrass is considered imperiled and vulnerable to extinction because of its rarity (INPS rank of GP2) (IDCDC 2003). It was proposed for listing as endangered under the ESA, but the U. S. Fish and Wildlife Service concluded there was a lack of strong evidence of negative population trend and that current conservation efforts will be effective in reducing threats below those required for listing under the Endangered Species Act (Federal Register, Vol. 69, No. 14, January 22, 2004). The Candidate Conservation Agreement between the BLM, the State of Idaho, and nongovernmental cooperators will contribute to the implementation of conservation measures for slickspot peppergrass in Idaho.

Threats to slickspot peppergrass include wildfire, wildfire management, wildfire rehabilitation, grazing and trampling by livestock, nonnative plants, land development, military training, mining, motorized vehicles, predation, fragmentation/isolation, and recreation (Quinney 1998, Caswell et al. 2003).

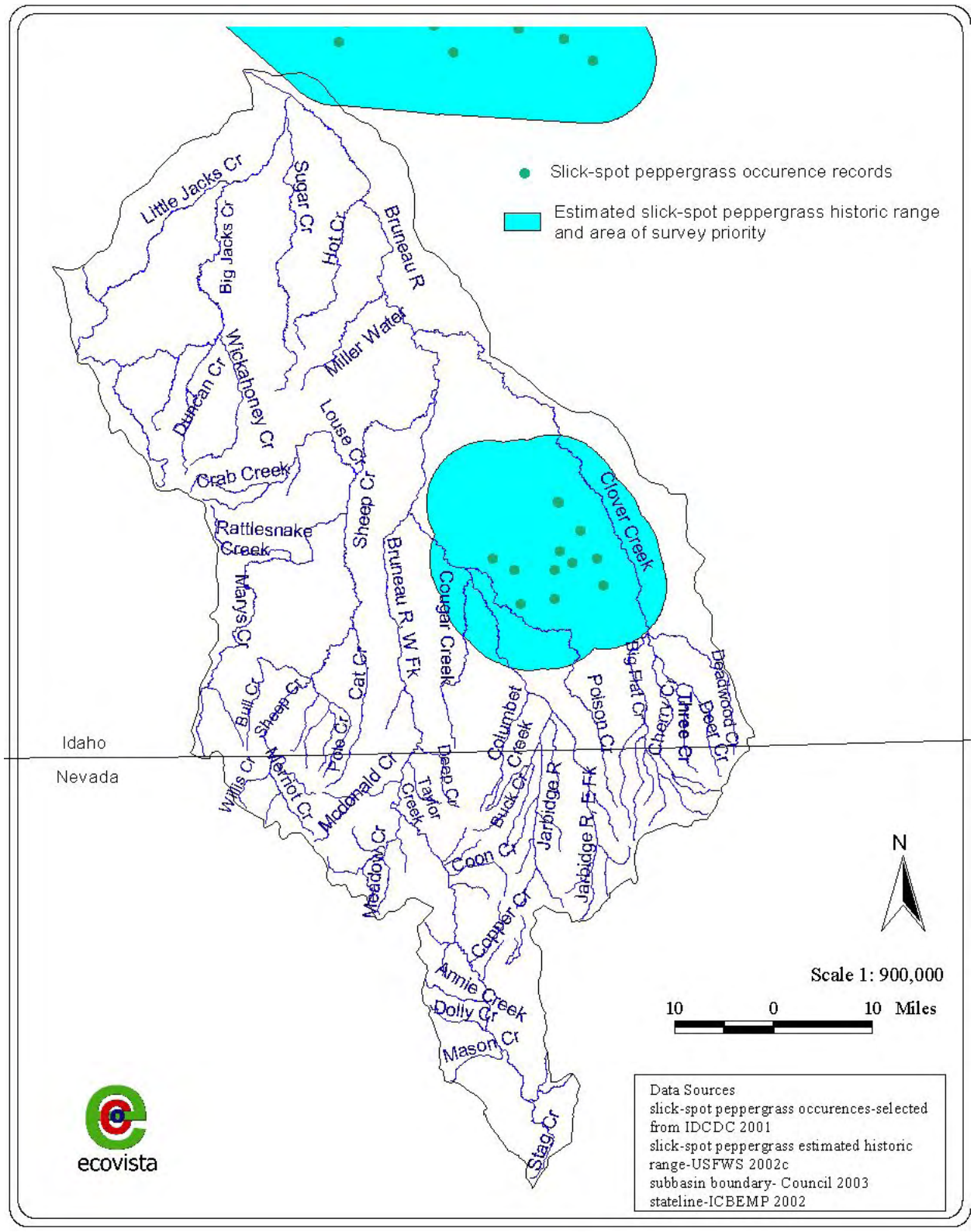

Figure 36. Area of survey priority and known occurrences of slickspot peppergrass in the Bruneau subbasin.

Riparian and Wetlands

Yellow Warbler

A medium-sized migratory wood warbler, the yellow warbler (*Dendroica petechia*) has the broadest distribution of any *Dendroica* species, making it amenable to survey and study. It is one of three groups of *Dendroica* subspecies: the yellow warbler (*aestiva* group), golden warbler (*petechia* group), and mangrove warbler (*erithachorides* group). Within the yellow warbler group, there are nine subspecies, including *D. p. morcomi*, the subspecies whose range includes the Bruneau subbasin. This subspecies breeds from the southern Yukon through interior British Columbia through eastern Washington, eastern Oregon, eastern California to western Montana, southern Wyoming, western Colorado, and northern Texas. Yellow warblers breed in North America in, roughly, the upper two-thirds of the United States from coast to coast north to the limits of shrub vegetation south of tundra in Alaska and Canada. They winter from northern Mexico to South America (mostly east of the Andes) to Amazon lowlands of northern Bolivia and Amazonian Brazil. There are some sparse winter records of yellow warblers in the United States (Lowther et al. 1999).

Yellow warblers are long-distance migrants and travel primarily at night (Lowther et al. 1999). In Oregon, birds usually begin arriving in late April, with arrivals peaking in late May (Gilligan et al. 1994). In northern Idaho, first arrivals were documented in early May (Burleigh 1972). Western populations typically begin their fall migration by late July. Spring and fall migrants are usually found in habitats most frequently used for breeding. Typical breeding habitat is willow-dominated wet, deciduous thickets. Yellow warblers are also found breeding in disturbed and early successional habitats. Winter range habitat consists of a variety of types from wooded and scrubby habitats to town plazas. Yellow warblers are primarily monogamous, with occasional polygynous matings. Because of the short time on the breeding range, only one brood is normally reared, with second broods rarely attempted. Nests are built in an upright fork of a bush, sapling, or tree, usually within a couple of meters of the ground but documented as high as 15 meters (Lowther et al. 1999). Clutches are four to five eggs. Lowther et al. (1999) reported nest success rates from British Columbia and the southwest coast of James Bay of 42% and 72%, respectively.

The yellow warbler is frequently reported as a host of the brown-headed cowbird. This situation is probably attributable to the warbler's abundance and shared range with the cowbird. Other sources of mortality may include exposure and predation. Yellow warblers may live as long as nine years in the wild (maximum reported), and an estimate of annual adult survival, based on band returns to the breeding area, is 0.53 (± 0.077 SE). Because this estimate does not account for dispersal, it is potentially biased low. Long-tailed weasels are known to prey on adults, and nest predators may include a variety of snakes, mammals, and avian species. The yellow warbler diet consists primarily of insects and other arthropods, with wild fruits taken occasionally. Food is captured by gleaning, sallying, or hovering (Lowther et al. 1999).

Yellow warblers have been documented in the BLM's Jarbidge Resource Area at Salmon Falls, Cedar, Deer, Flat, Clover, and Devil creeks and the East Fork Jarbidge River (Klott 1997). Although yellow warblers are considered "abundant and widespread" (Lowther et al. 1999), BBS results from 1966 to 2002 (Sauer et al. 2003) show a decreasing trend for Idaho (–1.6% per year, $P = 0.01$). There are three BBS routes within the Bruneau subbasin, but data are available for

only two of the sites. Trends from individual routes are presented by the BBS, but variance estimates are suspect because it is a single site analysis. The Hot Springs route (IDA-224) indicated a declining trend (–3.19% per year, $P = 0.90$), based on 11 years of data. The Humboldt National Forest route (NEV-902) estimated an increasing trend (42.9% per year, $P = 0.54$), but this percentage should be interpreted with caution because it is based on only two years of data.

The C.J. Strike HEP study results for the yellow warbler indicate that the existing scrub-shrub wetland cover type was rated as relatively good quality habitat (HSI = 0.67) (Blair 1997). Shrub canopy cover was less than what is preferred by yellow warblers, contributing to the decrease in value of the HSI from the optimal 1.0. Additionally, the shrub canopy was comprised of only 37% hydrophytic species, a factor that further reduced the HSI. The results indicate that trespass grazing is the most influential of the management actions analyzed in the HEP study (Table 28).

Table 28. Projected net changes in future average annual habitat units by cover type for the yellow warbler in Scrub-Shrub Wetland, C.J. Strike HEP study (Blair 1997). Approximately 290 HUs were present on the entire study area.

Management Action	Reach	Scrub-Shrub Wetland
		Net Change[a] (AAHU)
No change		
Reduced management funding	1	–11.60
Downstream operational impacts	4	
—Wetland cover type (28.3 acres)	4	–7.70
—Wetland cover type (40.75 acres)	4	–10.9
Acquire Simplot property	5	23.5
Downstream wetland/riparian habitat	4	18.3
Fence springs	1	0.40
Island loss/peninsula development		
—Island loss	1	–1.20
—Peninsula development	1	0.52
Trespass grazing		
—Increased trespass grazing	All	–201.93
—Reduced trespass grazing	All	92.34

[a] The "Net Change" results from the comparison of AAHUs for the subject action to the "No Change" action

Limiting factors include reduction or removal of willow habitat along riparian habitat from grazing as well as brown-headed cowbird parasitism (Lowther et al. 1999). Populations have benefited from grazing practices designed to maintain willow habitat in riparian areas. In a study on the Malheur National Wildlife Refuge in Oregon, yellow warblers were more numerous on transects having abundant willow and little or no cattle than they were on transects having low shrub volume and heavy cattle use (Taylor and Littlefield 1986).

White-faced Ibis

The white-faced ibis (*Plegadis chihi*) is a highly mobile, long-legged wading bird with a distinctively long, decurved bill. The bird is a highly gregarious colony nester that can also be found foraging in flocks. White-faced ibises have been identified by some ranchers as detrimental to alfalfa crops due to trampling and soil compaction. The majority of recent North American works consider the white-faced ibis a full species and do not recognize subspecies. During breeding and migration, white-faced ibises are associated with wetland areas such as reservoirs and irrigated fields. During the breeding season, birds are usually found at inland, shallow marshes with "islands" of emergent vegetation. If regular nesting areas are dry from drought or drainage from human activities, white-faced ibis will find new areas for nesting. During the nesting period, birds may forage 3 to 6 km from the breeding colony but have been documented traveling as far as 18 km. Toward the end of the breeding season, adults in Idaho were documented traveling 40 to 48 km between daytime feeding areas and nighttime roosts in tall emergents (Ryder and Manry 1994).

The breeding range of U.S. populations includes northern California, eastern Oregon, southern Idaho, southern Alberta, Montana, eastern North and South Dakota, and northwest Iowa south to the Mexican states of Durango and Jalisco. Coastal Texas and Louisiana also support breeding white-faced ibis. Northernmost populations regularly migrate north–south to coastal Texas and Louisiana and Mexico. Birds may also be found wintering in southern California and the lower Colorado River valley of Arizona. Birds in Idaho usually arrive on the breeding grounds in April and leave between September and October. In the Great Basin, the largest nesting colonies are usually in stands of hardstem bulrush (*Scirpus acutus*), Olney's bulrush (*S. olneyi*), and alkali bulrush (*S. paludosus*). Nests have been observed at Carson Lake, Nevada, and Malheur National Wildlife Refuge, Oregon, in hardstem bulrush. Although data are lacking, the white-faced ibises is presumed to be monogamous and produces one clutch a year. Nests are usually constructed in emergent vegetation or low trees and shrubs over shallow water, although they may be found on the ground on small islands. Nesting may be delayed by high water or habitat degredation (i.e., vegetation damaged by fire or herbivorous mammals). If an early nesting attempt fails, the white-faced ibis may attempt to renest, but second clutches have been documented as less successful (Ryder and Manry 1994). Birds lay two to five eggs per clutch, and in Nevada, a mean clutch size of 3.21 (n = 140) was calculated. Eighty-three percent (n = 42) of nests in the same area produced one or more 7-day-old chicks. Annual reproductive success was 2.54 per successful nest (n = 150), but lifetime reproductive success is unknown (Henny and Herron 1989). The oldest bird known in the wild was 14.5 years old, but band recoveries in Utah (n = 111) documented all birds dying by 9 years of age (Ryder and Manry 1994).

Threats to survival include exposure (particularly for small nestlings) and predation. Predation on adults is probably negligible, but on the feeding grounds, large raptors (*e.g.*, peregrine falcons or red-tailed hawks) occasionally take them. Eggs and small nestlings are at risk from avian and terrestrial nest predators. The main foods consumed by the white-faced ibis include aquatic and moist-soil insects, crustaceans, and earthworms. Feeding sites are typically shallowly flooded pond margins, reservoirs, marshes, or flooded agricultural fields where vegetation is less than 5 to 90 cm high. Plant materials and seeds that have been consumed by white-faced ibises are believed to have been incidentally ingested (Ryder and Manry 1994). Taylor et al. (1989) stressed that, in Idaho, mudflats are important sources of high concentrations of earthworms and chironomid larvae. These areas enable ibises to increase fat reserves prior to fall migration.

White-faced ibises are highly mobile and will shift breeding areas between years, making population census efforts difficult in the absence of coordinated surveys with standardized techniques repeated at regular intervals. Annual or biannual censusing of breeding colonies occurs in Nevada, Oregon, and Texas but is sporadic and incomplete in Idaho and other states. Population surveys and status assessments require coordinated efforts between states, agencies, and other relevant parties (Ryder and Manry 1994). White-faced ibis have not been detected along BBS routes in the Bruneau subbasin, but BBS trend estimates for Idaho (+13.4%, $P = 0.9$, $n = 5$) and the western region (+22.3%, $P < 0.001$, $n = 36$) indicate that populations have been increasing between 1966 and 2002 (Sauer et al. 2003). In 1996, a pair of white-faced ibises was observed near the U.S. Air Force Grasmere Study Area. Potential breeding habitat exists in Wickahoney and China ponds near Grasmere (USAF 1998). The Donabahba Yogee marsh on the Duck Valley Indian Reservation (Owyhee subbasin) has a large colony of nesting white-faced ibis (>2000 birds in 1993). Birds that were presumed to be from this colony have been observed feeding at reservoirs and ponds in the Bruneau River basin. Ibises also can be found in irrigated fields in Little Valley (Jack Creek tributaries to the Bruneau River) and the Bruneau River valley during spring and fall migration. Ten to 50 ibises have been observed in the Bruneau and Little valleys during the summer, but these sightings were considered uncommon occurrences (John Doremus, BLM, personal communication, December 2003). White-faced ibises have been observed in Cedar Mesa Reservoir, Heil Reservoir, and Camas Slough in the spring (BLM Jarbidge FO) (Klott 1996). Suitable nesting habitat is not present at Cedar Mesa and Heil reservoirs, and Camas Slough typically lacks late-season water. The white-faced ibis is protected by Idaho and Nevada and is classified as a type 4 sensitive species by the Idaho BLM (IDCDC 2003). The Heritage Network ranking of G5S2B indicates that the white-faced ibis is globally secure but a rare breeder in Idaho (IDCDC 2003).

Limiting factors for white-faced ibis include pesticides and habitat deterioration. DDT continues to be used on the wintering grounds in Mexico, and contaminant concentrations (DDE) remain high in Great Basin white-faced ibis populations, a factor that can contribute to a decrease in productivity. Cattle grazing and trampling of nesting habitat, prescribed burning of emergent vegetation to enhance habitat for waterfowl, drought, and human disturbance to nesting colonies can all negatively impact nesting success (Ryder and Manry 1994). Drought has been successfully mitigated by allocating limited water resources to prioritized breeding areas (Ryder and Manry 1994).

Willow Flycatcher

The willow flycatcher (*Empidonax traillii*) is a migratory bird species with a convoluted taxonomic history. Until 1973, it shared species status with the alder flycatcher (*Empidonax alnorum*). Authors recognize four and sometimes five subspecies of willow flycatcher that include *E. t. traillii, E. t. adastus, E. t. brewsteri, E. t. extimus,* and sometimes, *E. t. campestris*. Willow flycatcher subspecies can be defined by plumage coloration and wing morphology, but subspecific range boundaries are difficult to define due to overlap of these characteristics. Western subspecies include *extimus, adastus,* and *brewsteri*. The Bruneau subbasin is within the range of *E. t. adastus,* which breeds from southern British Columbia to eastern California (east-side Cascades and Sierras) and in the Great Basin to the Rocky Mountains, north of southern Utah. Habitat is generally considered to be in moist, shrubby areas that may have standing or running water (Sedgwick 2000). Although frequently associated with stands of willow (*Salix* spp.), willow flycatchers in the West have been documented in a range of habitats from beaver meadows (Sedgwick 2000) to early-growth clearcuts in Oregon (Morrison and Meslow 1983).

Willow flycatchers are long-distance migrants that breed in the United States and southern Canada and winter in southern Mexico, Central America, and northern South America. They arrive on their breeding grounds in the late spring and have a short breeding season (Sedgwick 2000). The average spring arrival of willow flycatchers to Malheur National Wildlife Refuge in southeast Oregon was reported as May 12 (Littlefield 1990), and fall migration usually peaks by late August east of the Cascades (Gilligan et al. 1994). Birds from a southeast Oregon study (1988–1997) exhibited site fidelity for breeding with over half of the breeding adults returning to the same general area and breeding again in subsequent years (Sedgwick and Iko 1999). Willows are commonly selected for nesting substrate, and nests are usually low (1–3 m off ground, on average) in the crotch of a bush or small tree. Clutches are usually three to four eggs but occasionally five may be laid. In southeast Oregon, mean first nest (unparasitized) clutch size was 3.69 ± 0.03 (SE) (Sedgwick 2000). Mean lifetime reproductive success for the birds in the southeast Oregon population was estimated as 3.59 ± 0.17 (Sedgwick and Iko 1999). Only one brood per season is produced although renesting attempts may occur after nest loss or predation (Sedgwick 2000).

A variety of avian and mammalian predators have been identified for willow flycatcher nests. Most predation in the southeast Oregon population was attributed to mammalian predators, primarily long-tailed weasel and mink (Sedgwick 2000). Seasonal fecundity losses are primarily by predation, which is greater at the egg stage than the nestling stage (Sedgwick and Iko 1999). Willow flycatchers primarily forage aerially for insects, but will occasionally feed on fruit. Drinking has not been reported, and water needs are presumably met from their insect diet (Sedgwick 2000).

Although willow flycatchers may reside in very high densities (Sedgwick 2000), Breeding Bird Surveys (BBS) (Sauer et al. 2003) from 1966 to 2002 show a decreasing trend for both Idaho (–3.65% per year, $P = 0.02$) and the western BBS region (–1.3% per year, $P < 0.001$). There are three BBS routes within the Bruneau subbasin, but data is only accessible for two of the sites. Although willow flycatchers have been documented in the Bruneau subbasin (Deer Creek) (Klott 1997), they were not detected along Bruneau subbasin BBS routes, precluding trend analysis for the subbasin utilizing this database.

E. t. extimus subspecies was listed as Endangered under the ESA (USFWS 1995b) and critical habitat identified for this subspecies was designated in New Mexico, Arizona, and California, where the largest populations are known to occur (USFWS 1997). Willow flycatchers are a protected nongame species in Idaho and a BLM sensitive species type 3 (IDCDC 2003).

Limiting factors for willow flycatchers may include predation, brood parasitism, and weather (Sedgwick 2000). Additional anthropogenic impacts to willow flycatchers are structures (*e.g.*, towers) encountered by nocturnal migrants, alteration of riparian zones, and habitat degredation. Grazing can induce soil compaction and gullying, reduction of willows, and alteration of willow height and volume (Harris et al. 1987). Reduction of cattle grazing and elimination of willow cutting and spraying resulted in increases in willow flycatcher densities in Oregon (Taylor and Littlefield 1986) and abundance was greater in areas that were relatively undisturbed (Taylor l986).

Columbia Spotted Frog

See discussion in above section on federally listed and candidate species (section 2.4.2.1).

Western Juniper and Mountain Mahogany Woodlands

Mule Deer

Mule deer (*Odocoileus hemionus*) are medium-sized cervids distributed across most of the western half of North America. The genus *Odocoileus* contains two extant species, *O. hemionus* and *O. virginianus*. *O. hemionus* has a tail that is white to black above and tipped with black. Mule deer occur in almost all of the biomes of western North America north of central Mexico with exceptions including the arctic tundra, southwestern U.S. desert regions, Central Valley of California, and probably the Great Salt Lake desert region (Anderson and Wallmo 1984). In Idaho, mule deer densities are highest south of the Salmon River. Because mule deer are Idaho's most abundant and widely-distributed big game animal, they provide more recreational hunting opportunities than any other big game species (Hayden et al. 2003).

Mule deer females will typically conceive during their second year and rarely the first. From 25 studies that examined a total of 1,795 females, the average number of fetuses per doe ranged from 1.14 to 1.85. Common litter sizes are two, particularly for females in their third or greater breeding year. Most populations have a male biases ratio of fetuses. Annual rates of postnatal mortality among five populations of mule deer ranged from 22 to 55% for males, 17 to 25% for females, and 45 to 69% for fawns of each sex. Average life span is unknown, but the maximum longevity of males and females recorded in the wild are 19 and 20 years, respectively (Anderson and Wallmo 1984).

Mule deer need highly digestible, succulent forage in addition to woody vegetation for maintenance requirements although a common misconception is that mule deer are "browsers" and could subsist on woody browse alone (Anderson and Wallmo 1984). The quality and quantity of spring food resources has a major effect on production and survival of fawns (Hayden et al. 2003). Mule deer capitalize on high quality food resources in the summer and are able to lower their energy demands to adjust to poorer forage availability through the winter. Seasonal movements are common, but most deer with established home ranges will use the same

summer and winter areas in consecutive years. The chronology of movement from lower (winter ranges) to higher (summer ranges) elevations is thought to coincide with plant phenology and rate of snow melt (Anderson and Wallmo 1984). Although winter range is considered a critical component of mule deer habitat, survival is largely influenced by the condition of a deer at the start of winter, and that condition depends on the quality of habitat that the animal occupies during the rest of the year. A winter range with good thermal cover will minimize energy loss (Hayden et al. 2003).

Populations of mule deer in Idaho have declined since the 1950s and 1960s and will likely never increase to the previous levels because habitat continues to diminish in quantity and quality over time. Idaho manages mule deer harvest by monitoring populations annually and responding to population changes. Mule deer seasonal habitats are delineated in the Bruneau subbasin (Figure 37), but refinement of these designations is an information need (Mike McDonald, IDFG, February 2004). Twenty-two trend analysis areas (Game Management Units) have been delineated across the state, and the Bruneau subbasin is within Analysis Area 12 (Units 41, 46, and 47) (Figure 23). The lack of trend area surveys in Analysis Area 12 has made setting populations objectives difficult for this area. Traditionally, Units 41 and 47 have supported substantial deer herds that provide hunting opportunities for southern Idaho hunters. Unit 46 has provided important general hunting opportunities but has never supported a large resident deer herd. Until and area-wide decline in the early 1970s, liberal hunting seasons were in place across the subbasin. A large number of deer on the eastern side of Owyhee County migrate between Nevada (summer) and Idaho (winter) seasonal ranges which makes a population census difficult for Idaho managers (Hayden et al. 2003). Very little mule deer aerial survey data exists for this area (Idaho portion of Bruneau subbasin), and population information is identified by Hayden et al. (2003) as a primary data need. Two analysis areas summarized by the NDOW contain portions of the Bruneau subbasin. The 061 Unit Group (061-064, 067-068) is exhibiting a decreasing population trend, and the 2002 population estimate was the second lowest ever calculated for this group. Poor winter range in this area is believed to dictate long-term population levels and proper management is necessary that facilitates increase in winter habitat capacity for deer. Units 071, 072, and 073 fell within a second analysis area (Unit 071-079 herd). Tag quotas for this herd have been reduced due to population declines resulting from four years of drought, wildfires, and the severe winter of 2001–2002 (Cox et al. 2003).

Human encroachment has eliminated much of the historic mule deer winter range with the development of ranches, farms, subdivisions, and industry located in the foothills and lower elevation areas. Livestock grazing has dominated land use in the area, and serious conflicts between mule deer and livestock are localized on the winter ranges and riparian areas. Fires have destroyed a large portion of winter habitat in Units 41 and 46 (Idaho), and these areas provide little browse to support deer (Hayden et al. 2003). Predators of mule deer include cougars, coyotes, bobcats, golden eagles, domestic and feral dogs, and black bears (Anderson and Wallmo 1984). No black bears are present in the Bruneau subbasin, and the impact of predators on mule deer populations is poorly understood (Anderson and Wallmo 1984, Hayden et al. 2003). Because mule deer are a popular game species, hunting mortalities may contribute to population regulation. Consistent records of hunting efforts and success facilitate estimating the impact of hunting on populations (Anderson and Wallmo 1984), which is thought to be minimal in Idaho (Hayden et al. 2003). Disease, parasites, and competition with other herbivores (wild and domestic) may also pose threats to mule deer populations (Anderson and Wallmo 1984), although elk are not a significant management concern for this area (Hayden et al. 2003).

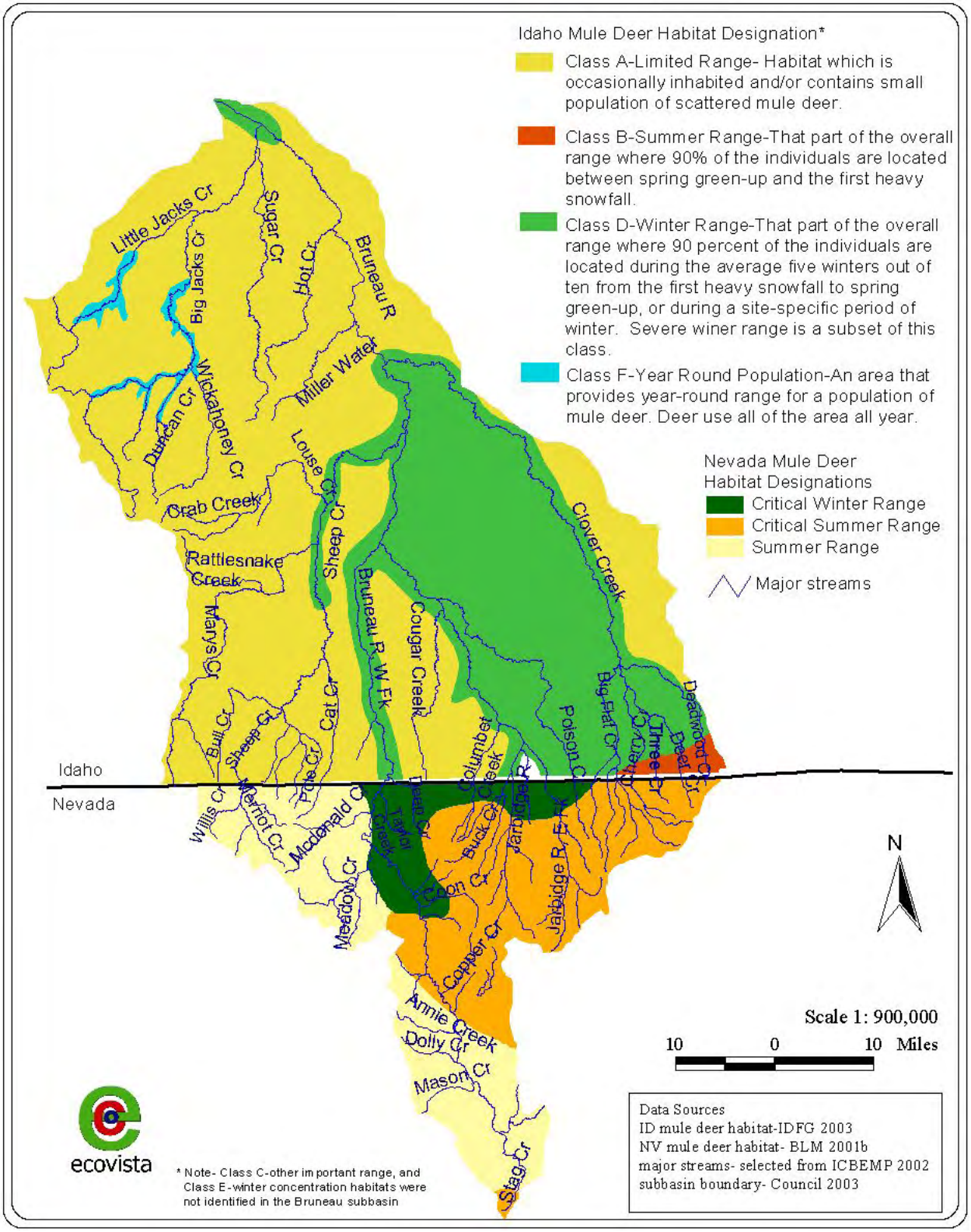

Figure 37. Mule deer habitat designations in the Bruneau subbasin.

Desert Playa and Salt Scrub Shrublands

Pronghorn

Pronghorn (*Antilocapra americana*) are large game mammals characterized by a robust build and long, slender legs and feet (O'Gara 1978). They are white on underside and rump and brown on their back with black and dark brown markings about the head and neck. The genus includes only one species which has been divided into five subspecies. *A. a. americana* comprise a vast majority of pronghorns today, likely including the Bruneau subbasin populations. Lines of subspecies delineation are somewhat uncertain between A. a. americana, A. a. oregona, and A. a. mexicana partly because there have been numerous transplants and mixing between subspecies. Pronghorn habitat consists of grasslands, grassland-brushlands, and deserts. Pronghorn are polygamous and have a territorial mating system, a system that ensures most mating is done by the largest and most aggressive bucks. Before European settlement in the United States, approximately 35 million pronghorns inhabited North America. By 1924, this estimate decreased to less than 20,000 animals (O'Gara 1978). Pronghorns are very important game animals in North America and valuable assets to the range because of their willingness to consume noxious weeds.

Northern populations of pronghorn depend heavily on browse, particularly in the winter when it can make up 80% or more of the diet (O'Gara 1978). Sagebrush may be an important winter dietary item and animals may switch to forbs during the summer. Pronghorn will move between winter and summer areas, and ranges of equal proportion of browse and forb species should meet yearlong dietary requirements of pronghorn populations. Pronghorn water requirements are related to the succulence and quantity of preferred forage. In the presence of forbs with high moisture content, water consumption decreases.

Nevada management units for pronghorn in the Bruneau subbasin include Units 61 (Area 6), 71 (Area 7), 72 (Area 7), and 73 (Area 7) (Figure 23). Pronghorn management units are divided into five groups in Idaho with each group comprised of management units with similar attributes and hunting opportunities (Rachael et al. 2003). Idaho management units in the Bruneau subbasin (Figure 23) include Units 41 (Group 1), 46 (Group 2), and 47 (Group 2). Hunting pressure is light or dispersed in Group 1 and usually occurs away from major population centers in aesthetically appealing areas. Group 2 supports high hunter densities, high harvest, and high success rates in many units. Population control hunts of doe/fawn pronghorn are often in these units. Management objectives for both groups are to maintain an average horn length of 12.0 inches in the firearm buck harvest and maintain a preseason buck:doe ratio of greater than 50:100 and 40:100 in Groups 1 and 2, respectively. Pronghorn population numbers in Idaho are low to moderate in comparison to high-quality habitats in Wyoming and Montana. This is considered attributable to low annual precipitation, poor range conditions, and conflicts with private landowners (Rachael et al. 2003).

Ground surveys for pronghorn are conducted by the NDOW in the North Central Elko County units (Units 061, 062, 064, 071, and 073) (Cox et al. 2003). Units 061, 071, and 073 are located in the southern region of the Bruneau subbasin (see Figure 23). From 1994 through 2002, pronghorn population estimates were following an increasing trend, but the numbers dropped by 2003. Because pronghorn populations are declining, the antlerless quota was lowered. The NDOW believes the herd is about 200 to 300 animals below the estimated winter range carrying

capacity and hopes numbers will increase within three to four years. The 1992–2001 average fawn ratio was 57 fawns per 100 does, and 43 fawns per 100 does and 49 fawns per 100 does were recorded in 2002 and 2003, respectively. The 2002 fawn ratio was the second lowest ever observed in this unit group. The surveys revealed buck ratios similar to the 1992–2001 average (36 bucks/100 does) in 2002 (38 bucks/100 does) and 2003 (37 bucks/100 does) (Cox et al. 2003). The IDFG conducted a fixed-wing line transect survey in 2002 in Unit 41. Results have not been released but incidental observations of pronghorn during bighorn sheep surveys and other opportunistic sightings indicate a static population. Population numbers in the Group 2 units have fluctuated widely the past 25 years. Declines to low levels were observed in the early 1980s with increases to 1992. At this point, the combination of drought and severe winter conditions in 1992–1993 are thought to contribute to the 30 to 50% decline. Pronghorn numbers in Units 46 and 47 appear to have declined, even with a substantial curtailing of harvest since 1994. Reproductive average in Unit 46 (0.82 fawns:doe) was based on a small sample but was above the long-term average of 0.50 fawns per doe from 1982 through 2002. The observed buck:doe ratio from 1991 to 2002 in Unit 46 has averaged 3% below the management objective at 0.37 (Rachael et al. 2003).

The C.J. Strike HEP Study results for pronghorn rated the shrub savanna cover type as very good quality habitat (HSI = 0.94). The slight lowering of the HSI value was influenced by taller than preferred shrubs. The remaining evaluated habitats (HSI values at TY0) for pronghorn included shrubland (0.73), desertic shrubland (0.78), desertic herbland (0.84), grassland (0.50), and forbland (0.50). Upland planting and trespass grazing would result in the greatest absolute change in AAHUs (Table 29) (Blair 1997).

Table 29. Projected changes in future average annual habitat units by cover type for the pronghorn, C.J. Strike HEP Study (Blair 1997).

Action	Cover Type (acres)						Total (AAHU)	Net Δ[a]
	Desertic Herbland	Shrub-land	Desertic Shrub-land	Shrub Savanna	Forb-land	Grass-land		
No change	1340.51	578.92	1644.17	4451.84	6339.15	1476.85	15831.44	0.00
Upland planting								
—Native	1168.37	552.41	1456.99	3923.15	7727.08	1496.74	16324.74	493.30
—Silver sage	1202.29	566.81	1487.86	4006.95	8779.42	1568.71	17612.04	1780.60
Gold Island habitat development	—	54.24	—	—	—	—	54.24	54.24
Peninsula development	—	—	92.43	—	—	—	92.43	92.43
Trespass grazing								
—Increased	1244.72	528.14	1433.37	3792.75	6339.15	1476.85	14814.98	–1016.5
—Reduced	1293.66	567.79	1472.02	4070.59	6339.15	1476.85	15220.06	–611.38

[a]The "Net Change" results from the comparison of AAHUs for the subject action to the "No Change" management action

Threats to pronghorn include fences, interstate highways, railways, and other barriers to movement. Domestic sheep pose competitive threats to pronghorns because they consume palatable forbs and sheep-proof fences restrict pronghorn movements. Cattle may also share resources with pronghorns, with one report stating that one cow utilized as much food as did 38 pronghorns (O'Gara 1978).

Fourwing Saltbush

Fourwing saltbush (*Atriplex canescens*) is a perennial shrub with many branches that ranges from two to six feet tall. It is a native of Idaho and also distributed throughout the western United States. Fourwing saltbush will grow on a wide range of soils and is mostly found in moderately deep to deep soils. It is an important species of the northern salt desert shrub association which is characterized by hot, dry summers and cold winters. Areas where the plant can be found include desert flats, gravelly washes, mesas, ridges, slopes, and sand dunes. The active growth period for fourwing saltbush is spring and summer. Its National Wetland Indicator status is facultative to obligate upland (UPL, FACU) species (NRCS 2003).

Fourwing saltbush can be used for beautification (ornamental), erosion control, livestock, and wildlife. Due to its extensive and deep root system (20–40 feet deep), it can effectively be used for erosion control, particularly where native plants are intact. It is considered nutritious for livestock. For cattle, the nutritive value is rated fair to good during the winter. Fourwing saltbush is favored by deer and is an important winter food source. Quail will use the plant for cover, roosting, and food (NRCS 2003). Other species, including pronghorn, elk, porcupine, ground squirrel, and jack rabbit, have been observed using this plant as well (Bowens et al. 2003, NRCS 2003). Native Americans ground the seeds to make flour for bread (Bowens et al. 2003).

There are no serious pests of fourwing saltbush, but small seedlings can be damaged by rabbits and other small rodents. Plants can be destroyed if in areas of heavy foot, horseback, or vehicle travel. In heavy winter deer concentration areas, overgrazing may be a threat if other food sources are unavailable. Grazing by livestock should not exceed 40% of the total annual growth during the growing period and 50% during the plant dormancy period (NRCS 2003). Others recommend that maximum plant performance can be obtained by allowing grazing by livestock only during the winter (Smoliak et al. 2003).