habitat along the river corridor provide suitable winter habitat. We saw a goshawk in one sample section in 1994, and are aware of several nests within the study area.

Reproductive Biology

Northern goshawk can be observed in courtship flight above nests stands by mid to late March. Courtship flights and nest building occur during this time for about 1 month prior to egg-laying. Clutches range from 2-4 eggs and are laid at 1-2 day intervals. Incubation lasts from 30-32 days and is primarily performed by the female. Hatching, based on back-dating from observations of recently hatched birds, is estimated to occur during the first part of June. Juvenile females will leave the nest at approximately 40 days of age and the smaller males at 35 days of age. During the fledging-dependency period, juvenile birds are highly vocal and their food-begging calls can be used to detect nest sites. This occurs from early July to mid-August, with the average date of fledging around the middle of July. The number of young fledged from successful nesting attempts is 1.7-2.5 young/nest (Reynolds and Wright 1978).

Ecology and Habitat Relationships

In the western United States, the northern goshawk has been associated with mature and old growth forest which can look markedly different depending upon the specific zone (i.e. Pacific vs northern Rockies) (Reynolds et al. 1982, 1989, 1992; Hayward and Escano 1989, Crocker-Bedford 1990, Patla 1991, DeStefano and Meslow 1994). Others consider the goshawk a generalist, utilizing all major forest types and a variety of age and successional stages (Reynolds et. al. 1992) High vegetative diversity for foraging may also be an important component of goshawk habitat (Hargis 1991). Based upon their location, these stands may have single or multiple layered canopies and are typically less dense than those used by sharp-shinned or Cooper's hawks (Reynolds 1983, Reynolds et al. 1982). The majority of nests found on the Targhee National Forest are associated with mature Douglas-fir forests, although nests have also been found in aspen and lodgepole pine stands (Patla 1991). The northern goshawk preys on mammals the size of tree and ground squirrels, hares and a number of avian species including sapsuckers, woodpeckers and mountain grouse. The current decline of this species is mostly associated with the loss of nesting habitat, foraging habitat and prey and their habitat associated with certain timbering and livestock practices, and fire suppression (Herron et al. 1985, Bloom et al. 1986, Crocker-Bedford 1990, Reynolds et al. 1992)). Human disturbance, poaching, and pesticides may also affect goshawks in some areas.

Detection Methods

All three accipiters nest within forested environments, each preferring a diversity of stand characteristics that range from young, dense, closed canopy stands to late succession, moderately open stands. A number of researchers have implemented the use of conspecific vocalizations to increase the detection of accipiters (Kennedy et al. 1993, Mosher et al. 1990, Rosenfield et al. 1988, Kimmel et al. 1990). Three vocalizations have been used for accipiter detection—the wail, alarm and food-begging calls (Kennedy et al. 1993). Broadcast calls of other raptors (great horned owls) have been used to elicit goshawk responses and increase species detection often with less effectiveness (Kimmel et al. 1990).

With experienced surveyors, Kennedy et al. (1993) found the highest detection of goshawks with the use of the alarm call during the nestling period and the wail or food-begging call used during the fledgling-dependency period. Rosenfield et al. (1988) had greater success eliciting Cooper's hawk responses using broadcast calls during the nestling period. Joy et al. found goshawks responding to taped vocalization ("alarm and food-begging") more often during nestling than fledgling period. The highest probability of detecting a goshawk within 100 m of a nest using taped vocalizations occurred

during the nesting period (70%) Kennedy et al. 1993. Beyond 300 m from a nest, the probability of detecting a goshawk without the use of taped vocalizations was zero (Kennedy et al. 1993)

Taped vocalization surveys should be conducted between June (nestling period) and August (fledgling-dependency period) for goshawks. Repeated visits and surveying for goshawks during their nest building and incubation periods (prior to May 15) should be avoided in order to minimize the potential of nest site abandonment (USDA 1993). Goshawk detection using conspecific broadcast calls was most successful when conducted between sunrise and noon (USDA 1993). Goshawk vocalizations can be easily confused with Cooper's hawk, and jays which mimic goshawk calls. Adult female vocalizations are lower and louder than are adult males which have lower and louder vocalizations than juvenile goshawks. Adult females have been found to be more respondent to broadcast calls than males (Fuller et al. 1981, Kennedy et al. 1993). Ground surveys can be initiated in March when adults are flying above nests stands in courtship flights.

Cooper's Hawk (Accipiter cooperii)

A species of temperate North America the Cooper's hawk is considered common in most states it ranges in (Reynolds 1989). However, few-state wide population estimates are available. It can be a migratory species in some areas, wintering Mexico and Central America. It can be found breeding from Canada to Mexico. The Cooper's hawk, as with many other raptors, has experienced significant declines throughout North America associated with the persistence of DDT in the environment. The Cooper's hawk has been recognized as a species of special concern since 1971. Although Cooper's hawk reproduction has been improving in the eastern United States, improvements have not been documented in the western United States where pesticides are thought to be affecting local populations.

Local Occurrence

A number of Cooper's hawks have been observed in the study are this past season. One adult was observed feeding on a prey item along the Heise to Black Canyon road on the north side of the river. This observation was in sage/grass habitat with the closest trees along the river within .5 mile. Another adult Cooper's hawk was observed in a conifer stand adjacent to the river. Numerous accipiter nests were later found in a stand of Douglas-fir near by. Cooper's hawk habitat does exist in the study area and more birds are expected upon further survey. We noted Cooper's hawks in two sample sections.

Reproductive Biology

Cooper's are a little behind goshawks in their arrival to their nesting territories, arriving from late March to early April. Pair formation, nest building and copulation takes 2-4 weeks before egg-laying occurs. Clutches of 3-6 eggs are laid around mid to late May and are incubated for 30-32 days. (Reynolds and Wight 1978) After hatching in late June, juveniles remain in the nest for another 27-30 days, attaining flight on the average sometime in July (Henny et al. 1985, Kennedy and Johnson 1986, Johnsgard 1990, Wiggers and Kritz 1994). Juveniles may remain near the nest dependent upon parental prey deliveries for another 3 weeks. The number of fledged young per nest attempt ranged from 2.0 to 3.6 (Reynolds and Wight 1978, Reynolds 1989).

Ecology and Habitat Relationships

The Cooper's hawk nests within deciduous and mixed forests such as those found along riparian zones, within small woodlots or in semiarid stands (Reynolds 1989). More so than other accipiters, Cooper's hawks will utilize open, small forested stands and second growth forests (Beebe 1974, Reynolds and Wight 1982, Moore and Henny 1983). When found in large continuous forests, they often nest near the edge of the stand. However, within these stands Cooper's

tend to place nests within the tree crown canopy or on mistletoe growths. Both strategies are thought to provide more cover and security from predators (Moore and Henny 1983). The Cooper's hawk is considered more of a generalist in its foraging than the sharp-shinned hawk. It will take both birds and mammals ranging in size from 44.2 g to 296.4 g, respectively (Storer 1966, Reynolds and Meslow 1984). It will take tree squirrels, chipmunks, ground squirrels, Stellar's jay, juncos, northern flicker, quail and robins to name a few prey (Kennedy and Johnson 1986, Reynolds 1989). The Cooper's home range is also quite variable, having been documented to range from 173 ha to over 1,500 ha (Craighead and Craighead 1956, Reynolds 1983). This species' large home range results in relatively low density over a larger landscape. The long-term conservation of this species will depend upon preserving quality nesting habitat and reducing pesticide contamination.

Detection Methods

The same survey protocol described for goshawks applies, with consideration to specific habitats used by Cooper's hawks (Rosenfield et al. 1988). Rosenfield (1985) noted that timing of taped calling is vital; Cooper's hawk adults did not respond during incubation. Tapes were an advantage to nest surveyors after hatching. Methodical ground surveys of areas at which adults were observed or vocalizing birds had earlier been identified have resulted in successful location of Cooper's hawks (Bosakowski et al. 1993).

The following unique features can help differentiate accipiter nests from other raptor nests: medium size nest against the bole of the tree within the canopy of the tree, nest may be lined with fresh green material such as conifer or deciduous tree limbs. Buteos, the raptors most likely confused with accipiters, may also line their nest with fresh tree limbs. It may take a combination of these unique habitat and nest features to differentiate between accipiter and buteo nests. Note Appendix A, Table 2 for specific information on breeding chronology.

Sharp-shinned hawk (Accipiter striatus)

The heart of the sharp-shinned hawks breeding range in North America is found within the boreal forests of Alaska and Canada. Other populations are found within California, the Northern Rockies, Arizona, New Mexico, Great Lake states, northern parts of Gulf states and the eastern states (Johnsgard 1990). The most migratory of the 3 accipiters, individual birds may winter as far south as Mexico to South America. Sharp-shinned hawk populations underwent a significant decline in the 1950s-1970s due to DDT contamination. Although there have been notable population increases recently, DDT is still found on it's South American winter range. The sharp-shinned hawk is considered a fairly common species in the western states (Reynolds 1989). The sharp-shinned hawk does not have any special state nor Federal status.

Local Occurrence

Sharp-shinned hawks have been observed a number of times and places in the study area. All of our observations have been made in higher elevations off the river bottom, generally near dense Douglas-fir stands. A preference for north facing conifer stands thought to represent more mesic habitat has been documented in other studies (Hennessy 1978, Reynolds 1978).

Reproductive Biology

Concealment from predatory raptors is important to this small accipiter. Sharp-shinned hawks achieve concealment by nesting in the thick foliage of conifers and some mixed deciduous forests (Reynolds et al. 1982, Moore and Henny 1983, Reynolds 1989). Sharp-shinned hawks arrive on nesting territories during early May. Egg-laying is finished from the end of May to mid-June. Clutches range in size from 2-6 eggs and are hatched about 30-32 days later in mid- to late-July (Reynolds and Wight 1978, Johnsgard 1990, Quinn 1991). Hatching of all eggs seems to

occur within a 1-2 day span (Reynolds and Wight 1978). Juveniles attain flight at approximately 21-24 days of age, but may remain in the nest territory for another 3 weeks to be fed by attendant adults. The range of fledged young per nest attempt is 2.7-3.5 (Reynolds 1989).

Ecology and Habitat Relationships

Of the three North American accipiters, the sharp-shinned hawk uses the youngest, most dense forests stands. It is thought that 80% of the North American breeding population nests in the boreal forest of the continent. The combination of a conifer patch within a larger deciduous stand is thought to provide preferred nesting habitat (Platt 1976, Reynolds 1989 Joy et. al 1994). Conifer stands are identified as important in providing a diversity of passerine bird species which are the primary prey of this highly specialized, bird-catching predator. Birds comprise the main prey item though small mammals such as voles, pocket gophers and shrews may also be taken. Their main diet includes many small birds, such as yellow-rumped warblers, robins, sparrows and juncos (Joy et al. 1994) Prey size averages at 17.6g for males and 28.4g for females. Foraging occurs in a variety of habitats, including shrub communities, deciduous and conifer forests and open habitats adjacent to nesting habitat. In the western United States, sharp-shinned hawks may move downslope, wintering in open woodland and foraging in adjacent grasslands (Johnsgard 1990).

Detection Methods

The same survey protocol described for goshawks applies with special consideration to sharp-shinned hawk habitat and nesting chronology (Appendix A, Table 2).

Peregrine Falcon (*Falco peregrinus*)

The Peregrine falcon, "the wanderer", breeds on all continents but Antarctica. In North America, the peregrine is found from the far north to Baja California and coast to coast (Johnsgard 1990). By the mid-1960s, fewer than 20 active peregrine eyries were known in the Rocky Mountain states, and none in the Greater Yellowstone Ecosystem (Platt and Enderson 1989).

The current distribution of the peregrine falcon in North America exists due to the successful reintroduction of this falcon through hacking and captive breeding. The peregrine falcon is listed as an endangered species by the Fish and Wildlife Service and on state lists. The current western population is now over 300 pairs (Peregrine Falcon Foundation 1993). The Greater Yellowstone Ecosystem is noted as an area of both historical peregrine falcon breeding and recent recovery due to reintroduction efforts (Platt and Enderson 1989). Threats to this species include contamination from pesticides, particularly in southern wintering areas, repeated human disturbance at nest sites and loss of prey base.

Local Occurrence

Outside the breeding season, peregrines are occasionally seen throughout the study area. Peregrine falcons nest at two locations within the study area. Nest sites are on cliff faces, one within a large cliff complex in the canyon section, and another on a small cliff near the river. No peregrines were seen in the randomly selected sample sections.

Reproductive Biology

Peregrines return to nesting eyries in April; breeding behavior is initiated later than by prairie falcons. In a period of pre-nesting courtship, paired adults exhibit their considerable flight abilities through well-studied aerial courtship displays (Cade 1982). Intruders are vigorously displaced from the nesting area. Pairs tend to reoccupy the same eyrie year after year, and pair bonds are thought to be retained for long periods.

Clutch sizes average about 3 eggs/eyrie (Bull 1974). Incubation takes 32-34 days from laying of the last egg to the nearly synchro-

nous hatching (Porter et al. 1973). Both sexes participate in incubation. Fledging occurs after 35-42 days.

Ecology and Habitat Relationships

The primary feature of peregrine falcon nesting habitat is usually a tall nesting cliff. Cliffs occupied by peregrines are typically over 150 feet high with an unobstructed view of surrounding foraging habitat and with ledges large enough to serve as nest and perch sites (Cade 1982, Johnsgard 1990). Nesting habitat may be most restricted by access to prey species, most often shore birds and waterfowl, or pigeons. Foraging occurs in a wide variety of habitats, including riparian woodlands, forestlands, shrublands, and prairies. Prey taken is mostly small birds, including swallows, shorebirds and mourning doves in riparian areas and passerines the size of gray jays and nutcrackers over high elevation forests (Sherrod 1978). We have seen local peregrines take rock doves from near the river canyon walls on several occasions. Peregrines also take some small mammals and insects.

Detection Methods

Surveys for eyries start with the delineation of suitable nesting habitat. Where large areas of suitable habitat exist aerial surveys can expedite the search. In our area the rare observation of an adult can narrow the search for the eyrie to a specific cliff or river stretch. Ground surveys are primarily just extended observation time behind a spotting scope at a cliff wall. The best time to survey rock walls for falcons flying in or out of eyries is best conducted early in the morning (1-4 hours post sunrise) and later afternoon (1-4 hours pre-sunset). Nest scrapes are often difficult if not impossible to observe from the ground and is again best delineated by the presence of an adult flying in or out of a crevice. Narrow, vertically streaked white-wash excrement on a rock wall is a distinct sign of the peregrine or prairie falcon (buteos and eagles white-wash is described more as a broad splash) and such observation is an indication of falcon presence. A "kacking" vocalization can also indicate the presence of a falcon. Surveys for territorial birds should be initiated in mid-March in suitable habitat. Juvenile peregrines are fledging around late June to late July.

Prairie Falcon (*Falco mexicanus*)

The prairie falcon breeds in the western North America east of the Pacific coastal ranges from British Columbia to Baja, across the Great Basin, Rocky Mountains and grasslands of the Dakotas, Colorado and western Canada. Prairie falcons winter a bit farther east and south across Texas and into Mexico (Johnsgard 1990). In winter, prairie falcons sometimes move to lower elevational open country within the breeding range where horned larks or other small birds or mammals are available as prey. This species is on the Audubon list of declining species, but may be secure on a continental basis (Cade 1982), with a total estimate for the species of 5 to 6 thousand pairs.

Local Occurrence

We are aware of three prairie falcon eyries within the study area, 2 in small cliffs on the canyon rim and 1 on a big wall in the South Fork canyon section. In 1994, we detected flying prairie falcons at one sample quadrat outside of these known nest areas.

Reproductive Biology

Prairie falcons return to eyries in March to April, and begin a courtship that may last for a month. Clutch sizes average about 4 to 5 eggs (Cade 1982). Egg laying occurs at an interval of about 2 days, or about 10 days for the entire clutch. Incubation, which takes 29-33 days, is not initiated until all the eggs are laid. The female does most of the incubation, although the male performs this task while the female eats the food that he brings into the scrape. Numbers of young