TECHNICAL BULLETIN NO. 03-2 IDAHO BUREAU OF LAND MANAGEMENT FEBRUARY 2003

ADULT TURNOVER, PRODUCTIVITY, AND NEST-TREE STATUS OF SWAINSON'S HAWKS IN AND ADJACENT TO THE SNAKE RIVER BIRDS OF PREY NATIONAL CONSERVATION AREA

by

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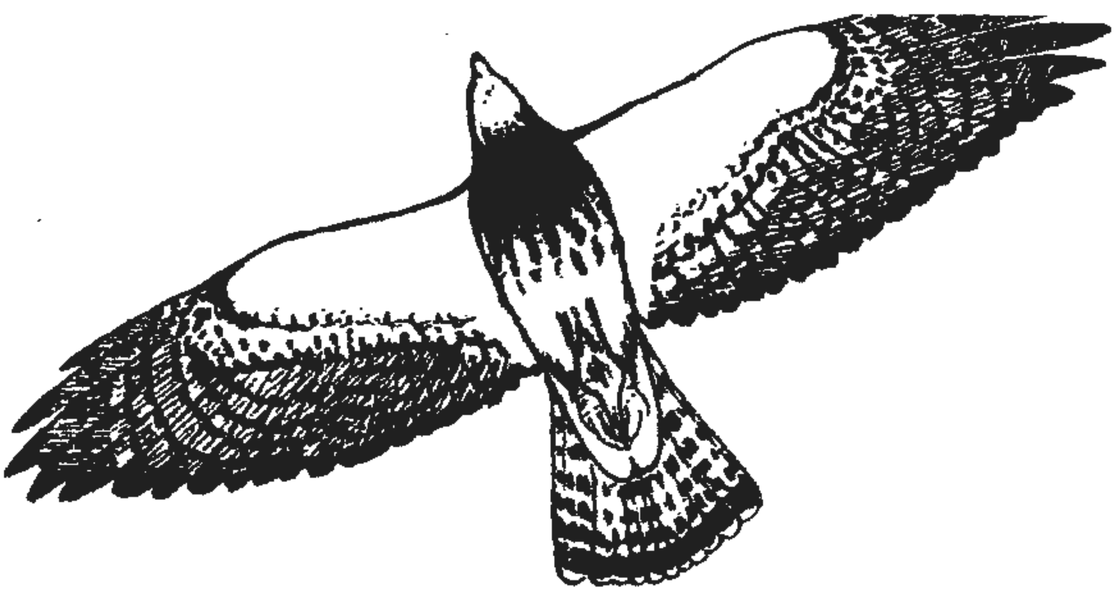

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Adult Turnover, Productivity, and Nest-Tree Status of Swainson's Hawks in and Adjacent to the Snake River Birds of Prey National Conservation Area

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30 September 2000

Project Background

Swainson's hawks (*Buteo swainsoni*) nest in grassland, shrubland, and agricultural areas throughout western North America (England et al. 1997). They typically nest in scattered trees of a variety of tree species including locusts (*Robinia* spp.), aspens and poplars (*Populus* spp.), and willows (*Salix* spp.). They eat mostly rodents such as ground squirrels (*Spermophilus* spp.), pocket gophers (*Thomomys* spp.), and voles (*Microtus* spp.), and breeding pairs become concentrated in agricultural areas where hay and pastureland support dense populations of ground squirrel and microtine prey (England et al. 1979). In areas of high prey numbers, the availability of suitable nest trees becomes a critical factor in limiting the density of nesting populations, particularly in the more arid areas of the West.

In southern Idaho, Swainson's hawks are found in abundance in hay and pasture lands across the Snake River Plain (Bechard et al. 1986). Distribution and density of the southern Idaho population appear to be limited mainly by availability of suitable nesting trees. Nesting pairs are particularly abundant in areas of juniper (*Juniperus occidentalis*) forests such as the Raft River Valley in southcentral Idaho. They are also abundant in agricultural areas where irrigation runoff and intermittent streams enhance the growth of scattered trees such as willows and poplars in the southwestern portion of the state. Due to the scarcity of trees in the Snake River Birds of Prey National Conservation Area, the Swainson's hawk historically was never a common nesting species in the area (USDI 1979). It was only in the mid 1980s that Swainson's hawks began to nest in the northwestern portion of the National Conservation Area (NCA) near the intersection of Swan Falls and Kuna Cave Roads (Bechard et al. 1986). Today, about 10 pairs of Swainson's hawks nest in that portion of the NCA each year. Settlement of the area by nesting Swainson's hawks coincided with development of agriculture in the area and the introduction of large expanses of alfalfa fields. Studies have not been conducted on the foraging ecology of these hawks, but it appears that the introduction of hay fields has increased the availability of ground squirrel and microtine prey in the area. Only the number of suitable nest trees appears to limit the population. Most of the trees currently used by nesting Swainson's hawks in the Bureau of Land Management (BLM) study area were not growing in the area prior to the development of agriculture (M. Kochert pers. observ.). These trees benefitted by increased water from the agricultural runoff made available by irrigation projects implemented in the 1970s. Today, the amount of runoff has decreased as a result of the conversion from gravity to sprinkler irrigation. Nest trees are also threatened by heavy livestock grazing and the increased frequency of range fires in the area. As a result, many of these nest trees are dying or threatened with loss or destruction. Questions regarding concerning the future status of these nest trees raise concerns about the future status of Swainson's hawks in this area of the NCA.

The purpose of this study was to record mate turnover, territory occupancy, and productivity of nesting Swainson's hawks on BLM land in the northwest portion of the NCA and on BLM land adjacent to agricultural areas south of Kuna, Idaho. Adults at these nests had been previously banded and color-marked as part of a larger study aimed at documenting the turnover and productivity of pairs of Swainson's hawks in agricultural and exurban areas in southern Idaho.

Our study also documented the current status of nest trees and threats posed by further alterations in water flows and runoff, livestock grazing, and increased frequency and intensity of range fires in the northwestern portion of the NCA.

Methods

Vehicle and foot surveys were conducted in the first two weeks of April to assess arrival times of nesting Swainson's hawks. Nest trees were checked one or two times per week during this period. Turnover was assessed by conducting two rounds of subsequent visits to each occupied nesting area. We conducted the first round of nest visits during nest construction. First round visits focused on all nest trees used in previous years and any known alternate nest trees in the area. Each nesting area was checked for occupancy by Swainson's hawks. We read color-band numbers of all banded birds prior to the onset of incubation to determine if unbanded birds had replaced banded adults from the previous year. At least two visits were made to areas that were not occupied during first visits to document the identities of any late-arriving adults. All adults were observed using 10 X binoculars and 20-60 X spotting scopes to check for and read color bands. We recorded color morph of each adult following Clark and Wheeler (1987) and classified adults as either light-unbarred, light-barred, rufus, intermediate, or dark morphs. We also recorded behaviors of adults including nest building, copulation, incubation, and feeding.

We conducted the second round of nest visits during May and June to determine the incidence of intra-season turnover of adult Swainson's hawks at occupied nest sites. We placed priority on visiting those territories that had banded adults during the first round of visits. These nest trees were visited at least once during incubation or brood rearing to resight color-marked hawks observed during first round of visits or to confirm any turnover of color-marked adults between the first and second rounds of visits. Nest trees that were not occupied during the first round of visits were revisited to determine if they had become occupied by nesting adults during the period between the two rounds of visits.

Productivity was determined from nests containing incubating hawks. We conducted a mid-season survey in late June to age young in nests. Fledging counts were conducted in July and August based on the ages of young observed during earlier surveys. We used the red-tailed hawk aging guide (Mortisch 1983) to age nestlings and we considered a nesting attempt successful if at least one nestling reached $\geq$31 days old.

At the end of the nesting season, each nest tree was revisited to record tree species, its height, and present condition. We categorized nest trees as alive (healthy), decadent (primarily dead), or dead and photographed each tree to document its condition. We also assessed current threats to nest trees caused by alteration of water flows, livestock grazing, and damage by range fires.

Results

Nest territory locations and productivity. We monitored 10 historical nesting territories on BLM land (Table 1, Fig. 1). Pairs occupied seven territories (70%), and six pairs (86%) laid eggs while the Swan Falls-Nicholson pair failed to lay (Table 1). Four of seven pairs (57% pairs successful) produced six young. Productivity averaged 1.5 young per successful nest, 1.0 young per laying pair, and 0.86 young per occupied territory (range = 0-2). Two (33%) of six egg-laying pairs failed to produce young. One pair failed after the young died in the nest. The other unsuccessful nesting attempt occurred at the Swan Falls-Kuna Cave nesting territory after intra-season turnover of females occurred. The new female, in Basic I (subadult) plumage, laid eggs but failed to hatch. We do not know if the first female to occupy the site in 2000 laid eggs before she died between mid-April to mid-May. This site was subject to considerable disturbance and vehicle tracks lead to the nest tree. Farm workers frequently used the grove of trees for shade during lunch. The nest tree was 70 m from a farm field and 40 m from a dirt road.

We also monitored 14 historical territories and one new territory (Initial Butte Farms) near BLM land (Table 1, Fig. 1). Pairs occupied all but one historical territory (93%) and all pairs laid eggs. Foliage prevented us from obtaining complete fledge counts at three nests, therefore, productivity calculations for territories near BLM land are minimum estimates. Ten of 14 pairs (71% pairs successful) fledged at least 23 young. Productivity averaged at least 2.30 young per successful nest, 1.64 young per egg-laying pair and occupied territory (range = 0-4). Four (29%) of 14 laying pairs failed to produce young.

Turnover. We read color bands on adult Swainson's hawks at five BLM nesting territories that had marked birds in 1999 (Table 2). Because the Cloverdale Dairy was vacant from 1997-1999, we did not include this nesting territory in our turnover assessments. The same males and females have occupied the Kuna Butte SE, Swan Falls-Kuna Cave, Sand Creek Sec. 23 territories since 1995 and 1996, 1996 and 1998, and 1996 respectively (Table 2). The unmarked male at Sand Creek Sec. 23 may have been the same unmarked male that occupied the site in 1999.

We confirmed intra-season turnover of an adult male and female at Swan Falls-Kuna Cave nesting territory in 2000 (Table 2). The female who occupied this territory in 1998-1999 re-occupied the site with a new, unmarked male in April 2000. In May she could not be found. The male that occupied this site in 1999 had replaced the first male and was mated with a new, unmarked female in Basic I (subadult) plumage. In July, we found the 1999 female dead under the 1999 nest tree. We could not determine cause of her death and do not know if she had laid eggs.

The female that occupied the Poen Road nesting territory in 1996 returned to nest at this site in 2000 after a three nesting season absence. Although this was technically not a turnover because the Poen Road site was vacant from 1997-1999, it was noteworthy. The female was first marked at the Poen Road nesting territory in 1995 when she was color banded and instrumented with a satellite radio transmitter. She occupied the Poen Road site in 1996 with the same mate from 1995, but did not lay eggs. We suspect she occupied the Sand Creek Tree site in 1997 with a new male. We trapped her in 1998 with an unmarked male at the Sand Creek Tree site, 2.5 km from the Poen Road site. Both she and the male matched the color morphs of the pair that occupied the site in 1997. The same adults occupied the Sand Creek Tree site in 1999. This female returned to Poen Road site in 2000 with a new, unmarked male.

We determined if the adults breeding at 12 nesting territories near BLM land were color marked and confirmed turnover at only one of these sites. It involved an intra-season turnover when the male from 1999 returned to the nesting territory and displaced an unmarked male. This was the fourth consecutive year that this male had displaced males that had apparently arrived before him.

Status of nest trees and nests. Nest trees used by Swainson's hawks on BLM lands averaged 9.4 m high (n = 19; range 6-17) compare to 13.9 m (n =15; range 7-25) for nest trees used in the nearby farmlands. Nests on BLM lands were built mainly in the upper portions of trees and most were on lateral or side branches. On 31 July, the last visit in 2000, six nests were entirely intact and only two completely gone. All nests on BLM lands and 13 of 14 nest in the farmlands were constructed in healthy or decadent trees in 2000. The one nesting attempt in a dead tree (Barker-Cole) failed before hatch.

We determined condition of 20 nest trees at 10 nesting territories on BLM land (Table 3). Swainson's hawks used nine cottonwood (*Populus trichocarpa*), eight elm (*Ulnus* spp.), two willow (*Salix* spp.), and one box elder (*Acer negundo*) trees. In 2000, 11 (55%) of these trees were alive and healthy (Figs. 2-7), 7 (35%) were dead (Figs. 8-10), and 2 (10%) were decadent or dying (Fig. 11). All eight elm nest trees were healthy, compared to only three of nine (33%) cottonwoods. All of the willow, the box elder, and four of nine (44%) cottonwood nest trees were dead (Table 3).

Five of 10 BLM territories contained dead and decadent nest trees (Tables 3 and 4). Although Kuna Cave (Figs. 11-14) and Sand Creek Sec. 23 (Figs. 15-16) nesting areas contained 8 and >40 trees respectively, nearly all of these trees were either dead or dying (Table 3). In 2000, the riparian area along Sand Creek in Sec. 23 contained only 3-5 healthy trees in a 400-m radius of the nest trees (Table 3), and only two of the trees within 400 m of the Kuna Cave nest trees were healthy (Fig. 12). Sand Creek Tree (Figs. 17-18) and Kuna Butte Sec. 13 (Figs. 8 and 19) nesting territories contained only one live tree each. The live tree within a 400-m radius of the 1998 Sand Creek Tree nest tree was within 10 m of a paved road. The live tree within 400 m of the former Kuna Butte Sec. 13 nest tree was too small to be used for nesting and was subject to cattle damage. The Poen Road 1995 (Fig. 9) and 1997 Sand Creek Tree (Fig. 10) nest trees were lone dead cottonwoods with no other live trees within a 400-m radius.

Although five nesting territories contained mainly heathy nest trees, most had few usable trees (Table 3). Cloverdale Dairy (Figs. 2 and 20) and Kuna Butte SE (Fig. 3) nesting territories contained tree groves with 8-20 healthy trees and no dead trees. In contrast, the Locust Grove SW and Swan Falls-Kuna Cave (Fig. 6) nesting territories contained isolated groups of 1-3 healthy trees, and the Swan Falls-Nicholson nesting territory contained only one tree within 400 m of the nest (Fig. 7). Although, at least 14 healthy trees occurred within 400 m of the Poen Road 2000 nest, 12 were Lombardy poplars (*Populus nigra*) in a row near a house. These trees, however, may not be very desirable for nesting. Of 114 Swainson's hawk nests studied in southwestern Idaho, none occurred in Lombardy poplars, although birds had an opportunity to use these trees (U.S. Geological Survey unpubl. data).

Of the three vacant historical nest areas on BLM land (2000), Kuna Butte Sec 13 contained no usable nest trees and Sand Creek Tree had only one tree next to a paved road. Locust Grove SW contained only two nest trees that were surrounded by agriculture development and subjected to much human disturbance.

We attributed the loss or degradation of five nest trees in the Kuna Cave and Sand Creek Sec. 23 nesting territories to decreased water flows from the farmlands (Table 4). Nest trees used in 1997-1998 and 1999-2000 at the Kuna Cave site were mostly dead (Fig. 12), and all of the trees in the grove were dying from lack of water (Fig. 14). Although the nest tree used at Sand Creek Sec. 23 in 2000 was alive, the trees used in 1997, 1998 and 1999 were dead (Fig. 15 and 16) along with numerous (>30) dead willow trees along Sand Creek (Fig. 21). Most of the trees along Sand Creek were alive in 1997. Water sources for trees in both cases has significantly decreased since the late 1990s when the nearby farms changed from flood to sprinkler irrigation of alfalfa fields (Fig. 22-23).

Damage caused by cattle rubbing against trees and using them for shade threatened nest trees at the Kuna Butte Sec. 13 and Sand Creek Tree sites (Table 4). The few potential nest trees in Kuna Butte Sec. 13 are being trampled and rubbed by cattle (Fig 19). In 2000, nest trees used at the Sand Creek Tree in 1997, 1998 and 1999 were dead; both trees died fairly rapidly between 1998-2000 from drought and cattle damage (Fig. 10 and 18). These trees and potential nest trees showed extensive rubbing of the bark by cattle and damage to the roots from cattle trampling vegetation around the base of the trees.

Surprisingly, fires killed only two nest trees (Kuna Butte Sec.13 and Poen Road 1995; Table 4). These trees died in the 1995 Point fire and have fallen down over the last five years (Figs. 8-9). This fire also destroyed all eight potential nest trees in the Kuna Butte Sec 13 nesting area, rendering it unusable by nesting Swainson's hawks. However, some tree reproduction had occurred by 2000. The former Kuna Butte Sec.13 nesting area contained 1-3 small elm trees, but these trees were subjected to cattle damage (Fig 19).

Discussion

The Swainson's hawk is an obligate tree-nesting raptor, and its range in western North America is highly dependent on availability of suitable nest trees (England et al. 1997).

Swainson's hawks nest on BLM land in the northwestern portion of the NCA, but the area supports a limited number of suitable nesting trees. During the last five years, several nest trees and potential nest trees have died due to the combined effects of water depravation, impacts from livestock grazing, and burning by range fires.

Swainson's hawks nesting in the farmlands near BLM lands north of the Snake River Birds of Prey NCA were more successful and productive than those nesting on BLM lands. Territories in the farmlands had higher occupancy and laying rates and larger broods at fledging than those in the NCA. Thus, productivity (young fledged per occupied territory) in the farmlands was about twice that in the NCA. We do not believe this difference relates to foraging habitats. Pairs in both strata nested near alfalfa fields, which provide good prey habitat (England et al. 1997). Nests in the farmlands were mainly in large cottonwood and locust trees about 1.5 times taller than those in the BLM land. These larger trees may provide a more secure nesting substrate and protection from disturbance. We attributed one of the breeding failures and one of the vacant territories (Locust Grove SW) on BLM land to disturbance from farm workers and vehicle traffic.

Turnover did not appear to differ between the BLM and farmland territories. Of the five nesting territories on BLM land occupied in 1999, we documented turnover of adult Swainson's hawks at only one site and the movement of one female between two nesting territories. At four nesting territories, the same females that had previously occupied the sites returned to breed and two males returned to sites they had previously occupied. We documented turnover at only one farmland territory.

Degradation of nest trees on BLM lands has occurred during the last five years and has increased at a rapid rate between 1997 to 2000. Cottonwood, willow, and box elder nest trees have fared the worst, with 75 percent of these trees either dead or dying in 2000. Elm nest trees were generally much more healthy than the other nest tree species, with all the elm nest trees classified as healthy. However, elm trees may not provide as secure nest substrate as locust or cottonwood trees. Our observations of 114 Swainson's hawk nests since the mid-1990s suggest that the finer branching of elm trees tends to make nests more vulnerable to destruction from wind than those in trees with stouter branching.

The most serious threat to nest trees was decreased water flows from the farmlands. The water source for currently-used nest trees in the Sand Creek Sec. 23 and Kuna Cave territories has nearly disappeared as a result of reduced runoff from the conversion from gravity to sprinkler irrigation from the nearby 20 Mile Farm and other farms. Most trees at Sand Creek Sec. 23 were alive in 1997, but nearly all had died by 2000 - including four nest trees. Cattle also threaten water stressed trees. As observed in northeastern Colorado and southwestern Montana (Olendorff and Stoddart 1974, Restani 1989), the death rate of trees is being hastened by cattle that seek shade from the trees or use them as rubbing posts. Trampling by cattle destroys vegetation around tree bases and increases erosion around the roots. Trees die from exposure of their roots coupled with the loss of their bark. Although only two nest trees burned, the entire

Kuna Butte Sec 13 nesting area was lost to fire. Loss to fire is an ever present threat.

The situation for nesting Swainson's hawks in the northwestern portion of the NCA is tenuous. Although 7 of 10 historical territories were occupied in 2000, only 2 contained healthy stands with numerous trees. The rest contained either few trees, and most were dead or dying. Territories with trees that are alive are threatened by fire, cattle grazing, disturbance from nearby farms, and loss of water supplies. The rate of tree loss appears to be increasing which is a cause for concern. Our results suggest that Swainson's hawks rarely nest in dead trees. If the current trend continues, most trees currently used by nesting Swainson's hawks will not exist in 10 years. Clearly, management measures must be undertaken to protect them.

Management Recommendations

Habitat conservation for Swainson's hawks involves enhancement and protection of foraging and nesting habitat (England et al. 1997). U.S. Fish and Wildlife Service management guidelines for Swainson's Hawk nesting habitat recommend safeguarding nesting pairs from disturbance and enhancement of nests and nesting substrates (Sharp 1986). Management strategies entail providing suitable nesting habitat through preservation of existing and potential nest trees and by active measures to increase availability of nesting substrates (Olendorff and Stoddart 1974, Estep 1989). Principal approaches for nest site management include protection of nest trees from damage caused by livestock, planting of new trees, construction of artificial nest structures, and regulation of public access (Olendorff and Stoddart 1974, Fitzner 1980, Sharp 1986).

To offset recent losses of nest trees in the northwest portion of the NCA, we recommended protection of existing nest trees and potential alternate nesting trees, increased water flows to currently-used nest groves, and planting of new trees. Because Swainson's hawks do not readily use artificial nesting structures (England et al. 1997), we recommend this action only on an experimental basis.

Protection of nest trees. Nest trees in the NCA are dying from a lack of water and damage from cattle rubbing against trees and trampling the roots. Protection of trees should be the priority action because existing nest trees are in place and the action can be readily implemented. We recommend that all nest trees and potential alternate nest trees be fenced in areas grazed by cattle (Olendorff and Stoddart 1974). Because of the threat of fire, we recommend fire proof barriers such as barbed wire and steel fence posts. A possible alternative is to place barrier timbers around nest trees as has been used by the U.S. Forest Service in the Pawnee National Grasslands (McKinley pers. observ.).

Increase water flows. Nest trees have died and they are rapidly dying at the Kuna Cave and Sand Creek Sec. 23 nesting territories. Others are threatened as less water runs off of the surrounding farms. We recommend that partnerships with landowners be developed to increase water flows to groves of trees where nest trees are located. Currently, the most critically threatened territory is the Sand Creek Sec. 23 nesting territory. The adjacent farm is owned by the City of Boise. We recommend that farm managers impound existing runoff water (Fig. 23), and divert it to the nearby Sand Creek Sec. 23 nest tree. We also recommend that BLM managers assess the feasibility of developing a partnership with the dairy northwest of the Kuna Cave nesting area to utilize water from the lagoon at the site. Some of this water could be channeled to the drainage that contains the cottonwood trees. We recommend that all territories be assessed to see how existing runoff can be most efficiently utilized.

Tree plantings. Selective tree plantings could be implemented as recommended for the Hanford site in south-central Washington (Fitzner 1980). However, plantings have the disadvantage of requiring a water supply until the trees have developed a sufficient root system to sustain themselves. Unless there is a nearby water source, water would need to be trucked in weekly. Therefore, we recommending planting trees at sites where water has been restored or where water is collecting. The Poen 1995 nest site is an example. Plantings will ensure that potential nest trees are established quicker than natural propagation. We recommend that drought tolerant species such as black locust (*Robinia pseudacacia*) be used in plantings combined with fast growing species like cottonwoods. When the fast growing species die, the more stable locust trees will continue.

Monitoring. Occupancy and productivity of the 10 historical Swainson's Hawk nesting territories in the northwestern portion of the NCA should be monitored because of the threats to pairs nesting in the area and degradation to their nesting habitat still exist. Sites where management actions are implemented (fencing and planting) should be monitored to assess the effectiveness of the management action.

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Table 1. Locations, breeding status, and productivity of Swainson's hawk nest territories on and near BLM land in 2000.

Site Name	Site No.[a]	UTMEW	UTMNS	Breeding Status	Hatch Date	# Young Fledged	Mortality
Territories on BLM Land							
Cloverdale Dairy	1	552684	4809158	Egglaying pair	6/21/00	0	2 nestlings
Kuna Butte SE	2	546775	4808614	Egglaying pair	6/4/00	1	
Kuna Butte Sec. 13	3	Vacant					
Kuna Cave	4	545730	4806729	Egglaying pair	5/13/00	1	
Locust Grove SW	5	Vacant					
Poen Road	6	548560	4807043	Egglaying pair	6/13/00	2	
Sand Creek Sec. 23	7	556402	4805828	Egglaying pair	6/11/00	2	
Sand Creek Tree	8	Vacant					
Swan Falls-Kuna Cave	9	547207	4808014	Egglaying pair		0	1 Adult female
Swan Falls-Nicholson	10	547540	4805820	Non-egglaying pair		0	
Territories Near BLM Land							
Baker Road	11	560816	4810257	Egglaying pair	6/1/00	3	
Barker-Cole	12	558939	4810245	Egglaying pair		0	
Blackcat-King	13	544418	4813212	Egglaying pair	6/10/00	3	
Canada-Melba	14	539500	4804180	Egglaying pair			
Cloverdale Radio Tower	15	Vacant					
Deer Flat-Robinson	16	541034	4816594	Egglaying pair	6/8/00	@2[b]	
Initial Butte		547230	4794507	Egglaying pair	6/30/00	1	
King-Cloverdale	17	553162	4813420	Egglaying pair	5/31/00	4	
Kuna Mora	18	559142	4811879	Egglaying pair	6/21/00	2	
Kuna Mora-Curtis	19	560649	4811808	Egglaying pair		0	
Kuna Mora-Locust Grove	20	550750	4812131	Egglaying pair	6/5/00	@3[b]	1 fledgling
Kuna-Locust Grove	21	550603	4815067	Egglaying pair	6/2/00	2	
McElroy-Canada	22	539040	4805260	Occupied			
Mora	23	552443	4811930	Egglaying pair	7/17/00	2	
North Power Canal	24	541090	4810590	Egglaying pair	6/6/00	@1[b]	1 fledgling
Robinson-Kuna Cave	25	540986	4808052	Egglaying pair	6/7/00	0	
South Power Canal	26	542110	4809872	Egglaying pair	6/7/00	0	

[a] Refers to number on study area map (Fig 1). [b] @= at least. Minimum count.

Table 2. Turnover of color-marked adult Swainson's hawks at occupied nest territories that had marked adults in 1999 on and near BLM land.

Site Name	Color Marked Adult 1999	Color Marked Adult 2000	Turnover	Comments
Territories on BLM Land				
Kuna Butte SE	Both	Both	No	Same male since 1995, same female since 1996
Kuna Cave	Both	Both	No	Same male since 1996, same female since 1998
Sand Creek Tree	Both	Female[1]	No[a]	Female at Sand Crk Tree 1998-99, Poen Rd 1995-96
Sand Creek Sec. 23	Female	Female	No	Same female since 96
Swan Falls-Kuna Cave	Both	Both	Yes[b]	Female from 99 died
Territories Near BLM Land				
Barker Road	Both	Both	No	
Barker-Cole	Both	Both	No	
Blackcat-King	Both	Both	No	Female since 1996; male since 1997
Deer Flat-Robinson	Female	Female	No	Female marked at McDermott-King 1996
King-Robinson	Male	Male	No	
King-Cloverdale	Both	Both	Yes[c]	Female since 1996, male since 19 97
Kuna Mora-Curtis	Male	Male	No	
Kuna Mora-Locust Grove	Both	Both	No	
Kuna-Locust Grove	Both	Both	No	Male since 1996; female since 1997
Mora	Female	Female	No	
North Power Canal	Male	Male	No	Male marked at Bowmont Robinson 1996
Robinson-Kuna Cave	Both	Both	No	

[a] Technically not turnover. In 2000 Sand Creek Tree territory vacant; female moved to Poen Road and secured new male.
[B] Intra-season turnover: 1999 female replaced; 1999 male replaced new male.
[C] Intra-season turnover: 1999 male replaced new male.

Table 3. Status of Swainson's hawk nest trees on BLM land, NW portion of the Snake River Birds of Prey NCA, 2000.

Site Name	Years Occupied	Tree Species	Tree Height (m)	Tree Condition[a]	No. Healthy Trees Within 400m Radius[b]	No. Decadent Trees Within 400m Radius[b]	No. Dead Trees Within 400m Radius[b]
Cloverdale Dairy	2000	cottonwood	10	1	8	0	0
Cloverdale Dairy	1996	cottonwood	17	1	20	0	0
Kuna Butte SE	1997, 1998, 2000	elm	8	1	7	1	0
Kuna Butte SE	1999	elm	9	1	7	1	0
Kuna Butte Sec. 13	1994	cottonwood	-	3	1	0	0
Kuna Cave	1999, 2000	cottonwood	6	2	2	4	2
Kuna Cave	1997, 1998	cottonwood	7	2	2	4	2
Locust Grove SW	1999	elm	10	1	1	2	0
Locust Grove SW	1998	cottonwood	16	1	0	0	0
Poen Road	2000	elm	12	1	12	0	2
Poen Road	1995	cottonwood	8	3	0	0	0
Sand Creek Sec. 23	2000	elm	15	1	1	0	>30
Sand Creek Sec. 23	1998[c]	willow	6	3	3	5	0
Sand Creek Sec. 23	1999	willow	7	3	5	7	>30
Sand Creek Sec. 23	1995, 1998	boxelder	9	3	3	5	>30
Sand Creek Tree	1997, 1999	cottonwood	7	3	0	0	2
Sand Creek Tree	1998	cottonwood	6	3	1	0	0
Swan Falls-Kuna Cave	2000	elm	7	1	1	1	1
Swan Falls-Kuna Cave	1997, 1999	elm	10	1	1	1	1
Swan Falls-Nicholson	1999	elm	8	1	0	0	0

[a] 1- healthy, 2 - decadent, 3 - dead

[b] Potential nest trees; large enough to be used by nesting Swaison's hawks

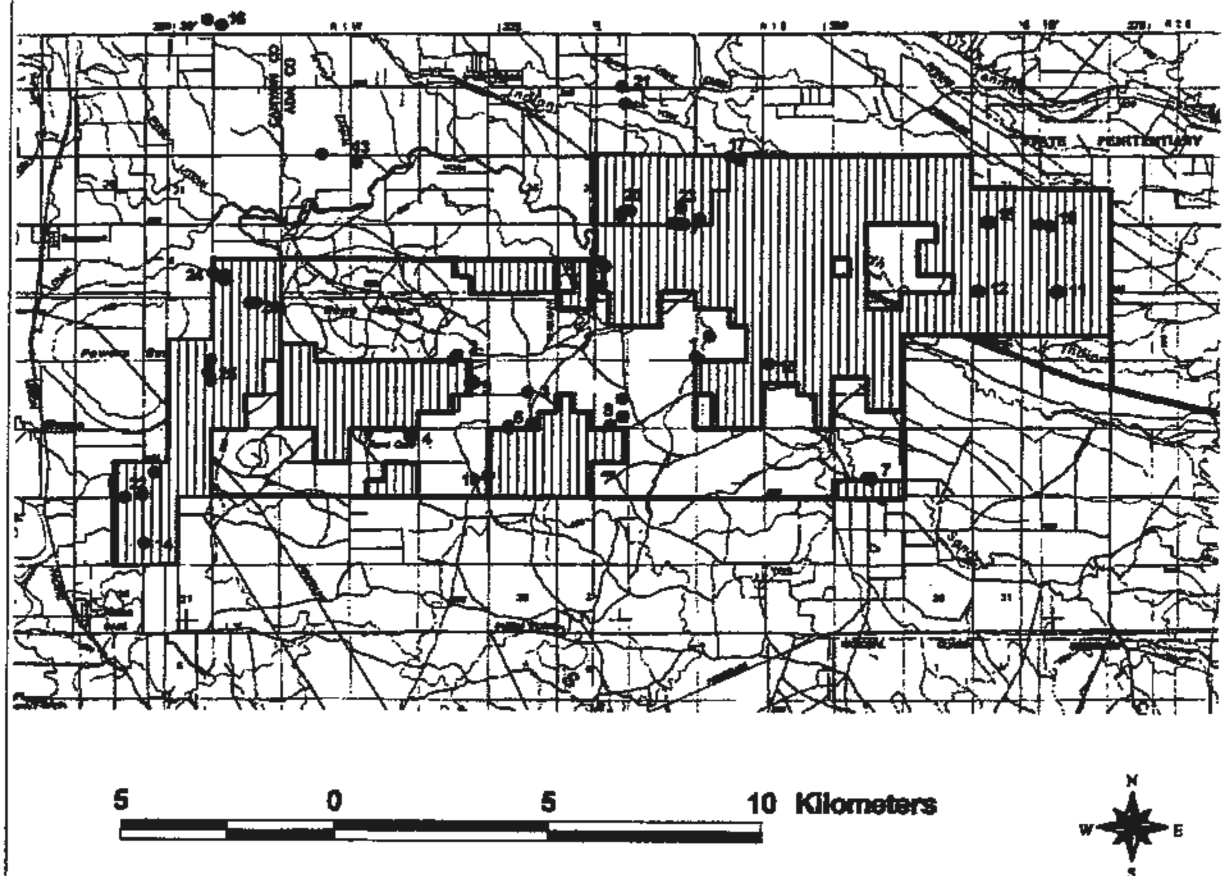
[c] Renest

Table 4. Suspected causes of death and degradation of Swainson's hawk nest trees in the northwest portion of the Snake River Birds of Prey National Conservation Area.

Site Name	Year Occupied	Species of Tree	Suspected Cause of Death
Kuna Butte Sec. 13	1994	cottonwood	fire
Kuna Cave	1999-2000	cottonwood	decreased water flow
Kuna Cave	1997-1998	cottonwood	decreased water flow
Poen Road	1995	cottonwood	fire
Sand Creek Sec. 23	1998	willow	decreased water flow
Sand Creek Sec. 23	1999	willow	decreased water flow
Sand Creek Sec. 23	1997-1998	box elder	decreased water flow
Sand Creek Tree	1997 & 1999	cottonwood	cattle and drought
Sand Creek Tree	1998	cottonwood	cattle and drought

Figure 1. Map of Swainson's hawk nesting territories on and near BLM land that were monitored in 2000.

Kuna-Melba Swainson's Hawk Study Area



- Historically occupied Swainson's Hawk nests. Numbers refer to sitenumbers in report table.

2000 Study Area

Land Ownership

Private

State

Federal

Figure 2.
Cloverdale Dairy nest tree, 5 July 2000

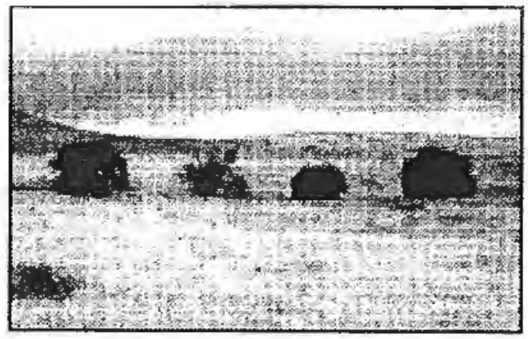


Figure 3.
Kuna Butte SE nest trees, 31 July 2000. Nest tree in 1999 on the right and 2000 nest tree on the left.

Figure 4.
Poen Road 2000 nest tree, 31 July 2000.

Figure 5.
Sand Creek Sec. 23 nest tree, 31July 2000. Nest tree on the right.

Figure 6.
Swan Falls-Kuna Cave nest tree, 31 July 2000. Nest tree used in 1999 on the right and nest tree used in 2000 on the left.

Figure 7.
Swan Falls-Nicholson nest tree, 31 July 2000.

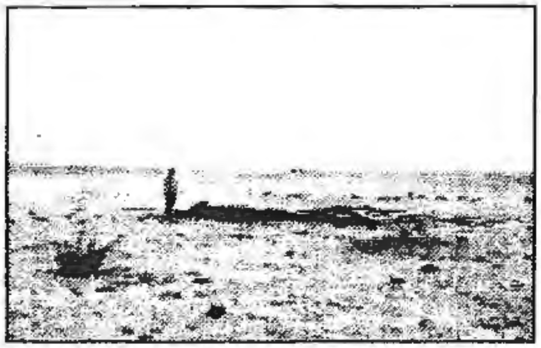


Figure 8.
Kuna Butte Sec. 13 nest tree, 31 July 2000.
Tree was killed in the 1995 Point Fire.

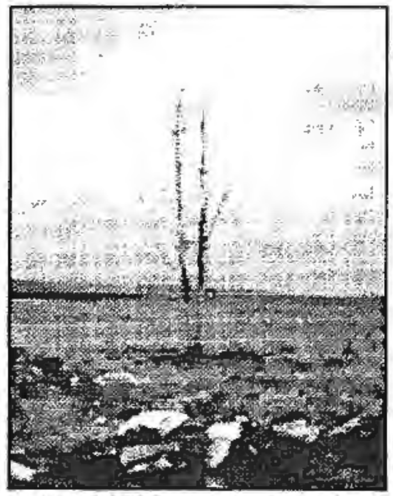


Figure 9.
Poen Road 1995 nest tree, 31 July 2000.
Tree was killed in the 1995 Point Fire.

Figure 10.
Sand Creek Tree nest tree used in 1997 and 1999, 31 July 2000. Tree died in 2000

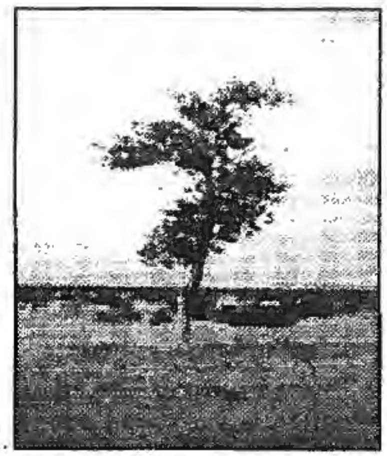


Figure 11.
Kuna Cave nest tree, 31 July 2000.

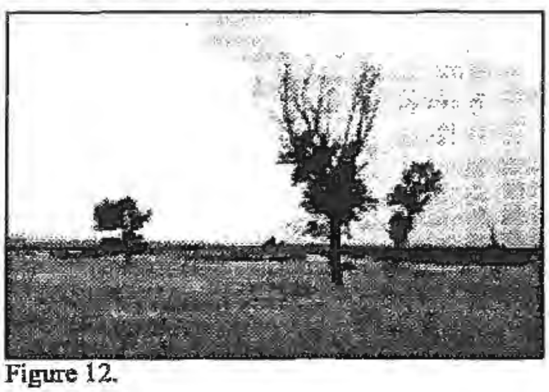


Figure 12.
Cottonwood tree just north of Sand Creek Tree nest tree, showing cattle damage, 31 July 2000.

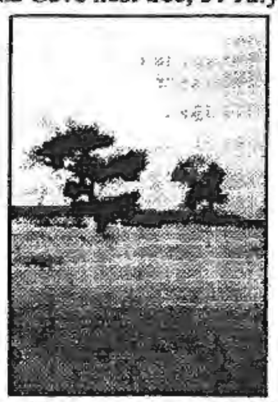


Figure 13.
Kuna Cave nest trees, 31 July 2000.
Nest tree used in 1997 - 1998 on the left, 1999 - 2000 on the right

Figure 14.
Water source for Kuna Cave nesting territory, 31 July 2000.

Figure 15.
Sand Creek Sec. 23 nest tree used in 1997-1998, 31 July 2000.

Figure 16.
Sand Creek Sec. 23 nest tree used in 1999, 31 July 2000.

Figure 17.
Dead cottonwood tree just north of Sand Creek Tree nest tree, showing cattle damage, 31 July 2000.

Figure 18.
Sand Creek nest tree used in 1998, 31 July 2000.

Figure 19.
Elm tree showing cattle damage in the Kuna Butte Sec. 13 nesting territory, 31 July 2000. Note the rubbed bark and lack of vegetation around the roots.

Figure 20.
Trees in the Cloverdale nesting territory, 5 July 2000. 1996 nest tree on the far right.

Figure 21.
Dead willow trees along Sand Creek near the Sand Creek Sec. 23 nesting territory, 31 July 2000.

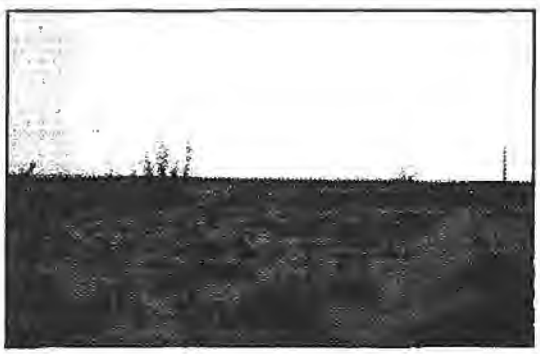


Figure 22.
Former water source for the Sand Creek Sec. 23 nesting territory, 31 July 2000.

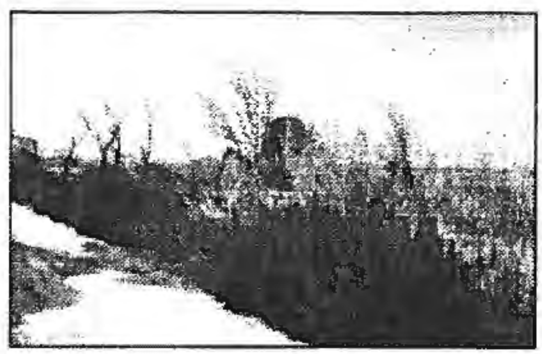


Figure 23.
Irrigation runoff from 20-Mile Farm near the Sand Creek Sec. 23 nesting territory, 31 July 2000.

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