

involved in the likelihood of a bird strike. Further study is needed of bird flight behavior at JNU.

Corvids

Common Raven (2.6 lb) and Northwestern Crow (13 oz) are both common at JNU. Crows were the second most common bird of concern (total 1100 birds) during Wilmoth's May 1999-to-May 2000 JNU study. In contrast, we recorded a total of only 8 crows throughout 2002 within our eleven 50-meter count circles (total of 22 hours of observation, in 10-minute periods). Many other crows were seen outside of the circles and count periods, but it does seem that they have recently become less numerous at JNU. Like Bill Wilmoth, Rich Gordan (pers comm) has observed nesting crows at the end of the spur dike—our T3 point count area—but not for the past several years. Crows are vocal and hard to miss when nesting, and it is unlikely that we could have overlooked them.

Closed spruce forest, among the least productive of all airport habitats for foraging birds and mammals, *does* attract communally nesting crows. We initially assumed that airport hazing staff had discouraged crow nesting here, but learned later that they had not done this. So the reason for crow declines is a mystery to us.

Ravens were more common than crows during our 2002 study. A favored location for ravens was the recently cleared Jordan Creek Triangle. On several occasions we found garbage flown into this site by ravens, surrounded by their tracks in the snow.

From 1990 to 2002, 7 crows were struck by aircraft at JFK International Airport. During the same period, kestrels were struck 37 times and harriers were struck 15 times. These extremely maneuverable raptors usually manage to elude even the agile crows during interactions, and are presumably much less common than crows at JFK. This leads us to speculate that the high intelligence of crows (and certainly of ravens) helps to account for the relative rarity of corvid strikes.

Ravens are known to damage parked planes, particularly those with fabric skin. Raven is perhaps less likely to be struck than to do the striking.

The two remaining corvids of the airport area—Steller's Jay (3.7 oz) and Black-billed Magpie (6 oz)—tend to stick low over trees, and are not often seen passing through JNU flight space.

Tree clearing—past and proposed

Between Yandukin and Crest Avenue is a 3.8 acre (1.5 hectare) undeveloped riparian corridor—considered by fisheries biologists to be one of the most productive and valuable reaches of Jordan Creek. We mapped and studied the hydrology, fisheries and bird use of this reach with Dan Bishop in 1986 (Bishop et al, 1987). ADF&G and SWCA have continued to monitor weirs below both Yandukin and Crest culverts, documenting the exceptional importance of



Fig 13 Above: Jordan Creek Triangle in 1986. Below: in summer 2001, shortly after trees were cleared.

this area to fish.

In February 2001, on a 6-to-2 vote of Juneau's Planning Commission, all spruce trees were removed from this Jordan Creek Triangle. According to airport officials at the time:

"... the trees obscure air traffic controllers' views of part of some taxiways and helicopter operations, provide habitat for birds that fly across runways, and could be a hazard for aircraft that stray from the regular flight path. . . Cutting down the trees would remove cover for birds and let airport workers see where birds are on the ground and try to scare them away." (Eric Fry, Juneau Empire, 2/28/01)

The decision was controversial. Because further tree clearing has been proposed for the Floatplane Pond Woodland, it is important to examine the results at Jordan Triangle. Although SWCA initially requested our bird survey work only in the Duck Creek Triangle and Floatplane Pond Woodland, we recommended establishing a comparison site in Jordan Triangle to gather information on how the avian community responds to this type of



Fig 14 View west to Jordan triangle, June 1991. Crest culvert at lower left. Close encroachment of spruce (left) and alder/willow (right) along creek channel probably inhibited most birds of concern.



Fig 15 Looking downstream to Crest culvert, 4/28/02. Logging of marginal spruce and deciduous brush improved the view and takeoff space for heron, mallard, and gulls.

habitat alteration. Our point count circle here became known as J1 (fig.1)

The lower (southernmost) third of the Jordan triangle channel is contained by dikes. Improved drainage on these raised surfaces allowed establishment of fast-growing spruces sometime after 1962. Upstream, the entire surrounding surface is active floodplain, and this reach supported only the more flood-tolerant willows and alders. These upstream channels meander naturally, with undercut banks, sheltering root masses, and more diverse in-stream cover than in the channelized portion. Overhanging deciduous foliage of willow and alder formerly shaded the stream and provided nitrogen-rich litter, until they were cleared in 2001.

To some human eyes, the Jordan triangle is now a scene of devastation. Responding in part to complaints, the airport hired a contractor to chip down the stumps most visible from Crest Avenue to ground level. This action was cosmetic, and had little effect on habitat values. To avian eyes, or at least to birds of concern, the Jordan Creek clearcut is more inviting now than when the stream was thickly fringed with shrubs and spruces.

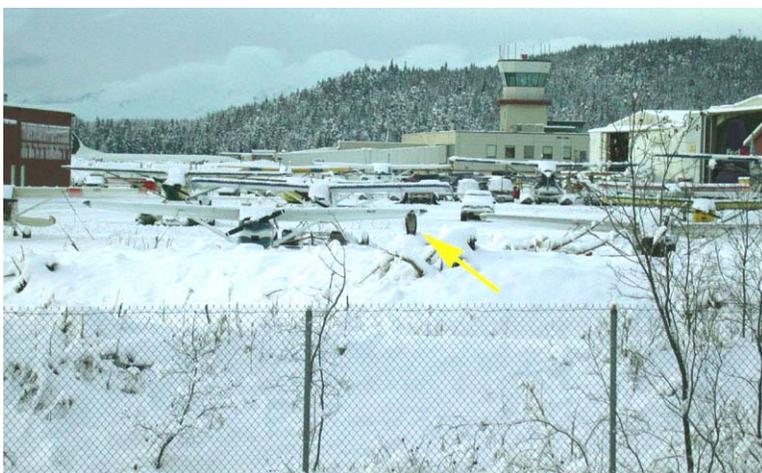


Fig 16 Heron resting on cleared dike, Jordan Creek triangle.

At the February 2001 planning commission hearing, the following arguments, pro and con, were recorded:

Airport officials said trimming the tree tops wouldn't alleviate the bird problem. . . . "We need to get rid of the cover, and that's getting rid of all the trees," said Ralph Sanford, who manages wildlife control at the airport.

But Ben Kirkpatrick, area habitat biologist for the state Department of Fish and Game, said great blue herons and eagles will continue to use the stream if the trees are removed, and they'll have a clear flight path across the runway. An open stream may attract more gulls, as well, he said.

"I would urge erring on the side of caution," airport manager Allan Heese told the commission. "We feel strongly that the removal of these trees will allow us to manage that bird hazard a lot easier and more efficiently than now." (Eric Fry, Juneau Empire, 2/28/01)

Our point count data and incidental observations suggest that Kirkpatrick was right. Most birds of concern are probably making increased use of Jordan Triangle. Furthermore, the improved visibility has not made it much easier for hazers remaining in or close to their vehicles to detect and scare birds from the meandering and slash-obscured channels. Often on our bird counts, we were unaware of the presence of heron or mallard until we walked into the site, flushing the birds.

Lacking data on bird use of Jordan Creek Triangle prior to tree removal, we must look to other comparisons of closed versus open habitats. Of the remaining 10 point count locations, the easternmost site on Duck Creek (D3) most closely resembles the pre-logging conditions at J1. The apparent low attractiveness of D3 to birds of concern (fig 17) is interesting. All of our point counts in semi-forested cover on airport property yield similarly depauperate tallies of large, problematic birds.

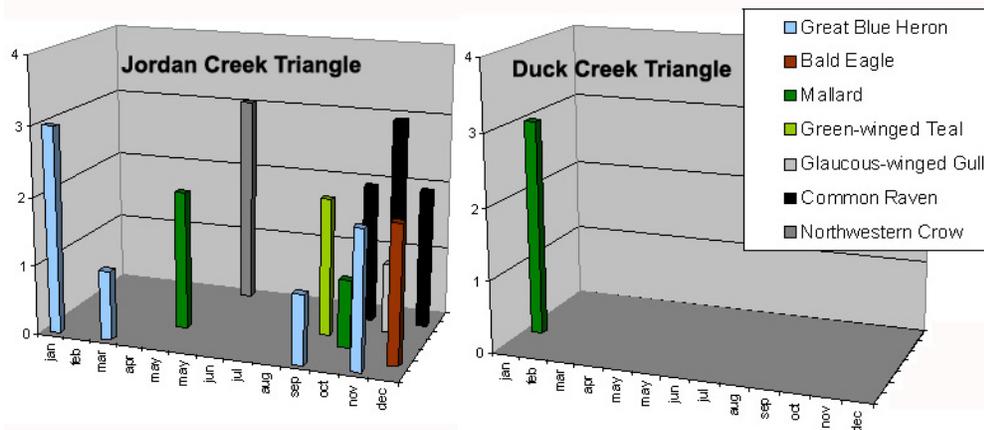


Fig 17 # birds within 50 meter radius on monthly 10-minute point counts in 2002, JNU. Only the 7 species of concern recorded on these sites are shown. **Left:** J1, cleared of trees to reduce attractiveness to birds **Right:** D3, retaining conifer/deciduous cover similar to that existing on Jordan Creek before logging. Total # individuals for birds of concern: Jordan 25; Duck 3. The 3 mallards at D3 were not on the creek but flying overhead.

The same great weight and relative lack of agility that make heron and waterfowl dangerous to planes also makes them tend to avoid tight spaces where takeoff options are limited, and where predators cannot be seen approaching. Eagles and gulls, while somewhat more maneuverable, likewise rarely use closed cover with poor visibility. All of these birds probably make more use of the Jordan Creek Triangle now than they did before logging.

Ravens and crows are highly maneuverable and unafraid of closed cover. They certainly used Jordan Triangle before trees were cleared. But even these birds may be finding more food at Jordan Triangle (or bringing more in from MacDonald's etc) than prior to logging.

Throughout winter 01-02, we documented very high populations of long-tailed voles—an irruptive species—in all meadow/brush communities at Juneau Airport. Tree removal definitely improved conditions for long-tailed voles at Jordan triangle. In addition to ravens, voles attract raptors and short-eared owls (large but extremely agile birds and probably way down on the list of likely airstrike hazards). On March 15, 2002, we found heron tracks in snow, wandering throughout the Jordan triangle far away from the creek itself, hunting voles.

In our opinion, the best compromise for Jordan Creek Triangle would have been to top the spruces, as favored at the hearing by commissioners Kendziorek and Gladziszewski, as well as local habitat biologists. This would have allowed the control tower full view of those portions of airport service roads, etc, not already obscured by hangar proliferation, and would also have maintained dense cover near the stream. This cover not only maintains quality fish habitat, but reduces the appeal of fish streams to most birds of concern.

Airport habitats ranked by attractiveness to birds of concern - implications for proposed development

As stated in the JNU Wildlife Hazard Management Plan (FAA, 2002), foraging habitat is generally a more significant attractant, at least in terms of airport safety issues, than is nesting or roosting habitat. It's easier to

deter birds from use of nesting/roosting habitat (eg. crow use of conifers) than from key foraging habitat (Wilmoth 2001).

To evaluate airport-area habitats according to their foraging value for the five major groups of birds of concern, we developed a ranking system (fig 19). To each of 12 habitats we assigned a subjective score (highest value = 3; no value = 0)*. Non-foraging values were disregarded. To give additional weight to the first three groups of birds, scores for eagle and corvids were divided by two. Any individual habitat could arguably be bumped up or down a rank or two, but the overall trend is clear. The ranking has many implications for airport management.

Least attractive habitats Ideally the lowest ranking habitats should be those closest to the runway and Floatplane Pond. Young closed conifer forest should not be cleared but *planted*, wherever upward growth will not eventually obscure critical views from the control tower. Even better is deciduous brush, because it has less potential to block tower views, and is more valuable to fish and non-threatening wildlife like songbirds.

The most attractive habitats In contrast, highest ranking habitats should be farthest from the runway and Floatplane Pond. The 5 highest ranking habitats are aquatic, and JNU is literally surrounded with them. The highest risk habitat - shallow lagoons - could be filled, dredged deeper, or wire-gridded. But that would still leave the second and third most attractive habitats—tidal mudflat/slough and the Mendenhall River—that bracket the east and west ends of the runway.

The fourth highest-risk habitat is anadromous stream. Duck and Jordan Creeks are severely impaired anadromous channels, badly in need of restoration. Such work is currently opposed by airport management and the FAA because of safety concerns. We believe there are ways to improve stream habitat for rearing fish and non-threatening birds while reducing their attractiveness to birds of concern (see page 54 of our Hotspots report).

* A slightly different and more data-driven approach to this ranking is explained on page 54 of our Hotspots report. There we used actual species counts from airport-area habitats. Results were similar to those of this more subjective ranking.