COMPARISON OF DIFFERENT WILDLIFE IMPACT MITIGATION STRATEGIES DURING THE CONSTRUCTION OF AN INTERSTATE GAS PIPELINE

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1994 TRANSACTIONS OF THE WESTERN SECTION OF THE WILDLIFE SOCIETY 3 :21-25

"Mitigation" as an applied wildlife management concept is still evolving. It was first developed within the Fish and Wildlife Coordination Act of 1934, as amended in 1946 and 1958 (Rappoport 1979). Not until 1974, however, did the U.S. Fish and Wildlife Service (USFWS) (Anon. 1974) provide a consistent definition in terms of the manner in which it should be accomplished. Jahn (1979) called for a stronger base of scientific information for mitigating individual situations to improve the quality of management alternatives and decisions. The need for greater accountability in mitigation has produced legislation such as California's AB 3180 (1988 California Statutes, chapter 1232), an act which ensures that mitigation measures imposed upon development projects are accomplished. These two aspects of mitigation, information and accountability, have been interpreted by various resource agencies in many ways.

During 1992 and 1993, one of the longest natural gas pipelines in North America was constructed along an existing pipeline corridor from central California to the Canadian border in Idaho, 1,044 mi. through four states and a wide diversity of habitat types. The project, which involved 845 mi. of new construction, underwent extensive regulatory review by the Federal Energy Regulatory Commission (FERC), the California Public Utilities Commission (CPUC), the USFWS, and the fish and wildlife agencies of California, Oregon, Washington and Idaho.

Although the FERC and the USFWS provided *de jure* project oversight for environmental protection, most *de facto* mitigation was negotiated with state fish and wildlife agencies. Early in the project, the proponents and the state agencies generally accepted the federal mitigation requirements which included, among others, a requirement for preconstruction surveys for all nesting raptors in the three northernmost states, as well as two dozen "special status" species. The mitigation strategy was to locate the resources in advance of construction (preconstruction surveys) and avoid active nests, dens and burrows. This resulted in construction operations "moving around" occupied sites during the breeding season and returning when the resources were less sensitive to disturbance, e.g., for a raptor nest, after the young had fledged.

Meeting this requirement proved extremely costly for the project proponents during the first year of construction. Construction delays on a project of this scope can demand tens of thousands of dollars per day, and there were several "move-arounds" in 1992. Proponents requested a complete renegotiation of mitigation provisions for the second construction year. Because measures were negotiated with each state individually, the compliance measures became a combination of different mitigation approaches. As we were able to roughly track costs and effectiveness of some of the techniques used, we were led to ask several questions about wildlife mitigation on large infrastructure projects. Preconstruction surveys are expensive and inevitably labor-intensive. Do surveys locate the full spectrum of sensitive resources? Do appropriate mitigation efforts follow discovery? And perhaps most important, can the funds committed to these surveys be more efficiently used, or directed toward different strategies for environmental protection?

PROJECT MITIGATION IN 1992 AND 1993

Preconstruction Surveys

Preconstruction surveys in 1992 covered a "corridor", centered on the project right-of-way (ROW) and extended out various distances according to the mobility of the target species, from a few hundred feet for San Joaquin kit foxes (*Vulpes macrotis mutica*) to 1.5 mi. for prairie falcons (*Falco mexicanus*). With the exception of urban and some agricultural areas, virtually the entire corridor was surveyed, with a goal of 100%

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coverage. Among other results, we recorded 99 nests of 16 raptor species in a mile-wide corridor through Oregon, Washington and Idaho, and 28 nests of five raptor species along 210 mi. of ROW in California. We provided information to state data bases that expanded range and habitat utilization information on harlequin ducks (*Histrionicus histrionicus*), northern pygmy owls (*Glaucidium gnoma*) and burrowing owls (*Speotyto cunicularia*).

We will use California data as an example of the level of effort required to complete preconstruction surveys on a project of this type. In 1992, an estimated 9,000 person-hours (figures include all office, travel and support personnel time) were expended on preconstruction surveys for 210 mi. of pipeline ROW surveys. Our surveys recorded a total of 34 discrete resources, representing 6 of 15 target species. This translates into a discovery "cost" of 265 person-hours each. Surveys in 1993 (which were limited to California) approached the problem of resource identification in a somewhat different manner than surveys in 1992, by making a low-cost "suitable habitat" reconnaissance several months before the preconstruction survey period began. Only appropriate habitat was searched during the 45-day preconstruction survey period. This clearly increased efficiency: operations in 1993 expended 7,800 person-hours and located 69 discrete sensitive resources (not including potential kit fox dens) associated with 5 of the 15 target wildlife species. Adjusting for the different mileage in 1993 (184 mi.), the discovery "cost" for wildlife resources uncovered by surveys ranged from a high of 265 hr. per resource in 1992 to a low of 131 hr. per resource in 1993.

We did not participate in preconstruction surveys north of California in 1993, but second-year surveys in Oregon were also considerably reduced, partially by substantial changes in the construction schedule and by replacing ground surveys with helicopter surveys. Surveys for non-special status raptors were eliminated in some areas.

Mitigation Monitoring

Mitigation monitoring was of two types. *Compliance Monitoring* was the day-to-day observation of the project's most basic requirements: trash collections, speed limits, wildlife in work areas, pollution control, etc. This task remained relatively stable between years. The two most common violations were trash left out overnight and pipe sections left uncapped: each was 42% of the total. Spoil pushed into kit fox habitat represented 10%. Lack of proper escape ramps, excessive dust emissions and a small oil spill were each 2%.

The second category was *Resource Monitoring*, i.e., determining the condition or vulnerability of resources that were discovered during the preconstruction surveys. In 1992, most resource monitoring comprised periodic observations of active raptor nests to determine when a nest could be declared "inactive" and construction could be allowed to proceed. In California in 1993, monitoring of this type was used to decide "whether construction has any effect on nesting behavior" (D. Zezulak, pers. comm.). Site specific construction modifications would be negotiated if negative effects were observed. This approach was approved by the California Department of Fish and Game (CDFG) apparently to allow a more flexible response than 1992's straightforward avoidance rule; similarly, avoidance of kit fox dens was modified in November 1992 to allow den excavation (Anon. 1993a).

A similar special status raptor monitoring provision was included in Oregon's renegotiated mitigation package for 1993. Oregon Department of Fish and Wildlife biologists made a one-time judgment on whether a nest would be affected (Anon. 1992). In either case, presumably, a positive evaluation of effect would halt or displace construction.

In California in 1993, we monitored with various degrees of intensity five Swainson's hawk (*Buteo swainsoni*) nests, two of which were >0.75 mi. from the ROW and not considered susceptible to disturbance. Through repeated observation of nests during construction noise and activity, the observers opined that project operations had no deleterious effect. To our nest observers, obvious negative effects would have been repeated flushings of incubating females, resulting in nest failure or predation on the young. This did not occur. We did note other responses to construction activities, mainly nestlings assuming a crouching posture when noise levels were high.

COMPARISON OF MITIGATION STRATEGIES

Survey and Monitor - Mitigation in Place

Preconstruction inventories of wildlife resources have an intuitive appeal and, when used to make substantive changes in project siting or scheduling, can be effective. Olendorff et al. (1981) noted that surveys for raptors also provided for a segment-by-segment analysis of the effects of construction and maintenance.

However, preconstruction surveys are expensive. As noted above, the discovery "cost" of a resource in

California ranged from 265 person-hours each in 1992, when crews covered virtually all the pipeline ROW, to 131 hours per resource in 1993. Assuming a labor rate of $50 per hour (to include travel and lodging costs), the minimum dollar cost for each resource surveyed is approximately $6500. How well does this expenditure serve the wildlife resource?

The act of surveying itself can have an impact (Bortolotti et al. 1985, Call 1978). Ferruginous (*Buteo regalis*) and red-tailed (*B. jamaicensis*) hawks, golden eagles (*Aquila chrysaetos*) and peregrine falcons (*Falco peregrinus*) have all shown some susceptibility to the kinds of disturbance inevitably caused by even the most conscientious surveyors (White and Thurow 1985, Steenhof and Kochert 1982). In a general sense, the environmental costs of surveying must be ranked against the benefits of protecting individual resources that are found. When protection is not rigorously provided to the resource and demonstrably effective, speculating whether the effort is being expended in the right place is reasonable.

With the surveys complete and sensitive resources mapped, how well did the resource monitoring effort in 1993 serve the specific mitigation objectives? Not well, in our opinion, and for three reasons. First, increased stress levels due to monitoring may have reduced survival potential in ways we could not see (Moberg 1987). All behavioral observations of this nature are extremely subjective. Second, even if a nest fails unequivocally in the presence of construction, the failure may not be attributable to construction activity. Nesting failures are common among birds in general and raptors in particular. A nest failure ratio of 1:3 or 1:4 appears frequently in the literature. In the largest sample available for raptors generally, 33% of all raptor nests failed (Newton 1979). For Swainson's hawks in California, Estep (1989) reported nest failure rates of 14% and 18% in a Central Valley survey. Put briefly, resource monitoring is hard to do well, and the information gained is virtually impossible to interpret.

Third, monitoring in itself does not constitute mitigation under California environmental law, with good reason. A valuable tool to document resources and impacts, monitoring *per se* is not mitigation according to the California Environmental Quality Act (CEQA) Guidelines (Section 15370). In straightforward situations, monitoring can help ensure that sensitive resource boundaries are honored. As employed on this project, however, monitoring was presumed able to prevent impacts to all sensitive resources. Preventing an impact, i.e. "avoiding" it pursuant to CEQA before the impact occurred, was often impractical. Monitors in the field did not have the authority to stop operations, and communications through the chain of command from remote field locations was time-consuming. Moreover, monitoring an effect of construction implies by definition that some degree of impact has already occurred.

Off-site Mitigation, in-kind

In his summary of proceedings of a national symposium on mitigation, Swanson (1979) stated the principle of on-site accountability for mitigating negative impacts that has since become doctrine for some states. The general policy of the CDFG has been to use avoidance as the primary tool to moderate impacts (Dennis 1994); on-site mitigation "in-kind" (i.e. directly addressing the lost productivity of the resource) was the second choice, and off-site mitigation in-kind the third. These priorities have recently been questioned. Dennis (1994:10) reflected the opinion of many when she wrote that "too often avoidance equals postage-stamp mitigation." The priorities are now being re-examined (R. Rempel, pers. Comm.).

We can compare the cost-effectiveness of one type of in-kind, off-site mitigation with that of preconstruction surveys followed by avoidance and monitoring. In Washington, project proponents constructed 42 nest platforms to compensate for the lost productivity of ferruginous hawks due to construction disturbance. The approximate cost of installation of these structures was $30,000 (J. Gouge, pers. comm.), or about $715 each. When evaluating the success of such platforms in Alberta (Canada), Schmutz et al. (1984) recorded an 80% use rate the third year after construction. Even making a conservative estimate of a 50% use rate, and a 50% failure rate of nests on platforms, ten successful nests would emerge from this mitigation effort, at a cost of $3000 each. Project preconstruction surveys located two ferruginous hawk nests during the 1992 surveys. Using the resource "discovery cost" of $6500 each, locating the nests required the commitment of $13,000 in project mitigation funds.

It required $13,000 to discover two nests (with no guarantee that avoidance or monitoring would ensure protection), but only $6,000 to create two successful replacements. The conclusion, from this case study, is inescapable: mitigation funds can be far more cost effective—at least from a population biology standpoint—when spent on well-planned off-site mitigations in kind.

Applications of this approach were not limited to ferruginous hawks, nor to Washington state. Another example of efficiently applied resource mitigation was near a burrowing owl colony on the project ROW in northern California. The performance of artificial burrows installed there in 1992 and was examined in 1993. We found 88% of all artificial burrows (n=17) were used, many as nesting burrows. Within the colony as a whole, productivity seemed adequately buffered against the loss of two burrows due to construction: in 1992, five adult pairs were observed with 21 young, and in 1993 seven pairs were observed with 20 young. Several authors have noted the success of artificial nests for this species. Collins and Landry (1977) found a 66% use rate within a year of installation.

Off-site Mitigation, out-of-kind

The Idaho Department of Fish and Game and the Idaho Panhandle National Forest of the U.S. Forest Service accepted conservation easements, purchased for private lands, as partial mitigation for project impacts (M. Luttrell, pers. comm.). A goshawk (*Accipiter gentilis*) nest had been discovered during preconstruction surveys in 1992. The nest failed, either naturally or for reasons which may have been associated with survey or construction activity. Preferred goshawk habitat was scarce in the area, and the strategy was to protect some lands from development through the easements, land which might be purchased by the federal government within the conservation easement period, and then managed by the Forest Service for long-range maintenance of this species.

Oregon, as part of its 1993 renegotiation and in connection with reduced preconstruction surveys, accepted a single payment of approximately $300,000 (or $4,000 per nest where surveys were conducted) to support habitat improvement programs and raptor research (Anon. 1992).

SUMMARY AND CONCLUSIONS

As the cities and towns of the West continue to grow, wildlife biologists both within state and federal oversight agencies and in the private sector will continue to be asked to describe ways to alleviate the effects of development on wildlife and other resources. Conjecturing about, and trying to mitigate for, the secondary or tertiary effects of large infrastructure projects usually exceeds common standards of "reasonableness". The answer, as it has evolved over the past decade, has been a combination of surveys and mandated mitigation for the wildlife resources encountered. That such surveys have value is not in question—they contribute to knowledge of the ranges and populations of many animals which would otherwise go unstudied. On the project being considered, preconstruction surveys resulted in range extensions for two species. Moreover, they serve as a defensible basis for negotiations between state agencies and project proponents.

However, preconstruction surveys are not systematic scientific sampling and they are expensive. For a linear corridor a few hundred feet wide and an average set of special status species, costs can range up to $500 per linear mile, or more if species demanding specialized protocols (e.g., bats) are suspected. In many cases these costs are far greater than replacing or even augmenting populations of the same species in nearby areas.

Off-site mitigation, out-of-kind, strikes us as too poorly defined. Idaho's request for vaguely construed conservation easements and Oregon's acceptance of cash payments to support wildlife programs belies the logical connection between cause and effect, and gives the unfortunate impression that mitigation is merely a matter of paying cash—a simple project expense like a license fee.

Alternative Mitigation Strategies

One alternative would start with the project proponent and the oversight agencies agreeing on an *estimate* that a certain number of sensitive resources exist in an area, and an *assumption* that a certain percentage of these will be negatively impacted by construction. BioSystems' 1992 project report (Anon. 1993b) used survey data to propose a predictive index for raptors in the habitats found north of California. A predictive index can be the basis for estimating what lies in the project ROW or zone of influence.

Assuming what the impacts will be is more difficult. Literature on the effects of disturbance can be confusing to interpret. However, as noted above, direct observations of a raptor nest do not provide information that is more defensible than professional conjecture. Used with caution, the literature can suggest the numbers of nests, burrows, dens or individual animals which may be lost due to construction. Project funding for environmental protection could then be directed at plans or programs which, within the bioregion, might be more effective than surveying and protecting resources actually in place.