

Appendix A

State DOT Interviews on Minimizing Impacts to Aquatic and Terrestrial Habitats

Minimization Questions for Impacts to Terrestrial Habitats

The intent of these questions is not to examine the state of the science but how to insert the science into common practice. We want to know: 1) how practitioners are changing or adopting new processes to address minimization of habitat fragmentation; 2) what specifically drives the change, 3) how is performance and success defined; 4) how is performance and success monitored; 5) where are the best dollars:results ratios obtained?

Terrestrial Habitat Crossing Questions

1. Approximately what % of your agencies existing highway miles have wildlife sensitive design features? (*Note: wildlife sensitive design features include overpasses, underpasses, exclusion fencing, retaining walls and other related features whose purpose is to minimize the roadways impact on wildlife*)
2. What are the most commonly used wildlife sensitive features? Please estimate how many miles they are employed on.
 - a. How is their effectiveness monitored?
3. Where do your monitoring success standards come from? What regulation or policy determines success standards?
4. Does your state have cost-tracking methods for:
 - a. Wildlife fence maintenance?
 - b. Annual inspection and maintenance of wildlife crossing facilities?
 - c. Excluding human use of wildlife crossings?
 - d. How is this work funded?
5. In your geographic area, which wildlife crossing practice and/or technique provides the greatest ecological benefit to dollar cost, and why?
 - a. What species benefit most from this practice/technique?
6. Is there a process in place to identify and plan for potential retro-fits to existing facilities?
 - a. What is the source of the funding?
7. Are there standard or adopted methods for assessing existing facilities that focus on wildlife permeability for:
 - a. Road-associated mortality data; which specifically includes road kill surveys, especially for small mammals and herptiles?
 - b. Wildlife-Vehicle Collision data collection; which specifically includes collisions with large mammals for which accident reports and insurance claims are filed?

- c. Terrestrial wildlife crossing assessment? (*may address target species, road design features and habitat centric attributes (proximity to likely migratory corridors, hibernacula locations, etc)*)
 - d. Fence assessment? (*may address target species, fence design features and habitat centric attributes*)
8. What information and/or process do you use to identify habitat hot spots?
 - a. What biological information is used to determine the most appropriate solution or range of solutions?
 9. For a typical project, describe how efforts to minimize habitat fragmentation are incorporated into the planning and design of the project. Describe at which stages habitat fragmentation is assessed, what methods are used, and how wildlife sensitive design features (minimization efforts) are incorporated.
 10. Is there a program available for ground maintenance personnel to report observations of terrestrial crossing conditions, or issues such as roadkill, condition of fencing, trees down, etc.?
 - a. How are non-biologist staff educated or made aware of such issues?
 11. Have you ever wanted to use a wildlife passage or other wildlife sensitive design features in a certain situation or project but could not? If so, what were the obstacles to incorporating the feature (e.g. design constraints, cost)?

Arizona Department of Transportation

August 19, 2010

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(written input also provided by Justin White, ADOT Research Biologist)

Wildlife Linkages

Arizona Department of Transportation (ADOT) has a well-developed terrestrial crossing program known as Wildlife Linkages. Linkages incorporate fencing for desert bighorn sheep and elk, and undercrossings/culverts for desert tortoise and other large ungulates. While the exact mileage of these features is unknown, it is estimated that approximately 5% of highways and approximately 30% of the rural roads in Arizona have wildlife sensitive design features.

Their effectiveness is monitored by Arizona Game and Fish Department (AZGFD) and the ADOTs Natural Resource Management Group (NRMG) using wildlife-triggered cameras, still digital infrared cameras, videotaping and limited road kill data collection activities. Animals are collared in order to determine where crossing are prevalent and to determine wildlife permeability. This monitoring provides a baseline for wildlife movement data in terms of exactly where they cross the road and where to locate a crossing structure. Post-construction road studies are conducted to see if animal patterns change or to determine if fewer animals cross. Success is measured by monitoring these movements both before and after the structure is provided.

Determining solutions to fragmentation

AZGFD has a team dedicated to identifying hot spots and also works to improve models for target species based on empirical information in order to determine the most appropriate solution or range of solutions. Empirical data is used to fine tune models by targeting specific species and their best possible path and suitable habitat or preferred crossing/habitat interfaces. AZGFD provides wildlife linkage assessment, consisting of habitat maps, species preference and requirement, which provides a least cost model to select best possible habitat and where it can be connected. Wildlife linkage mapping and wildlife movement models are good at determining roughly where a crossing should be but the preferred method is to collect data in the field. ADOT also uses GPS movement data collected by AZGFD. There are currently 400-500 animals collared in the state including bighorn sheep, mule deer, white tailed deer, elk, and desert tortoises. As a result of this tracking, migration corridors, up to 50 miles long have been identified and this information has changed wildlife management practices in the state.

Corridor studies typically include the assessment of habitat fragmentation and how wildlife sensitive design features can be incorporated. Pavement preservation projects do not typically consider these issues. Overall there is uneven consideration of these elements in the project design phase. ADOT has learned that describing traffic safety objectives relative to wildlife permeability is one way to raise the overall environmental awareness.

Topography is not always favorable for ADOT to use certain wildlife sensitive design features that they might otherwise like to use. Land ownership and the cost of acquisition can also be an issue as well as land development. ADOT has to consider the future issue of whether the crossing will be feasible in the future when the corridor linkage is choked off. Cost of design and materials are always a consideration. There is also the “political topography” to consider. If such projects can be linked to public safety, they are sometimes more favorably viewed in the political realm.

Monitoring and determining success

There is no written policy with regards to monitoring success standards, but there is an informal understanding among experts and engineers at ADOT that each species reacts differently and that crossings are designed for different purposes. The level of success is different for each species so a general statement or proof that animals are crossing is not a strong indication of success. The best indication is if animal movements are similar in pre- and post-construction scenarios which indicates a relatively minimalized disruption of habitat connectivity. ADOT research branch funding has been used to conduct wildlife crossing and fence assessments, however they have found that a better practice is to include these assessment requirements in the Design Concept Report (DCR) and during scoping.

ADOT feels that assessing existing facilities using road associated mortality data is unreliable. Databases have not been consistently implemented and the data is not comprehensive, especially for small mammals and herptiles. Currently, wildlife-vehicle collision data is collected when it relates to traffic and risk management legal claim cases. ADOT is currently working to build a more solid database so that assessments can be conducted more thoroughly. If a reduction in wildlife-vehicle collisions is shown, it is generally accepted that the structure has been successful from a traffic safety standpoint. In Arizona, fencing and wildlife undercrossings provide the greatest ecological benefit to dollar cost, while also considering safety. Large ungulates such as elk and deer are the prime safety species for fencing and undercrossings. Smaller mammals and herptiles can use these crossings as well.

There is a process in place in Arizona to identify and plan for potential retro-fits to existing facilities on a case-by-case basis. Although not a structured review process, this process relies upon the project managers’ awareness of existing structures and where there are collision problems. Evaluations look at whether the structure is of adequate size and spacing for large animals and also whether culverts can be retrofitted with tie-in fencing for small animals. Federal funding has helped to support these reviews.

Maintenance and costs

Arizona has a maintenance labor tracking database called PECOS which stands for maintenance Performance Control System database. It details how many labor hours are required for each task and

the expected material costs. The system has not been integrated to specifically separate costs of maintaining game- specific fencing however, the maintenance of monitoring cameras is separated and individually tracked. NRMG maintains crossings and inspects culverts, while large overcrossings are treated as bridges and are inspected from an engineering perspective by ADOT as such. Maintenance funding typically comes from Arizona State Tax . Research validation may also be federally funded is associated with a federally funded highway project. ADOT has been trying to incorporate monitoring costs into construction costs but this has met with some resistance, as there is some belief that monitoring should be part of the maintenance costs.

Surrounding land ownership is taken into consideration during design in excluding human use of wildlife crossings, and so this cost is not broken out. Federal land agencies can restrict human access but ADOT has not yet had to place signage at these crossings yet to restrict human use. Not all crossings exclude humans; sometime people use the crossing during the day and this does not impact nocturnal animals.

ADOT is in the process of trying to create an environmental coordinator position for each maintenance district. It would be the job of this position to make maintenance crews aware of wildlife features and to get crews to fill out the road kill form for all types of animals. Currently there are informal training sessions conducted with environmental staff.

Florida Department of Transportation

August 9, 2010

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Terrestrial Crossings

Florida Department of Transportation (FDOT) uses fencing along many sections of roadway but the exact mileage of fencing and other wildlife sensitive design features is unknown. Barbed wire fencing and twelve foot high fences are used, and fencing is also used to provide crocodile crossings, 16 of which were constructed in the past year. This type of exclusionary fencing is the most commonly used wildlife sensitive design feature by FDOT, along with underpasses. These features are used for the crossing of black bear, panther, key deer, snakes, turtles and salt water crocodiles. Florida also has Roadside Animal Detection System (RADS) which involves a sensor that activates a notification system to alert drivers when a panther or other large animal steps into the right of way.

Determining Solutions to Fragmentation

Florida incorporates efforts to minimize habitat fragmentation into the project planning and design process by involving all resource agencies throughout the process. The type, size and location of crossings are site specific and must adhere to State and Federal safety criteria. Since most of the roads in Florida are at sea level, crossings are usually associated with wetlands issues and subsequent mitigation. Oftentimes FDOT is restricted in using wildlife sensitive design features due to cost. Other issues include lack of available public land and issues with drainage. Cost must be weighed against the effectiveness and actual usage of the crossing by species. The use of overpasses are rare, as they are limited by topography and therefore, cost.

Road kill data is used to identify habitat hotspots and is used to determine the most appropriate solution or range of solutions; provided the road is not planned for expansion. Florida DOT also uses Efficient Decisionmaking Transportation Processes (EDTM) and wildlife crossings guidance developed with state agencies. Florida Fish and Wildlife Conservation Commission (FWC) have an active role in data collection and research. There is a collaboration process that takes place with the resource agencies but it is generally informal.

Monitoring and Determining Success

There are no official regulations or policies that determine success associated with the effectiveness of the crossings, but success is determined by whether or not the crossing is actually being used by the target species. The effectiveness of many crossings is monitored with motion sensor cameras. Sometimes it is also possible to measure success by whether or not there has been a reduction in roadkill in the area of the feature. The use of underpasses has resulted in a dramatic drop in roadkill

numbers in Florida, in terms of panther and black bears, as has proved to provide the greatest ecological benefit to dollar cost.

When considering retrofits to existing facilities, there is no dedicated source of funding for such retrofits, and FDOT must rely on both state and federal funds. There is no official process in place to identify and plan for potential retro-fits to existing facilities, as it is site specific. FDOT will look at whether there is an increase in traffic or increase in roadkill due to increase in populations by looking at roadkill data that FWC keeps on black bears, panthers, and key deer. They also conduct DNA studies and radio collaring and work with Federal resource agencies. Land crossings can only be considered if the land on both sides of the road is publicly owned and if there is sufficient habitat and/or a guarantee that future habitat will be available.

In the assessment of existing facilities, road associated mortality data is looked at in terms of wildlife permeability for large mammals. There are also situations where the public may bring an issue to the attention of FDOT, which may result in an assessment being conducted. Assessments may also be done by resource agencies, and also when a new road is build or an expansion is done to an existing facility. FDOT is aware of models to aid in conducting these assessments, but does not rely on them due to the fact that land use in Florida changes so rapidly and the land use data in the models cannot be kept up-to-date. Fence assessments are conducted when the fence is associated with underpasses and for the exclusionary fencing which directs animals to the crossings.

Maintenance and costs

Cost tracking methods for wildlife fence maintenance and inspection of crossings do not exist within FDOT. These costs are not broken out because they are contracted outside of the Department. Fence maintenance is part of the standard DOT maintenance program, which is mostly state funded, or federally funded in the case of the interstate system.

A program for education of FDOT personnel to report observation of terrestrial crossing conditions (roadkill, trees down, etc.) is not available in Florida. Most personnel are tasked with maintaining fencing and other features for safety of humans, not for the sake of the crossing itself. However, since migration of large mammals is not a major issue in Florida, there are few safety concerns related to fencing. Instead, education falls within the responsibility of the seven district environmental management offices throughout the state.

Idaho Transportation Department

September 24, 2010

Sue Sullivan- Environmental Section Manager

Terrestrial Crossings

Idaho Transportation Department (ITD) is decentralized and consists of six districts. It is estimated that less than 1% of Idaho's roadways include wildlife sensitive design features. The most commonly used wildlife sensitive features are bridges, culverts/underpasses and fencing for deer, bear, raccoon and elk. The practice of building bridges and culverts wider to accommodate passage has been found to be the technique that provides the greatest ecological benefit to dollar cost.

There are times when IDT has wanted to use a wildlife passage or other wildlife sensitive design features in a certain situation or project but could not. Cost is an obstacle, as well as land acquisition beyond the ROW.

Recently, the American Recovery and Reinvestment Act of 2009 provided some federal stimulus money that ITD will use for several wildlife projects. ITD will be building a wildlife underpass on SH-21 along the Mores Creek Arm of Lucky Peak Reservoir. This project will facilitate wildlife crossing for elk and deer in an area that has been identified as a safety concern due to the high number of collisions between motorists and wildlife. The project has been a cooperative effort with IDFG and will function as a wildlife migration corridor and habitat linkage area between the Boise River Wildlife Management Area and the Sawtooth and Boise Mountains.

Monitoring and Determining Success

There is no process in place to identify and plan for potential retro-fits to existing facilities, however sometimes bridges are replaced and build wider to allow for terrestrial crossing. Terrestrial wildlife crossing assessments are only done for existing facilities if they are associated with an EA or an EIS.

Currently, ITD does not monitor crossings to determine success or effectiveness.

Determining Solutions to Fragmentation

The issue of habitat fragmentation is not usually addressed during the planning and design phase of a project unless there are threatened and endangered species involved and/or if resource agencies have raised a concern. Most of the time, if the issue is addressed it is because of a safety concern.

To identify habitat hot spots, ITD relies on discussion with maintenance personnel and regulatory agencies. A few years ago, ITD in cooperation with the Federal Highway Administration (FHWA), and Idaho Department of Fish and Game (IDFG) initiated two major statewide projects to make highways safer for wildlife and people. The first effort was to identify wildlife and fisheries linkages in relation to state and federal highways and was started in 2005 and completed in 2006 with a statewide map,

database, and prioritized linkage sites being identified. The second effort was a statewide online wildlife-vehicle collision database that was developed to monitor wildlife mortality caused by vehicles. However, according to ITD, this information is not widely available and consistently applied by all districts.

Maintenance and costs

Idaho does not have cost-tracking methods for maintenance of crossings or fences. Most of the fences are privately owned by landowners whose main concern is keeping livestock on their property.

There is not an official program available for ground maintenance personnel to report observations of terrestrial crossing conditions, however, maintenance personnel have assigned sections of roadway and become very familiar with that stretch of road and have observational expertise. Annual meetings are conducted with maintenance personnel to assure that they are aware of issues.

Vermont Agency of Transportation

August 17, 2010

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Terrestrial Crossings

Less than 1% of existing highway miles in Vermont have wildlife sensitive design features that were intentionally designed. The reason for this is that most of Vermont's Interstates were built in the 1950's and 1960's and at that time, wildlife sensitive design was not an issue. Vermont Agency of Transportation (VTrans) Vermont has decided to concentrate on improving and maintaining its existing infrastructure and not on building new roads through its "Road to Affordability" initiative.

Bridges and box culverts, benefitting deer, are the most commonly used terrestrial wildlife sensitive design features in Vermont. It can be assumed that replacing culverts provides the greatest ecological benefit to dollar cost, although no actual cost- benefit analysis has been done. In bridge replacement projects, there is an effort to design oversized bridges and spans and keep abutments out of the water in order to provide for crossings.

Determining Solutions to Fragmentation

In Vermont, efforts to minimize habitat fragmentation are made when conceptual plans are developed. VTrans has a Geographic Information Systems (GIS) model for habitat linkage assessment. There are no standards or adopted methods for assessing existing facilities that focus on wildlife permeability, which is why the GIS model was developed approximately 5 years ago. Using the GIS model, VTrans coordinates with Vermont Fish and Wildlife (F&W) and data is reviewed by transportation biologists. If significant habitat is being bisected, the level of the project is raised and coordination with F&W occurs. There is a GIS layer for wildlife-vehicle collision data, but it is not considered to be reliable since there is no formal reporting for collision data. In determining hotspots, the GIS model assigns a wildlife crossing value to roadways and those roadways get a closer look by VTrans. Information used to determine solutions includes; threatened and endangered species, habitat type, habitat quality, overall connectivity, some historic roadkill data, and other factors such as how close the forest edge comes to the highway edge and types of cover. Vermont receives federal highway funds for some planning and research efforts.

As per the "Road to Affordability" initiative, Vermont is doing mostly small projects involving widening and re-striping so habitat fragmentation problems are not common in these types of projects. Threatened and Endangered species issues are also not a common occurrence, with the exception of Indiana Bat.

There are always situations where VTrans would like to use crossings, and they frequently advocate for them, but money is the issue. Safety is also an issue. VTrans tries to encourage the design of longer

bridges which results in reduced maintenance cost and fewer permitting issues. Other obstacles include time constraints associated with acquiring land along the right of way, even for temporary easements. Acquiring adjacent property is very time consuming and prohibitive.

Monitoring and Determining Success

There are no regulations or policies that require monitoring or determine success. Pre-construction monitoring was not done in the 50's and 60's when the interstates were built. Therefore, there is no baseline available for monitoring today. Subsequently, few passages are actually monitored. Crossings that are monitored, are mainly for deer and also bobcat using remote cameras, digital infrared cameras, track pads/beds with soot or sand, snow tracking (in winter), visual monitoring, and tagging and recapture for small mammals.

VTrans' "Road to Affordability" focuses on updating existing infrastructure. For the most part, retrofits consist of replacing signs and guardrails. Sometimes plantings are altered to benefit wildlife by helping to funnel them towards the appropriate area. The Army Corps of Engineers also has new mandates regarding the consideration of connectivity for aquatic species which VTrans works to assess with Vermont Fish and Wildlife.

Maintenance and costs

VTrans does not have cost tracking methods associated with maintenance of wildlife sensitive design features. Most maintenance part of routine district maintenance. VTrans has a federally funded training program called "Road Ecology" for non-biologist staff to be made aware of issues associated with terrestrial crossings. Participation is voluntary, however it is estimated that approximately 75% of staff has taken and benefited from the training. The training is required for some supervisor positions.

Minimization Questions for Impacts to Aquatic Habitats

The intent of these questions is not to examine the state of the science but how to insert the science into common practice. We want to know: 1) how practitioners are changing or adopting new processes to address minimization of habitat fragmentation; 2) what specifically drives the change, 3) how is performance and success defined; 4) how is performance and success monitored; 5) where are the best dollars:results ratios obtained?

Aquatic (Non-Fish) Habitat Crossing Questions

1. Approximately what % of your agency's existing water and wetland crossings have aquatic habitat sensitive design features?
2. What are the most commonly used aquatic habitat sensitive features and how is their effectiveness monitored?
3. Where do your monitoring success standards come from? What regulation or policy determines success standards?
4. Does your State DOT have cost-tracking methods for:
 - a. Operation of existing facilities?
 - b. Inspection, Maintenance and Monitoring of aquatic crossings?
 - c. Excluding ATVs from wetlands and riparian corridors?
 - d. How is this work funded?
5. In your geographic area, what aquatic habitat crossing practices and/or techniques provide the greatest ecological benefit to dollar cost, and why?
What species benefit most from this practice/technique?
6. Is there a process in place to retro-fit existing facilities during routine maintenance?
7. Are there standard or newly adopted methods for assessing existing facilities that focus on aquatic and semi-aquatic species permeability?
 - a. Does the assessment focus on specific target species, bridge/culvert design features and aquatic organism passage requirements?
 - b. What criteria are used to define the upper and lower ends of an assessment area for habitats and connectivity concerns?
8. Are storm water management BMPs, including roadway drainage systems, designed to restrict access to untreated runoff by semi-aquatic species?
9. What information and/or process do you use to identify wetland dependent species habitat hot spots?

- a. What biological information is used to determine the most appropriate solution or range of solutions?
10. Is there a program available to ground maintenance personnel to report maintenance issues associated with bridge and/or culvert crossings (such as downed trees, beaver dams, fish kills, etc)?
- a. How are non-biologist staff educated or made aware of the importance of such issues?
11. Have you ever wanted to use a structure which was larger than the hydraulic minimum requirements to facilitate aquatic habitat passage or protection and couldn't? If so, what were the obstacles to incorporating the feature (e.g. design constraints, cost)?

California Department of Transportation

September 2, 2010

Melinda Molnar- Senior Fisheries Biologist

Aquatic (non-fish) Passages

It is estimated that approximately 5 – 10% of the current water and/or wetland crossings in California have design features meant to enhance or promote habitat use and/or passage. Caltrans provides passage for anadromous fish, as required by law, but passage for other aquatic species is improved, by proxy, and there has been more of an emphasis on passage for amphibians and other wildlife over the past decade .

The most commonly used aquatic habitat sensitive features in California are culverts designed to pass fish and other aquatic species, the effectiveness of which may be monitored on a case by case basis, as required by the project permits, agreements, and consultations. In California, the use of culvert baffles, fish ladders and bridges instead of culverts, provide the greatest ecological benefit to dollar cost in accordance with California Senate Bill 857, which amends California Fish and Game Code to incorporate specific provisions regarding Caltrans' progress in removing barriers to fish passage. The type of structure that is used depends on the topography. Anadromous fish and other aquatic species that use the same habitat such as amphibians and reptiles will benefit most from these practices.

Species and Habitat Identification

For large projects diversity is determined for different types of affected habitats. Some specific tools are available for agencies such as; CA Central Valley Wetlands and Riparian GIS, Atlas of Biodiversity of CA, and California Natural Diversity Database which are specific to certain areas in California. The biological information that is used to determine the most appropriate solution or range of solutions comes from the Endangered Species Act (ESA) with regards to critical habitat as well as Recovery Plans. The location of breeding ponds and upland habitat in relation to the fragmenting road or facility, genetic isolation, local data/knowledge on movement patterns, availability of funds and maintenance are all taken into consideration when determining solutions. GIS and the natural diversity databases. Once these criteria are determined they are followed by field work.

Caltrans has a Wildlife Crossing Guidance Manual and wildlife crossing website that provides methods for assessing proposed projects that focus on aquatic and semi-aquatic species permeability. This tool includes a library of publications used for information sharing. It was finalized in late 2009, so all newer projects can integrate the tool into the planning process and policies (Regional Transportation Planning Guideline updates, CA Interregional Blueprint (sketch modeling considering land use and transportation needs with wildlife connectivity, and California Essential Habitat Connectivity Project (CA Department of Fish & Game). This tool concentrates on stream reach based factors, highlighted by requisites for

salmonid passage, at riparian crossings but considers landscape level connectivity for certain threatened and endangered species when within the known range of these species.

Cost is continually prohibitive of wildlife improvement components to projects, to include passage locations. Caltrans has used oversized/ bottomless arch culverts. Cost and safety are the concerns, not environmental issues. There can also be issues with design standards requiring that smaller than desirable culverts be used.

Monitoring and Determining Success

Caltrans monitors crossing locations if it is identified as an objective of the mitigation and monitoring plan, which would require Caltrans to define success criteria and to monitor the site in order to meet the criteria. Even if monitoring is not required, biologists may go back to see if things are functioning but not record any data.

Monitoring success standards are largely dependent on the purpose of the habitat crossing improvements. Pre, during and post construction surveys have been done for mammals to evaluate roadkill reductions due to fencing and crossing improvements. They also may depend on the requirements for a permit or consultation. ESA may determine success standards associated with authorized take and or recovery goals.

There are no processes in place to retro-fit existing facilities during routine maintenance, however if a retrofit can be used to alleviate a passage situation, then that will generally be the first choice. Anadromous fish are giving more immediate attention than are non-fish aquatic species, as required by Senate Bill 857.

There are standard or newly adopted methods for assessing existing facilities that focus on aquatic and semi-aquatic species permeability. Reconnaissance and detailed fish passage assessment surveys give the slope/grade/low flow velocity of a crossing location, which can be applied to other species of concern, when present. However, this method might not be useful in isolated wetland habitat areas. Assessments focus on specific species such as Coho, Chinook, Steelhead and Pacific Lamprey. The up and downstream points of an assessment area would be dependent on the topography of the specific location; that is they are specific to that stream reach in the direct vicinity of the road crossing. The physical boundaries of the stream reach extend from the upstream point of tail water control, from the glide of a resting pool directly upstream of the crossing, to the downstream point where the stream crossing bed profile ties back into the natural channel bed profile.

Maintenance and costs

Caltrans does not have a single cost tracking method associated with aquatic passages. A pilot program is being developed for ground maintenance personnel to report maintenance issues associated with bridge and/or culvert crossings (such as downed trees, beaver dams, fish kills, etc).

Planning Horizon Meeting Webinars (2 have been conducted in the past 4 years) to educate non-biologist staff on the importance of such issues. Some experienced staff have attended field inspections with maintenance staff to review baffles, fish ladders and other in-stream structures. There is a list of all in-stream structures for species issues and maintenance managers and engineers are aware of where these structures are. Caltrans also establishes maintenance liaisons who serve as a point of contact for maintenance personnel to ask questions if they don't know what to do in the field. Signage is also placed in areas where threatened and endangered species are located for mowing purposes.

Connecticut Department of Transportation

August 12, 2010

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Aquatic (non-fish) Passages

Connecticut Department of Transportation (ConnDOT) estimates that approximately 1/8 to 1/10 of new projects have a sensitive function of design and have gone into construction over the past 5 years. The number of existing water and wetland crossings with aquatic habitat sensitive design features is unknown. Since 2005, ConnDOT has incorporated new U.S. Army Corps of Engineers (ACOE) specific culvert crossing criteria into design and also in the design of replacements.

The most commonly used aquatic habitat sensitive practice used by ConnDOT is providing natural substrate bottoms at non-bridged stream crossings. Typically at least a foot of natural substrate is placed over the culvert bottoms in situation where bottomless arches are unsuitable. At crossings with more than one culvert the dry culvert is also filled with natural substrate and provides for some wildlife passage although this is not the primary intent of the practice. Approximately 1/3rd of ConnDOT projects also involve the use of in-stream rock weirs or veins for bank or channel stabilization which also add some habitat value.

Monitoring and Determining Success

The monitoring of aquatic crossings is not required and because of lack of staff and funds they are not monitored voluntarily by ConnDOT. Their effectiveness may be evaluated if Department of Environmental Protection Fisheries and Wildlife (DEP) follows up on a particular project. Effectiveness is usually only monitored as a condition required by an associated permit. The project that have been monitored have been found to be holding up well during storm events. Monitoring of fisheries is usually an aspect of a wetland monitoring site in accordance with ACOE and is done by DEP. This usually includes photo documentation and planting monitoring.

Channel work and rock work including rock weirs and veins which incorporate natural streambed material back into the environment have been found to be the most effective practices providing the greatest ecological benefit to dollar cost. Trout seem to benefit the most from these practices, however, any species including invertebrates that can utilize the structures will and do benefit. The gradation of natural material creates natural crevices for invertebrates to use. Weirs act as a backwatering device, creating pools for species to use as well. These techniques do involve certain costs incurred during construction because of extra work with contractors, but this cost is generally less than the cost of new structures or the cost of plantings for shade and invasives.

There is no process in place to retrofit existing facilities during routine maintenance. Aquatic passages are only incorporated during design and construction stages. Assessments of existing facilities are not conducted unless initiated by a feasibility or corridor study. ConnDOT relies on DEP to come to an agreement on target species. ConnDOT also uses a database on natural diversity that lists occurrences of species as well as field visits. The criteria for defining the ends of an assessment area for habitats and connectivity concerns is dependent upon regulatory agencies and agreements based on study area and cost.

Species and Habitat Identification

As noted above, aquatic passages are incorporated during design and construction stages. Hot spots are identified during the environmental review process during delineation and using the state mapping database. Coordination takes place with DEP and engineers once hot spots are identified. Hot spots are also identified during vernal pool studies conducted in the spring. Information gathered in the field along with collaboration with other DOTs is used to determine the appropriate solution or range of solutions for addressing species habitat hot spots.

All proposed projects attempt to meet the DEP crossing guidelines and ACOE 2005 culvert criteria. Stormwater management Best Management Practices (BMPs), including roadway drainage systems, are usually designed to restrict access to untreated runoff by species such as box turtles and hog nose snakes. Care is taken so as not to place inlets or outfalls in the habitat of such species. Detention ponds have standard fencing and rip rap used for both maintenance access and as a deterrent to animals.

Topography is the main obstacle that is encountered by staff when designing structures for aquatic habitat passage. Another obstacle is flood management regulations requiring that they maintain certain hydrologic conditions. Approximately 1 or 2 out of every 10 projects may have such a conflict and require a compromise be reached.

Maintenance and costs

ConnDOT relies on maintenance staff to report any problems with crossings. Unless the use of ATVs is affecting maintenance or they have received complaints from the public, the use of wetlands and riparian corridors by ATVs is not monitored. There are no specific funds set aside for monitoring and cost-tracking methods do not exist.

In the past, maintenance personnel received training in invasive species and mowing protocol to stop the spread of invasive plant species. Currently, ConnDOT suffers from a shortage of staff and manpower and relies on maintenance to use their own judgment and to contact environmental staff if they think there is a problem. It is common that more senior staff have more experience. Set protocols do exist for things like removing beaver dams which includes BMPs and permitting.

Georgia Department of Transportation

September 1, 2010

Rich Williams- Georgia Department of Transportation

Aquatic (non-fish) Passages

While the percentage or mileage of Georgia's water and/or wetland crossings with design sensitive features is not known, most of the aquatic design features are known to be in northern Georgia and involve trout passage. Georgia deals mainly with issues involving trout, federally protected darters, freshwater mussels, flatwater salamander, bog turtles, and terrapin.

The aquatic habitat crossing practice and/or technique that provides the greatest ecological benefit to dollar cost in Georgia is bridging. But while bridging may be most beneficial it is also the most costly technique. Generally bridges benefit most species including terrestrial.

Species/ Habitat Identification and Design

GDOT Environmental Procedures Manual, Chapter V: Environmental Studies, outlines some general methods for assessing proposed projects that focus on aquatic and semi-aquatic species permeability such as looking 100 feet beyond the project limits and other situation-based options which are reported in an Ecology Survey Report. This report is transmitted to the appropriate agency that is responsible for the type of habitat or species identified in the report where further consultation will take place. Wetland dependent species habitat hot spots are not specifically identified during planning but there is coordination with agencies focusing on all habitats though the Department of Natural Resources (DNR) and Georgia Fish & Game. The biological information that is used to determine the most appropriate solution or range of solutions come from the results of field work, trapping, and coordination with specialists at DNR. Occurrence and trapping data from DNR is incorporated into biological assessments and solutions come from the Endangered Species Act (ESA), Section 7.

Stormwater management BMPs, including roadway drainage systems, are not designed to restrict access to untreated runoff by semi-aquatic species unless there is a protected species or critical habitat at issue. If such species or habitat is present, the practice is that the runoff is drained to shoulder and treated by running through grass well or rip rap as required by ESA Section 7.

There have been many times where GDOT would like to use a structure which was larger than the hydraulic minimum requirements to facilitate aquatic habitat passage or protection but could not do so due to increased cost associated with building larger structures. However, one new advancement is that GDOT is looking at incorporating 4 inch high openings in median barriers, to provide for turtle crossing.

Monitoring and Determining Success

The most commonly used aquatic habitat sensitive design features are a result of the US ACOE (Savannah District) Regional Conditions which require GDOT to look at channel spanning using bridges as part of permit review process. The Regional Conditions require the spanning of perennial streams and embedding culverts if the use of bottomless arches is not feasible. The effectiveness of such features is not scientifically monitored, but GDOT along with FHWA sometimes does site visits to inspect their condition. No formal monitoring is required by regional conditions or regular permit requirements.

During project related work such as a widening or in the case of a failure of an existing facility, a culvert may be replaced with an embedded culvert or bottomless arch. There are no routine maintenance procedures that would facilitate retrofits or upgrades solely for the purpose of aquatic passage. Additionally, there are no methods or standards for assessing existing facilities that focus on aquatic and semi-aquatic species permeability unless it is specifically addressed in the scope of work.

Maintenance and costs

Georgia DOT does not have cost tracking methods for maintenance associated with aquatic passages.

Currently there is no program available to GDOT staff and/or ground maintenance personnel to report maintenance issues associated with bridge and/or culvert crossings (such as downed trees, beaver dams, fish kills, etc). But if there is a sensitive area, GDOT will put up signs in the area and expect personnel to refer to the spreadsheet of restricted activities. The current procedure is to educate staff during construction for species of concern and provide information sheets to the contractor to be kept on site for reference. Employees on job are expected to be familiar with and species of concern.

Minnesota Department of Transportation
September 28, 2010

Peter Leete- Department of Natural Resources Transportation Hydrologist (DNR-MnDOT Office of Environmental Services Liaison)

Aquatic (Non-Fish) Passages

The most commonly used aquatic habitat sensitive design feature in Minnesota is the use of passage benches in bridges, which are a modification in rip rap that allows for carrying-through of the game trail. While monitoring is not required, Minnesota DOT (MnDOT) has contracted with the state university to monitor passage benches using game trail cameras. Recessed culverts have also been successful and are being studied by universities.

In Minnesota, the use of passage benches at bridged crossings provide the greatest ecological benefit to dollar cost. The cost of adding a passage bench under a large bridge is generally minimal. The passage bench was originally designed for the Canada lynx but MnDOT has found that they are used by other species such as timber rattlesnakes. Recessed culverts have been found to benefit macro invertebrates because they allow for a slower velocity during normal flows and can carry bedload during peak flows.

The construction of the passage benches has been considered a “safety improvement” for the fisherman crossing under the bridges, which has made the projects more favorable with the State. When possible, MnDOT prefers to avoid using terms like “critter crossing” noting that it may downplay the importance of the passage.

Species and Habitat Identification

In March 2006, MnDOT and the Department of Natural Resources (DNR) developed a manual titled: Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001. Chapter 1 of the Best Practices Manual covers species protection and assessment for proposed projects. The process denotes that as early as possible, MnDOT send an early notification memo through DNR to see if there are habitat issues involved with regards to the future project. At that point, DNR field staff comments on issues and then the project is designed to meet habitat fragmentation concerns.

The US Forest Service MESBOAC process is being tested for use by MnDOT in developing aquatic passages. MESBOAC is a method for sizing culverts and bridges based in fluvial geomorphology and is an acronym for the following steps:

1. Match culvert width to bankfull stream width
2. Extend culvert length through the sideslope toe of the road
3. Set culvert slope the same as stream slope
4. Bury the culvert 4 to 18 inches into the stream bottom. Depth depends on culvert size
5. Offset multiple culverts

6. Align the culvert with the stream channel
7. Consider headcuts and cutoffs

In order to identify wetland dependent species habitat hot spots, areas of environmental sensitivity are identified through the Natural Heritage GIS database and further specific comments on habitat types, trout waters, calcareous fen wetlands and others are made by resource agencies.

Cost or complications with right of way is generally what restricts MnDOT from using larger structures to facilitate aquatic species passage. However, according to the DNR liaison, he has found that MnDOT has no problems in meeting resource agencies requests.

Monitoring and Determining Success

There are informal/nonstandard efforts for assessing existing facilities that focus on aquatic and semi aquatic species permeability in some regions but there are no statewide efforts beyond the Best Practices Manual. The Manual provides guidance for design during project planning and construction phases. The assessment of existing facilities does not specifically focus on specific target species, bridge/culvert design features and aquatic organism passage requirements. Resource agency coordination usually drives design for target species as well as criteria to define the upper and lower ends of an assessment area for habitats and connectivity concerns.

There are no monitoring success standards for Minnesota's aquatic passages, nor are there processes in place to retro-fit existing facilities during routine maintenance. DNR fisheries has begun inventorying culverts to be replaced on a case-by-case basis.

Maintenance and Costs

MnDOT does not have cost-tracking methods for operations or maintenance of aquatic passages. They are working on developing a program for maintenance personnel to report maintenance issues associated with bridge and/or culvert crossings, but currently maintenance is only tasked with maintaining structures from a safety perspective. MnDOT has environmental coordinators that work with maintenance staff in each region in order to educate non-biologist staff on issues associated with aquatic passages.

Appendix B

State DOT Screener Survey and Results

NCHRP Task 68 Implementing Measures to Reduce Highway Impacts on Habitat Fragmentation

Welcome to our survey! This research is being conducted on behalf of the National Cooperative Highway Research Program Project 25-25, Task 68 titled: Implementing Measures to Reduce Highway Impacts on Habitat Fragmentation.

The objective of this research is to document existing techniques and measures employed by transportation agencies to assess and mitigate impacts of existing and planned highway development on wildlife habitat fragmentation from both a terrestrial and aquatic standpoint. The goal is to identify and recommend solutions that are cost effective and can be immediately implemented using readily available technology to provide significant habitat connectivity benefits. The product of this research is intended to be an interactive electronic document for use by state DOT practitioners, regional environmental coordinators and other transportation and environmental professionals.

The following survey questions are intended to identify states that:

- Regularly use techniques for avoiding habitat fragmentation and habitat connectivity loss as it relates to highway projects;
 - Have established methods of compensating for these types of impacts to habitats and wildlife resulting from highway projects;
 - Commonly utilize habitat connectivity solutions;
 - Are willing to contribute further to this research by participating in a follow-up telephone interview.
-

We appreciate your taking the time to answer these short questions to the best of your knowledge. Your input is very valuable to our study.

* Asterisks in the survey indicate that the question requires an answer

Which State DOT are you associated with? ***This question is required**

1. Does the statewide or regional transportation planning process in your state incorporate the State Wildlife Action Plan (SWAP) or consider natural resource protection, wildlife and/or stream corridors, or critical habitat for threatened and endangered species?

- Yes
 - No
 - Not sure
-

2. Does the planning process contain written objectives such as "maintain habitat connectivity" or "minimize habitat fragmentation" or something similar?

- Yes
 - No
 - Not sure
-

3. Are there provisions or mechanisms for your state to proactively address connectivity rather than reactively mitigate?

- Yes
 - No
 - Not sure
-

4. Does your state prioritize areas for habitat protection/connectivity and/or have state or regional habitat connectivity plans?

- Yes
 - No
 - Not sure
-

5. Are critical habitat mapping, terrestrial and aquatic wildlife corridors, and/or other information readily available during the transportation planning process in your state?

-
- Yes
 - No
 - Not sure

6. Has your state adopted compensatory mitigation strategies for impacts due to habitat fragmentation and loss of connectivity for projects?

-
- Yes
 - No (please skip to question #7)
 - Not sure

6a.) If you answered YES to question #6:

What form did the compensatory mitigation take? (please check all that apply)

-
- Habitat creation
 - Restoration
 - Preservation
 - Enhancement
 - Land Transfer
 - Credit Purchase
 - Monetary Donation
 - In-Lieu Fee
 - Other

6b.) If you answered YES to questions #6:

Approximately how many projects are you aware of in your state that have used compensatory mitigation for habitat fragmentation in the last ten years?

-
- 0-10
 - 10-25
 - 25-50
 - 50+
-

7. When considering compensatory mitigation for habitat fragmentation and loss of connectivity of habitats, are potential mitigation sites weighted differently based on connectivity to adjacent habitats?

-
- Yes
 - No
 - Not sure
-

8. Do regulatory agencies require post-construction monitoring of compensation mitigation to determine if they are effective or meeting performance goals?

-
- Yes
 - No
 - Not sure
-

9. Would you or another DOT staff member be willing to participate in a brief phone conversation to discuss your answers further? ***This question is required**

-
- Yes, contact information provided below
 - No, thank you
-

10. Contact information for telephone interview (information will remain confidential)

First Name

Last Name

Title

Email Address

Phone Number

Thank you for taking our survey! Your response is very important to us.

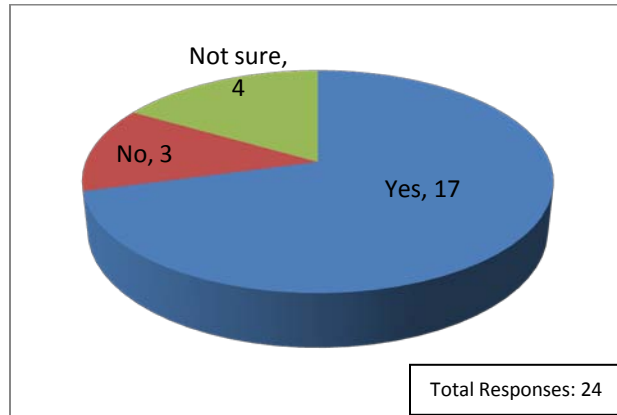
If you indicated that you would like to participate in a telephone follow-up, we will be contacting you within the next few weeks.



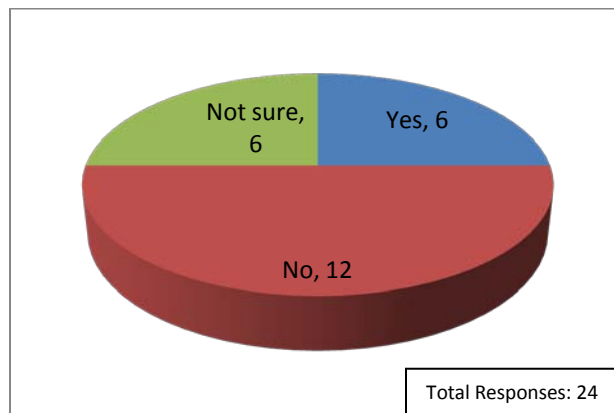
Screener Survey Report

This section provides a look at the screener survey in detail and the resulting data report, processed in September 2010.

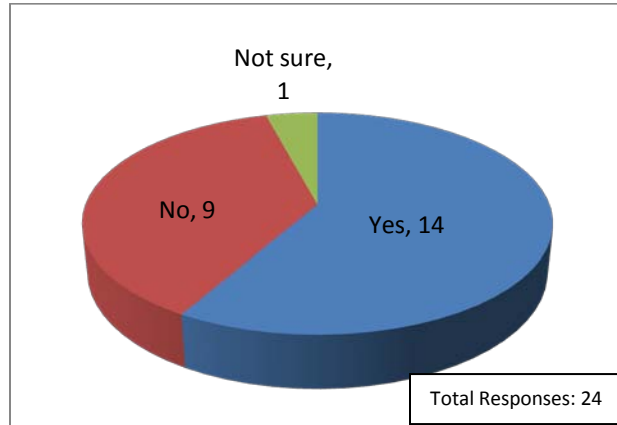
1. Does the statewide or regional transportation planning process in your state incorporate the State Wildlife Action Plan (SWAP) or consider natural resource protection, wildlife and/or stream corridors, or critical habitat for threatened and endangered species?



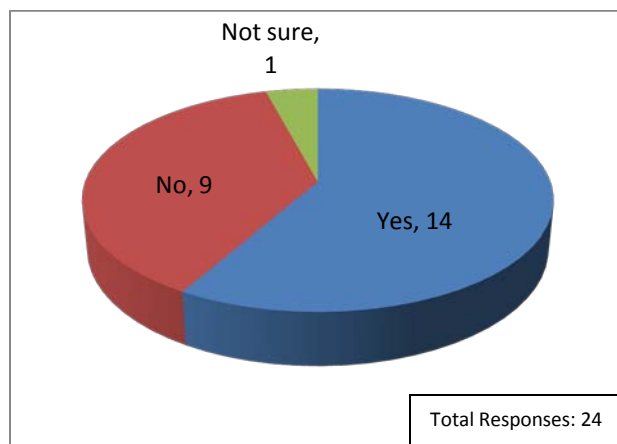
2. Does the planning process contain written objectives such as “maintain habitat connectivity” or “minimize habitat fragmentation” or something similar?



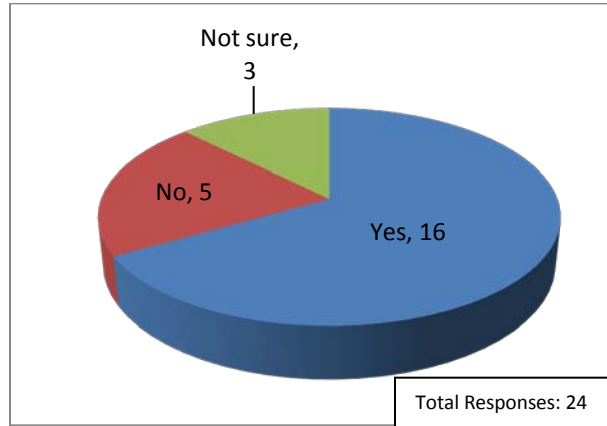
3. Are there provisions or mechanisms for your state to proactively address connectivity rather than reactively mitigate?



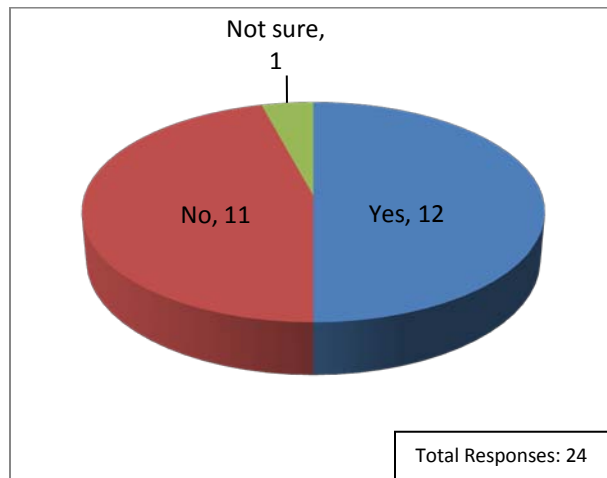
4. Does your state prioritize areas for habitat protection/connectivity and/or have state or regional habitat connectivity plans?



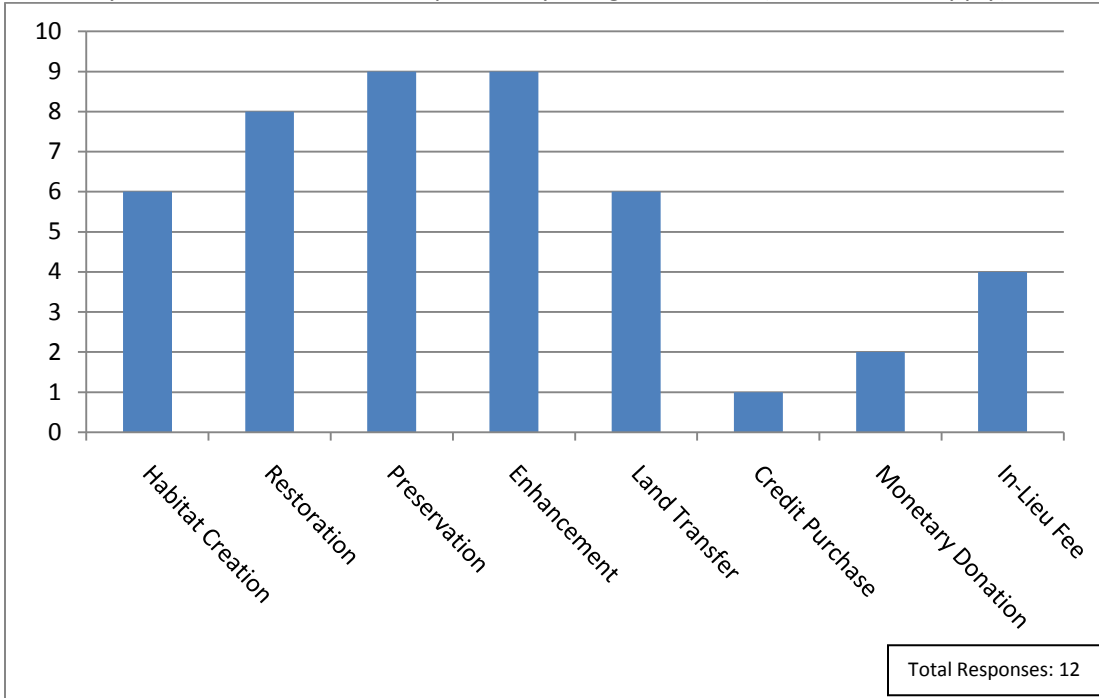
5. Are critical habitat mapping, terrestrial and aquatic wildlife corridors, and/or other information readily available during the transportation planning process in your state?



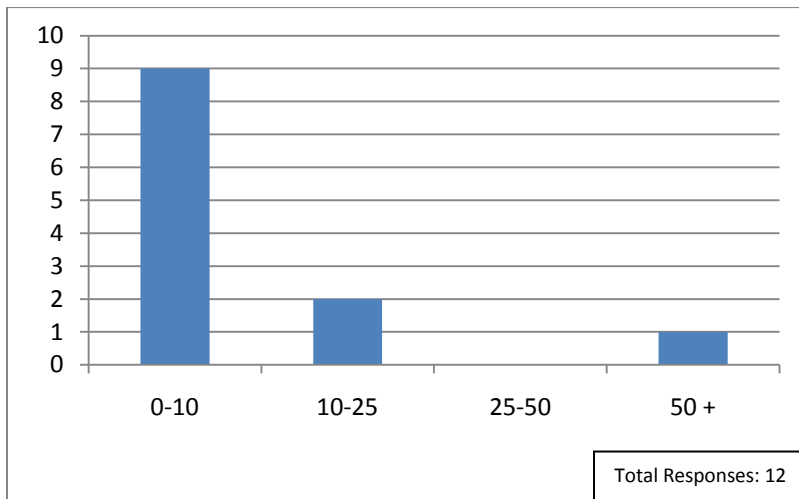
6. Has your state adopted compensatory mitigation strategies for impacts due to habitat fragmentation and loss of connectivity for projects?



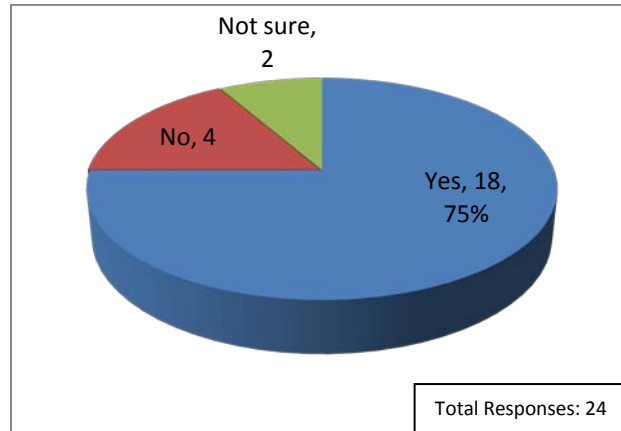
6a. If yes, what form did the compensatory mitigation take? (check all that apply)



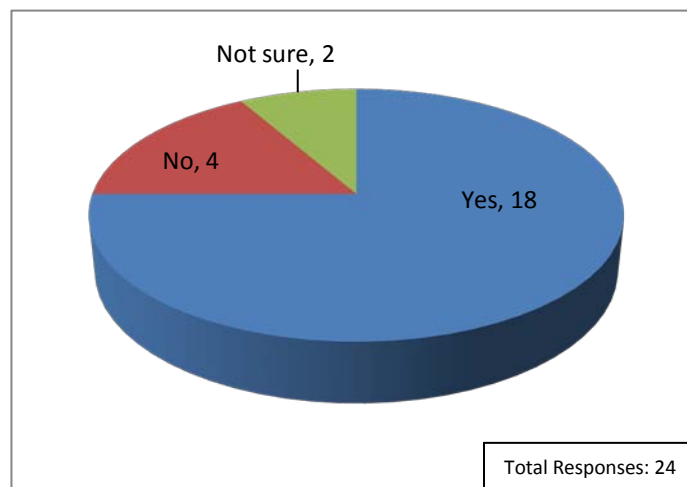
6b. Approximately how many projects are you aware of in your state that have used compensatory mitigation for habitat fragmentation in the last ten years?



7. When considering compensatory mitigation for habitat fragmentation and loss of connectivity of habitats, are potential mitigation sites weighted differently based on connectivity to adjacent habitats?



8. Do regulatory agencies require post-construction monitoring of compensation mitigation to determine if they are effective or meeting performance goals?



Appendix C

State DOT Interviews on Avoidance and Compensation

Screening survey questions 1 through 3 largely determined if a system for avoiding impacts at the state wide or regional planning level is practiced. Screening survey questions 4 and 5 largely determined if a system for avoiding impacts at the project planning level is practiced. Screening survey questions 6 through 10 determined the level of organization regarding the compensation process. Some questions asked during the avoidance and compensation interviews will be based on replies (yes) to certain screening survey questions.

Avoidance During Statewide & Regional Planning

1. If the answer to **screening survey question 1** was yes, then ask: What information from the State Wildlife Action Plan is specifically used for statewide and/or regional planning?

With regards to the SWAP:

- a. Is there general language which includes or conveys the message or spirit of the SWAP in to planning considerations?
 - b. Is mapping of potential habitats of listed species and/or records of occurrence included?
 - c. Does it combine natural resource mapping including habitat core areas, corridors and generally addresses a level of connectivity for unlisted species?
 - i. Is there a weighted scoring system for prioritizing identified areas?
 - d. Does it include a landscape analysis specific to the planning area that includes “living” data sets, WVC reports and/or biological field data, and defines potential presence of indicator species or groups of species based on specific habitat requirements, patch size, perimeter : interior area, and/or level of connectivity parameters?
 - e. Does it incorporate restoration plans for listed species?
 - f. If you have additional information or a different approach, please describe.
2. If the answer to **screening survey question 2** was yes, then ask: Please state the planning objectives which pertain to habitat fragmentation/connectivity. Please explain how objectives to avoid habitat fragmentation/connectivity loss are put into practice during the statewide or regional planning process. Please also explain if they have been successful.
 3. If the answer to **screening survey question 3** was yes, then ask: Please explain or expand on how your transportation agency proactively avoids connectivity issues at the statewide or regional level? Are these efforts successful?

Avoidance During Project Planning

4. Please explain or expand on how your transportation agency prioritizes areas for habitat protection and maintenance of connectivity at the project planning level?
5. At what stage in the planning process, or under what project circumstances, have natural resource/regulatory agencies specifically expressed concerns about habitat fragmentation?

6. Is there a standard procedure for identifying potential wildlife habitat fragmentation impacts during the alternatives analyses? Are impacts quantified, if so how? Have resource agencies been satisfied with this process?
7. In your transportation agency, what is the most common type of roadway project; new alignment, capacity improvements (i.e., widening of existing alignment), or safety/intersection improvements?
8. Is there a standard process for addressing stormwater management facility impacts, in addition to the roadway footprint, during project planning?
9. Has your transportation agency incorporated wildlife crossing structures or specific wildlife exclusion (fences or retaining walls) features into a roadway project based on a preliminary impact analysis conducted during the development of alternative alignments or as part of the preliminary design phase?
10. Has your transportation agency included impacts to wildlife resulting from proposed roadway generated noise in the impact analysis?
11. Has your state developed stream & river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria? How have the resource agencies responded to these protocols?

Compensation Based Questions

12. If the answer to **screening survey question 6** was yes, then ask: Please explain how your states compensatory mitigation strategy replaces impacts from habitat fragmentation. Is there a standard method for scoring/weighting or quantifying these habitat impacts to derive an equivalent mitigation?
13. What is/are the most common types of compensation your agency uses specifically for habitat mitigation: in-lieu-fee, preservation, enhancement, restoration, creation? Please rank from most common to least common.
14. Do your coordinating natural resource agencies identify or prepare/maintain a list of preferred compensation sites or banks?
15. Does your regulatory/natural resource agencies accept the purchase of wetland/riparian/conservation bank credits for the mitigation of habitat fragmentation and connectivity loss?
16. With regards to online **survey question 7** “when considering compensatory mitigation for habitat fragmentation and loss of connectivity of habitats, are potential mitigation sites weighted differently based on connectivity to adjacent habitats” please explain how the site search process weights sites relative to connectivity to existing habitats.

17. For compensatory mitigation, have regulatory agencies with mitigation plan approval authority provided guidelines that dictate the content, format and timing of a mitigation plan submission? How specific are the guidelines in addressing specialized habitats in your region?
18. Have the resource agencies included special permit conditions which specifically address habitat fragmentation/connectivity compensation? If so, please provide an example. Are these conditions effective?
19. Are there performance and success standards for compensation activities and if so, how are they monitored? How do requirements vary based on type of compensation?
20. If Question 8 is answered yes, ask: If monitoring of mitigation sites is required:
 - a. How does the monitoring differ between mitigation types?
 - b. How long is the typical monitoring period?
 - c. How often and how many monitoring reports do the agencies require?
 - d. How often do the agencies provide feedback on monitoring reports?
 - e. Have you found that the sites have been successful?

Arkansas State Highway and Transportation Department

John Fleming, Section Head - Special Studies, Environmental Division
(provided by email)

Avoidance During Statewide & Regional Planning

With regards to the State Wildlife Action Plan (SWAP), Arkansas uses the distributional data for “Species of Greatest Conservation Need” and distributional data on specific habitat types may also be utilized, i.e. locality data for prairie remnants. Mapping of potential habitats of listed species and/or records of occurrence is included in the SWAP and depending on the species and potential impacts, the SWAP may also incorporate restoration plans for listed species.

The resource agencies are responsible for identifying potential wildlife habitat fragmentation impacts and submitting comments during the National Environmental Policy Act (NEPA) review process. Connectivity issues are rarely considered at the regional planning level, unless listed species are involved. Habitat fragmentation issues are usually handled during the Endangered Species Act Section 7 consultation process between FHWA and the USFWS.

Avoidance During Project Planning

During the project planning process, potential habitats of listed and proposed Endangered, Threatened, and Sensitive species are identified to avoid and minimize habitat impacts during the development of alternatives. During the “cursory review” phase, Arkansas State Highway and Transportation Department (AHTD) personnel review projects to determine if proposed project corridors may potential impact listed or sensitive species or habitats based on known occurrences. These occurrences are based on information maintained by the Arkansas Department of Natural Heritage and areas are prioritized during project planning by the state and regional resource agencies. Once project alternatives have been selected the informal consultation process begins with USFWS. If formal consultation is deemed unnecessary, additional comments from USFWS regarding habitat fragmentation/connectivity typically come following review of the NEPA document. Natural resource/regulatory agencies specifically express concerns about habitat fragmentation during the NEPA process, in the form of comments provided following initial review of the NEPA document.

Arkansas has a standard process for addressing stormwater management facility impacts, in addition to the roadway footprint, during project planning. If issues do arise with resource agencies, it is typically due to inadequate implementation and maintenance of stormwater management facilities by the erosion control contractors during construction.

Arkansas has incorporated wildlife crossing features into roadway projects based on a preliminary impact analysis conducted during the development of alternative alignments or as part of the preliminary design phase in the form of wildlife passages for small mammals, amphibians, and reptiles in

areas where median barrier walls were constructed to reduce impacts to wetland habitats. Fencing was also installed to direct animals to these crossings.

The most common type of roadway projects in Arkansas are capacity improvement projects. Impacts to wildlife resulting from proposed roadway generated noise are not included in the impact analysis.

Arkansas has not developed stream and river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria. However, the Little Rock District Corps of Engineers, in conjunction with the local resource agencies have developed a functional assessment protocol that incorporates fluvial processes and provides suggested standards for stream crossings. If crossings do not meet these standards, mitigation may be required.

Compensation Based Questions

Compensatory mitigation is typically not required solely for habitat loss unless the land is owned by a state, federal or local government or enrolled in a federal program like the Wetlands Reserve Program. There are no special permit conditions which specifically address habitat fragmentation/connectivity compensation. Compensatory mitigation is only required during the Clean Water Act Section 404 permitting process. With regards to wetlands, the majority of AHTD's compensatory mitigation to date has been the restoration of wetlands at banks owned and maintained by AHTD. The coordinating natural resource agencies do not identify or maintain a list of preferred compensation sites or banks. The US Army Corps of Engineers has developed a national standard for mitigation plan submission and monitoring requirements. All types of mitigation sites are monitored for a period of 10 years, with annual reports required. The agencies rarely provide feedback and the sites have been found to be successful.

Indiana Department of Transportation

Nathan Saxe, Administrator , Ecology and Waterway Permitting Section, InDOT

October 1, 2010

Avoidance During Statewide & Regional Planning

Indiana Department of Transportation (INDOT) is working with Indiana Department of Natural Resources (DNR) on a habitat-based study that will prioritize areas within watersheds and ecoregions and give INDOT a framework to use towards efforts at avoid habitat fragmentation at the statewide and regional planning level. The study is based on the Indiana Forest Management Plan.

Currently, INDOT relies on DNR to identify areas of concern on a project by project basis and INDOT responds to comments from consulting parties. DNR recommends the use of crossings to compensate for habitat fragmentation.

Avoidance During Project Planning

The earliest stages at which habitat is considered is during the NEPA process at the step that Indiana calls "red flag" which occurs after scoping/ field visits and before meetings with regulatory agencies. Red Flag issues are put into a commitments database, along with recommendations from regulatory agencies and responses. Habitat fragmentation is not generally considered unless it is specifically received as an agency concern in a letter. Since the process is fairly new, Indiana is still getting an idea of what the regulatory agencies will expect of them. There is no standard procedure for identifying potential wildlife habitat fragmentation impacts during the alternatives analyses.

Indiana has utilized 100% of American Recovery and Reinvestment Act (ARRA) funding and is constructing new alignments, major road projects and widenings. A large, new project I-69, has impacted Indiana Bat habitat and has required that INDOT make substantial minimization commitments. Impacts to the Patoka river floodplain, wetlands and an established Indiana bat corridor were minimized by bridging the entire area, which was costly (originally 500 ft extended to 4400 ft). There have been individual projects where the effects of noise on the Indiana Bat have been considered, but usually impacts of noise impacts are only analyzed for humans.

There is a process for the management of construction of stormwater sites along roadways on a case-by-case basis, but not a defined program.

Resource agency suggestions to use wildlife crossing structures are provided in early coordination letters and sometimes in permit conditions. Indiana has a lot of managed drainageways. INDOT will also look at state police wildlife-vehicle collision data and will also observe animal tracks in the field. The state does not have many migrating species to consider other than birds and bats. INDOT has implemented some structures for snakes and toads and note that as long as long as the cost of a crossing can be justified as reasonable and feasible they will implement it. Indiana does not often incorporate fences

and walls, since they do not have defined corridor areas. Admittedly they need to better define where the crossing points are. Right now it is done on a project by project basis using aerial imagery used to define habitats and areas of cover to determine use.

Over the last year INDOT has revised standard drawings on structures to consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria. For example, Clean Water Act Section 401 permit condition have advised that structures be sunken in order to allow them to fill in with substrate. Resource agencies that are aware of the new protocols have responded very well to them.

Compensation Based Questions

Sites are not identified on the basis of compensating for habitat fragmentation. However, INDOT hopes to be able to implement this in the future and is currently looking to other states for examples of how compensation for fragmentation is handled. Mitigation sites are identified on a project by project basis. While sites are not specifically identified because of their connectivity to adjacent habitats, the ideal sites are ones that are likely to have success because they are adjacent to habitat. There is DNR regulatory language which specifically states that an action on state lands cannot be approved if it "...prevents all species from continuing to prosper...". However, while this language can be linked to addressing the issue of habitat fragmentation on state lands, it does not apply to private land.

According to Clean Water Act Section (CWA) 401/404 impacts to waterways, streams and wetlands must be mitigated as close to the impact as possible. In this respect, INDOT has a Woody Revegetation Program for any stream crossing, new bridge or bridge replacement, which functions as a banking program. It is based on re-establishing wooded corridor as close to the structure as possible, based on riparian corridor upstream and downstream. For each qualifying project, INDOT has a landscape architect look at the potential to do replantings within the right of way. The woody revegetation program is voluntary on the part of INDOT and most revegetation sites do not require a permit because the only action is riparian planting. However, these projects are audited and the riparian plantings are monitored so that they may can be applied as compensatory credit on other projects.

Indiana does have a list of preferred mitigation sites (3) for banking that are within the city of Indianapolis. These sites were chosen because of a mutual interest between InDOT and the City in restoring these sites. INDOT is working with DNR to develop an in lieu fee program for impacts to wetlands and streams.

The CWA Section 401/404 permit issued by Indiana Department of Environmental Management (IDEM) defines monitoring requirements, procedures and success criteria for stream/wetland compensation sites. The criteria have always been for vegetation and hydrology and not specific to wildlife fragmentation. DNR will address certain conditions like tree replacement mitigation because other areas are covered under CWA Section 401/404. The IDEM is expanding monitoring requirements, recently they have included a 1-2 year warranty of the planting materials, requiring replanting a site if planting mortality is too high. They are considering expanding the plant warranty to 5 years in certain

situations such as for hard to replace wetlands like drumlin or side hill seep springs. Five years is considered to be a normal monitoring period for a typical wetland with monitoring reports required annually. More complex sites with certain hydrological characteristics may be monitored for 10 years. Bank sites are monitored for 15 years. During the final year of monitoring, ACOE and IDEM will visit sites just before credit approval and provide feedback. INDOT has found that all of their compensation sites are being utilized, but since there is no defined monitoring, if habitat is still there then they assume wildlife is using it and therefore it is successful.

INDOT has been funding liaison positions at ACOE, USFWS and DEM for specific projects for the past three years. It has been shown that liaisons improve review times and hold monthly meetings which helps with communication and defines regulations.

Maryland State Highway Administration

(Office of Planning and Preliminary Engineering)

Heather Lowe- Team Leader, Env Planning Division, NEPA compliance

Donna Buscemi- Team Leader, Env Planning Division

October 18, 2010

Avoidance During Statewide & Regional Planning

In avoiding habitat fragmentation during statewide and regional planning, Maryland State Highway Administration (SHA) uses a GIS tool called “Green Infrastructure” (GI) that was recently developed. It is still being introduced throughout the SHA and recently to regional planners and to Metropolitan Planning Organizations for use in their long range planning efforts. The Green Infrastructure assessment includes everything in the undeveloped environment which was mapped in GIS and is now used to screen projects at the statewide level. The GI tool identifies critical areas known as hubs and corridors and based on this identification SHA makes every effort to minimize impacts. Some Maryland counties are also developing their own versions of the tool. Even though it is not required, Maryland makes every effort to proactively avoid connectivity issues at the statewide or regional level by using the Tool and sharing information early and upfront.

The GI Tool identifies hubs and corridors and highlights critical gaps where restoration efforts are needed to improve the quality of habitat. The GI Tool covers habitat and listed species as a separate layer and there is a weighted scoring system for prioritizing identified areas. It includes a landscape analysis specific to the planning area that includes “living” data sets such as Wildlife Vehicle Collisions (WVCs) which are collected by all districts and put into the Large Animal Removal Reporting System (LARRS) database. The Tool utilizes an Eco-logical approach/ systems approach, rather than a species specific approach. Maryland SHA coordinates with the Maryland Department of Natural Resources (DNR) for species specific information. SHA relies on their relationship with the DNR in requesting input on threatened and endangered species and waterway impacts and to convey any messages in the State Wildlife Action Plan (SWAP) to them during the process.

Avoidance During Project Planning

SHA has provided guidance on how to use the Green Infrastructure Tool for both major planning projects and minor/system preservation projects. It specifies that language addressing habitat fragmentation should be included in the Purpose and Need statement and that consideration be taken to avoid sensitive habitats. Guidance suggests that the GI should be discussed in both the Natural Environmental Technical Report (NETR) as well as the Indirect and Cumulative Effects Report.

System preservation projects are currently the most common type of roadway project in Maryland.

Using the GI Tool, SHA develops preliminary alternatives looking at connectivity in the project area and determines what alternatives would have the biggest impact and highlights more viable alternatives. If impacts cannot be avoided than efforts will be made towards stewardship. The GI Tool is also used at

the project planning level, and can be tailored to an individual project using the “Cadillac” approach. This approach involves intense data collection and analysis of project study area watersheds, and the use of an optimization model for stewardship and/or mitigation opportunities. This approach was recently used on the US 301 project through Waldorff and was found to be a great success. It encouraged stakeholder participation and allowed the project to move more quickly through the planning process which saves money. On the InterCounty Connector project (ICC), park areas where large habitat areas are protected and connectivity could be maintained were given the highest priority. The priority areas were then set according to zoning, with dense development being the lowest priority.

The first stage at which the agencies may express concerns about fragmentation is during Scoping to discuss the development of the Purpose and Need Statement which includes a visit to the project area and a “brainstorming” session with regulatory agencies. Then the agencies have input at milestone/Concurrence Point #1 when the Purpose and Need is developed. SHA then develops preliminary alternatives, and DNR can offer opinions before it goes to public/public workshop. The alternatives are then narrowed down and agencies again offer input at Concurrence Point #2, before the preferred alternative is presented and shared. Mitigation will be presented once the project is funded for design. There are monthly project review meetings with the resource agencies during which they may express concerns about habitat fragmentation at any time.

SHA has an environmental impact matrix that they use to quantify impacts. Currently it includes wetlands, streams, historic sites and properties. SHA will begin to include the GI identified hubs, corridors and gaps as if it were another resource and start discussing impacts.

There are new MD Department of Environmental Protection (DEP), rules for stormwater management during Environmental Site Design, to move away from ponds and towards more linear design, and SHA is in the middle of this transition. The Natural Environmental Technical Report (NETR) gathers baseline water quality data from Maryland Biological Stream Survey (MBSS), County water quality data or a watershed plan. The water quality impacts are described at a watershed level. The design of Best Management Practices (BMPs) occurs after planning, and NETR. For one project in particular, Maryland SHA located stormwater management facilities outside the roadway fencing so that they would be less likely to draw animals toward the road (constructive nuisance). Impacts to resources are avoided, minimized and mitigated the same as for the roadway.

MD SHA has designed longer bridge spans using rocks along the edge to create safety areas for small animal crossings. SHA has also contributed to research through a University of Maryland study on culvert use by large and small mammals. SHA has developed a database for Large Animal Removal Reporting System (LARRS) which can be used to determine areas along roadways where animal/vehicle encounters are frequent. During a widening project, they may also look at WVCs and incorporate crossings if necessary. On recent projects SHA used 8 foot tall chain link fence buried 1 foot in the ground, with mesh attachments both above and below ground if adjacent to forests. Fencing is inside ditch lines, goes up and over culvert headwalls, and is tied into noise barriers and bridge abutments.

The Maryland Department of the Environment has developed stream and river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria. For example; requiring a one foot burial of culverts to allow for the development of natural streambed material within the culvert. On the more recent InterCounty Connector (ICC) long culverts may have weirs to provide grade control to ensure the proper depth of water and retaining natural sediments for the stream bed throughout.

Compensation Based Questions

Compensation is only performed when required. Preservation and enhancement have been recently used. SHA has taken the initiative to provide stewardship through Wildlife Management Enhancement Plans on properties obtained for preservation and enhancement. The GI Tool helps SHA to understand where the agencies priorities are by identifying gaps and corridors that should be considered as potential mitigation sites but currently SHA does not use banking as compensation.

The new 2008 ACOE compensatory mitigation rule on CWA Section 404 is very specific. The compensatory guidance rule has changed the mitigation process and MD SHA and the Corps are resolving differences with the old rules on a case by case basis. However, no compensatory mitigation is required for wildlife habitat at this time and there are no specific guidelines.

The resource agencies have sometimes included special permit conditions which specifically address habitat fragmentation/connectivity compensation. For example, on the ICC project, if the wildlife structure also acted to carry stream or flood flows, then regulatory agencies placed conditions. If the structure had no resource impacts, then it was a discretionary item. On the ICC project, conditions have required that a flood flow cell (in box culvert) must have a surface that is easily traversable by wildlife and be non-erosive and also that riparian buffers along streams under bridges must be at least 30' wide and vegetated to provide stream stability and habitat connectivity. Another condition was that a box culvert cell for deer passage must be a minimum of 12' x 12' square or fit a 12' x 12' square if another shape. These conditions have been found to be effective to date.

New Hampshire Department of Transportation

Cathy Goodmen- Senior Environmental Manager, Bureau of Environment at NHDOT.

September 30, 2010

Avoidance During Statewide & Regional Planning

New Hampshire DOT has been making efforts to get municipalities and regional planning commissions to examine and consider conservation lands in the area before they suggest new roads to be placed on the 10-year plan for funding. New Hampshire DOT has been working with NGOs (NH Audubon) for the past year to develop guidelines for looking at areas that are more preferable and promoting awareness of corridors and limiting fragmentation and to implement these guidelines in the municipalities. They also use New Hampshire's Statewide Geographic Information System (GIS) Clearinghouse called GRANIT to determine sensitive habitat and areas to avoid during corridor planning and regional planning. Detailed information from GRANIT is not available at the regional level.

Avoidance During Project Planning

Safety and intersection improvements are currently the most common in New Hampshire, followed by widenings and last would be new alignments. At the project level NH uses the GRANIT system- some info includes flood plains, conservation lands, spoil sites, and the SWAP.

At the project planning level, letters are sent out as soon as a project is proposed. Letters are sent to agencies and town officials to inquire about the area in which the project may be located and to determine if they know of any issues associated with the project area. If a critical issue is identified, a meeting will be held. Natural resource agencies may express concerns about habitat fragmentation at monthly meetings involving the State and federal agencies ACOE, USFW, FHWA, NH F&G, NJDEP, Natural Heritage bureau etc.. When a project comes up, and there are issues, it will be presented at the monthly meeting to obtain comments. Meetings may occur several times during the course of design, and options may be altered based on comments.

There is not a standard procedure for identifying potential wildlife habitat fragmentation impacts during the alternatives analyses. New Hampshire uses a project by project approach. Transportation safety or motorist safety may limit the options available when it comes to avoiding habitat fragmentation. There is currently no method to quantify fragmentation.

If a project is going to open up more than 10,000sq of land, designers look at methods to treat stormwater and incorporate stormwater management facilities into the planning of the project. Look for areas to do drainage detention, swales, treatment underground. These options are also presented at natural resources meetings for agency input.

New Hampshire has incorporated wildlife crossing structures into a roadway project based on a preliminary impact analysis conducted during the development of alternative alignments or as part of the preliminary design phase by using large bridges to span an entire flood system. They also include

larger structures over small water area to allow for crossing as well as box culverts. Crossings are monitored by cameras and have been successful. New Hampshire has developed stream & river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria which includes more stream calculations. The process is new in 2010 and so far the agencies have been pleased.

New Hampshire does not include impacts to wildlife resulting from proposed roadway generated noise in the impact analysis. Since most improvement projects are located in more populated areas, the noise affects on wildlife would not be considered a new impact.

Compensation Based Questions

New Hampshire uses a compensatory mitigation ratio table to compensate for impacts from habitat fragmentation. Preservation and enhancement, are the most common forms of mitigation as well as some restoration. New Hampshire has done a lot of creation in past but is finding that it is not working that well. They do not have banks, but have started an in lieu fee program and it is frequently used. The in lieu fee program is run by New Hampshire Department of Environmental Services (DES). The cost of creation and acreage in that specific area is transferred by the project sponsor into a fund for that watershed area. Entities that want to do wetland restoration or creation can apply for funds within the watershed.

DES determines the potential mitigation sites and DOT believes that they may be weighted, especially with regards to in-lieu-fee mitigation. Mitigation follows ACOE regulations and sites are determined on a project by project basis. Sometimes the resource agencies include special permit conditions which specifically address habitat fragmentation/connectivity compensation that are more stringent than the state. For example, on one project, the state only required preservation of an upland area, but the ACOE required creation in order to protect the land.

There are no performance or success standards for compensation activities but usually if there is a mitigation site, it will be stated in the permit that it has to be successfully vegetated by the next season. NHDOT will monitor them for at least 5 years and present a monitoring report. They will also visit the site with agencies and get comments. Creation sites are monitored and reported on every year for 5-6 years. Preservation sites are monitored every 3 years for illegal use of site, and reported on for 20 years. Monitoring reports are not required by the agencies.

As for success, preservation has been found to work fine. However, creation only sometimes works well because they may not be replacing the same resource that was lost, it is creating a useful habitat- just not same kind of habitat.

New York State Department of Transportation

Brandon Greco, Environmental Specialist

September 23, 2010

Avoidance During Statewide & Regional Planning

The NYS Comprehensive Wildlife Conservation Strategy (CWCS) identifies the following as a statewide conservation priority: “Develop land protection strategies for large blocks of unfragmented forests by working with private land owners and public land managers, transportation planners, and local government to reduce planned fragmentation.” The CWCS lists endangered/threatened species by major river basin, but does not include habitat maps or records of occurrence. These data are available to NYSDOT through the NY Natural Heritage Program.

NYSDOT also refers to the Monitoring and Performance Reporting Framework Report (September 2008) which uses forest fragmentation and stream connectivity as status measures for conservation targets and lists general management and restoration recommendations for certain species and taxa within each major river basin.

It is mainly through case-by-case assessment and coordination with resource agencies that NYSDOT proactively avoids connectivity issues at the statewide or regional level. USACE regional conditions for NWP require culvert designs that facilitate aquatic organism passage (span, natural substrate).

Avoidance During Project Planning

At the project planning level NYSDOT researches projects to prioritize culvert replacements with respect to habitat quality and connectivity benefit. There is Guidance on USACE regional conditions for stream crossings but the DOT must determine where the extra expense is warranted and where it is not. NYSDOT has access to NY Natural Heritage data, and staff is trained in its use and interpretation. This data is considered in project scoping.

Agencies may express concerns about habitat fragmentation in their comments on the EIS/EA. For projects without EIS/EA, agency concerns are expressed later, usually during design phase (pre-application meetings or permit review).

The most common type of roadway project currently at NYSDOT is are safety improvements, with a focus on maintenance of existing infrastructure. Currently NYSDOT does not have many projects that are large enough to require an alternatives analysis, and as a result have not developed a standard procedure to identify potential wildlife habitat fragmentation impacts at that time. Loss of habitat can be quantified (e.g., acres of forest, miles of stream) and this seems to satisfy the resource agencies.

There is not a standard process for addressing stormwater management facility impacts, in addition to the roadway footprint, during project planning.

NYSDOT has funded research to identify/model herpetile mortality hotspots and to refine herpetile crossing designs. The Department is also involved with current research to identify aquatic barriers on

streams with high quality habitat to help prioritize culvert replacement. Also, the potential for deer-vehicle collisions are evaluated in project design, and are addressed through statewide education/awareness. These efforts have been found to be successful.

NYSDOT has incorporated wildlife crossing structures or specific wildlife exclusion features into a roadway project based on a preliminary impact analysis conducted during the development of alternative alignments or as part of the preliminary design phase. For example, the Stewart Airport access improvement project incorporated an amphibian crossing (box culvert and retaining walls) to mitigate for fragmentation of wetlands.

NYSDOT has developed stream and river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria. They established the Interagency Aquatic Connections Team (InterACT) to write ecological performance standards and engineering design guidance for stream crossings. The resource agencies have responded favorably to these protocols, due to their involvement.

Compensation Based Questions

The amount of mitigation required for habitat fragmentation is somewhat arbitrary; it is based on negotiation with resource agencies. NYSDOT uses preservation, enhancement, and creation types of mitigation, however, habitat mitigation is not used often enough for any type to be considered common. NYSDOT does not use banking for the mitigation of habitat fragmentation and connectivity loss. In general, close proximity/connectivity to adjacent habitats is preferred when considering compensatory mitigation for habitat fragmentation and loss of connectivity of habitats, but there have not been enough projects with habitat mitigation to be able to develop a process for weighting.

Resource agencies have included special permit conditions which specifically address habitat fragmentation/connectivity compensation. For example, permit conditions for the Stewart Airport access improvement project included provisions for monitoring roadkill and use of the amphibian crossing structure. USACE regional conditions for stream crossings (NWP program) require avoidance/minimization of aquatic habitat fragmentation by dictating crossing span and substrate. NYSDOT considers these conditions to be effective.

There are no performance and success standards for compensation activities; monitoring results are used for adaptive management. Compensation monitoring includes population sampling (e.g., Indiana bat mist netting), observation of conservation measures (e.g., nest box use, crossing use, planting survival), and road kill surveys. If the site is being utilized, it is considered successful.

Differences in monitoring are based on the specific conservation measures rather than on mitigation type. Sites are usually monitored for a period of 1-5 years, depending on species and nature of mitigation. One permit requires monitoring of vernal pools for 10 years. The requirement of monitoring reports varies by project and responses from the agencies are uncommon. Thus far, most sites seem to be successful. There has been one observed failure (an amphibian crossing), and some sites are too new to allow a conclusion.

Oregon Department of Transportation

Mindy Trask- Monitoring Program Coordinator, Geo-Environmental Section

October 11, 2010

Avoidance During Statewide & Regional Planning

Oregon has addressed habitat conservation at the state and/or regional level via Statewide Planning Goal 5 *Natural Resources, Scenic and Historic Areas, and Open Spaces* (Goal 5). Goal 5 is primarily implemented through the local governments. The State Goal requires an inventory, assessment and protection depending on the analysis.

Although Oregon has a comprehensive mapping program at the statewide scale via the State Wildlife Action Plan (SWAP), which includes priority habitats (called “Strategy Habitats”) it is unknown how widely it is understood or utilized. It includes a weighted scoring system for prioritizing identified areas and it includes a landscape analysis specific to the planning area that includes “living” data sets, but not connectivity information. This mapping program is only available by request and requires the purchase of a license. In Oregon, the mapping of listed and rare species is conducted by the Oregon Natural Heritage Information Center, and that has been in effect far longer than the SWAP.

Oregon has many possible habitat conservation plans to consider, but the most widely utilized one is the Oregon Plan for Salmon and Watersheds. Some Metropolitan Planning Organizations (MPOs) and counties have their own planning documents for consideration of core habitats and a few even include corridors. Recently published statewide Wildlife Linkages maps are also available for consideration of habitat connectivity across highways and major roads.

The Wildlife Linkages data is available for planners for use planning wildlife sensitive crossings on highways, but it is unknown how widely it is used. The data may be considered difficult to interpret for a practitioner without a biology and GIS background, and ODOT is still in the process of training on its use. Oregon has also staffed a position at Oregon Department of Fish and Game (ODFW), for the specific purpose of looking at habitat connectivity statewide for roadways.

Avoidance During Project Planning

Preservation (maintenance of the existing infrastructure) is the most common type of roadway project in Oregon. Capacity improvements are uncommon.

Regulatory resources (wetlands, listed species critical habitat, fish passage [regulated in Oregon]) have the highest priority during project planning. Unless it involves a regulated resource, protection and maintenance of connectivity is voluntary, and depends on how proactive the local ODOT or Fish and Wildlife biologists are during project development.

If concerns about habitat fragmentation are not in addressed in local comprehensive plans, which usually it is not, then agency concerns are expressed at the project scoping phase, and depend on input from local Fish and Wildlife biologist.

There is not a standard procedure for identifying potential wildlife habitat fragmentation impacts during the alternatives analyses. For large scale planning and EIS, Oregon conducts interagency statewide multi-agency forums. Decision points in the process allow for resource agency input. When listed species are involved (e.g., northern spotted owl, bald eagle), Oregon does include impacts to wildlife resulting from proposed roadway generated noise in the impact analysis.

The process for addressing stormwater management facility impacts, in addition to the roadway footprint, during project planning is being revised. Standard local operating procedures for endangered species (SLOPES) ACOE permit requires stormwater mgmt plan with a specific format. State fish passage regulations include stream and river crossing protocols that consider aquatic habitat requirements in addition to hydraulic criteria, but they do not really address fluvial processes. ODOT has a small program for addressing fluvial processes when a bridge replacement utilizes a certain programmatic ESA consultation.

Oregon has incorporated a few wildlife crossing structures or specific wildlife exclusion features into a roadway project based on a preliminary impact analysis conducted during the development of alternative alignments or as part of the preliminary design phase but they are not common.

Compensation Based Questions

Compensatory wetland mitigation and mitigation for habitat for listed species are the most common types of compensation ODOT uses. For the former, priorities are set by regulators: creation, restoration, enhancement, in-lieu fee. Preservation has only recently been allowed on a case-by-case basis. For listed species, restoration and enhancement are most common. There are 6 banks in the state. However, Oregon natural resource agencies do not accept the purchase of wetland/riparian/conservation bank credits for the mitigation of habitat fragmentation and connectivity loss. There is no mitigation requirement for connectivity except at the EIS level. At the EIS level the requirements are project specific.

There are some programmatic that are fairly specific in addressing specialized habitats in the region. In terms of habitat mitigation there are broad restoration goals (SLOPES) but they are not at the level of considering conservation strategy.

When there is a permit requirement for compensation activities, there are performance standards typically included in the permit conditions. The typical monitoring period is for 5 years and reports are required annually during that time. Agencies rarely provide feedback on the reports. Success depends on the project type. Mitigation sites are usually about 80% successful- wetland sites are usually about 50% successful overall. Oregon does monitor rare plant populations but this is not a permit driven requirement.

Texas Department of Transportation

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October 29, 2010

Avoidance During Statewide & Regional Planning

Texas Parks and Wildlife Department (TPWD) has developed the Texas Conservation Action Plan (TCAP) which TxDOT considers to be the central planning document for natural resources when developing a project. It is currently undergoing revision and is scheduled to be approved by U.S. Fish and Wildlife in March 2011.

TCAP includes the construction of a detailed mapping database of potential habitats, listed species and/or records of occurrence based on based on the NatureServe Ecological System Classification System. The project supporting the GIS database is called Ecological Systems of Texas, which is a mapping project of all vegetation and is a 5 year project in its 3rd year. DOT helps maintain the database by updating any data they may come across in the field, however they consider it to be the responsibility of the resource agencies to identify the resources that need to be protected. Under an Memorandum of Agreement (MOA) with TPWD, TxDOT provides training on how to use the tool so that the interpretation of the data can be as uniform as possible. Under this MOA, the TxDOT is allowed access to the database of rare resources, otherwise access to the database is controlled since there is concern with releasing information on rare plants and animals to the public. Regional planners do not have access to the database since per the agreement with TPWD, only those with training can access it. The current process is for regional planners to send a request and get information through coordination with TPWD.

The system allows for map objects to be generated at 10m resolution. The database includes occurrences which are updated whenever new mapping info available and it incorporates restoration plans for listed species habitats. It does not incorporate WVCs at this time as that reporting system is being revamped, but will be included in the future. There is a layer called Texas vegetation map which breaks down ecoregions into community scale designations. It redefines ecoregions to be more in-line with EPA designations, so that there is more consistency when crossing state boundaries.

Avoidance During Project Planning

When it comes to avoiding habitat fragmentation during project planning, TxDOT has found that it is more effective to have all agencies and stakeholders involved as early in the project development process as possible so that they can think about A&C in the early stages. Goal is to bring in stakeholders and agencies as early on in the process even at 0-20% design complete.

The issue of fragmentation is discussed during alternatives analysis and is addressed in environmental documents as part of impacts and indirect and cumulative impacts analysis. TxDOT looks for, and expects to see a discussion of fragmentation in these documents. They would even like to see a

discussion about potential disruption to gene flow and how that can affect population dynamics if possible. used to talk about species of concern. Now species of greatest conservation need.

The most common type of roadway project in Texas is new projects followed by rehabs, widenings, bridge replacements, maintenance.

TxDOT feels that looking at stormwater management impacts are crucial and notes that there are very strict limitations on design parameters and implementation. They are currently studying things like Permeable Friction Course which is a permeable roadway where the roadway acts as a filter. This type of technology can reduce the size of facilities and therefore impacts associated with the placement of stormwater management facilities.

TxDOT does have some crossing structures and expects that as they shift into an ecosystem management strategy and look at things on an ecosystem scale rather than a roadway, project specific scale, it will become increasingly important to look at animal movements. The lack of large crossing structures is due to the fact that Texas is not known to have migrating herds that have fluid movements. However, they have taken the initiative to install dedicated crossings that are independent of the hydraulic function of the roads. They have built toad tunnels with funnel features for eastern toads. For Ocelots they have placed shelves in underpasses that may fill with water because Ocelots do not like to get their feet wet. They have also put large cutouts in the jersey barriers to allow Ocelots through, should they become trapped on the roadway. Commonly, TxDOT scientists will work with engineers to design bridges larger to allow enough room from edge of water for wildlife to move through. These types of crossings are easy to design up front rather than try to retrofit.

Texas DOT has always included impacts to wildlife resulting from proposed roadway generated noise in the impact analysis because they consider impacts at the landscape scale with an eye towards the future.

As mentioned above, TxDOT has developed stream and river crossing protocols that consider aquatic habitat and fluvial process requirements in addition to hydraulic criteria, on a project by project basis. For example, on a I-35 widening project, stormwater and bridge abutments were designed to go above and beyond minimum standards because they were located immediately upstream of a salamander species which was identified at the onset of the project. TxDOT Environmental Affairs worked with design engineers on where and how to design for it and hopes that in the future, this type of thinking will be standard among engineers.

Compensation Based Questions

There is a mechanism in place through an existing agreement with resource agencies that allows for compensatory mitigation to replace impacts from habitat fragmentation of non-federally regulated resources, but it is not really used. The standard is that mitigation must be discussed but it is left to the discretion of the department. With the new TCAP TxDOT is looking at ways to have a more rigorous system for calculating impacts.

The most common types of compensation TxDOT uses specifically for habitat mitigation are preservation, enhancement, restoration, creation, and in-lieu fee. There is an expectation that in the near future, in-lieu fee will be more predominantly used as TxDOT is looking at ways to do banking for wildlife impacts. TxDOT makes an effort to focus mitigation on enhancing good habitat areas that exist, but the resource agencies decide on the best way to spend the funds. Resource agencies have included special permit conditions which specifically address habitat fragmentation/connectivity compensation in the form of temporary, enforceable conditions in a Biological Opinion.

There is no typical monitoring periods as monitoring differs between mitigation types. For example; long term/lifelong monitoring during maintenance activities is appropriate for a high profile species such as an endangered orchid (ladies tresses) that prefers a disturbed roadside environment. For the Mussel a period of 2 years was appropriate because literature shows that 2 years is when they should be re-established. Some monitoring requires annual reports, on which agencies generally provide feedback. Overall, Texas has found that the “postage stamp” compensation sites are not usually successful and they are expensive to maintain. TxDOT is making a deliberate shift away from this piecemeal type of compensation and towards ecosystem-based efforts. They are working with partners at resource agencies and using that good working relationship to genuinely enhance conservation within the states.