# A PROGRAMMATIC AGREEMENT TO MIMINIZE HIGHWAY PROJECT IMPACTS ON CANADA LYNX *(LYNX CANADENSIS)* IN COLORADO

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**Abstract**

Multiple highway projects which may affect lynx are proposed throughout the State of Colorado. Because these projects are federally funded, they must comply with the requirements of the ESA. The process for determining if and how a project will impact lynx will be similar for all projects. Therefore, a programmatic agreement between CDOT, FHWA and USFWS, outlining a standard methodology for impact assessment and mitigation design, has been developed. The programmatic agreement removes a large amount of uncertainty and redundancy from the Section 7 consultation process for all projects. By following the programmatic=s standards, CDOT will ensure that projects and mitigation are designed to reduce impacts to the lowest possible level prior to consultation. These standards also ensure that USFWS evaluates projects on a consistent, predictable basis. All projects designed according to the programmatic agreement=s standards should have minimal impact to lynx, be approved by USFWS, and move forward in a timely manner.

**Introduction**

On July 8, 1998 the U.S. Fish and Wildlife Service (USFWS) published a proposed rule to list the contiguous United States population of the Canada lynx (lynx; *Lynx canadensis*) as threatened (Federal Register 1998) under the Endangered Species Act (ESA). Final listing will most likely occur within the next year. The ESA requires that Federal actions not jeopardize threatened and endangered (T&E) species, avoid and minimize adverse effects to them, and enhance their conservation through beneficial effects were practicable.

Lynx are a specialized predator, highly adapted to moving in deep snows and preying upon snowshoe hare. Their primary range in north America is the northern boreal forests of Alaska and Canada. Boreal forest habitat types in the mountains of Utah, Wyoming, and Colorado represent the southern margin of the lynx=s range. Multiple highway projects which may affect lynx are proposed throughout the State of Colorado. Because these projects are federally funded, they must comply with the requirements of the ESA.

Although little data exists regarding the behavioral response of lynx to roads, the available evidence suggests that lynx respond to roads negatively. *Canada Lynx in Idaho* (Terra-Berns et al. 1998) reports that lynx tracks are often observed paralleling roads and trails, but rarely crossing them. Stevens et al. (as cited in Gibeau and Heuer 1996) conducted a tracking study along a busy ski area access road and recorded 15 crossings by lynx, half of which entailed at least one aborted attempt before successfully crossing. Lynx studied by Apps (pers com 1998) readily cross narrow (10 meters wide) roads, but only at night when there is no traffic and always at locations with dense road side cover. He has not recorded lynx crossing a four-lane highway. Additionally, lynx are susceptible to mortality as a result of being struck by vehicles (Mech 1980, Ferrares 1992, Weaver pers com 1993), and the secondary impacts of roads also have negative impacts on them (Reudiger 1996). Increased human use of lynx habitats occurs when roads create access to them. Such use degrades and fragments lynx habitat by increasing human disturbance and human caused mortality, and by allowing lynx competitors to access previously unavailable habitats (Parker et al. 1983, Koehler and Aubry 1994).

Because of these potential impacts to lynx, the Colorado Department of Transportation (CDOT), the Federal Highway Administration (FHWA), and USFWS will be required to conduct a consultation to ensure ESA compliance for each highway project. This consultation process is mandated by Section 7 of ESA, to ensure that Federal actions meet the requirements of the ESA. Because the process for determining if and how a project will impact lynx is similar for all projects, a programmatic agreement between CDOT, FHWA and USFWS, outlining a standard methodology for impact assessment and mitigation design, was developed. Additionally, the information in the programmatic agreement document can be used during project planning to design projects with minimal impact. Although the agreement is not a substitute for thoughtful, project specific evaluations, it will help to simplify the analysis process and ensure a consistent approach from project to project, streamlining the Section 7 process.

**An Overview of the General Section 7 Consultation Process**

Figure 1 outlines the general Section 7 process. A planned project is evaluated for the impact(s) it will have on T&E species, and based on the magnitude of the impact(s) a category of effect is assigned to the project. There are four categories of effect, and they are formally defined by USFWS (see Appendix A). For Ano effect@ or Amay affect, will not adversely affect@ findings, a Section 7 consultation is not required. If an action agency declares a project will have Ano effect@, it is the action agency=s responsibility to prove that position if challenged. Projects that screen to the adverse effect level require consultation so that USFWS can ascertain how the action agency will avoid or minimize adverse effects. Prior to consultation, a Biological Assessment (BA) describing baseline conditions, proposed action, and potential effects is prepared by the action agency. The BA is then submitted to USFWS for use in their evaluation of project effects. Using the information contained in the BA, USFWS issues either a concurrence that there will be no adverse effects, or a Biological Opinion (BO), outlining their finding in regards to adverse effects, and the potential for jeopardizing the species. Projects which screen to a jeopardy determination must either be re-designed to eliminate that effect, moved, or withdrawn.

Although the ESA requires consultation occur, it does not specify a format for the process or the supporting documentation (BAs, BOs, etc.). Both the documents and the progression of the consultation process can vary widely in content and quality, resulting in consultations that are needlessly time consuming and complex. Ultimately, this can cause project delays.

**CDOT=s Programmatic Section 7 Consultation Process for Lynx**

A programmatic agreement (PA) between the USFWS and an action agency, which standardizes certain planning, design, and impact evaluation procedures for similar projects which may impact a protected species, simplifies and streamlines the consultation process. Under this PA, projects that meet the standards for Ano effect@ or Anot likely to adversely affect@ will be easily identified by both CDOT and USFWS. There should be no disagreement as both agencies will base their assessments on the guidelines contained in the programmatic agreement document (PAD). As with the general Section 7 process, a consultation and a full BA is not required. Instead, CDOT will send a letter to advise USFWS of the project and the Ano effect@ determination. USFWS will then issue a letter of concurrence based on this information, and the project may go forward.

Projects that initially screen to an adversely affect on lynx will still require consultation, so that USFWS may judge the adequacy of proposed mitigation to reduce the impact. The detail and intensity of the process will be commensurate with the magnitude of predicted impacts. By using the standard set of USFWS approved impact evaluation and mitigation planning criteria contained in the PAD, CDOT will ensure that all projects and mitigation are designed to reduce impacts to the lowest possible level prior to consultation with USFWS. These standards will also ensure that USFWS evaluates projects on a consistent, predictable basis to determine their impact on lynx. Costly delays, stemming from unforeseen USFWS requirements should be eliminated.

As with the general Section 7 process, a BA, describing baseline conditions, the proposed project, impacts, and their effects, is required for projects which may adversely effect lynx. However, because an extensive discussion of lynx life history and ecology is included in the PAD, the BA need only include project specific information. The format of the BA is specified in the PAD, and the level of detail presented in each section of the BA will be commensurate with the estimated magnitude of the effects.

**An Overview of the PA: Determining Project Effects**

The effect category a project falls into is determined by the type and magnitude of its impact on lynx. As detailed in the PAD, determining the effect of a proposed project on lynx is a complex process of multiple, inter-related steps (Figure 2) First, the type(s) and magnitude of impact(s) that will occur is (are) identified, based on the factors discussed below; all projects should be designed to eliminate and minimize impacts to the greatest extent possible. Second, mitigation measures to alleviate impacts that can not be avoided through project design are added, and their effectiveness estimated. Third, impact magnitude and mitigation effectiveness are combined to determine the severity of the impact and the consequent effect a project will have on lynx.

Figure 3 presents the formalized framework adopted by the PA for categorizing a project=s effect. Because information regarding the natural history of lynx in the Southern Rocky Mountains is scarce, there is a substantial amount of uncertainty to the process. However, by considering the best available scientific data, a reasonable determination can be made. Because projects are unique, the framework presented does not define specific effects associated with specific types of projects. The PA does, however, specify that when project impacts are determined to be severe, an explicit part of the process is to consider if the purpose and need for the project outweighs the impacts. A decision not to build a project may be the most legitimate form of mitigation for projects which have only minimal benefits to motorists but severe impacts to lynx. This consideration is particularly critical if a project will have ecosystem-wide impacts (e.g., impacts to landscape-scale habitat connections) USFWS has cited the importance of avoiding these types of impacts if lynx are to be effectively protected (Patton, pers com).

The PA prompts the evaluator to consider three habitat-related factors, impact type, and project type (all discussed below) when determining the type and intensity of impacts that occur as a result of a project. These factors are considered again when choosing mitigation measures, and estimating their effectiveness.

**Quality of Lynx Habitat in Project Area:** A detailed description of lynx habitat, based on data collected in Washington, Montana, Idaho, Alaska, and Canada, is included in the PA. Briefly, suitable lynx habitat encompasses blocks of both feeding and denning habitat and the travel corridors that connect these blocks. Because suitable habitat in Colorado is naturally fragmented due to topography, secure travel corridors probably play a key role in maintaining population viability. Data about habitat use by lynx in Colorado is being collected by CDOW during and following the current re-establishment effort. This data may indicate patterns of habitat use unique to the southern portions of this species range, and will be considered as soon as it becomes available.

**Presence of Lynx in the Project Area:** The likelihood of lynx presence is closely related to habitat function and quality, and because lynx are highly mobile, lynx may move to any area of suitable habitat at any time. If suitable habitat exists in the project area, or if the project area acts as a linkage between suitable habitat areas, it must be assumed that lynx are potentially present.

**Existing Roadway Related Impacts:** Existing impacts are determined by the type of existing roadway (e.g., county road, unimproved two-lane, four-lane, etc.), surrounding land use, and intensity of both roadway and land use. Existing impacts influence habitat quality and provide a baseline for the magnitude of change that the project will cause. Existing roadway impacts also play a role in determining habitat quality and visa-versa. Project impacts are based, in part, on impacts currently occurring due to the existing roadway in the project area. For example, if existing impacts are severe, modifying the roadway may add little additional impact. Evaluating existing impacts may also provide an opportunity to design the proposed project to decrease impacts. Because ESA directs federal agencies to undertake actions that will contribute to the de-listing of species where practicable, the PA recommends that such opportunities be used where possible.

**Impact types:** The PAD discusses four broad categories of impact types which may occur to lynx as a result of highway projects including 1) habitat fragmentation, 2) habitat loss, 3) direct mortality, and 4) disturbance. Depending on individual project design and the surrounding landscape, the four impacts types take different forms and may be direct or indirect. Impact type contributes to impact severity and is the foremost consideration when choosing appropriate mitigation.

**Project types:** For impact assessment purposes, the PA directs the evaluator to consider four broad, potentially overlapping project types: 1) projects resulting in increased traffic speed and volume, regardless of changes in roadway footprint, design, and surrounding cover; 2) projects that do not remove any woody cover (shrubs or trees); 3) projects that do remove woody cover; and 4) bridge/culvert replacements. Increases in traffic volume and speed increase the barrier effect of a road, regardless of changes in roadway footprint, design, and surrounding cover. Because lynx are highly sensitive to cover distribution and quality, projects that remove even very small amounts of cover are more likely to have a Amay affect@ finding, then projects that remove no cover. Detailed analysis is required to determine the quality of any cover removed and its importance to lynx. Bridge and culvert replacement often includes alignment adjustments and consequently some removal of vegetation. However, because properly designed bridges and culverts offer safe road crossing opportunities for lynx, negative effects of cover removal may be canceled out. Therefore, these projects should be considered separately.

**An Overview of the PA: Examples of Impacts and Their Effects**

Project effects are a function of the severity of project-related impacts on lynx. The PA categorizes the effects of projects as follows:

**No Impact = No Effect:** Projects which have no impact and will therefore automatically be classified as Ano effect@ are those that do not cause any additional habitat fragmentation, habitat loss, increase chances of mortality or disturbance, and/or are located in habitat that is of such low quality (at both a local and a landscape scale) that lynx are very unlikely to use it. These types of project will not require any lynx specific mitigation measures. Projects which would fall into this category include:

- ? Projects located in areas heavily influenced by development (e.g., urban areas, subdivisions).
- ? Projects located in open habitats with no nearby woody cover (e.g., grasslands with no shrubby cover, cultivated areas).
- ? Projects located in habitat areas that offer no resources to lynx (i.e., no denning, foraging, or travel corridors; consider both local and landscape scale travel corridors).
- ? Resurfacing projects that do not change the roadway function or footprint in any way.

**Negligible Impacts = May Affect/Not likely to Adversely Affect:** Projects which will be classified as Amay affect/not likely to adversely affect@ are those which cause a negligible or improbable impact to lynx. Projects that qualify for this classification should not have adverse impacts at the individual or the population level and can never result in Atake@. Take of a threatened or endangered species is defined in the ESA and covers a wide range of negative impacts, which may or may not result in mortality. These project types are unlikely to require lynx specific mitigation measures. Projects which should be considered for this category include:

- ? Projects which occur in areas which have a very low potential to be used by lynx for foraging, denning, or as movement corridors.
- ? Projects which remove only a small amount of cover adjacent to the roadway.
- ? Projects which add a small amount of additional roadway width (e.g., shoulders) but do not require a significant removal of cover, nor significantly increase traffic volume or speed.
- ? Projects which do not result in a significant change in roadway function

**Moderate/Severe Impacts = Likely to Adversely Affect or Likely to Jeopardize/Adversely Modify Critical Habitat:** The higher the quality of lynx habitat in a project area, the more likely the project=s impacts are to fall into this category. Because it is often difficult to quantify the exact amount of impact that will occur as a result of projects in this category, effective mitigation plans must be conservative, erring on the side of over-compensation. Projects types for which this category should be considered are listed below:

- ? Projects located at the edge of or within suitable denning habitat
- ? Projects located at the edge of or within high quality foraging habitat
- ? Projects which impinge a high quality travel corridor(s), i.e., a wide corridor that offers foraging opportunities, a corridor that joins areas of high quality habitat, or a corridor that is the only link between blocks of suitable habitat. These corridors may function at either a local or a landscape level, and must be assessed from both perspectives.

Project design also plays a role in reaching these effect categories. These triggers include:

- ? Projects which add significantly more roadway width, relative to existing widths. Increased widths result from increased paved surfaces, cuts, and fills.
- ? Projects which add substantial amount of vertical barriers, including retaining walls, raised medians, jersey barrier, and split alignments.
- ? Projects which remove existing features which facilitate animal roadway crossing, including replacing existing bridges over drainages with culverts or pipes and reducing the width of medians currently wide enough to provide cover and a resting spot for crossing animals.
- ? Projects which remove significant amounts of shrubby or woody cover adjacent the roadway.
- ? Projects which significantly change existing roadway function, i.e., result in significant increase in traffic speed and/or volume.

**An Overview of the PA: Mitigation**

The intent of the ESA is to promote restoration of federally threatened and endangered (T&E) species so that T&E status is no longer required. With this goal in mind, all projects should be designed to avoid and minimize impacts. Mitigation is required when avoidance and minimization of impacts is insufficient. Figure 4 outlines the conceptual basis for determining the effect category a project will fall into, based on existing condition, project type, and the effectiveness of planned mitigation.

Mitigation varies with impact type, impact magnitude, and the unique features of each project. Most mitigation measures fall into two broad categories, including 1) habitat replacement, enhancement, or protection, and 2) design based mitigation. In general design based mitigation is preferred by USFWS, but a combination of the two strategies may also be acceptable, or even necessary, in some cases. A third type of mitigation, the use of Least Disturbing Practices (LDPs) during construction, and avoiding construction during critical times of year, is also important for reducing temporary, construction related disturbance impacts. Additionally, LDPs and timing of activities could be used to reduce maintenance related impacts.

Design based mitigation focuses on the design of the roadway itself and/or involves designing and adding features specific to the mitigation goal. Design based approaches which make highways permeable to wildlife movements in general, and to lynx in particular, will mitigate fragmentation impacts. Highway permeability can be improved both through thoughtful highway design as well as the addition of wildlife road crossing structures (WRCS). The PAD contains detail descriptions of underpasses and overpasses designed for lynx.

When impacts will potentially occur to lynx as a result of a highway project, the PAD establishes the following standard mitigation. First and foremost, impacts shall be reduced by ensuring that the highway design itself minimizes all impacts to the extent possible. Standard highway design features which reduce impacts include:

- ? Minimizing the total project footprint
- ? Avoiding areas of high quality and important habitat
- ? Oversizing box culverts planned as part of the project, or using bridges instead of box culverts
- ? Sizing bridges planned as part of the project to provide a dry pathway along side streams crossed
- ? All stream courses and gullies containing riparian cover will be culverted or bridged; small diameter pipes will not be used, and drainages will not be filled.
- ? Preserving and or planting woody cover to screen approaches to culverts and bridges
- ? Preserving woody roadside cover wherever possible
- ? Revegetating all areas disturbed during construction

Additional mitigation measures which can be used to compensate for project impacts that can not be removed by highway design are as follows:

- ? Retro-fitting previously filled drainages to act as WRCS, i.e., removing fill and using either a large CBC or a bridge to span the drainage.
- ? Using overpass-style WRCS to reconnect ridge-line travel corridors bisected by highways.
- ? If a travel corridor is bisected by an existing road, a WRCS will be constructed to reduce fragmentation.
- ? If high quality habitat is bisected by a road, a WRCS will be constructed to reduce fragmentation.
- ? If disturbance to lynx is predicted to increase as a result of a project, habitat based mitigation measures (e.g., easements restricting activities) will be implement to reduce or remove the impact.
- ? If high quality habitat is lost due to a highway project, habitat will be protected, replaced or enhanced at a predetermined ratio. This could include restoring degraded areas, purchasing easements to restrict activities in lynx habitat, or removing small forest access roads to reduce human access a disturbance.

If mitigation measures within the project area will be inadequate to counter negative project impacts, off-site mitigation should be considered. By definition, habitat replacement must occur outside the project area; habitat protection and enhancement are also more likely to be effective if they

occur away from the project area. Off-site design based mitigation may also be an option in some cases. For example, if the impacts of a planned project require an underpass for mitigation but there are no suitable locations for an underpass within the project area, an underpass could be built under a nearby section of the highway.

Estimating mitigation effectiveness will rely on knowledge of wildlife movement patterns through the project area, vegetation and topography in the project area, and information from future studies about general wildlife movements across highways, of lynx movements in Colorado, and the success of other mitigation projects. These types of studies are all currently being conducted. In the absence of such study results, information about project areas is particularly important for estimating the success of planned mitigation measures. However, because of the limited of data currently available, it may be difficult to quantify mitigation efficacy. Because of this lack of data, post-construction monitoring to assess effectiveness, and a commitment to redesign and retro-fit ineffective design-based mitigation measures, is considered an essential part of any mitigation plan by USFWS.

**An Overview of the PA: Enforcing Commitments**

Practices and procedures to avoid and minimize impacts during construction, maintenance, and roadway operation will be specified and agreed to in the MOU between CDOT, FHWA, and USFWS that adopts the PAD as the standard template for all Section 7 consultations regarding lynx. These practices and procedures will then be include in all construction specifications CDOT gives to its contractors. Random monitoring during construction will be implemented to ensure that all specifications are being followed. Standard practices and procedures for maintenance will also be agreed upon in the MOU.

## Appendix A: USFWS Definitions of Effects

**No effect** B no effect to a listed species or designated critical habitat will occur.

**May affect, Not likely to adversely affect** B the effects on a listed species are expected to be discountable, insignificant, or completely beneficial. Insignificant effects relate to the size of the impacts and should never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. Based on best judgement, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effect to occur. The action agency must seek written concurrence of this finding from the USFWS. If the service concurs, no further consultation is required.

**May affect, Likely to adversely affect** B if any adverse effect to listed species, at the individual or the population level, may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, the proposed action is Alikely to adversely effect@. If incidental take is anticipated to occur as a result of the proposed action, a A is likely to adversely effect@ finding must be made. A formal Section 7 consultation is required to determine how and if a project may proceed.

**Likely to jeopardize/adversely modify critical habitat** B when the proposed action is likely to jeopardize the listed species or adversely modify critical habitat. A formal Section 7 conference is required to determine how and if a project may proceed.

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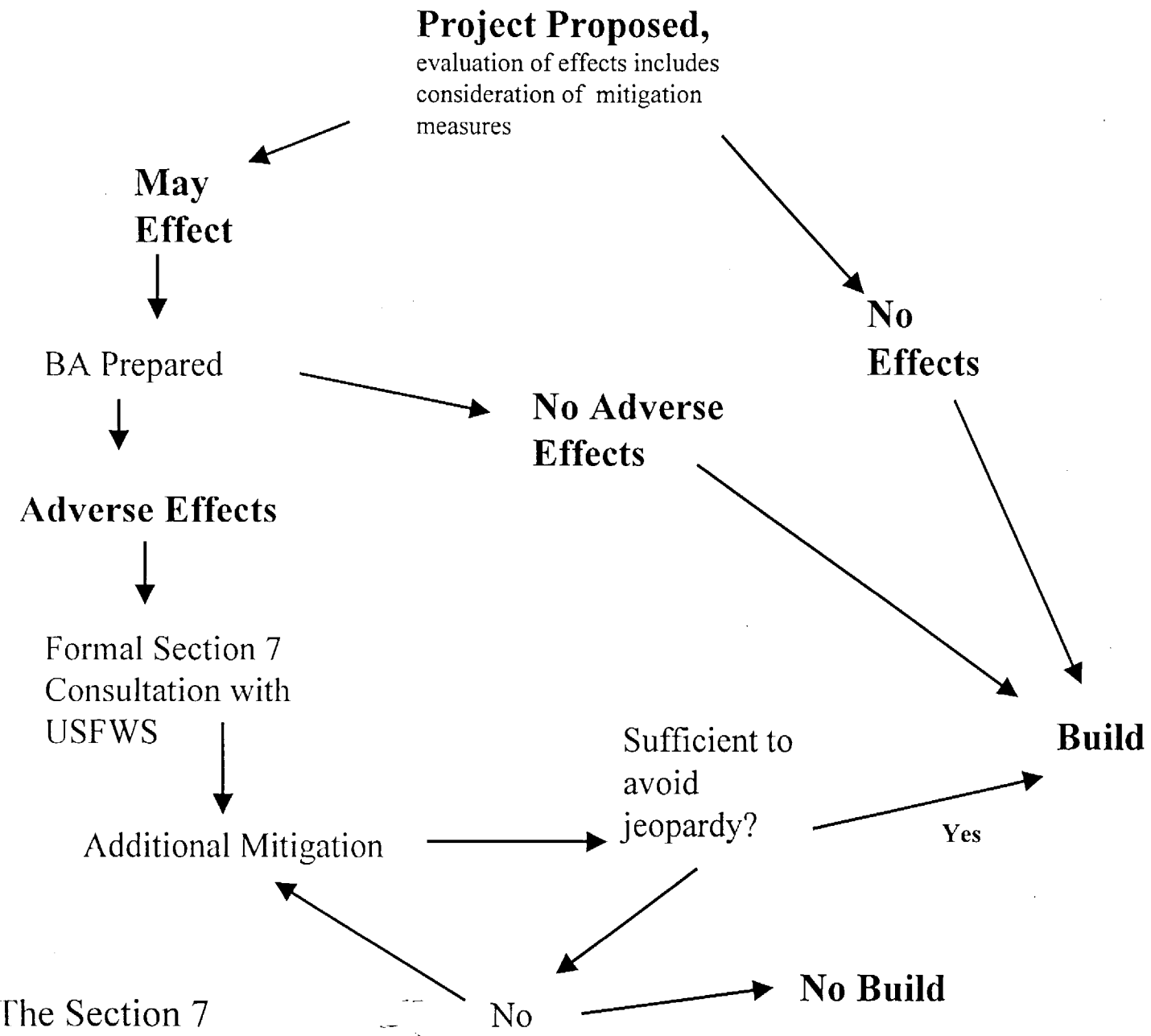



Figure 1. The Section 7 Consultation Proccess

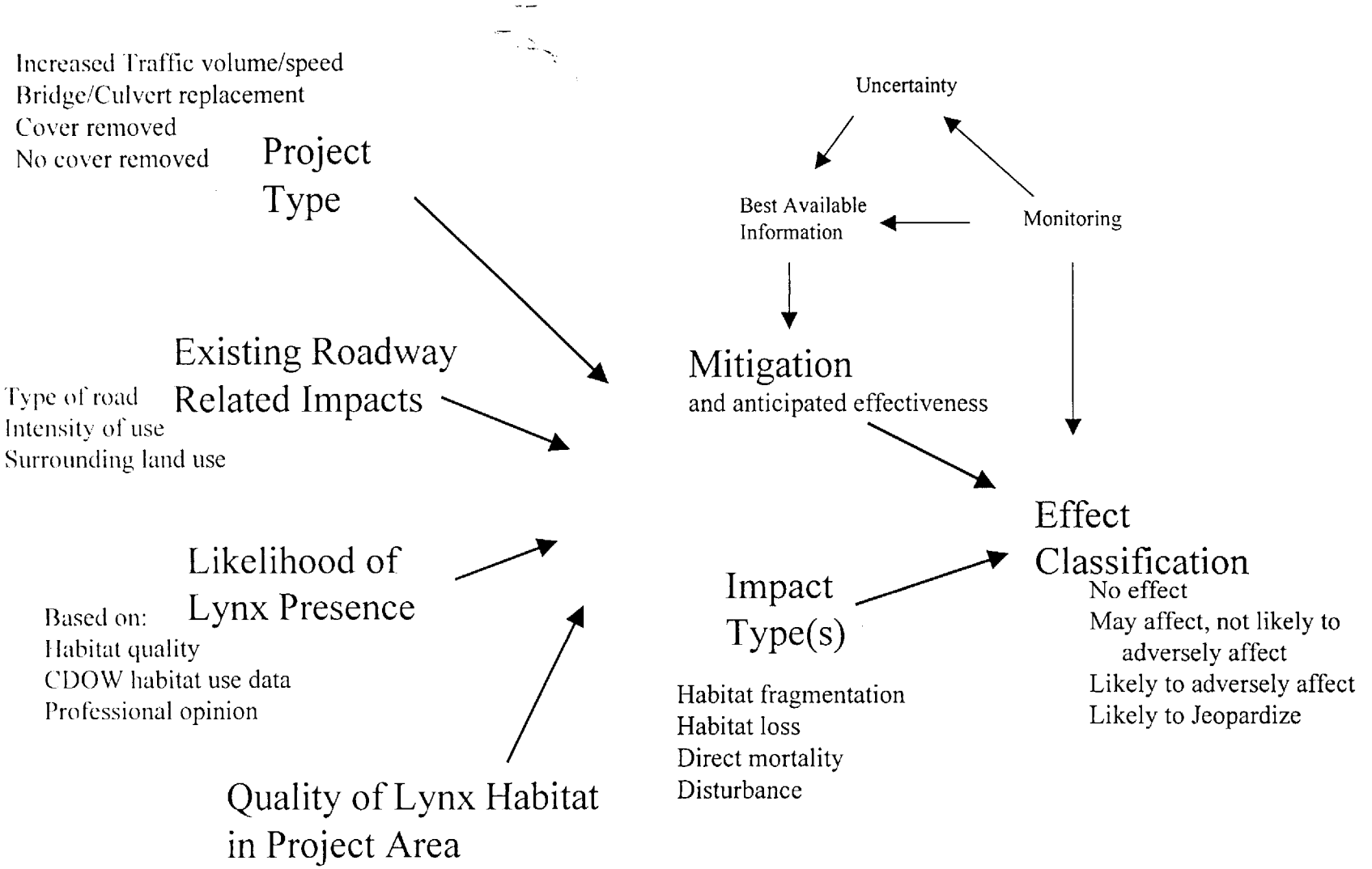



**Figure 2**. Information to consider when determining impacts, planning mitigation, and classifying effects. The figure demonstrates the complex interrelationship of the information required to classify the effects of highway projects on lynx. Detailed explanations of the bold-faced terms are provide in the text.

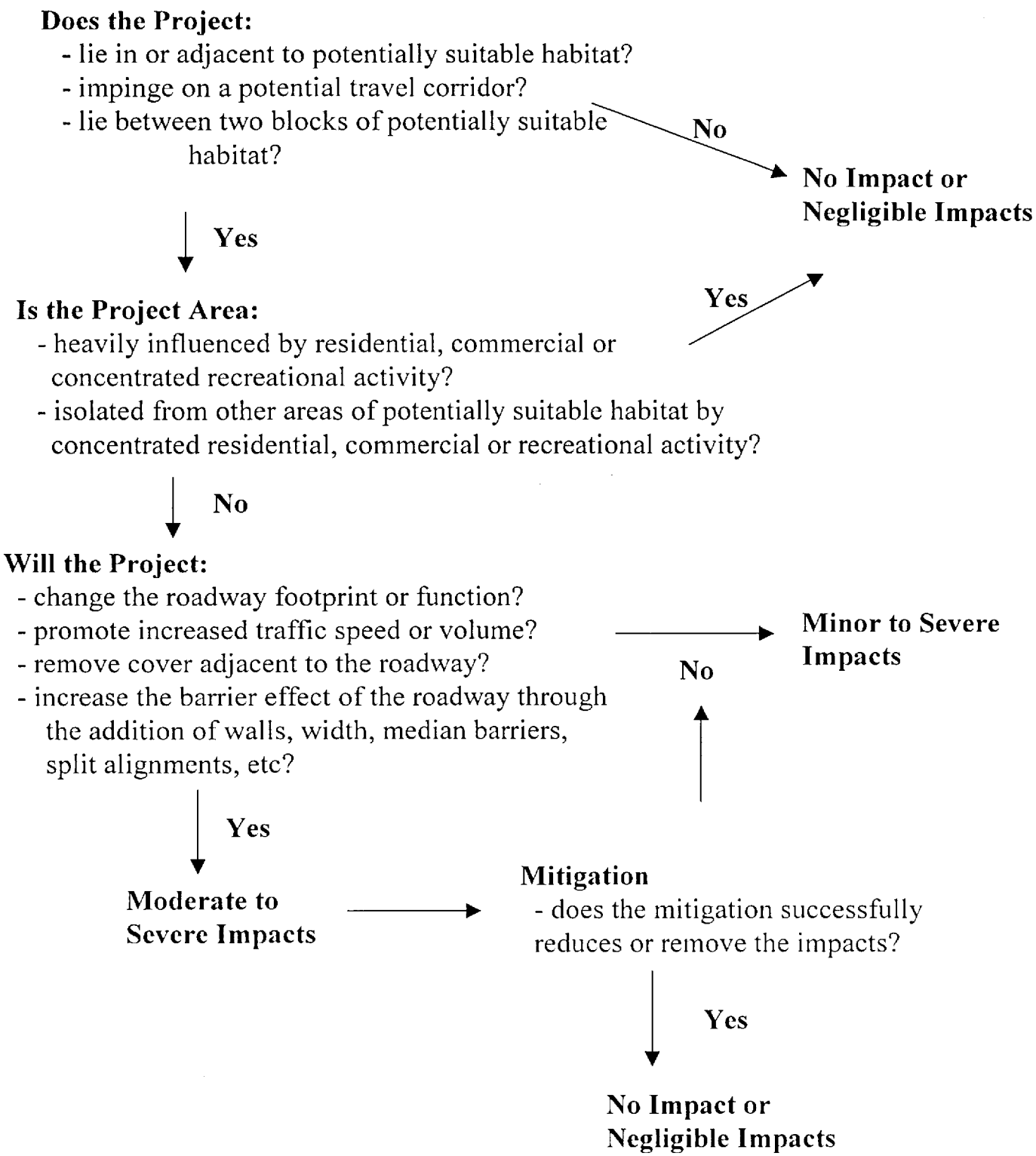
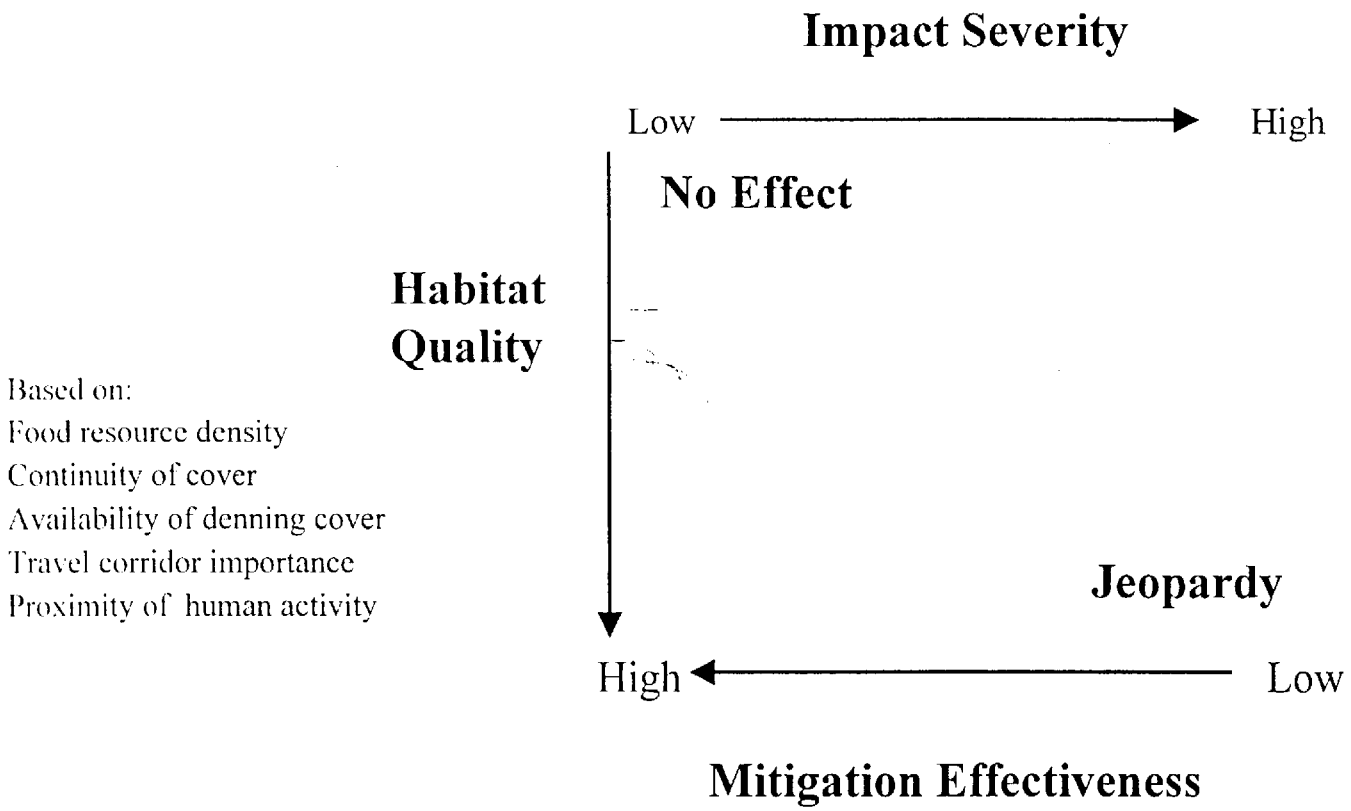



**Figure 3.** The process for determining initial project impacts, e.g., the level of impact that will occur before mitigation. The questions posed in the flow chart are answered based on the background material presented in Chapter 3, project specific information, and the best available information about the status and habitat use of lynx in Colorado

Figure 4. Conceptual Basis for Classifying Effects after the Addition of Mitigation

Based on:
Amount of cover removed for project
Total roadway width
Increased traffic volume and speed
Additional of roadway features (walls, guardrails, raised medians, etc)




Based on:
Food resource density
Continuity of cover
Availability of denning cover
Travel corridor importance
Proximity of human activity