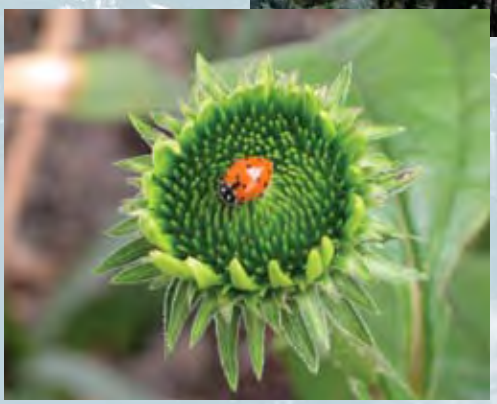
The Department of Environment and Natural Resources plays a major role in managing the state's natural resources.



Dear Interested Parties,

The Department of Environment and Natural Resources plays a major role in managing the state's natural resources. As part of its mission, the department carries out that responsibility by reviewing activities covered by the State Environmental Policy Act (SEPA). The department's ability to assist applicants and other stakeholders in preparing and reviewing SEPA documents ultimately leads to better decisions being made in protecting our environment. One of our biggest challenges today is assessing secondary and cumulative impacts. While there is no standard approach, the department has developed a guidance document that offers assistance on how secondary and cumulative impacts can be identified, assessed and documented, as required by SEPA.

As the environmental agency with review, compliance and enforcement authority, it became clear that secondary and cumulative impacts were not being fully addressed due to the difficulty in understanding the interrelations of these impacts. While direct effects on the environment are easier to document, the analysis of secondary and cumulative impacts is more difficult due to defining the project study area, projections of future development and evaluation of project-induced growth effects.

The Secondary and Cumulative Impacts Guidance Manual provides a framework for identifying significant environmental issues and provides practical techniques in analyzing secondary and cumulative impacts and their effect on our resources, ecosystems and human communities. The guidance manual translates current statutory and regulatory requirements into practical guidance for preparation and review of environmental documents. It also shares with practitioners our experience in review of past projects by identifying issues likely to be of concern to state and federal review agencies. The manual does not establish new policy or requirements and should not be viewed as conclusive but rather as an environmental planning tool.

DENR believes the guidance manual will simplify the environmental review process, assist in the planning of small or large scale projects and provide information to help advance environmental reviews and regulatory decisions. DENR staff, applicants and other stakeholders are encouraged to use these guiding principles, as allowed under existing statutes and rules, when preparing and reviewing environmental documents. As growth continues in North Carolina and as counties and cities plan for this growth, I encourage local governments to plan ahead, communicate with the correct state and federal agencies and invest in maintaining North Carolina's economic health.

Sincerely ,

William G. Ross Jr.

William G. Ross Jr.

Acknowledgments

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Cover Background Photo: Joyce Kilmer Memorial Forest
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Cover Photos: N.C. Wildlife Resources Commission

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Note: For your convenience all bold, italicized words in the guidance are defined in the Definitions section of this document.

1. Introduction to SEPA and SCI Analysis

The State Environmental Policy Act (SEPA) requires the evaluation of ***direct, secondary*** and ***cumulative impacts*** (SCI). Direct impacts are easier to define because they are predictable and certain to occur. While SEPA and some departmental ***permits*** require the evaluation of SCI, both Department of Environment and Natural Resources (DENR) staff and consultants have struggled with practical application of these concepts. Uncertainties over perspectives of space and time, the depth of scientific research required and even some of the terminology used in the statute and associated rules have hindered the thorough assessment of SCI in ***Environmental Assessments*** (***EA***) and ***Environmental Impact Statements*** (***EIS***).

Environmental documents and permit applications are returned to the ***applicant*** when the SCI requirements have not been adequately addressed. Frequent delays in environmental document review have made it necessary to develop better guidance. This guidance document clarifies the issues surrounding SCI analysis to make the SEPA process easier for applicants, permitting agencies and interested citizens.

The document enhances the individual components of the SEPA process and identifies a four-step process for ***project*** review and implementation. As SCI are examined, the four steps presented detail the types of information that are needed, when SCI are ***significant***, how to minimize impacts and how to present the findings.

This document was prepared by DENR staff and is intended for those that prepare or review environmental documents where the department is the lead project agency.

2. What is SEPA?

The SEPA is modeled after the National Environmental Policy Act (NEPA) and was adopted into law by the N.C. General Assembly in 1971(G.S. 113A, Article 1-13). The SEPA review process helps decision makers understand the environmental impacts of a proposed project. Implementation of SEPA requires documentation describing the project and identifying both the alternatives and the environmental impacts in a public document prior to any final decisions or actions. This law has several purposes:

- Encourage the wise, productive and beneficial use of the natural resources of the state without damage to the environment;
- Preserve the natural beauty of the state;
- Create a public awareness of our environment and its related programs; and
- Require state agencies to consider and report on environmental aspects and consequences of their actions involving the expenditure of public money or use of public land.

The SEPA requires state agencies to review and report the environmental effects of certain activities in either an EA or EIS.

When Does SEPA Apply?

For a project or activity to be subject to the SEPA it **must involve three** of the following triggers:

1. An ***action*** by a state agency (such as appropriating land or money, awarding grants, issuing permits, or granting licenses); **and**
2. Has a potential significant effect on natural resources, public health and safety, natural beauty or historical or cultural elements of the state's common inheritance; **and**
3. Expenditure of public monies; **or**
4. Private use of public land, state-owned submerged lands or public waters.

What are public lands? Public lands as defined in G.S. 113A-9 (7) would include all land owned by the state of North Carolina, by any state agency, or by the state for use by any state agency or political subdivision of the state. It includes submerged lands owned by the state (such as ***public trust areas***; see Appendix I).

"Use of public land" refers to those activities that result in changes to the natural cover or topography and include:

- The grant of a lease, ***easement*** or permit authorizing private use of public land; or

- The use of privately owned land for any project or program if the state or any agency of the state has agreed to purchase the property or to exchange the property for public land (1971, c. 1203, s. 9; 1991 (Reg. Sess., 1992), c. 945, s. 3.) (North Carolina General Statute 113A-9 (11)).

How is the level of environmental impact determined? DENR has developed rules establishing minimum criteria to identify those projects requiring an environmental document (see Appendix II). Generally, an environmental document will not be required for any project that falls below the minimum criteria. If the project exceeds the established minimum criteria, or if there are questions regarding the applicability of SEPA, please contact the DENR ***lead agency*** with primary permitting authority (see Appendix III).

Minimum criteria or thresholds have been developed to distinguish project activities with a high potential for environmental impacts (major) from those with only minimal potential (non-major) (see Appendix II). If the project falls below both general and specific ***minimum criteria thresholds***, then it is exempt from the SEPA review and no further environmental documentation is necessary. **If no threshold is identified in the rules, assume that the project requires environmental documentation and subsequent state review.**

There are special circumstances when the Secretary of DENR may determine that an environmental document is required, even though the project falls below the minimum criteria threshold. These "activities of special nature" are identified in DENR's rules for minimum criteria (see Appendix II and Step 2, Determining Significance of Secondary and Cumulative Impacts).

Note: If an applicant is required to prepare a NEPA document, the NEPA document must be submitted to the State Clearinghouse to meet SEPA requirements.

Role of DENR and its Agencies in Fulfilling the Law

For each project subject to the SEPA, one department serves as the ***State Project Agency***. When DENR is designated the State Project Agency, it takes responsibility for ensuring compliance with the SEPA requirements. DENR's authority is delegated to the primary permitting agency within DENR, which is recognized as the lead agency. The lead agency has responsibility for preparing (or overseeing the preparation of) an environmental document. The Secretary of DENR will designate the most appropriate agency to take the lead when there are two primary permitting agencies.

The lead agency is responsible for:

- Fulfilling DENR's SEPA responsibility;
- Organizing the participation of other state and federal agencies in project reviews;
- Coordinating with local governments, consultants and others to assure quality control of concepts and data in preparation of environmental documents; and
- Assist with the resolution of DENR's concerns.
- Any questions regarding the SEPA or minimum criteria should be directed to the lead agency.

3. Overview of SEPA Documents

Reporting of a project's environmental impact is documented as either an Environmental Assessment (EA) or Environmental Impact Statement (EIS). The type of environmental document is determined by significance of the potential impacts associated with the project. The purpose of the EA or EIS is to describe the project's direct, secondary and cumulative impacts on, but not limited to:

- Topography and Floodplains
- Prime or Unique Agricultural Lands
- Air Quality
- Soils
- Public Lands and Scenic Recreational and State Natural Areas
- Water Resources (ground water and surface water)
- Land Use
- Noise
- Forest Resources
- ***Wetlands***
- Areas of Archaeological or Historical Value
- Shellfish or Fish and Their Habitats
- Wildlife and Natural Vegetation
- Protected Species
- Socioeconomic Consideration
- Coastal Area Management Act (CAMA) Jurisdictional Areas and Public Trust Areas (if applicable)

The following provides an overview of the ***scoping*** process and the EA and EIS documentation process. More specific information on final documentation and review process is found in Step 4.

Scoping

Scoping can be done for any project and is a useful tool in preparing an EA or EIS. While not a requirement of SEPA, DENR encourages the scoping process. It is an effective way to define project alternatives and identify impacts that can be altered or resolved while the environmental document is still in the early development stage. Scoping provides the best opportunity to identify key project issues, set appropriate boundaries for analysis and identify relevant past, present and future activities. Scoping allows the review agencies to ask questions regarding the effects of a project on growth, its proximity to sensitive areas and species, potential SCI and other related issues. Early coordination with the appropriate state and federal agencies often:

- Expedites the environmental impact analysis;
- Reduces the likelihood that an environmental document will contain inadequate or erroneous information;
- Helps determine the level of environmental review; and
- Saves time in preparing the environmental document.

Scoping provides an excellent opportunity to solicit input from local officials (e.g., town/city planners, mayors, planning board members, county commissioners). Scoping also provides a way for local governments to understand the environmental issues and possible consequences of a proposed project before preparing an EA or EIS. Coordination with local governments is especially important when researching and proposing project ***mitigation***, because local planning and zoning requirements may need to be considered.

When DENR is the State Project Agency, a scoping notice can be submitted directly to the Department of Administration's State Clearinghouse, where documents are distributed to state agencies for review and response. However, it is recommended that the applicant notify the DENR lead agency prior to submission. Scoping meetings with state and federal agencies are encouraged and should be coordinated with the lead agency.

What Should a Scoping Notice Include?

At a minimum, scoping notices should include:

- Synopsis of the purpose and need of the project;
- Description of the proposed location of the project (including location map);
- Alternatives (including no ***action***);
- Project ***site plan***;
- Description of activities to be associated with construction, or implementation and maintenance of the project (square footage or acreage of footprint of entire project, site improvements such as grading, filling, landscaping, connection to existing utility and sewer lines and/or utility installation, amount of paved and otherwise impermeable surface, construction of any stormwater control devices);
- The compatibility of the project with various local, state and federal ordinances, laws and regulations;
- Plans and policies that may influence project design or impacts;
- Description of the project components (roads, building, parking);
- List of permits that may be required; and
- Identification of environmental features, ***noteworthy characteristics*** and environmental issues or impacts, including potential SCI.

Scoping Questions

A detailed project description should be included to help the state agencies to focus on the most important issues. The following is a list of typical questions asked by the state agencies (Note: some of these questions may not pertain to all project types.):

- What natural resources within and outside the ***project footprint*** could be negatively affected by the proposed project?
- What streams or lakes originate in, flow through or are adjacent to the project site?
- Will any wetlands be impacted by the proposed

project? If yes, how many acres? If yes, have the wetlands been delineated?

- Will the project be located outside the 100-year floodplain?
- Will the proposed construction encroach into or lie adjacent to areas containing any of the following: outstanding resource waters, high quality waters, nutrient sensitive waters, significant natural heritage areas, shellfishing waters, water supply watersheds, anadromous fish waters, primary and secondary nursery areas or essential fish habitat?
- Does the project site or construction corridor encroach into an area (terrestrial or aquatic) containing any federal or state listed species in the Natural Heritage Program database or any federal listed species in the U.S. Fish and Wildlife Service records? If yes, list each species.
- Have recent surveys been conducted for species or resources listed above? If yes, when, what were the results and who performed the surveys?
- Will the project increase demand for public water or sewer?
- Will the project increase stormwater runoff?
- Will the project discharge wastewater (e.g., septic systems, process waters, treated effluent) to surface waters, wetlands or the ground?
- Will the project involve or result in any land-use changes?
- Will the project provide new or improved service to an area?
- Is the project part of a larger activity that is or may be connected to other proposed projects by individuals, agencies or organizations?
- Is the project similar to past, present or future projects in the same geographic area? If yes, how is it similar?
- Do other activities (government or private) in the same geographic area have similar impacts on resources (use of public trust areas, displacement of wildlife, wetland loss) to those of the proposed project? If yes, what are the

potentially similar impacts?

- Will the project involve an expansion of service or is it a replacement without any added capacity?
- Will the project affect the type of growth within the ***service area***?
- What is the projected growth within the service area of the project?
- Will the project be compatible with existing zoning or land uses?
- Will the project entail any known cumulative effects that have been previously determined to be significant on a local, regional or global scale?
- Will a scoping meeting be held with resource agencies?

The SCH requires 16 copies of the scoping notice, and a cover letter should be included indicating the name of the DENR lead agency.

Environmental Assessment (EA)

An EA is the primary tool to determine if an EIS should be prepared. The EA should discuss the need for the proposed project, the existing environmental conditions, reasonable alternatives, potential impacts and justify the issuance of a ***Finding of No Significant Impact (FONSI)***. If an EIS is not required, the EA should document and demonstrate that the activity will not cause significant impacts to the environment. When direct, secondary and cumulative impacts are discussed, the significance of the impacts or whether no impacts exist should be documented. This includes ***encroachment-alteration effects*** and ***growth-inducing effects*** that may result from the proposed project.

Although the State Clearinghouse has general guidelines for preparing an environmental document, DENR's guidelines are more project-specific. The preparer should contact the lead agency to determine any specific document preparation requirements of that agency. An environmental document prepared for DENR should include at a minimum:

- Proposed project description;
- Purpose and need for the project;
- Description of the area to be served by the project;
- Project site plan;
- Alternative analysis (including no action);
- Description of existing environmental features or natural resources (also called Affected Environment);
- Predicted environmental impacts (also called Environmental Consequences);
- Avoidance and minimization measures;
- Other mitigation measures (e.g., rectification, reduction or compensation).
- Listing of state and federal permits required;
- Various maps and aerial photography, depicting as applicable:
    - Construction and project study areas;
    - Environmental features described;
    - High growth areas;
    - ***Environmental justice*** populations;
    - Land use;

- o Existing and proposed public utilities;
- o Public lands;
- o ***Watershed*** boundaries; and
- References.

If it is determined through the DENR internal review process that a project's implementation will not result in significant impacts to the environment, the lead agency will issue a Finding of No Significant Impact (FONSI). Conversely, if review of an EA indicates that a project is likely to, or will, have significant environmental impacts, an EIS will need to be prepared.

Finding of No Significant Impact (FONSI)

When a FONSI is issued, it briefly describes why the project will not have any significant environmental impacts. The FONSI describes the following:

- The project, including a description of the area affected by the proposed activity and a site location map, where appropriate;
- A statement explaining why the proposed project will not have a significant adverse impact on the quality of the environment, with reference to mitigation activities or conditions to be carried out; and
- A statement that no EIS is to be prepared and that the FONSI completes the environmental review.

Environmental Impact Statement (EIS)

An EIS must be prepared if the impacts of a project are likely to be significant. What constitutes a significant impact may vary depending on the type and/or location of a project. In addition, an EIS may be requested by the lead agency based on the comments received during the review of the EA. The components of an EIS are similar to those in an EA, but are intended to provide a more extensive evaluation of a project's direct, secondary and cumulative impacts, confirmation that such impacts have been avoided, minimized or otherwise mitigated, and a more comprehensive alternatives analysis. An EIS written for DENR should include at a minimum:

- Purpose and need for the project;
- Description of the environmental impact of the proposed project;
- Any significant, adverse environmental effects that cannot be avoided should the proposal be implemented;

- Description of the alternatives for meeting the purpose and need, including the alternative of taking no action;
- The relationship between short-term uses or impacts to the environment involved in the proposed project and the maintenance and enhancement measures to maintain long-term productivity of the area being impacted;
- Any irreversible and irretrievable environmental changes that would be involved in the proposed project should it be implemented;
- Discussion of the social, economic and environmental impacts of each alternative, the reason for eliminating alternatives from the detailed study, and the preferred alternative;
- Identification of the environmental impacts of the project including: direct, secondary and cumulative impacts;
- Appropriate mitigation measures not already included in the alternatives; and
- Any potential conflicts with federal, state or local plans or policies.

SCI should be discussed in the EIS for all reasonable alternatives. It is DENR's experience that although documents usually address the direct impacts of a project, most do not adequately discuss SCI. Without a complete evaluation of all of the environmental consequences of the proposed alternative, it is impossible for the agencies to fully determine if the project will have minimal impacts on the environment. The project may be delayed if these impacts are not adequately addressed in the document.

An EIS is prepared and reviewed in two phases: a draft and a final document. Each of these phases contributes to the preparation of a ***Record of Decision (ROD)***. Again, if the level of significance is not clear or unknown, an EA can be prepared to make that determination.

Record of Decision (ROD)

After preparing a final EIS, a ROD is prepared explaining why a particular course of action is taken. A copy of the ROD is provided to the State Clearinghouse by the lead agency. The ROD is not circulated for review, but copies are provided to state and local agencies for informational purposes only. Contents of a ROD are:

- Statement explaining the decision;
- Identification of alternatives that were considered and those that are environmentally preferable;
- Discussion of why the chosen alternative was selected;
- Discussion of the agency's statutory authority and other state policies; and
- Explanation of why mitigation measures were or were not adopted.

Limitation of Action during SEPA Review

While work on an environmental document is in progress, regulatory agencies within DENR cannot take any final permit action until the environmental document is completed and approved through the

State Clearinghouse. Other actions such as land-disturbing activities or any part of construction cannot be approved until the final environmental document (FONSI or ROD) for the project is published in the Department of Administration's Environmental Bulletin and adopted by the DENR lead agency.

Public Hearings

SEPA does not require a public hearing; however, a hearing may be held if significant public interest is expressed regarding a proposed project. A hearing is helpful in clarifying issues, gathering additional public comment and increasing public awareness. Coordination with the lead agency and evaluation of comments gathered during the review process should determine whether a public hearing is needed. A public hearing should always be considered a priority in controversial projects.

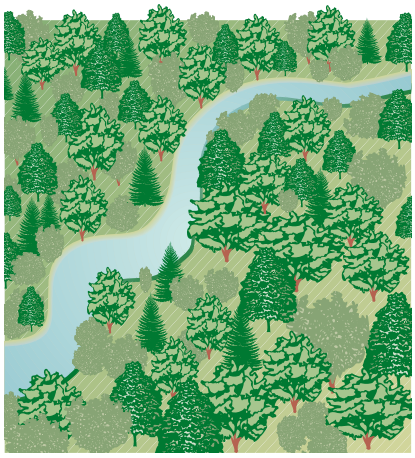
4. Types of Environmental Impacts

DENR environmental documents should include a description and analysis of the project's direct, secondary and cumulative impacts. Any type of project can have direct, secondary and cumulative impacts. This section provides a definition for each of these impact types, instructions on how these impacts should be documented in an EA or EIS, and methodologies for evaluating a project's impacts on a given resource. Figure 1 illustrates the differences between these types of impacts.

Figure 1. Direct, Secondary and Cumulative Impacts

A roadway is proposed to cross this forested stream. The stream ecosystem has intact riparian buffers that maintain good water quality and protect aquatic species.

1. The new road and bridge construction creates sediment flows into the stream. This is a direct impact on the stream.
2. Later, new homes are built. Curb and gutter systems draining to storm sewers channel water laden with oil, chemicals and fertilizers directly into the stream. These are secondary impacts on the stream.
3. Development increases in the watershed. More impervious surface is added that further increases the amount of water that flows off the land after it rains. These are reasonably foreseeable activities known as cumulative impacts.



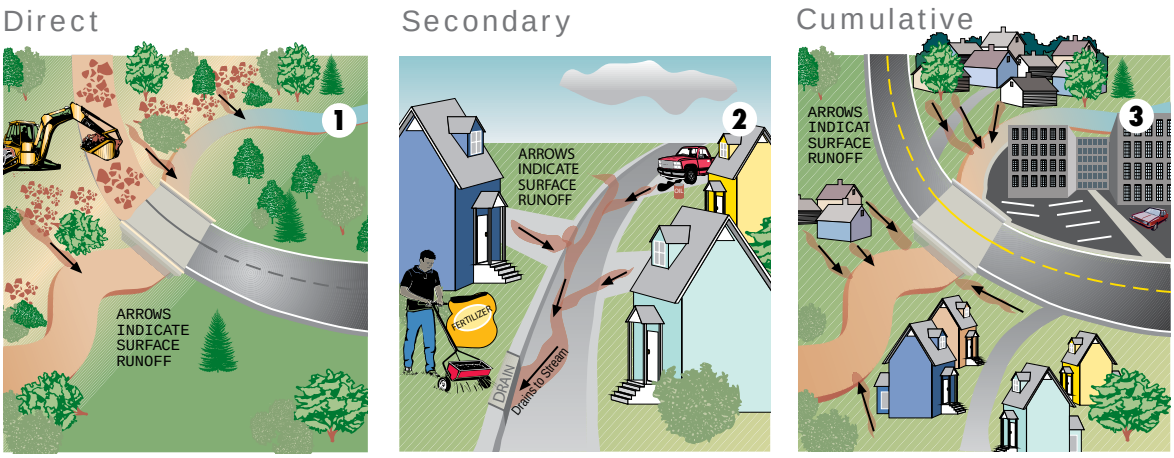


Figure 1

Direct Impacts

Direct Impacts are those effects caused by a project that occur at the same time and place. Direct impacts result from project construction and the project itself. When determining the impacts of a proposed project, direct impacts are easier to identify because they are predictable and certain to occur. Some examples include:

- Wetlands that are filled and wetland acreage lost when a new road is built through a wetland;
- Cleared forested areas for a project's construction cause mortality or displacement of wildlife; and
- Cleared forested areas cause impacts to water quality and aquatic life from exposed soils running off of the construction site into adjacent wetlands, streams or reservoirs.

If direct impacts are determined not to be significant, it cannot be assumed that SCI are insignificant or should not be evaluated. The severity of impacts may relate to other projects with individually insignificant but cumulatively significant impacts.

Secondary Impacts

Secondary impacts, or indirect impacts, on natural resources occur later in time or farther removed in distance as a result of the project's construction and operation. Secondary impacts are sometimes thought of as "chain reaction" effects. In such cases, an initial project can cause changes in land use, population density and growth rates that may affect air, water or other natural, cultural systems. The effects of these chain reactions (e.g., commercial/subdivision development in rural areas) may add to other impacts already occurring in the vicinity of the initial project. Such impacts could be significant should a project's service area include, or drain to, waters with Division of Water Quality (DWQ) special designations (e.g., High Quality Waters, HQW) or nationally or state Significant Natural Heritage Areas (SNHAs). For example, infrastructure such as sewer lines are installed or improved; then eventually new subdivisions are built. Secondary impacts to the stream system result when curb and gutter systems from these subdivisions channel stormwater, laden with oil, chemicals and fertilizers, directly into streams. There are two types of secondary impacts and a project may include one or both of these:

1. ***Encroachment-alteration Effects*** – The physical presence of the project may affect the function of natural systems through a series of secondary effects. Examples include:
    - Habitat fragmentation from physical alteration of the environment;
    - Lethal, sub-lethal and reproductive effects from pollution;
    - Degradation of habitat from pollution;
    - Disruption of ***ecosystem*** functions (e.g., predator-prey relations); and
    - Disruption of natural processes (e.g., watershed hydrology).

2. ***Growth-inducing Effects*** – The presence of a project may affect the pattern or density of development. Some projects are proposed

to serve development that is already present or planned, some are planned to attract new growth, and others will serve a combination of both. These changes in the pattern or density of development would not occur if the project is not implemented. Determining the contribution of a project to new growth can be difficult in a community that is undertaking a variety of measures to encourage new development opportunities. For example, changes in accessibility attributed to a transportation project may induce growth (e.g., a subdivision).

Cumulative Impacts

Cumulative impacts are those that result from the incremental effects of the original direct impact combined with the impacts of other past, present and ***reasonably foreseeable*** projects in the area. By itself, a proposed project may not constitute a significant stressor; however, multiple development activities, which individually may be insignificant, can collectively degrade the surrounding ecosystem beyond its ability to recover. Impacts from individually minor, but collectively significant, activities taking place over a period of time may need additional analysis. For example, as development increases in a watershed, more impervious surfaces are added that increase the amount of water that flows off the land after it rains. Analysis may be required to determine whether stormwater controls are needed to manage the impacts of additional runoff. Cumulative impacts on resources may occur outside the project footprint and can occur great distances downstream or downwind.

Cumulative impacts can result from multiple or single projects and can be additive or synergistic. Additive impacts are the effects of multiple activities as they add up, and their combined effects contribute to the degradation of the same environmental feature. For example, stormwater runoff from one residential development may not result in significant degradation of water quality, stream stability and aquatic habitat; however, the construction of additional residential developments within a watershed may result in severe degradation of water quality, stream stability and aquatic habitat. Synergistic impacts are the effects of multiple disturbances acting together and are greater than the sum of the individual disturbances. For example, while the discharges of nutrients or hot water to a river may not significantly impact the aquatic ecosystem, the combined impact of the two discharges may cause algal blooms, which cause a loss of dissolved oxygen and a fish kill.

The assessment of cumulative impacts is not substantially different from the assessment of direct or secondary impacts. One difference is that cumulative impacts may require a more detailed review of possible effects. As with the review of secondary impacts, cumulative impacts analysis is easier to address when done early in the review process.

In recent years, SCI has received increased attention from agencies as a result of court decisions and citizen input on individual permit applications. Agencies have also realized that SCI effects can last longer and

cause more damage than direct impacts. A bridge spanning a stream may seem like a single direct impact but the SCI of the bridge may be much more significant over time. If the bridge improves access to undeveloped lands, it may lead to more development, including driveways and parking lots, that increases stormwater runoff. A water or sewer line extension may similarly lead to additional development and stormwater runoff, thereby degrading water quality and threatening aquatic species. So even though a construction project's footprint may be small, its SCI can affect water quality for miles downstream and for years to come.

4. The Four-Step Process for Evaluating Secondary and Cumulative Impacts

When it is determined that a proposed project requires review under SEPA, it is necessary to identify the essential elements and particular issues that should be studied. In developing an approach for forecasting and assessing environmental impacts, several fundamental questions must be asked early in the planning process. For each project, it will be necessary to define how far out in time and space to look for potential impacts. The "study area" describes the geographic or spatial limits of the environmental review. Temporal boundaries define both how far into the future project impacts will be studied and past activities that will be considered as potentially contributing to cumulative effects. Determining the study area and temporal boundaries depends on the resources affected and the magnitude and scale of the project's impacts. A thorough examination of issues related to study area and temporal boundaries and past and present activities reduces gaps in information. The following steps can be used to develop and assess environmental conditions and aid in the preparation of the appropriate environmental document. Steps 1 through 4 are explained, along with charts and details, throughout the guidance manual.

Due to interrelationships that exist between environmental features, study area boundaries, temporal boundaries and pertinent information regarding relevant past, present or future actions, tasks associated with Step 1 are best performed concurrently.

STEP 1

Step 1 – Gathering Information
- Determine Study Area Boundary
- Determine Study Time Frame
- Describe Environmental Features
- Identify Project Design and Alternatives

STEP 2

Step 2 – Determining Significance of SCI
- Determine Environmental Consequences
- Determine Significance of SCI Effects

STEP 3

Step 3 – Reducing Significance of SCI
- Avoid
- Minimize
- Mitigate
- Conclude Magnitude and Significance of SCI
- Agency Expectations

STEP 4

Step 4 – Documenting Your Findings
- Prepare an Environmental Assessment
- Proceed to a Finding of No Significant Impact
- Prepare an Environmental Impact Statement
- Proceed to a Record of Decision

Step 1: Gathering Information for Secondary and Cumulative Impact Analysis

To conduct the environmental review process efficiently, it is important to define specific project objectives and identify feasible alternatives, environmental features and potential impacts within the project boundary. Field studies should be performed early during project development. Particular attention should be paid to any anticipated changes in the physical environment and any unique features. Activities that may result in growth, pollution or increase in demand for services such as utilities should be identified early in the process and studied in detail.

Early input from various agencies and technical and scientific experts is important as the applicant considers the SCI of a project. In gathering information, applicants should consider existing environmental conditions and potential impacts on natural resources, for example:

- Surface water quality;
- Aquatic communities;
- Ground water quality;
- Water supplies;
- Vegetation;
- Wildlife; and
- Air quality.

The level of detail provided can simplify the environmental review process and help DENR make knowledgeable and informative environmental decisions. When several agencies are involved in the project's review, differences of opinion may occur when interpreting the significance of SCI. Conflicts can be avoided when an applicant begins early to identify project impacts, initiate appropriate studies and work with agencies on resolving issues related to SCI. Planning ahead and communicating with state and federal agencies avoids delays in the environmental review process.

Determine Study Area Boundary

The consideration of SCI in an environmental document is confined to the project study area. The project study area is the area of land, water and atmosphere where there are reasonable expectations for impacts to occur.

The first step in determining the boundary for the project study area is to overlay the project site plan on a map with environmental and man-made features that the project may impact. These may include, but are not limited to:

- ***Project's service area*;**
- Topography;
- Surface water features, such as streams, impounded waters and wetlands;
- Locations of or critical habitat for, species designated as special concern, significantly rare, threatened or endangered;
- Shellfish or aquatic and terrestrial wildlife and their habitats;
- Transportation and utility corridors;
- Park and game lands, refuges, trails, conservation areas, greenways and ***buffers***;
- Delineated floodplains;
- Timber and agricultural lands;
- Municipal and planning boundaries;
- Census tracts; and
- Permitted wastewater discharges and water withdrawals.

The preliminary extent of the ***study area boundary*** includes all overlaid features. The size of the project study area will vary by the type of project and may be adjusted by the inclusion or exclusion of features during consultation with the state and federal agencies. The study area boundary may change as information is acquired during the environmental document's drafting and review.

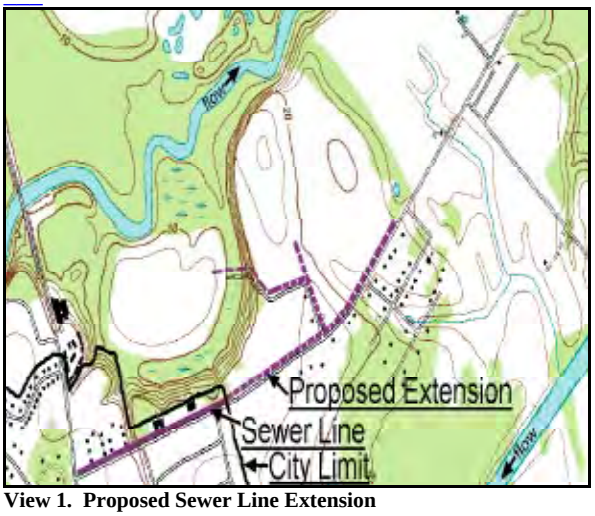
Those features that are outside, but close to, the study area boundary may be impacted and may need to be included in the study area. Features farther away may not be significantly impacted and may be excluded from the project study area. Some impacts are related to slope, such as movement of pollutants into surface waters, alteration of streamflow patterns and ground water recharge, while other impacts are not slope-dependent, such as habitat fragmentation and light or noise pollution.

Some questions to consider when determining the boundaries of the project study area include:

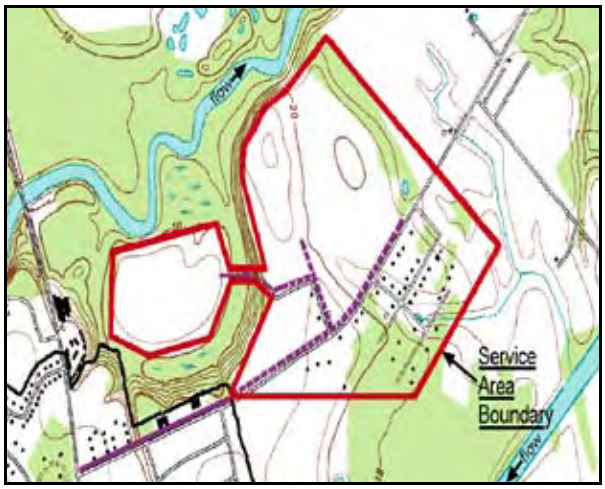
- Is the project growth-inducing (e.g., a new or expanding water or wastewater treatment plant or a distribution or collection network)?
- Will other development result as a consequence of the proposed project?
- What is the extent of other similar projects in the area?
- Is the project sited on uplands or in the floodplain?
- Are there federal or state listed protected species?
- Are there downstream impacts within the watershed?
- Are there any air quality issues?

Figure 2 illustrates the designation of a study area for a hypothetical sewer line extension project away from a city center. The service area of the proposed sewer line extension encompasses all lands upon which existing or future development will tie into the line for the elimination of waste water. Using the map's topographic features and environmental feature overlays, the study area boundary is defined by the lands draining and surface waters receiving runoff from development support by the project plus other past, present and future impacts. This is a general example used for illustrative purposes only. Consult with the lead agency for further guidance in developing the study area boundary specific to your project.

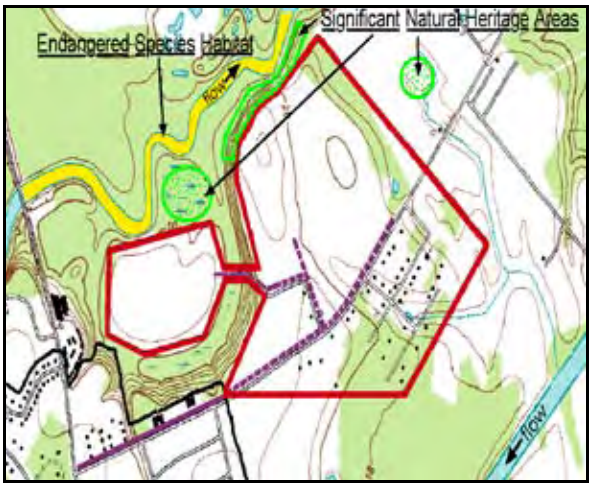
Figure 2. Determining the Study Area Boundary.



View 1. Proposed Sewer Line Extension



View 2. Proposed Sewer Line Extension Service Area



View 3. Environmental Features Overlay

View 4. Final Study Area Boundary

Legend

Forested Area	Endangered Species Habitat	Wetlands	Buildings
Nonforested Area	Elevation Contours (feet)	Water Feature	Road
City Boundary	Sig. Nat. Heritage Area	Pipeline	Proposed Pipeline
Study Area Boundary	Service Area Boundary	Non-Study Area	

Figure 2

Determine Study Time Frame

When evaluating a project's SCI it is important to establish a time frame to evaluate impacts to natural resources. The goal when setting a time frame for the analysis is to capture the relevant past and future trends, activities or projects that may cause SCI on the natural resources. As with the study area boundary, the study time frame may change as information is acquired during the document's drafting and review.

Determination of the study time frame needs to be coordinated with DENR's lead agency during the planning stage. Items to consider when establishing the study time frame include, but are not limited to:

- Consideration that some natural resources may already be degraded. It is important to determine whether these natural resources, such as critical habitat or a species' population, have stabilized from previous impacts or are still vulnerable. The evaluation of historic data may indicate trends to help in projections of future ***sustainability*** of these natural resources.
- A lack of reliable information may limit how far into the past or future data can be gathered. For example, planning departments generally are aware of pending development projects between three months to three years into the future; seldom is site-specific information available for longer time periods. Comprehensive planning documents and area population and employment forecasts can provide information for 20 to 30 years into the future.
- Public and private infrastructure is usually assumed to have a life span of 20 to 30 years before requiring renovation. Therefore, a forecast period of approximately 20 years is chosen for many studies and often coincides with the planning efforts undertaken by local governments.
- Some natural resource data can have an extensive period of record (e.g., U.S. Geological Survey's stream gage data).

Figure 3 is an example of an approach used to determine the appropriate time frame. The time line is actually a composite of individual time frames relating to existing conditions (blue line) and relevant past and future trends (black arrows). The items noted are not inclusive of all information that may be considered in the SCI analysis. The final time frame (red line) may vary depending upon: data availability, anticipated project impacts and best professional judgment. The initial project study area may be modified as new information becomes available.

Figure 3. Determining Study Time Frame.

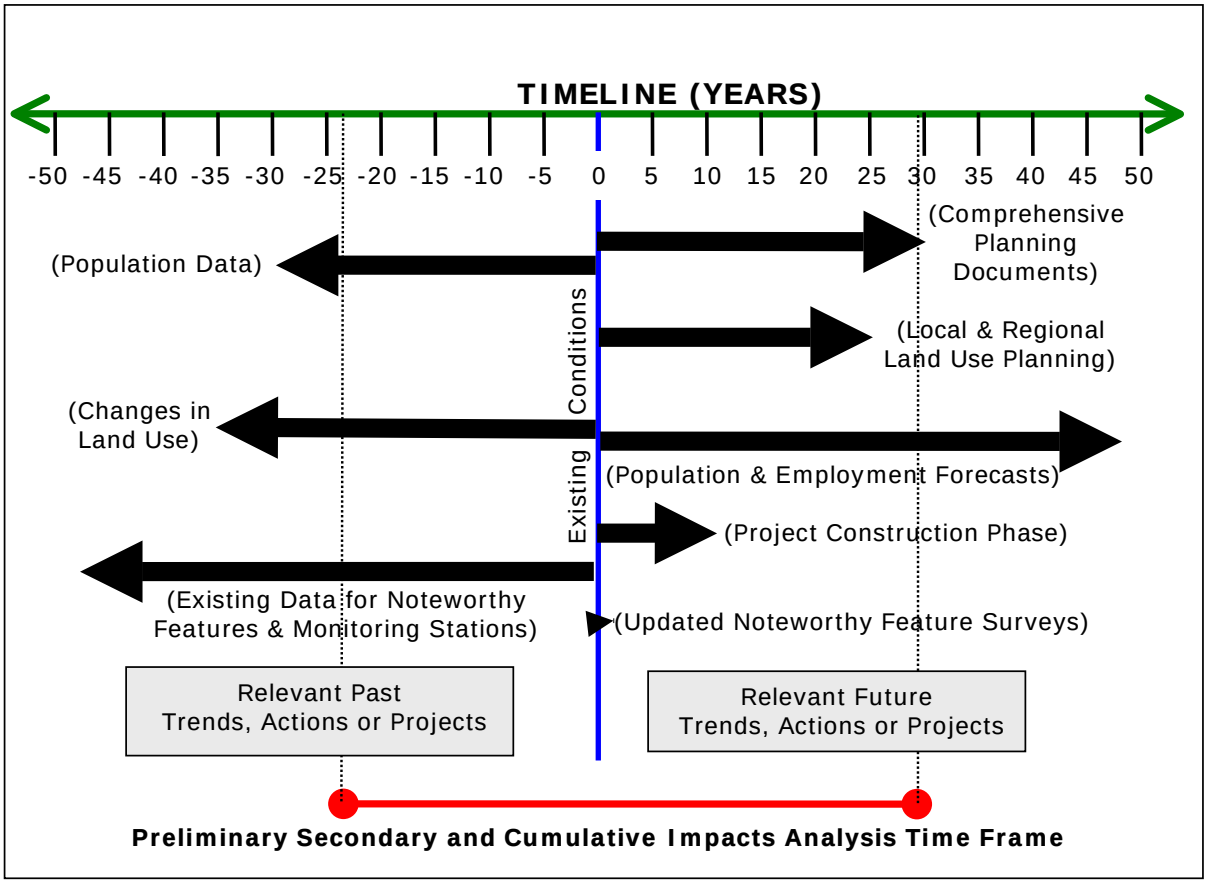


Figure 3

Describe Environmental Features

The environmental document should include a description of each of the environmental features or natural resources found at the project's construction site(s) and within the study area boundary. This information determines if the proposed project is appropriate for the study area and if it will create any conflicts related to conservation, development, ecological function or quality of life.

DENR encourages applicants to use current digital data when presenting information in environmental documents. Current mapping technologies using computer aided design (CAD) and geographic information systems (GIS) provide environmental features in a digital format suitable for analysis and presentation. Site-specific features that are either not available in a digital format or are not current can be easily digitized, spatially correlated and mapped. See Appendix IV for additional online resources. For questions regarding environmental features, contact the DENR lead agency (See Appendix III).

When describing the environmental features, the environmental document should include, but should not be limited to, the following information:

1. Topography and Floodplains

   Describe and include maps of the study area's physiographic region (i.e., mountains, piedmont, coastal plain), topography (i.e., landforms, slopes and elevations), floodplains and geology. Describe whether previous major projects have shaped the study area's current topography. Flood Hazard Boundary Maps and Flood Insurance Rate Maps (FIRMs) are available in digital and paper format from the N.C. Department of Crime Control and Public Safety's Emergency Management Division or the Federal Emergency Management Agency (FEMA).

2. Soils

   Describe and include maps of all soil types in the study area. Include a discussion on whether any soil types will be a constraint to the proposed project. County soil survey data are available from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). The NRCS offers digital soil information at Soil Data Mart or Web Soil Survey.

3. Land Use

   Describe the current land use within the study area. Include maps and/or aerial photographs of the study area that show the location of existing or proposed infrastructure. Include information and maps and/or aerial photographs on the following:

   - Land use associated with developed parcels;
   - Undeveloped parcels that are approved and pending construction; and
   - Protected open spaces, such as park and game lands, ***riparian*** buffers and lands with existing conservation easements.

   For infrastructure expansion projects, information on existing, planned and projected services should be discussed. Zoning information can be described, but that information is not as critical as existing land use. Maps should delineate any ***extraterritorial jurisdiction*** (ETJ) areas. The map and description should provide the ***hydrologic unit code*** (HUC) for affected drainage areas. The HUC scale needed may vary depending on project type and location.

4. Wetlands

   Describe the location, type, function (e.g., flood control, wildlife habitat, ground

water recharge), and quality of wetlands within the study area. Describe any past or present activities that currently affect wetland resources. If possible, include a wetland inventory map depicting the project site, its service area, protected buffer areas, conservation lands and government jurisdictional boundaries. Assess wetland functions and values using a methodology accepted by DENR. Wetlands on the project site should be identified by a professional wetland scientist (PWS) or environmental scientist and surveyed using GPS by a licensed professional land surveyor (PLS). National Wetland Inventory maps can be used to estimate potential wetland impacts but should not be used as a sole source in identifying wetlands within the study area. The Division of Coastal Management offers a watershed-based wetlands functional assessment model for coastal counties referred to as NCCREWS.

5. Prime or Unique Agricultural Land

Identify and map the location of farmlands considered prime, unique or of statewide importance. Identify any agricultural lands with an existing agricultural conservation easement. The NRCS has mapping sources.

6. Public Lands and Scenic, Recreational and State Natural Areas

Describe and map all public lands and natural areas within or adjacent to the study area. This includes, but is not limited to, federal, state, and local parks and game lands, parcels protected by conservation easement, public trust waters, publicly accessible beaches, state-owned submerged lands, and other scenic and recreational areas. The N.C. Wildlife Resources Commission (NCWRC) has game land maps. The Natural Heritage Program has information about Significant Natural Heritage Areas (SNHAs).

7. Areas of Archaeological or Historical Value

As allowed by the Department of Cultural Resources, provide maps and text of information from record searches of known archaeological sites, such as prehistoric remnants, shipwrecks and cemeteries, or significant historical features or structures that may be impacted by the project. Also, report the results of any additional field surveys that may have been conducted. If studies have not been conducted, discuss whether the site has been previously disturbed, and if so, how the site has been disturbed. List any buildings on the site and their approximate age. Additional information can be obtained from local historic preservation commissions, the National Register of Historic Places (NRHP) and the State Historic Preservation Office's Survey and Planning Branch.

8. Air Quality

List and describe any air quality permits that exist or that may be required. Describe ambient air quality conditions, areas of nonattainment and any state implementation plans that may be impacted. Discuss any previous odor problems or complaints due to any existing facilities. The U.S. Environmental Protection Agency (USEPA) uses the Air Quality Index (AQI) to report ambient air quality conditions. Contact the N.C. Division of Air Quality for additional information.

9. Noise Levels

Describe noise levels associated with construction, operation and maintenance of the project. Describe any noise abatement plans to reduce noise. Describe any applicable local noise ordinances. Describe existing, adjacent sources of noise, including airports, vehicular traffic and industrial activities.

10. Surface and Ground Water Resources

The area of concern used to determine impacts for water resources includes surface water and ground water systems that could be impacted by water withdrawals, effluent discharges and spills or stormwater runoff associated with construction and operation of the proposed project.

Identify the river and sub-basin(s) containing the project and study area and the name, classification and use support rating for all waters. Refer to the applicable DWQ Basinwide Water Quality Plan for information. Discuss whether any waters are on the state's 303(d) list or have special water quality designations (e.g., Outstanding Resource Waters). For wastewater discharge projects, describe and characterize the receiving water body, such as wetland systems, tidal systems or low-flow water bodies. Discuss ground water use, quality, quantity, depth and recharge. If applicable, discuss any past or present activities that currently affect the condition of surface or ground waters.

Identify all water resources on a map, preferably an aerial image and include the project site location, service area, river basin, governmental jurisdiction boundaries, protected buffer areas and any conservation lands.

For wastewater projects, discuss the function, location and operating status of all existing systems and conditions on site. The NPDES Program in DWQ must receive and respond to a speculative discharge limits request by the applicant prior to submittal of an environmental document. In addition, the following information should be provided:

- The current average daily flow and maximum capacities
- The system's permit limits
- The permit limits that are being requested
- The existing sewer line network that the proposed project will connect to, including pipe sizes, location and type of lines.

For surface water project proposals, such as interbasin transfer certificate petitions, the compilation of available data, performance of studies and the associated analyses and presentation of results are needed. Applicants are requested by the Division of Water Resources (DWR) to provide:

- Growth projections to justify water need;
- Available flow records and a hydrologic evaluation of surface waters using flow statistics (i.e., annual mean, ***7Q10***) and ***duration curves*** (i.e., percent exceedance values, ***recurrence intervals***) to determine water availability;
- Determination if there are any existing water resource management conditions, either permitted or voluntary, within the stream basin, project service area or project study area (e.g., regulated or unregulated interbasin transfers, capacity use permits, voluntary use agreements), and any potential up- or downstream uses that may cause riparian rights conflicts;
- Formulation and evaluation of alternatives to meet the need necessitating the proposal, such as conservation, interconnection, leak detection, reclamation;
- Results of field studies (the applicant should consult with DWR to determine if field studies or models are required to determine water availability, impacts to both surface and ground waters, and instream flow requirements associated with ***biotic*** sustainability [e.g., aquatic habitat, fish passage, sediment transport, nutrient cycling, temperature regime, riparian and floodplain connectivity] water quality standards, water quality ***assimilative capacity***, aesthetics, recreation and navigation); and
- Proposed impoundments should include reservoir stage-storage relationship and operations model to determine availability and associated impacts.

11. Forest Resources

Describe and map these resources, both natural and silvicultural, within the project study area. Information on dominant forest types and terrestrial communities can be obtained from the U.S. Forest Service and the Natural Heritage Program. Report whether any forest resources are protected through rule, local ordinance or easement.

12. Fish, Shellfish and Their Habitats

Describe freshwater, brackish, estuarine and marine fish and shellfish communities and their aquatic habitats. Describe whether shellfish areas closed to harvest are classified as highly productive areas or spawning areas. Identify and discuss the condition of essential fish habitat in or near the project site. Discuss whether other activities currently affect this resource. Describe the amount and condition of submerged aquatic vegetation (SAV) habitat located within the project study area. Information for this section can be obtained from sources such as the Division of Marine Fisheries, Division of Coastal Management, Division of Water Quality and the Natural Heritage Program. Include information on existing marinas, wet and dry slips and boat launching facilities within the study area that may affect these resources. Information should be provided on where navigation and existing uses occur, especially sport and commercial fishing and shellfishing.

13. Wildlife and Vegetation (including Rare, Threatened or Endangered Species)

Describe and map aquatic and terrestrial wildlife habitat within the project study area. Include a list of dominant plant, aquatic and terrestrial wildlife species and a list of federal or state designated endangered, threatened or special concern species. Describe the amount and condition of submerged aquatic vegetation (SAV) habitat located within the project study area. A listing of designated species and vegetation communities is available from the Natural Heritage Program's Web site (See Appendix IV). Significant Natural Heritage Areas (SNHAs), as identified by the Natural Heritage Program, should be identified and mapped. If data are available, include location maps of these resources.

Identify Project Design and Alternatives

The environmental document should provide a detailed description of the preferred alternative, all reasonable project alternatives considered and the alternative of taking no action. The applicant should provide reasonable, accurate and relevant data and analysis used in the alternative selection process. The consideration of all alternatives, including no action, and the final selection must be based upon a fair and balanced consideration of environmental factors, taking into account direct, secondary and cumulative impacts, economics, meeting the project objectives and feasibility. The environmental document should describe the site selection process and factors considered in choosing the proposed location, state the reasons the preferred alternative was selected, and the reasons for eliminating the others.

An alternative is reasonable if it meets the project's objectives and minimizes impacts to the environment as much as possible, which can be achieved through project design, mitigation or both. Reasonableness includes even those alternatives that either would impact to some degree the attainment of the project objective or would be more costly. The document should describe the alternative's cost (if applicable) and why it was accepted or rejected. Also, some lead agencies may request that a specific set of alternatives be considered.

STEP 1

Step 1 – Gathering Information
- Determine Study Area Boundary
- Determine Study Time Frame
- Describe Environmental Features
- Identify Project Design and Alternatives

STEP 2

Step 2 – Determining Significance of SCI
- Determine Environmental Consequences
- Determine Significance of SCI Effects

STEP 3

Step 3 – Reducing Significance of SCI
- Avoid
- Minimize
- Mitigate
- Conclude Magnitude and Significance of SCI
- Agency Expectations

STEP 4

Step 4 – Documenting Your Findings
- Prepare an Environmental Assessment
- Proceed to a Finding of No Significant Impact
- Prepare an Environmental Impact Statement
- Proceed to a Record of Decision

Step 2: Determining Significance of Secondary and Cumulative Impacts

In order to determine the significance of SCI, the environmental impacts of a project must first be identified. Based on the severity of the impacts, the environmental document will either be an EA or an EIS. The decision on whether an EA is satisfactory or an EIS is needed can be made prior to Step 2; however, the following details provide the information necessary for making that determination. The purpose of Step 2 is to go beyond the typical project description and determine the impact-causing activities of the project.

Determine Environmental Consequences

The knowledge of how a particular environmental feature or natural resource responds to environmental change (i.e., the cause-and-impact relationship; Figure 4) is essential for determining the SCI of multiple projects. To understand cause-and-impact relationships more clearly, the applicant needs to consider the cause (project) and the environmental impact associated with its implementation on natural resources. Interagency coordination through scoping is often the best tool for identifying potential project impacts.

Determining SCI to the environment usually falls under three general categories:

- Those that describe or model the cause-and-impact relationships of interest, often through matrices or flow diagrams;
- Those that analyze the trends of impacts or changes in a natural resource over time; and
- Those that overlay landscape features to identify areas of sensitivity, value or past losses (maps and GIS analyses).

Many techniques are available to evaluate SCI. It is up to the applicant, in coordination with the lead agency, to determine which technique best evaluates SCI based on project type and environmental features. Below are some examples of techniques that can be used.

Note: This guidance document provides general information about the law. Applicants should consult with DENR lead agencies to identify specific and applicable rules. Any third party data referenced in this guidance document does not constitute an endorsement by DENR, nor is it intended to imply a preference of data sources.

Flowcharts and Models:

A cause-and-impact flowchart is commonly used to establish linkages between a project and SCI. The content of this section must show a clear relationship between the project and non-project impacts to environmental features within the project's study area or time frame boundaries. See Figure 4.

Figure 4. Cause-and-Impact Flowchart.

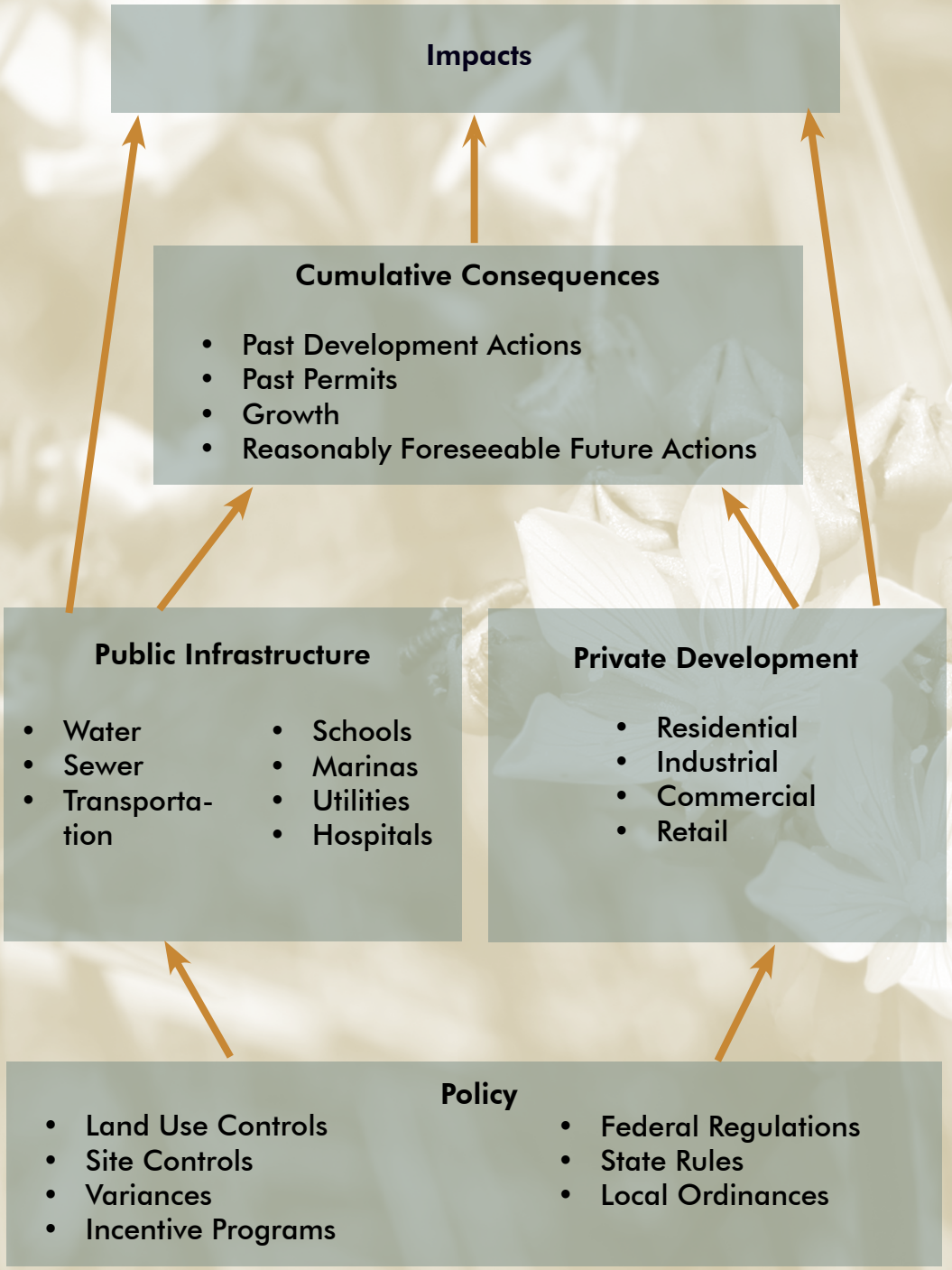


Figure 4

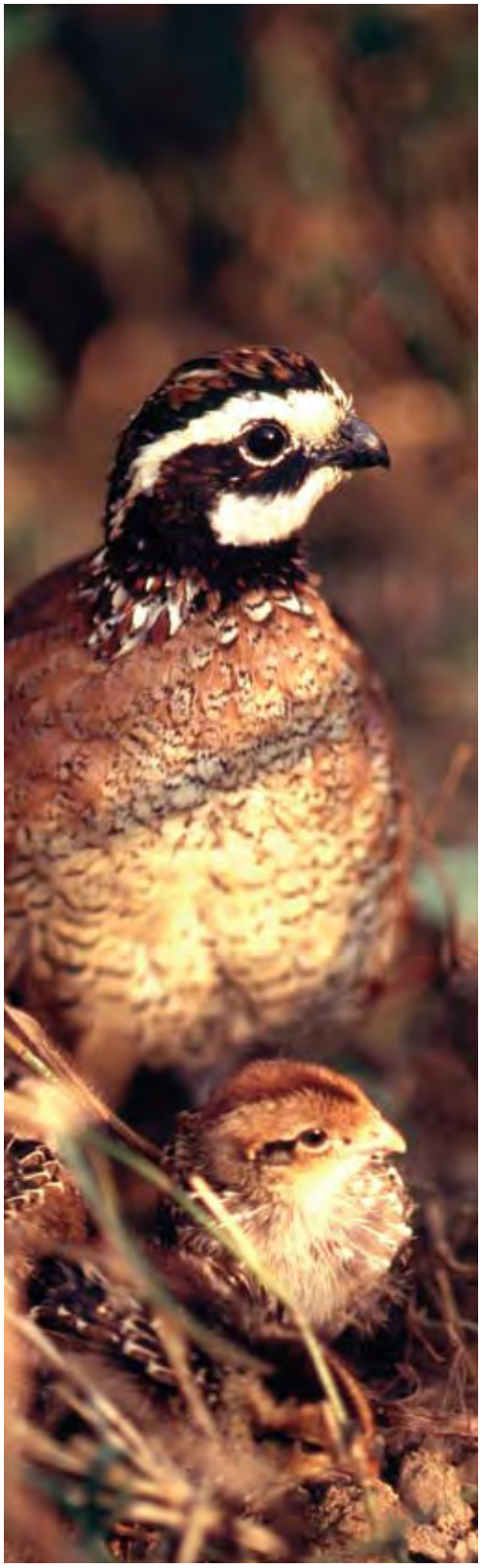
Land Use Forecasting Models are used by metropolitan planning agencies, municipalities, counties and other forms of government to provide information about alternative future land use scenarios. Predictive models take regional demographic forecasts, readily available from state data centers or private sector vendors and convert these to small-area forecasts based upon factors such as accessibility, school capacity, water/sewer capacity, nearby land uses, land availability constraints and zoning categories. The predictive power of these models is determined by the quality of the input data and level of spatial detail. As with many of the ***quantitative*** techniques discussed, land use models have incorporated GIS technology and are available now as an "add-in" program to popular GIS platforms.

The value of these models is constrained by one or more of the following: the learning curve required for model implementation and interpretation of results; cost, time and other resource requirements; and the quantity/quality of input data required to effectively produce reliable forecasts. Therefore, unless a model covering the study area has already been developed, staff limitations may preclude model creation by some agencies. Whether the models are dynamic (forecasts are calculated internally) or deterministic (user creates various inputs externally), there will always be some level of uncertainty regarding the results because many land use decisions are made in a highly variable, free-market environment. Further, there is an underlying policy-related question as to how alternative land uses generated from one of these models should be incorporated into the decision-making process when future land uses have already been forecasted by N.C. Department of Transportation's metropolitan planning organizations (MPO) or rural planning organizations (RPO). This decision depends on how the MPO/RPO conducted its land use forecasts initially. Did they take into account future roadway or other infrastructure projects that can contribute to growth? If the answer is no, then land use modeling may be appropriate; if many of the infrastructure questions have been dealt with during the population and employment forecasts, then alternative land use modeling may not add much value to the analysis.

The use of models becomes more important as urban areas in North Carolina attempt to understand more about the effects of various policy decisions on urban growth patterns and the secondary and cumulative effects from those patterns. It is expected that some urbanized areas will have these models already in place, and they can be used to help test various proposed infrastructure decisions.

Water Quality Models are used to determine water quality impacts from ***point sources*** and ***nonpoint sources***. Nutrient concentrations, dissolved oxygen levels, algal biomass, temperature and pH are typical model outputs. However, there are substantial differences between the various models in terms of accuracy and the level of effort needed to create them. Some examples include:

- Hydrological Simulation Program-FORTRAN (HSPF);



- Agricultural Non-Point Source Pollution Model (AGNPS);
- Water Quality Analysis Simulation Program Version 4 (WASP4); and
- Stormwater Management Model (SWMM).

Runoff and Hydrology Models can help determine stream stability, watershed geometry, drainage networks, empirical flood peaks, annual runoff or low-flow values. The Indicators of Hydrologic Alteration (IHA) provided by The Nature Conservancy and the U.S. Army Corps of Engineers' Hydrologic Engineering Center (HEC) suite of models examine the extent of project alteration to historic stream flow patterns. The Instream Flow Incremental Methodology (IFIM), provided by the U.S. Geological Survey (USGS), is a protocol to evaluate and negotiate the impacts of stream flow alterations on aquatic habitat.

Pollutant Loading Baseline Models establish the concentration or quality of a pollutant that may be discharged by an existing condition or the application of a change in existing conditions (i.e., future build-out conditions). An example of this type of modeling would be the National Water Pollution Control Assessment Model (NWPCAM). Pollutant Loading Baseline Models can estimate runoff from land application areas to a receiving waterbody.

Checklists and matrices are useful tools to use when establishing linkages between projects and SCI. A project impact checklist is an example of how these can assist the applicant in the consideration of project and SCI interactions (See Figure 5).

Figure 5. Project Impact Checklist (additional insert provided)

Impact	Potentially Significant Impact*	Less than Significant Impact	No Impact	Impact	Potentially Significant Impact*	Less than Significant Impact	No Impact
Environmental Modification				**Transport/Operations**			
Exotic plant/animal introduction	☐	☐	☐	Changes in traffic patterns	☐	☐	☐
Modification of habitat	☐	☐	☐	Railroad	☐	☐	☐
Deforestation	☐	☐	☐	Mass transit	☐	☐	☐
Alteration of hydrology	☐	☐	☐	Automobile	☐	☐	☐
Alteration of drainage	☐	☐	☐	Trucking	☐	☐	☐
River flow modification	☐	☐	☐	Aircraft	☐	☐	☐
Channelization/Dredging	☐	☐	☐	River and canal traffic	☐	☐	☐
Loss of riparian buffer	☐	☐	☐	Recreational boating	☐	☐	☐
Land Transformation and Construction				Alter travel circulation patterns	☐	☐	☐
New or expanded transportation facility	☐	☐	☐	Alter travel times or costs between major trip origins and destinations	☐	☐	☐
Erosion control and terracing	☐	☐	☐	Communications	☐	☐	☐
Increased impervious surfaces	☐	☐	☐	Operations or services	☐	☐	☐
Shoreline stabilization	☐	☐	☐	**Service Area Change**			
Service or support sites and buildings	☐	☐	☐	Utility enhancement	☐	☐	☐
Ancillary transmission lines, pipelines and corridors	☐	☐	☐	Service Area Change	☐	☐	☐
Barriers, including fencing	☐	☐	☐	New or expanded access to activity center	☐	☐	☐
Channel hardening	☐	☐	☐	New or expanded access to undeveloped land	☐	☐	☐
Canals	☐	☐	☐	**Waste Emplacement and Treatment**			
Bulkheads or seawalls	☐	☐	☐	Landfill	☐	☐	☐
Cut and fill	☐	☐	☐	Emplacement of spoil and overburden	☐	☐	☐
Resource Extraction/Alteration				Underground storage	☐	☐	☐
Surface excavation	☐	☐	☐	Sanitary waste discharge	☐	☐	☐
Subsurface excavation	☐	☐	☐	Septic tanks	☐	☐	☐
Wetland or open water fill and drainage	☐	☐	☐	Stack or exhaust emissions	☐	☐	☐
Processing				**Alteration to one or more of the following:**			
Hazardous materials storage	☐	☐	☐	Hiking/Biking/Horse/Canoe Trails	☐	☐	☐
Objectionable odors	☐	☐	☐	Wild and Scenic Rivers	☐	☐	☐
Resource Renewal				Coastal Salt Marshes	☐	☐	☐
Reforestation	☐	☐	☐	Wildlife Restoration Site	☐	☐	☐
Preservation	☐	☐	☐	303(d) Streams	☐	☐	☐
Stream restoration	☐	☐	☐	Trout Streams	☐	☐	☐
Ground water recharge	☐	☐	☐	Shellfish Beds	☐	☐	☐
Waste recycling	☐	☐	☐	Area of Environmental Concern	☐	☐	☐
Site remediation	☐	☐	☐	Significant or Registered Natural Heritage Area	☐	☐	☐
Chemical Treatment				High Quality/Outstanding Resource Waters	☐	☐	☐
Fertilization	☐	☐	☐	Water Supply Watersheds	☐	☐	☐
Chemical deicing	☐	☐	☐	Mitigation/Restoration Areas	☐	☐	☐
Chemical soil stabilization	☐	☐	☐	SAV	☐	☐	☐
Pest control	☐	☐	☐	Gamelands	☐	☐	☐
Weed control	☐	☐	☐	Parklands	☐	☐	☐

* If significant, describe duration, source and scale in documentation.

Figure 5

Maps and GIS Analyses are maps that detail current and future land use patterns. When overlaid with environmental features, they provide a visual representation of potential SCI. Large printed maps (i.e., poster sized) are easier for viewing the impacts of land use on environmental features (see Appendix V).

GIS Techniques can define study areas, and aid in the analysis of data collected from the field, retrieved from the Internet, or interpreted using remote sensing, (e.g., ***viewshed***, water quality and proximity analyses). The N.C. OneMap Web site and the N.C. Center for Geographic Information and Analysis (CGIA) are excellent sources; however, municipalities and counties also maintain their own databases of land parcels, tax information, historic properties, orthophotography, streets/rights-of-way, water/sewer features and other public infrastructure investments.

Overlay Techniques are valuable for SCI analysis for setting study area boundaries and assessing proximity effects related to cumulative impacts from other projects.

Remote Sensing and Coverage Sampling are not analysis tools. However, they are useful for interpreting spatial data and serve as foundations for many other kinds of analysis. Remote sensing describes the process whereby features on an image map are initially acquired, usually in a vector-based format that can be analyzed.

Coverage Sampling is the basis for creating statistically sound spatial analyses that require random sampling of features located on a map surface.

Water/Wastewater Analysis is another field where a variety of GIS-based tools already have been developed. Some estimate runoff, sedimentation and nutrient values for an entire watershed. Some can show the path of a drop of water over a three-dimensional map surface. Contact DWQ for additional information (See Appendix III).

Environmental Categories for Inclusion

All impacts should be quantified where feasible. The environmental document must clearly differentiate the project's SCI. The following are DENR's expectations for adequate description of impacts to environmental features examined within environmental documents, based on SEPA statutes, rules and the permitting requirements of review agencies. Please note that some lead agencies may have more specific requirements that must be addressed.

In this section of the environmental document, the discussion should center on the direct, secondary and cumulative impacts the project will have on the following topics. Identify both the project's construction and operational impacts for each of these topics. State if there will

be no impact in any of the specific topic categories below. State also if the impact is small and deemed to be insignificant for each applicable topic. In all categories, quantify impacts where feasible (i.e., in terms of acres, linear feet, etc.). If a resource does not exist on or near the site, then indicate "Not Applicable (N/A)" for the applicable topic below.

1. Topography and Floodplains

- Discuss whether the project will change the existing topography.
- Identify and evaluate any encroachments of the project on floodplains.
- Identify and evaluate any impacts to riparian buffers.

2. Soils

- Discuss impacts such as clearing, grading and compacting.
- Discuss whether the project will cause any soil disturbance or contamination.
- If soil is to be moved, provide how many square feet will be disturbed and how many cubic yards will be moved and to what location.
- If soil is expected to be contaminated, discuss the contaminant.

3. Land Use

- Describe how the project will change land use and how these new land uses fit into the intended land use of the entire area in terms of conservation, development, ecological function and quality of life.
- Discuss how local zoning or land-use plans will need to be changed.
- For projects intended to promote or induce new land development:
  - Describe the anticipated amount of development that will occur as result of the project.
  - Describe where it is expected to occur in terms of proximity to the environmental features previously described.
  - Describe how the project will affect existing land use(s).
  - Describe anticipated development patterns and population densities.
  - Provide the anticipated percentage of impervious surfaces within the project service area.
  - If the project is being undertaken to accommodate a specific land development project, describe the project.

4. Wetlands and Waters of the United States

- Describe all project activities that will occur within wetlands.
- Describe any direct impacts and SCI on wetlands from the project.
- If wetlands are to be filled, provide how many acres are involved and the type of

authorization (permit) required.

- If diversion/addition/withdrawal of surface water is anticipated, discuss impacts to existing wetlands.
- Discuss any long-term impacts to wetlands from project operation.
- Identify and describe the nature of any proposed stream crossings, whether the stream to be crossed is perennial or intermittent, and provide detailed illustrations of each crossing.
- Assess wetland functions and values using a methodology accepted by DENR. Wetlands within the project site should be identified by a professional wetland scientist (PWS) or environmental scientist and surveyed using GIS by a licensed professional land surveyor (PLS).

5. Prime or Unique Agricultural Land

- Describe impacts to farmlands considered prime, unique and of statewide importance.
- Discuss how much acreage will be lost and how much retained in that use.
- Describe what the impact of the loss will be.

6. Public Lands and Scenic, Recreational, and State Natural Areas

- Describe and quantify impacts to federal, state or local parks, game lands, open spaces, scenic or recreational areas, Significant Natural Heritage Areas and lands protected by conservation easement on or adjacent to the site.
- Discuss the loss of any informal scenic or recreational site functions.

7. Areas of Archaeological or Historical Value

- Discuss whether the project will affect any areas of archaeological or historical value.
- Discuss whether any buildings will be demolished or renovated. If yes, include photographs of buildings on the site.

8. Air Quality

- Describe air quality impacts, including the effects of a growing population (e.g., vehicular pollution, industrial emissions, increases in ozone action days).
- Discuss whether the ambient air quality will be affected by the project.
- Discuss both the construction and the operation of the project.
- Consider cumulative impacts as this project is added to the existing development.
- Discuss whether any open burning will occur.
- If parking is involved and there will be more than 750 spaces, a Complex Air Source permit will be required.

- Confirm if the project will increase odor levels or increase the possibility for odor complaints.

9. Noise Levels

- Discuss whether the project will increase noise levels.
- Discuss whether adjacent properties will be affected by noise level.

10. Water Resources (Surface Water and Ground Water)

- Describe the project's impacts during its construction and operation.
- Describe pre-project and as-built impervious surface coverage and stormwater runoff at the project's construction site or sites and within the project service area and/or adjacent parcels.
- Discuss anticipated erosion rate impacts on-site and downstream, sedimentation changes and downstream water quality changes.
- Discuss compliance with local and state buffer requirements and sedimentation and erosion control programs.
- Provide information on whether the project is located in a basin where special buffer rules apply.
- Describe any type of water quality variances that will be required for the project's construction.
- Identify and describe the nature of any proposed stream crossings, whether the water body to be crossed is perennial or intermittent, and provide detailed illustrations of any such crossings.
- Describe how the project will impact streams, waterbodies identified as impaired, or waterbodies with a noteworthy characteristic.
- Discuss the impact of future land development on quantity and quality of water resources.
- Assess wetland functions and values using a methodology accepted by DENR. Wetlands within the project site should be identified by a professional wetland scientist (PWS) or environmental scientist and surveyed using GIS by a licensed professional land surveyor (PLS).

For sewer lines, discuss how and where the proposed lines will connect to existing and future systems.

- Provide how many linear feet of pipe, pipe diameter and design flow in millions of gallons per day.
- Discuss the wastewater treatment plant and/or system to which the proposed line will connect and the entity that owns or operates the plant.

- Detail the current permitted and average daily flow in millions of gallons per day.
- Discuss if there is a hook-up moratorium or ***Special Order by Consent (SOC)*** that applies to the proposed wastewater collection system.
- Discuss whether the proposed additional flow will require the wastewater treatment plant to be expanded or re-rated.
- If it is a discharge, identify the water body it discharges into.
- If it is a non-discharge system, specify treatment method and disposal destination.

Generally, the appropriate hydrologic units for assessing urban runoff are the watershed and ***subwatershed.*** The subwatershed is considered by the USEPA and others as the optimum scale for planning purposes at the local level for the following reasons:

- The influence of impervious cover on hydrology, channel stability, water quality and biodiversity is most evident at the subwatershed scale because the receiving water body is typically a headwater stream.
- The subwatershed scale helps local officials more easily identify impacts of individual development projects and sources of pollutants.
- Subwatersheds are typically small enough to be within the borders of one or two political jurisdictions. This eases the manageability of implementing runoff controls under local regulatory authority.
- The subwatershed scale affords sufficient detail to provide useful management information and allows assessments and evaluations to be completed relatively quickly.

11. Forest Resources

- If any trees are harvested, describe any ***best management practices*** (BMP) to be used.
- Discuss the proximity to streams, ditches or wetlands.
- Discuss overall forest growth and condition (tree size, age, type and quality).

12. Shellfish or Fish and their Habitats

Describe the types of impacts the project will have during both construction and operation on freshwater, brackish, estuarine and marine fish and shellfish communities and their habitats. Consider on-site and nearby aquatic habitats. Note: if impacts will affect rare, threatened or endangered freshwater mussel species, these impacts may be addressed under "Section 13: Wildlife and Natural Vegetation (including rare, threatened or endangered species)".

- Discuss the proximity of the proposed project to classified shellfish waters and indicate whether these are opened or closed.
- If dredging is involved, quantify the amount of disturbed and undisturbed shallow bottom habitat in the project vicinity.

- Discuss whether the project would result in the deterioration of existing fish habitat.
- Discuss whether the proposed project would interfere with movement of any resident or migratory fish species, especially threatened, endangered or anadromous fish.
- Discuss how the proposed project will be timed so as to minimize adverse impacts to shellfish and fish.
- Discuss the proximity of the proposed project to any known submerged aquatic vegetation.
- Describe how the proposed project will affect bodies of water with the following classifications:
  - Outstanding Resource Waters
  - High Quality Waters
  - Impaired waters (on the 303(d) list)
  - Nutrient Sensitive waters
  - Water Supply watersheds
  - Open Shellfishing Waters
  - Anadromous Fish Waters
  - Primary and Secondary Nursery Areas
  - Essential Fish Habitat

13. Wildlife and Natural Vegetation (including Rare, Threatened or Endangered Species)

- Provide a description and a land cover type map showing acreage of wildlife habitat to be impacted by the project. In addition, provide detailed information on all direct impacts to aquatic and terrestrial wildlife resources and their habitats (e.g., stream or wetland crossings).
- Describe how much of the existing natural vegetation will be destroyed or altered by the project.
- Discuss whether wildlife would be displaced by the proposed project.
- Provide a list of federal and state endangered, threatened, special concern and rare species found in the county where the proposed project is located. List the species, the species' status, the habitat potential for species presence and the probable impact of the proposed project on the species. Information can be obtained from the Natural Heritage Program Website (See Appendix IV).
- For endangered, threatened, special concern or significantly rare species provide information on impacts to each species, including why it will be impacted.
- If wildlife will be displaced, describe surrounding areas that provide similar types of habitat and/or whether the project will include any possible relocation to areas nearby. Describe the long-term effect if more development is planned for the area.

- Describe whether the proposed project will change the species diversity or number of any species of plants or animals.
- Describe whether the proposed project will result in the degradation of existing wildlife habitat.
- Describe whether the proposed project will interfere with movement of any resident or migratory wildlife species.
- Describe whether the proposed project will conflict with any local policies or ordinances protecting natural resources or any provisions of an adopted habitat conservation plan.

14. Introduction of Toxic Substances

- Discuss whether any toxic substances will be introduced during construction or operation of the project. If so, identify these and how they will be used.
- Discuss any measures that will be taken to ensure that toxic substances will be treated in accordance with all appropriate regulations so that there will be no significant environmental impact.

Determine Significance of Secondary and Cumulative Impact Effect

DENR agencies have developed specific minimum criteria thresholds for initiating the environmental review process. The minimum criteria, which are based on factors such as project size and proximity to sensitive resources, identify projects that are unlikely to have significant impacts and allow them to move forward without SEPA review. DENR's SEPA rules, however, also provide that the Secretary can require SEPA review for a project that would normally fall under the minimum criteria thresholds. These "Activities of a Special Nature" (See Appendix II) include projects that may have significant impacts (direct, secondary and cumulative) that are not considered in the minimum criteria. The final decision of whether a project must be reviewed with regard to these impacts is left to the discretion of the Secretary of DENR. The following questions may help the applicant determine the significance of a project's impacts:

- Is the resource, ecosystem or human community vulnerable to change?
- Are there laws, rules or policies to protect the resource, ecosystem or human community from SCI that are likely to be triggered due to project implementation?
- Is a particular resource locally, regionally, environmentally, culturally, economically or socially important?
- Is the resource, ecosystem or community a part of a local, regional or nationwide plan or management initiative focused on obtaining specified goals?
- Can the impacts be controlled or mitigated?
- Is there significant public interest in the project?

Determining the significance of SCI of a project that exceeds the minimum criteria threshold, or is considered one of the "Activities of Special Nature" involves applying both technical analysis and judgment by DENR and varies with the location of the proposed project. Determinations should be based on the following:

- Scale, severity, duration, type, size and frequency of the SCI; and
- Applicable legal requirements (such as emission and discharge limits in permits or rules).

The following is a partial list of impacts that may be considered significant:

- Impacts associated with growth and land development that occur as an intended result of the project under consideration;
- Natural ground cover and drainage pattern disruptions;
- Urban stormwater runoff;
- Water and/or air quality degradation;
- Loss of riparian and other habitat areas;
- Impacts to threatened or endangered animal and plant communities;
- Threats to public health;
- Increases or decreases in flooding;
- Reduced quality of life; and
- Alteration of High Quality Waters, Outstanding Resource Waters, water supply, nutrient sensitive or 303(d) waters.

General Criteria for Secondary Impact Analysis

The need for an environmental review of secondary impacts is triggered whenever a project creates an area of impact within the defined study area. The area of impact can exceed the actual footprint of the project or intersects areas containing (or likely to contain) significant natural resources. Examples include two types of projects: 1) infrastructure projects or 2) projects that impact aquatic and terrestrial natural areas or protected species.

Infrastructure Projects

All areas included within the study area boundary for an infrastructure project should be considered within the area of impact for that project. Infrastructure projects include any project that provides or will provide a service to development and may affect the density, pattern, or feasibility of development. Examples include, but are not limited to:

- Transportation projects, including roads, bridges, railways, public transit using dedicated rights-of-way;
- Water and wastewater treatment plants, water and sewer lines, pump stations;
- Power generation facilities, substations and transmission lines;
- Public utility lines (natural gas lines, electric lines, phone lines, fiber-optic lines,

other types of cable);
- Dumps and trash collection facilities;
- Stormwater management facilities and projects (e.g., stream channelization);
- Street lighting; and
- Schools.

Infrastructure projects, in particular sewer projects, which require a state permit or fall under SEPA and are recognized as "Activities of Special Nature" should be reviewed for SCI at some level. As mentioned in Step 1, a service area should be formally designated prior to any level of review and included as part of the project's documentation. In cases where there is a significant threat to protected resources and if sufficient mitigation is not provided, DENR may request that no new development be served by the project.

Privately sponsored infrastructure projects are normally exempt from SEPA review. However, the area served by a private project should be incorporated into the service area for a public sponsored or regulated project if they become connected or are likely to become connected in the future. For example, an area served by private sewer lines should be incorporated into the service area for a public wastewater system into which it connects.

Impacts to Aquatic and Terrestrial Natural Areas

Areas of impact also include areas where project activities or development (facilitated, induced or otherwise related to the project) are likely to have effects that extend into or beyond the buffers needed for the protection of resources. Recognized natural areas include park lands, game lands and areas of recognized ecological or scientific research value. Also included are the natural habitats of fish and wildlife, including terrestrial, aquatic and wetland habitats.

Protection guidelines and thresholds for the review of impacts to general aquatic systems are provided in the NCWRC's Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality (NCWRC Guidance Memorandum; see Appendix VI). The Division of Coastal Management and Division of Marine Resources may have additional or other triggers for the review of impacts to aquatic systems. Additional triggers for the review of impacts to terrestrial natural areas and wildlife habitats include ecological impacts, impacts to human uses and impacts to protected species.

Ecological Impacts

Impacts from projects that reduce buffers needed to protect natural areas and wildlife habitats should be evaluated. These impacts likely result in edge effects or habitat alterations. Edge effects can include changes in:

- Degree of light and darkness;

- Temperature;
- Wind effects;
- Invasion by exotic, disturbance-tolerant species; and
- Penetration by edge-habitat predators and parasites (e.g., cowbirds).

In general, terrestrial buffer widths needed to offset edge effects depend on the habitats and species to be affected, as well as the types of impacts likely to result from a project. Data suggest that buffers of 750-1000 feet may be needed to protect against edge effects. Conversely, any project that creates a habitat edge within 750 feet of a sensitive natural area, or that adds to the level of disturbance along an existing edge, may require consideration in the environmental review.

Impacts from projects that disrupt wildlife movements should be evaluated. These impacts include habitat fragmentation from projects such as road construction and utility corridors. Any project within a sensitive natural area that fragments habitat, severs or reduces habitat connectivity, or creates a barrier (e.g., increasing the number of traffic lanes along a highway, or addition of concrete median barriers) may require consideration in the environmental review. For example, bridge construction or replacement should be subject to environmental review because riparian areas are often the only wildlife habitat corridor connections left in the landscape.

Impacts from projects that alter existing hydrology and surface wetlands need to be evaluated. One tool that identifies impacts to aquatic habitats is NCWRC's Guidance Memorandum (see Appendix VI). The Division of Coastal Management and Division of Marine Resources may have additional or other triggers that identify impacts to aquatic habitats. Other impacts include:

- Increases and decreases in flood frequency, duration and extent;
- Disconnection of the floodplain due to decreased over-bank flows caused by lowered water tables or stream incisement;
- Disturbance of steep slopes and other upland habitats subject to erosion;
- Dewatering surface wetlands (including seeps and isolated pools) due to ground water withdrawal; and
- Contamination of surface wetlands.

Impacts to Human Uses

Significant impacts to scenic values and recreational uses may require consideration for environmental review. Such impacts include:

- Visual impacts, including impacts to scenic vistas, as well as areas surrounding trails and greenways;
- Noise impacts;

- Reduction of safety zones surrounding game lands; and
- Creation of hazards on state canoe trails or failure to provide notification of such hazards.

Impacts to Protected Species

In addition to natural areas, impacts to protected species may require consideration for environmental review where protected species are on the federal or state lists of endangered or threatened species.

Aquatic species

The NCWRC's Guidance Memorandum (see Appendix VI) identifies protection guidelines and thresholds for environmental review. The Division of Coastal Management and Division of Marine Resources also have authority over these resources and may have additional or alternative protective guidelines or thresholds.

Federally listed species

In addition to prohibitions on direct take, the Endangered Species Act also authorizes protection from incidental take (such as those resulting from secondary impacts). Specific guidelines have been developed to offset these impacts for certain species (e.g., impacts to foraging habitat for red-cockaded woodpeckers). In other cases, the U.S. Fish and Wildlife Service may need to be consulted to determine whether the SCI of a particular project requires the applicant to obtain an Incidental Take Permit. Ideally, this should be determined during scoping and the outcome included in the project's environmental document submitted for federal and state review.

State listed species

Guidelines have generally not been established for terrestrial species. However, the presence of state-listed species within an intact block of natural habitat may identify that block as a sensitive natural area (e.g., a Significant Natural Heritage Area), in which case the guidelines established above for natural areas should apply.

General Criteria for Assessing Cumulative Impacts

The need for an environmental review for cumulative impacts is triggered whenever a significant natural resource that may be affected by either direct or secondary impacts of a project is already being affected by other projects, has previously been affected by other projects or may be affected in the future by projects currently in the planning stage. It is the applicant's responsibility to contact local governments to obtain information on past, present or future projects.