Science Guidelines for the Bureau of Natural Heritage Conservation

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Executive Summary

Science is essential to the mission of the Bureau of Natural Heritage Conservation. In this document the Bureau defines precisely what it means by science and provides a consistent explanation of how it uses science in decision-making. This document also provides guidelines for stakeholder and science advisory groups, and defines the precautionary principle and its role in Bureau decisions. Bureau determinations affect numerous stakeholders with varied interests; clearly defined phrases and guidelines in this document will help the Bureau make complex and sometimes contentious decisions consistently and efficiently.

The Bureau of Natural Heritage Conservation recognizes that to fulfill its responsibility to protect and manage Wisconsin's natural resources, it must maintain a quality, science-based program. Doing so requires recruiting talented staff and supporting continuous learning and professional development for all staff levels. To ensure scientific integrity, the Bureau should use peer review to carefully vet research and other activities that require a sound scientific basis (e.g., inventory and monitoring).

Sound policy decisions are informed by comprehensive, accurate, and objective information, including not only the best available biological and ecological science, but also information about economic, social, and cultural aspects of the issue. The Bureau of Natural Heritage Conservation should compile, analyze, and summarize the best available science and share this information with all parties involved in the decision-making process. Commonly accepted sources of scientific information include: peer-reviewed literature, gray literature, expert opinion, and observations. Decision-makers should consult the full range of such scientific thought on the topic at hand. Critiques and alternative points of view should be discussed and acknowledged openly.

To ensure sound and objective policy making, a range of alternatives should be considered and evaluated whenever possible, and the decision-making process should be clearly identified at the outset. A consistent, transparent, and standardized procedure will help to instill public confidence in Bureau decisions.

The Bureau of Natural Heritage Conservation should work to ensure that science and stakeholder advisory groups possess a balanced mix of knowledge, experience, and perspectives needed to address the issue. Science advisory groups are to be composed of professionals highly qualified in the subject area and should provide technical expertise both to the decision-makers and to stakeholders. Questions regarding how to manage natural resources can only be addressed by reconciling scientific information with the values and expectations of stakeholders. Stakeholder advisory groups are composed of individuals—often representing organizations or agencies—with an interest in the issue and/or may affect or be affected by the issue. Their advice is integral to making sound resource management decisions.

In cases where scientific evidence is not available to address the exact nature and extent of risk, the decisions of the Bureau of Natural Heritage Conservation follow the precautionary principle, i.e., taking action to protect public health or the environment if a reasonable threat of serious harm exists, based upon the best available science. The litmus test for application of the precautionary principle is the combination of a reasonable threat of serious harm and scientific uncertainty. Participating stakeholders and scientists should be informed that the precautionary principle is fundamental to the Bureau's approach to decision-making, and that it applies to all parties working with the Bureau.

These guidelines represent the Bureau of Natural Heritage Conservation's use of best available science to inform its actions and decisions, and to conduct and fund best science that contributes to the Bureau's ability to conserve, manage, and restore natural resources in Wisconsin.

I. Introduction

The mission of the Bureau of Natural Heritage Conservation (also referred to as the 'Bureau') of the Wisconsin Department of Natural Resources (DNR or 'department') is to identify, protect and manage native plant and animal species, natural communities and other natural features; enhance and restore populations and habitats of rare and endangered species; and promote knowledge, appreciation and stewardship of Wisconsin's native species and ecosystems for present and future generations. Bureau actions to achieve this mission follow applicable state statutes and administrative code, and use the best available science (for definitions and terms, see section III, 'Defining science', p. 9) within an ecosystem management decision-making framework[1].

The Bureau of Natural Heritage Conservation both creates and uses scientific knowledge. The Bureau generates scientific information through surveys, inventories, and research projects; and staff act as peer reviewers of scientific processes and literature. Additionally, Bureau staff and administrators use the best available science to inform activities, decisions, and the development of plans, policies and guidelines, specific examples of which include:

- Managing landscapes, natural communities, species, and specific properties, including developing management plans
- Decisions relating to Wisconsin's endangered species law, including assessment of and listing decisions for rare species
- Other regulatory decisions (e.g., permits, species regulations, Endangered Resources Review, Endangered Species Act Section 7)
- Providing guidance (e.g., species guidance documents, avoidance and minimization measures, survey protocols)
- Developing and subsequently revising various conservation plans (e.g., species recovery plans, master planning for state properties, Wildlife Action Plan, Fisheries, Wildlife, and Habitat Management Plan)
- Awarding grants (State Wildlife Grants, Landowner Incentive Program, Citizen Based Monitoring)
- Developing response plans for major new and emerging threats to natural resources (e.g., white-nose syndrome response plan, natural resources climate change adaptation plan)

[1] Ecosystem management is an approach that blends human needs and values with ecosystem capability and sustainability. It is based on the premise that natural resources should be managed as natural systems, and that humans are an integral part of these systems. The ecosystem management decision-making framework guides decision-makers in choosing among alternatives that consider ecological, socioeconomic and institutional implications. The model also incorporates aspects of the precautionary principle (discussed further in Section IV, p. 12), by finding ways to take action to help reach conservation goals in the face of uncertainty.

- Bureau and subprogram reviews, strategic planning, and budget and work planning decisions

Purpose of the Science Guidelines

Modern conservation and management calls for clearly articulated scientific and ethical standards, such as the US Department of the Interior's recent document - "Integrity of Scientific and Scholarly Activities" (DOI 2011). These Bureau of Natural Heritage Conservation science guidelines are for Bureau staff[2], and outline the Bureau's commitment to:

1) **use the best available science to fully inform all Bureau actions and decisions**,
2) **conduct and fund best science that contributes to the Bureau's ability to conserve, manage, and restore natural resources in Wisconsin, and**
3) **enhance the scientific capacity of the Bureau so that it is best positioned to carry out both 1) and 2).**

This document also provides **guidance on implementing key aspects of the above policies**. Specifically, these guidelines will:

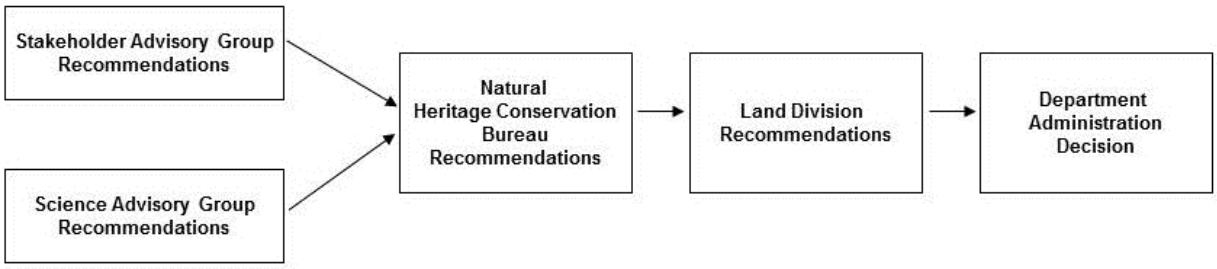
- Describe the **critical role of science**, and how it should be applied consistently and clearly in the decision-making process for all Bureau activities.
- Provide **transparency** to stakeholders and the public regarding how the Bureau uses the best available science to inform all Bureau activities and decisions.
- **Clarify** what the Bureau means when it uses the terms science, best science, and best available science (along with a host of other related terms).
- Allow the Bureau to be **proactive** in planning for and implementing efficient processes to make decisions regarding complex and contentious issues.
- Identify how the Bureau incorporates the **precautionary principle** into decisions involving scientific uncertainty.
- Recognize that **people** are fundamental to the ability of the Bureau to deliver on its scientific responsibilities, and outline the Bureau's initiative to increase its scientific capacity through supporting innovation and continuous learning by all staff.
- Identify Bureau **standards and expectations** for conducting and funding sound scientific research.
- Facilitate **consistency** and **efficiency** in Bureau decision-making, particularly decisions that affect many and diverse stakeholders, by developing guidelines for stakeholder and science advisory groups in decision-making processes.

[2] Staff are diverse, but all are responsible for following and implementing these guidelines. Thus the term staff in this document specifically includes permanent, project, and long-term contract staff, as well as non-seasonal LTEs.

II. Science and decision-making in the Bureau of Natural Heritage Conservation

The Bureau of Natural Heritage Conservation makes policy decisions that affect diverse conservation efforts targeting natural communities and native species in Wisconsin. Sound policy decisions must be informed by comprehensive, accurate, and objective information. Such information includes the best available biological and ecological science and also information about economic, social, cultural, and other aspects of the issue. The extent to which the latter types of information are considered in actions and decisions is often defined by state statutes, administrative rule, or department policy.

In many cases, final decision-making authority rests with individuals outside of the Bureau (e.g., department administration, the legislature). In these cases, recommendations by the Bureau of Natural Heritage Conservation to the decision-maker follow the approach above. The Bureau of Natural Heritage Conservation also works to ensure that decision-makers fully consider the science and other input relevant to the issue before making a final decision (for more detailed information about the Bureau's initial decision-making process, see section VII, 'Guidelines for stakeholder and science advisory groups', p. 27). The following figure illustrates the general decision-making process.



The decision-making process varies depending on the issue at hand, applicable laws, and other factors. In all decisions, however, the Bureau strives to adhere to the following general principles and guidelines:

- A strong commitment to science-based decision-making, ensuring that **all Bureau decisions are informed by and fully consider the best available science**. This commitment includes responsibility for: 1) compiling, analyzing and summarizing as appropriate the best available science relevant to the decision at hand, and 2) sharing this information with all parties participating in and/or informing the decision-making process. The best available science (for defintions of terms, see section III, 'Defining science', p. 9) will include 1) first and foremost, ecological and biological science related to the natural resource(s) being considered, and 2) economic and social science, consistent with the ecosystem management approach.
- A decision-making process that is clear, consistent, and transparent to help ensure 1) the integrity of and hence the public confidence in the decisions and 2) that decisions

regarding more contentious species/issues are made in the same fair, objective, open, and science-based manner as decisions regarding other resources.

- Up-front identification and sharing with all parties participating in and/or informing the decision-making process of: 1) the specific objectives or question(s) at hand to inform and focus the process, 2) the specific process to be used, 3) the legal, policy, and other considerations and requirements relevant to the decision, and 4) the specific roles of groups and individuals participating in the process.
- Use of science and stakeholder advisory groups whenever warranted (because of the complexity or potential impacts of the issue) to ensure that balanced, diverse perspectives and stakeholder concerns are identified and considered. Other standing teams defined in law or program guidelines may also fulfill this role (e.g., State Wildlife Grant advisory group).
- Use of the precautionary principle whenever the topic involves both scientific uncertainty and the potential for harm to natural resources.
- Consideration and evaluation, whenever possible, of a range of alternatives (and associated consequences, including economic costs when appropriate) to help ensure sound and objective decision-making. This approach applies to policy alternatives as well as ecological scenarios and biological alternatives (e.g., modeling parameters when determining minimum viable population estimates).
- Acknowledgement of the biases common in decision-making (e.g., values trade-offs, bias toward the status quo, excessive risk aversion; Maguire and Albright 2005), and a commitment to take actions to identify and remove these biases.
- Consideration of the potential conflicts of interest relevant to the science we conduct and information that we use (e.g., related to funding sources), and a commitment to identify and address these conflicts.
- Continual evaluation and refinement of the Bureau's use of science in decision-making, particularly in terms of evaluating: 1) how the best available science was reflected in the final outcome, and 2) how effective the outcome was in meeting initial objectives.
- A consistent commitment to documentation, including organizing, retaining, and sharing all pertinent information, as appropriate.

III. Defining science[3]

The Bureau is committed to fully considering the **best available science** in all of its decisions and activities, and to conducting and funding **best science** that contributes to the conservation of natural resources in Wisconsin. It is therefore important that the Bureau define what it means by these terms.

Best Science

Best science is the result of the scientific process, which generally includes a clear statement of objectives; a clear conceptual framework; sound experimental design; rigorous analysis; sound logic; clear documentation of methods, results, and conclusions; and peer evaluation. Often the scientific process is implemented via a research plan, which explains how the investigators will address each of the elements of the scientific process. A well thought out research plan establishes an unbiased process that can be repeated, and provides clear results.

Best Available Science

Often, best science is simply not available. Rather, the best available science must be used. Best available science consists of four commonly accepted sources of scientific information: 1) peer-reviewed literature, 2) gray literature, 3) expert opinion and/or professional judgment, and 4) observations. Each of these sources differs in quality, respectability and accessibility. Each must be evaluated and characterized on a case-by-case basis to determine its relevance and suitability for the specific purpose at hand.

<u>Peer-reviewed literature</u>

Peer-reviewed literature is scientific research that has been subjected to a formal peer review process. Current scientific research is shared primarily through peer-reviewed journals. Peer review is the process of critically reviewing information to ensure that the quality of that information meets standards set forth by the scientific community. Peer review is the most accepted and reliable process for assessing the quality of scientific information. Its use as a quality control measure enhances community confidence (including that of scientists, managers, and stakeholders) in the findings presented. Peer review is not infallible, but it has proved valuable for uncovering errors and providing diverse perspectives on data collection, analysis, and interpretation. The peer-review process typically includes an evaluation of the clarity of the hypotheses, the validity of the research design, the quality and appropriateness of the methods for the particular question being asked, and the strength of the results and conclusions. Peer review is generally conducted by qualified specialists who were not involved in the original development of the information. Peer reviewers are selected based on expertise, independence and the absence of conflicts of interest. Because of these attributes of peer-reviewed literature, it is most often the first and primary source of scientific information for informing Bureau decisions and actions whenever available.

[3] This section draws heavily from information and guidance presented in Sullivan et al., 2006.

Gray literature

Gray literature refers to publications issued by government, academia, business, and industry, in both print and electronic formats, but not controlled by commercial publishing interests, and where publishing is not the primary business activity of the organization (Auger 1994, Weintraub n.d.). Gray literature is commonly produced for scientific purposes and includes government documents and reports (e.g., technical reports), working drafts, theses, conference proceedings, newsletters, bulletins and fact sheets. Often, gray literature has not been subjected to a formal peer review process.

The Bureau uses gray literature to supplement the available peer reviewed literature. It is especially useful when the latter is insufficient to provide the required information about the topic. Gray literature is not used to replace peer reviewed results. Before using gray literature, staff should have a clear understanding of the quality of and purpose for which the literature was developed. Aspects to consider include the validity of the research design and methods, the strength of the results and conclusions, the extent to which the document was subjected to a formal or informal peer-review process, and author qualifications and affiliations.

Professional judgment and expert opinion

The terms professional judgment and expert opinion are often used interchangeably. However, expert and professional qualifications differ in important ways, and therefore the two are treated separately here.

An **expert** is a person with extensive knowledge or ability based on research, experience, or occupation in a particular area of study. An expert's authority to provide information (be it in the form of opinions, recommendations, judgments or decisions) in his/her specific area of expertise is recognized and granted by his/her peers. Because of an expert's credentials, training, education, publication or experience, an expert's opinion may be officially and legally relied upon by others, including decision-makers. Expert opinion can be very reliable, especially when multiple experts are consulted and provide similar information on the topic in question. Sometimes expert opinion is the primary source of scientific information available to answer a question or upon which to base a decision.

A **professional** is someone who has academic qualifications or specialized knowledge in a particular field of study in which they are currently practicing. Their work follows the technical and ethical standards and behaviors that are characteristic of their profession and they strive for high quality in the work that they produce. Professionals often compile the information on which recommendations are based. In the context of this document, professionals are most often staff of the Bureau of Natural Heritage Conservation (some staff are also considered experts on specific topics).

The Bureau most often uses expert opinion to supplement the available peer-reviewed and gray literature. Often both experts and professionals will provide input to the decision-making process through participation in a science advisory group. In all cases, the Bureau will carefully review qualifications of the individuals consulted both prior to seeking their input and also

when evaluating information provided. Whenever possible, the Bureau will seek input from multiple individuals.

Observations

A reliable observation is often the first indication of something new or rare on the landscape. An observation may confirm and validate predictions based on other information, or it may reveal something wholly unexpected that triggers new research or management. Observations—both contemporary and historical—frequently constitute the best scientific information available, particularly for rare organisms or systems.

Bureau activities and decisions often use observations together with available peer reviewed and gray literature. One example is the Natural Heritage Inventory (NHI) database, which is comprised of observations from a variety of sources, including formal inventories conducted by the Bureau. A strict and highly detailed quality-control process is implemented to ensure the accuracy and reliability of NHI data. In all cases, the specific type, quality, and reliability of the observational information is carefully evaluated by experts and/or professionals in the subject area for its suitability for the purpose in question.

IV. The precautionary principle[4]

One of the core values of the Wisconsin DNR is to 'anticipate and prevent damage to the environment and develop processes and policies to protect our resources and the well-being of the public.' In working to implement policies that support this value within the framework of applicable laws, the Bureau of Natural Heritage Conservation adopts the following working definition of the precautionary principle:

> **Precautionary principle means taking action to protect the environment if a reasonable threat of serious or irreversible harm exists based upon the best available science, even if abundant scientific evidence is not available to assess the exact nature and extent of risk.[5]**

The precautionary principle is well suited to ecosystem management and protection. Ecosystems have components that link and interact at multiple geographic scales, change over time, and respond to changes in biodiversity (Fluharty et al. 1999). Ecosystems also have limits and thresholds, and actions that exceed these limits can lead to irreversible change that can devastate ecosystems. The Bureau often focuses specifically on endangered resources, which include species listed as threatened or endangered at the state or federal level, special concern species, high-quality or rare natural communities, and State Natural Areas. The precautionary principle is especially relevant to endangered-resources management and protection because many rare species are highly vulnerable to disturbance but have not received detailed study.

Precautionary principle application to decision-making has five main components: 1) A need to take precautionary action before full scientific certainty of cause and effect is available. This component is fundamental to the Bureau's approach to decision-making and will be applied both to Bureau staff and to partners, stakeholders and others working with the Bureau as part of a decision-making process. 2) Setting well-defined goals is a critical step that encourages planning, explicit articulation of the uncertainty or risk, applying actions proportionate to the threats, and consideration of social and economic costs and benefits. 3) Alternatives must be sought and evaluated, including the alternative of forgoing the proposed activity and/or decision. 4) When applicable laws and policies allow, proponents of an activity should be responsible for demonstrating that the proposed activity will not cause serious or irreversible harm to ecosystems based on the best available science. Monitoring of the impacts of the actions should be carried out by the project proponent. Monitoring needs to be focused on the correct indicators articulated in the goals. Monitoring results must be shared with relevant parties and acted upon. 5) Stakeholders, and scientists play important roles in an open and transparent process.

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[4] This section draws heavily from information and guidance presented in Tickner et al., 1998.

[5] A number of other specific definitions of the precautionary principle exist, but all incorporate the need for preventive, anticipatory measures when an activity raises threats of harm to the environment, wildlife, or human health, even if some cause-and-effect relationships are not fully established (Smith 2000).

An adaptive management strategy is a key element to effectively implement the precautionary principle, along with support for research to reduce key uncertainties.

It is important to note that application of the precautionary principle is prescriptive only in that it requires explicit consideration of potential harm and uncertainty in decision-making (Raffensperger et al. 2000). The principle does not prescribe specific actions. Policy decisions will be made on a case-by-case basis that considers the best available science and other relevant input.

When does the Bureau of Natural Heritage Conservation apply the precautionary principle to decision-making?

The precautionary principle is applied when *the combination of reasonable threat of serious or irreversible harm and scientific uncertainty exists*. If there is certainty about cause and effect, then acting is no longer precautionary, although it might be preventive.

Uncertainty can be present in many different ways. Examples include uncertainty in models of systems and parameters used to populate those models, and uncertainty in how systems will respond to disturbances (including cumulative, indirect, and synergistic effects). Uncertainty may also be present simply because necessary studies have not yet been conducted on particular areas of life history or impacts of an activity or process on a species or community. Some kinds of uncertainty can be addressed and reduced; others cannot.

Bureau staff and science advisory groups (when established) are responsible for assessing when the issue at hand includes the combination of a reasonable threat of serious harm and scientific uncertainty. The staff person or group will be responsible for identifying and assessing the type and magnitude of potential harm to the resource in question, and the types and magnitude of uncertainty reflected in the best available science relevant to the issue.

Examples of use of the precautionary principle in Wisconsin

1) **The Incidental Take provision of Wisconsin's Endangered Species Law (s. 29.604, Wis. Stats.)** shifts the onus of responsibility to the project proponent by requiring submission of a conservation plan as part of the permit process. The conservation plan must detail, among other things, both how the project proponent will minimize and mitigate impacts to the species and what alternatives to the taking that were considered.

2) **The Great Lakes Water Quality Agreement of 1992** called for phasing out all persistent toxic substances in the Great Lakes Ecosystem 'whether or not unassailable scientific proof of acute or chronic damage is universally accepted.' As noted by one of the commissioners, "When we commissioners asked scientists what they knew about the effects of pollutants on people and wildlife, they would say they knew nothing for sure. Finally we began asking them what they believed was happening, based on their vast experience and observations. What those scientists of diverse backgrounds said then convinced me that we knew enough about the effects of those discharges to try to eliminate them altogether."

The precautionary principle will help the Bureau protect natural resources for the public, now and in the future, by: 1) consistently identifying and focusing conversations on conservation goals, 2) clarifying what is known and not known about an issue, 3) providing a basis to identify critical research questions that can reduce future uncertainty, 4) providing a mechanism for moving forward with actions to reach conservation goals in the face of uncertainty, and 5) gathering information through monitoring to help inform and refine future actions (adaptive management).

A stepwise process for using the precautionary principle in Bureau decision-making:

Step One: Identify the possible threat and characterize the problem

Purpose of step: gain a better understanding of what might happen should the activity start (or continue) and ensure that the Bureau is asking the right questions about the activity.

Sample questions to ask:

- Why is the activity a problem? Presumably it has the potential to negatively impact a resource that the Bureau is charged with protecting.
- What is the potential spatial scale of the threat - local, statewide, regional, national, global?
- What is the full range of potential impacts? Impacts to specific species or loss of biodiversity? Impacts to waterways, air, or soil? Do indirect impacts need to be considered?
- What is the magnitude of possible impacts (intensity)? Is the extent of harm negligible, minimal, moderate, considerable, or catastrophic?
- What is the temporal scale of the threat? Consider both: 1) persistence of impacts (immediate, short term, mid term, long term, inter-generational) and 2) the time lapse between a threat and possible harm (immediate, near future, distant future). The further in the future harm might occur, the less likely that impacts can be predicted, the harder it will be to identify and halt a problem.
- How reversible is the threat? (easily/quickly reversed, difficult/expensive to reverse, irreversible, unknown)
- What are the short and long term risks of conducting an action?

Step Two: Identify what is known and what is not known about the threat.

Purpose of step: Gain a better picture of the uncertainty involved in understanding this threat.

Sample questions to ask:

- Can the uncertainty be reduced by more study or data? If so, and if the threat is not great, a project with substantial benefits might be continued.

- Are we dealing with something that is unknowable or about which we are totally ignorant? High uncertainty about possible harm is a good reason not to proceed with a proposed project.
- What is known about how this stressor might affect the resource in question in addition to all of the other stressors already acting upon it (i.e., additive, synergistic and cumulative effects)?
- Do claims that an activity is safe mean only that it has not yet been proven dangerous?

Consider listing what is known and what is not known about the threat to gain a better comparative picture and understand gaps in knowledge.

Step Three: Reframe the problem to describe what needs to be done

Purpose of step: Better understand what purpose the proposed activity serves, including the potential benefits to society. For example, a development provides housing, a pesticide provides pest management. The problem can then be reframed in terms of what needs to be achieved in order to more readily identify alternatives.

Step Four: Identify alternatives

Proper use of the precautionary principle requires identifying (brainstorming) a broad range of possible alternatives. Alternatives can include further study of the issue, stopping existing activities or not initiating the proposed activities, or preventing, controlling, mitigating, or remediating potential negative impacts.

Step Five: Check for biases

Biases are often inherent in decision-making, particularly when the decisions address complex situations involving uncertainty (Maguire and Albright 2005). Biases typically involve inappropriate weighing of alternatives, such as the assumption that the suite of alternatives includes a 'safe' option that carries no risk (i.e. labeling "no action" or status quo as less risky). Biases can also include weighing more immediate negative affects higher than long-term risk, underestimating cumulative effects over space and time, or overestimating probabilities (positively or negatively) based on current events and general acceptance of the alternative. In this step, check for such biases in the suite of alternatives being considered, as preparation for deeper analysis.

Step Six: Assess alternatives

A comprehensive, systematic analysis of alternatives to initiating (or continuing) activities which may negatively impact resources is integral to the precautionary principle. This analysis refocuses the question from how much risk is acceptable to whether there is a safer, better way to undertake the activity. The difficulty and cost of modifying activities to reduce the risks presented should be considered.

The assessment of alternatives is a multi-stage process.

1) First, screen out options from your initial brainstorming that seem impossible.
2) Second, assess the remaining alternatives to determine whether they are politically, technically, and economically feasible. Keep in mind that something that is not economically or technically feasible today may be feasible in the near future.
3) Finally, consider potential unintended consequences of the proposed alternatives. A common criticism of the precautionary principle is that its implementation will lead to more hazardous activities. This need not be true: alternatives to a threatening activity must be equally well examined.

Step Seven: Determine the course of action

Purpose of step: Take all the information collected thus far and determine how much precaution should be taken in terms of stopping (or not initiating) the activity, requiring alternatives, or requiring modifications to reduce potential impacts.

Stakeholders and scientists (or formal stakeholder and science advisory groups, if established) will likely be involved in parts of this process. If so, each group should be presented with the collected information that is relevant to their role in the process (e.g., science advisory groups would consider the potential range and magnitude of impacts and uncertainties, stakeholder advisory groups might consider goals and possible alternative actions). Note that there may be overlap in the information to be reviewed and issues to be considered by each group. Collectively, the weight of evidence would lead to a recommendation of the best course of action. The group recommendation(s), along with the process and information involved in reaching the recommendation(s) should be documented and shared with stakeholders and other interested parties.

Step Eight: Monitor and follow up

Purpose of step: Monitor the activity over time to identify expected and unexpected impacts.

When allowable in the context of the applicable laws, those undertaking the activity should bear the financial responsibility for monitoring. Monitoring, however, should be conducted by an independent source whenever possible. The information gathered will help indicate whether additional or different courses of action are warranted.

V. Conducting, funding, and approving best science, including guidelines for research contracts and permits

The Bureau is committed to conducting, funding, and approving best science to conserve, manage, and restore endangered resources in Wisconsin. In addition, the Bureau seeks to ensure that, to the greatest extent possible, activities that the Bureau funds or permits record and provide data and material to assist future management and conservation activities. The following steps – in concert with the department's research priority process (led by the Division of Science Services) and standard guidelines for contracts for services – will ensure that the Bureau's expectations of the type of science conducted and funded using Bureau resources are clear, and that the Bureau and the public have a mechanism for ensuring sound results.

These guidelines apply both to funding directly from the Bureau and to other funds administered by the Bureau (e.g., State Wildlife Grants, Landowner Incentive Program), to the extent allowable under the laws and guidelines for those specific programs. In addition, this section refers primarily to research reports (including literature reviews) and contracts or permits to conduct research, but parts of the section may also be applicable to contracts for inventory, management, monitoring and other activities that also require a sound scientific basis and share many of the same components as research projects.

Best science is a result of the scientific process, which is implemented by means of a research plan. A sound research plan promotes unbiased, repeatable results; it includes background information on the topic and describes whether any of the identified hypotheses have already been successfully tested, clearly noting whatever critical information is lacking. A research plan or final research report should include the following elements:

- A clear statement of objectives
- A conceptual model, which is a framework for characterizing systems, stating assumptions, making predictions, and testing hypotheses
- A good observational or experimental study design and a standardized method for collecting data
- Reliable, consistent and secure data and metadata storage
- Statistical rigor and sound logic for analysis and interpretation
- Clear documentation of methods, results, and conclusions[6]
- Peer Review

[6] Research plans will describe anticipated results and, wherever possible, will demonstrate that the proposed study design has adequate statistical power to achieve stated study objectives.

Clear statement of objective

The first step to develop a research plan and ensure a high-quality scientific process is a clear statement of objectives. Without such a statement, procedures can easily be applied haphazardly and results may be ambiguous. Although disputes regarding a study's inferences and conclusions often focus on the methods employed, problems frequently arise from the wrong questions being asked during initial research plan development (Landy et al. 1994). Scientists, stakeholders, resource mangers, and policymakers must therefore convene early in the process to decide on the questions that need to be addressed through science. With objectives carefully stated and questions clearly articulated, scientists can develop the remainder of the research plan so that it appropriately meets the objectives.

Conceptual model

The next step is to develop a framework for laying out assumptions and predictions and testing hypotheses – what are the assumptions and reasoning on which the hypotheses are founded, based on our understanding of the major components and processes in the system? The framework may involve a mathematical or conceptual model that allows assumptions to be identified and agreed on, and inputs, outputs, and uncertainties to be judged openly and objectively. Consideration should be given to models that allow predictions under alternative management scenarios.

Observational or experimental study design and standardized data collection

The information that emerges from analysis is only as good as the information that went into it. Using accepted scientific standards to collect information helps to ensure that the factors influencing data quality are understood. An observational or experimental study design is a plan for collecting data with the purpose of testing hypotheses or estimating parameters, typically through statistical analysis. Standard, accepted designs help avoid conflicts later in the analysis and peer review processes.

Analysis and interpretation

Data are usually analyzed and interpreted in the context of a hypothesis being tested or a model being used for estimation and prediction. Researchers should document assumptions inherent in such models and hypotheses, either in outlining why one model or another was chosen or in justifying assumptions used. Alternately, a suite of models and assumptions can be explicitly tested to determine variability in the results.

Reliability of finding

Quality of knowledge is often assessed on the basis of its reliability and verifiability. Because ecological data and knowledge are contextual, results applied outside of this context may result in unreliable conclusions. Frank communication of the limitations of knowledge can promote respect between scientists and policymakers (Bolin 1994).

Peer review

A basic precept of science is that it must be verifiable. The most direct verification method is to simply repeat the study or experiment and observe the same results supporting the same interpretations. However, direct verification is not always possible and is often expensive and time-consuming. Instead, scientists often use the process of peer reviewing a study to evaluate scientific results. The peer review should cover: 1) the validity of the methods used, 2) whether the methods and study design adequately address the objectives, 3) whether the results that are reported are adequate for interpretation, 4) whether the results support the conclusions, and 5) whether the findings represent a significant advance in scientific knowledge. Typically, several knowledgeable scientists conduct the review independently and anonymously. In the context of natural resources management, scientific results become controversial to nonscientists most often when the results potentially change societal policy. In these cases, the peer review process must be particularly rigorous.

To help implement the Bureau's commitment to conduct and fund best science, the Bureau will conduct an internal peer review of both research plans and final reports for research projects conducted or funded by the Bureau. This process is not meant to be onerous; it will provide a helpful, broader perspective before significant time and funds are committed to research projects, or before findings and interpretations are finalized and used or published. Section chiefs shall be responsible for implementing and documenting the process in accordance with the type and cost of research being proposed, helping to ensure that the proposed research matches the Bureau's mission and budgetary priorities and is conducted in a manner that will produce sound scientific results. In general, the initial research plan review will include: 1) a professional in the department responsible for providing general feedback on the proposed work, and 2) another individual with expertise in the specific subject area responsible for providing feedback on specific methods proposed. An attempt will be made to incorporate input from both the DNR Science Services Division and outside expertise. Subsequent review of the final product will be similar in terms of expertise and representation from within and outside of the department and will focus on the first four elements outlined in the preceding paragraph.

Guidelines for Research Contracts[7]

High-quality scientific information is a crucial and often limiting resource for conservation and management. To ensure that work funded by the Bureau of Natural Heritage Conservation produces sound results that maximize benefits to conservation and management, the Bureau will clearly communicate in a written agreement signed by **every** recipient of its funds and resources (contractors, grant recipients, etc.):

- Deliverables (products) expected, in detail, including timelines wherever applicable

[7] Parts of the section may also be applicable to contracts for inventory, management, monitoring and other activities, which should be based on sound science and have many of the same components as research projects.

- That payment is contingent on delivery
- That all data, including metadata, must be reliably stored, and delivered in organized, accessible form upon completion of the contract or grant
- Publishing rights of both the Bureau and the recipient(s)
- That all aspects of the funded work may be peer-reviewed, and must be retained and provided on demand

Deliverables and data

The Bureau provides funds and resources to numerous individuals and a variety of public and private organizations for scientific work, including research, inventories, and monitoring. In each contract or grant agreement the Bureau will describe protocols and products in detail, and will include timetables wherever possible. In all cases where applicable, deliverables will include data (including metadata, original field data, field and corrected GPS datapoints, digital images, and raw and analysis data) in organized, accessible, review-ready form. In addition, wherever applicable, contracts and agreements will make clear that specimens, tissue samples, and other records, photographs, waypoints, notebooks, samples or objects obtained or collected on projects that involve funding from or administered by the Bureau ultimately belong to the public (e.g., Wisconsin Statute Chapter 29.011 states "the State of Wisconsin holds all wildlife in trust for the public and no animals or any parts thereof may be held by an individual"), and must be provided to the Bureau on demand.

The Bureau may, where appropriate, stipulate in agreements that funding recipients provide the Bureau brief documents about the work, at the beginning, during, and upon completion of the work, to be shared with property managers or owners or the general public.
All deliverables, including all data, must be delivered, fully reviewed (including data-quality review), and approved by an appropriate Bureau staff member before final payment will be authorized.

Publishing

Although the Bureau has rights to all data and samples collected with Natural Heritage Conservation funds, in some cases funding recipients (e.g., grant recipients) may also have rights. Typically, such rights include rights to publish in a scientific journal. Wherever the recipient has such rights, the funding agreement will explicitly state the recipient's and the Bureau's publishing rights, including time windows, and will also clarify that such rights do not negate the Bureau's rights to all funded data and objects for other purposes (e.g., education, management, and conservation).

VI. Enhancing the Bureau's scientific capacity[7]

The Bureau of Natural Heritage Conservation makes management and policy decisions that affect a diversity of conservation efforts targeting native species and natural communities in Wisconsin. Sound decisions must be informed by the best available biological and ecological science. Given the vital role of science in the management of natural resources, the Bureau of Natural Heritage Conservation is dedicated to building and enhancing its scientific capacity. The Bureau of Natural Heritage Conservation is committed to supporting a quality scientific program that:

- **Is strategic in its focus:** The Bureau's strategic plan should guide enhancement and expansion of scientific skills and knowledge within the Bureau related to emerging issues (e.g., climate change, renewable energy including wind, solar, and biomass) that may impact natural resources.
- **Addresses both current and emerging issues:** Scientific efforts must be directed at issues that are important to the Bureau and department missions and stakeholders today. Additionally, the Bureau must be able to identify and assess emerging policy issues related to natural resources that have yet to become public priorities.
- **Values people:** The Bureau recognizes that people are fundamental to its ability to deliver on its scientific responsibilities to protect and manage Wisconsin's natural resources. The Bureau will invest in the resources needed to effectively recruit, develop, recognize, support, and retain talented scientific staff now and in the future.
- **Embraces creativity and innovation**: The Bureau encourages staff to think in creative and innovative ways to address existing and emerging natural resources issues. This involves an understanding that the Bureau expects staff to take informed risks when appropriate to the situation and potential conservation outcome.
- **Supports continuous learning and professional development of staff**: The Bureau values the diversity of interests, skills, and experiences that staff bring to the Bureau, and encourages staff to pursue additional interests and training that build the scientific capacity of the Bureau as a whole.
- **Provides adequate resources to achieve these goals**: The Bureau will strive to provide modern facilities, equipment, software, and networks that are adequate to achieve these goals within the means made available to the Bureau.

[7] This section draws heavily from concepts presented in California Dept. of Fish and Game 2008.

Approaches

Scope

Support and enhancement of skills and knowledge at all levels is necessary to achieve the overall goal - from the Bureau as a whole, to smaller functional areas within the Bureau, and to individual staff. Areas of particular focus may include areas where responsibilities may overlap or complement each other, where there may be different perspectives on an issue, or where the Bureau would benefit from having multiple individuals with similar or complementary skills.

Focus

In some cases, it may be helpful to have larger groups of people, or even staff within the whole Bureau, learn about new topics that are relevant to all aspects of the Bureau (e.g., climate change). In other cases, priority topics may be relevant to smaller groups of staff or individual employees. The tools and approaches used will take into account these differences.

Key to Success

To make the initiative successful, strong support from Bureau leadership is needed to set up a positive feedback loop that results in maximum benefit both to staff and to the Bureau. Staff must feel supported and encouraged to pursue learning opportunities; this collective body of new knowledge will then benefit the Bureau as a whole, leading to even stronger Bureau support for the initiative in the future.

Roles and Responsibilities

Successful implementation of this initiative requires leadership, commitment, and support at all levels – from Bureau leadership to supervisors, to formal and informal mentors, and to employees themselves. Below we outline roles and responsibilities at each of these levels. In the section that follows, we provide examples of actions that the Bureau may support at each of these levels to improve the overall science capacity.

Bureau

- Support initiative actively, broadly and on a continuing basis. Successful implementation starts with strong, active Bureau support visibly demonstrated to staff on a regular basis through interactions with and support for programs, functional areas, and staff at all levels. With this kind of support, staff will feel comfortable and encouraged to pursue learning opportunities, knowing that the initiative is important enough to the Bureau to identify staff time and funding sufficient to achieve goals.

- Reference these science guidelines in position descriptions to emphasize the role of science in staff duties, responsibilities, and activities, and the support the Bureau provides to staff to maintain and enhance their scientific knowledge over time.
- Require that a learning plan be completed as part of the annual performance review for all non-seasonal Bureau staff regardless of formal designation (FTE, LTE, long-term contract, etc.).
- Require identification of time in staff work plans (whether formal, as for FTEs, or informal for other types of employees) sufficient to achieve learning goals.
- Identify funding in biennial budget process for training, professional development, and other learning opportunities for Bureau staff. This should include providing staff with access to scientific journals relevant to their duties and the mission of the Bureau.
- Convey to staff that they are valued for the diversity of experiences, skills, and interests that they bring to the Bureau (and are expected to continue to develop), as well as for the specific roles (positions) that they will play in the Bureau in the future.
- Identify, cultivate, and provide continuing support for strong linkages through partnerships, collaboration and integration with universities and other science-based agencies and organizations at a programmatic level, as well as with DNR Science Services.
- Require that Bureau staff involved in conservation and research activities seek peer review of study plans before initiating projects.
- Encourage Bureau staff to publish in peer-reviewed journals.

<u>Supervisors</u>

- Review and approve learning plans for each non-seasonal employee (FTE, LTE, long-term contract, etc.) as part of his/her annual performance evaluation, including helping to identify appropriate learning opportunities (particularly for newer employees) and providing early feedback on draft learning plans (e.g., appropriate topics, amount of time, timing).
- Assist employees in achieving learning goals by identifying ways in which learning opportunities can be integrated into other tasks. Hold employees accountable for achieving learning goals.
- Encourage mentoring (formal or informal), particularly for newer staff and staff located in regional offices.
- Encourage staff to take advantage of resources available through the DNR training office.
- Provide employees with software (e.g., graphing, statistical, mapping) to help them perform needed work and develop skills relevant to their position and to the Bureau.

Employees (non-seasonal, including FTEs, LTEs, and long-term contract employees)

- Develop learning plan with input from supervisor, functional area, mentor and program.
- Complete annual learning goals; seek assistance from supervisor if difficulties arise that seem likely to prevent you from achieving goals.

Examples (note that not all examples will apply to all staff)

Supporting staff in pursuing in-house training and learning opportunities

- Encourage staff to take advantage of DNR training opportunities and resources (http://intranet.dnr.state.wi.us/int/at/hr/edt/).
- Host periodic seminars focusing on emerging topics of broad interest to staff in the entire Bureau, and addressing in particular how the topic affects/may be affected by endangered resources.
- Encourage staff to attend seminars offered by DNR Science Services and other DNR programs that are relevant to the Bureau, and to initiate relationships with staff in these programs to foster continued learning and input related to natural resources issues.
- Encourage staff to attend a university seminar series of interest and relevance to the Bureau of Natural Heritage Conservation as a whole, and smaller functional areas within the Bureau (e.g., free seminars are offered regularly by the Nelson Institute [http://nelson.wisc.edu/events.html] along with many individual departments).

Strengthen links with universities and other regional scientists, science programs, and science institutions

- Encourage staff to accept honorary fellowships where appropriate (most often available to PhD level scientists who have close working relationships with a university program).
- Encourage staff to participate in university committees addressing topics of relevance to the Bureau and natural resources in Wisconsin (e.g., Wisconsin Initiative on Climate Change Impacts, Research Animal Care and Use, Nelson Institute).
- Encourage staff to give lectures to university classes, providing opportunities to learn about topics new and old, interact with students and identify gaps in student learning, and build relationships with professors.
- Encourage contracting with university students and staff (e.g., small contracts for development of species guidance), providing support and learning opportunities for students, experience in a reviewer/mentor role for DNR staff, and building relationships with university staff and programs.

- Encourage provision of funding for graduate student research projects and post doctoral positions when appropriate, providing benefits similar to those above on a longer term and more in depth basis.
- Encourage staff to take specific university courses as appropriate to their learning goals/plans and the needs of the Bureau.
- Encourage staff to identify scientists and science programs in neighboring states with similar interests and responsibilities, to foster relationships with these biologists, and to create opportunities for productive one-on-one or group interactions .
- Develop and maintain relationships with relevant university programs (e.g., UW Herbarium) that can provide additional resources and technical expertise (e.g., plant identification).

Supporting staff in pursuing external training and learning opportunities

- Encourage staff to take courses through UW-Milwaukee field station and other similar field stations/institutions to improve and broaden skills (e.g., identification of grasses, sedges, lichens).
- As funding and travel restrictions permit, encourage staff to take other courses (outside of Wisconsin) that improve and broaden skills related to their position and to the complement of knowledge in the Bureau as a whole.

Independent learning to keep abreast of emerging scientific issues and trends

- Science Daily (http://www.sciencedaily.com/) is a good source for quick information on the latest published research in many topic areas.
- Subscribe as a bureau to key journals (e.g., Conservation Biology, Ecological Applications, Restoration Ecology) and place them in a location where they can be browsed. Solicit input from staff regarding journals of highest importance, and those which individuals/programs may already be receiving.
- Compile an Natural Heritage Conservation information page on the intranet for staff use: links to electronic mailing lists, university seminars, common places that provide training, online journals, etc.
- Subscribe to electronic mailing lists that provide information about learning opportunities relevant to staff positions and the Bureau as a whole.

Temporary assignments/opportunities to work with other science-based agencies and organizations as well as other areas within the Bureau

- Encourage staff to pursue temporary assignments both within the Bureau and/or department as well as with other agencies/science-based organizations (e.g., The

Association of Fish and Wildlife Agencies, The Nature Conservancy) working on topics/projects of relevance to the Bureau.

- Work to provide similar opportunities for staff from other agencies and science-based organizations to come to the Bureau of Natural Heritage Conservation.

Position Bureau to recruit future staff with exceptional scientific backgrounds and skills

- Pursue connections and cultivate relationships with students in relevant undergraduate and graduate level programs in the Midwest Region (focusing on Wisconsin) to provide information to them about the kind of work the Bureau of Natural Heritage Conservation does and potential future opportunities to work with the Bureau (including collaboration). This might include giving scientific or career-focused seminars in individual courses. Focus on the positive, exciting work that the Bureau is conducting while providing realistic information on the challenges faced in managing natural resources at the state level.

Other

- Provide a mechanism for staff to share information abut their skills and expertise in particular areas and coursework they have taken (e.g., formal facilitation training). This could be accomplished in a variety of ways, such as Bureau meetings, a central location to post CVs, or a roster/database of skill sets.
- Take advantage of the skills, education and interests that new employees bring to the Bureau by asking them to give a seminar on their previous work soon after they're hired (e.g., at a Bureau meeting). Similarly, encourage existing employees to do the same through periodic short talks on current research/activities.

VII. Guidelines for stakeholder and science advisory groups[8]

Introduction

The Bureau of Natural Heritage Conservation makes policy decisions that affect a diversity of conservation efforts targeting native species and natural communities in Wisconsin. Sound policy decisions must be informed by comprehensive, accurate, and objective information. Such information includes both the best available biological and ecological science as well as information about economic, social, cultural, and other aspects of the issue. Including science and stakeholder advisory groups in the decision-making process, whenever warranted (due to the complexity or potential impacts of the issue), ensures that balanced, diverse perspectives and stakeholder concerns are identified and considered in the decision-making process.

Typically, complex or contentious decisions made by the Bureau will involve three types of teams: a decision-making team, a stakeholder advisory group, and a science advisory group. The Bureau will determine when an issue warrants formation of such teams. In some cases, the decision-making team may be the Bureau of Natural Heritage Conservation Management Team or Policy Team. The team may also be defined in statute or rule, e.g., the State Natural Areas Advisory Council. In other cases, the composition of the decision-making team may be quite different and may include individuals from outside of the DNR. Formal decisions made outside of the Bureau, for example by DNR Administration or the legislature, are generally preceded by a recommendation and additional information from the Bureau.

Important requirement for all individuals involved in a decision-making process

To ensure the most objective process possible, individuals (including DNR staff) may participate in only one team or group (e.g., a member of the decision-making team may not be a member of the stakeholder advisory group) for a given decision/topic. Members of one group or team may serve as liaisons with another group or team (e.g., the leader of the science advisory group may serve as the overall project coordinator, or as the liaison to the decision-making team). If timing, staffing, funding, or other considerations affect this principle, the situation will be resolved by the Bureau of Natural Heritage Conservation and communicated to all parties.

Role and responsibilities of the decision-making/oversight team:

- Make decisions/recommendations (as appropriate) regarding the issue at hand, using the precautionary principle whenever appropriate and evaluating a range of alternatives whenever possible (see section I, 'Introduction', p. 5).
- Be informed of and fully consider input from both the science and stakeholder advisory groups before making final decisions.

[8] This section includes information from The National Academies 2003.

- State clearly the information/input requested from stakeholder and science advisory groups throughout the process, and clarify if an advisory group is being asked to vote and/or reach consensus on particular issues.
- Working with the project leader, request legal interpretation and consultation as needed from DNR Legal Services. Legal interpretation and consultation is the responsibility of the DNR and is not within the purview of either the science or stakeholder advisory groups.
- In some cases, provide policy/procedural guidance and problem-solving assistance to the project leader and advisory groups (in some cases, this may be done by the Bureau of Natural Heritage Conservation).

Science advisory groups

The science advisory group's purpose is to provide information and recommendations to the decision-making/oversight team, helping to ensure that decisions regarding management of native species and natural communities in Wisconsin are informed by the best available science.

Role

Provide scientific and technical expertise to the overall process, including to the decision-making/oversight team and to the stakeholder advisory group, through testimony or written documents. The group is expected to focus on the biological and ecological aspects of the topic, but may also provide scientific and technical expertise in environmental, economic, social, and other aspects of the issue. The group may be asked to make recommendations related to scientific aspects of the topic (e.g., prioritized list of research needs, a management scenario expected to result in the greatest protection for a specific population). Setting management goals lies outside of the realm of the science advisory group, because management goals incorporate human values in addition to scientific information. However, scientists can inform others about the consequences of management goals and actions, which may lead to revised goals and actions. Specific tasks will vary by issue. Examples include:

- Identify and evaluate underlying assumptions
- Identify and evaluate sources of scientific uncertainty
- Assess how proposed and alternative management goals, policies, and strategies may impact populations in both the short and long term
- Identify critical research needs
- Review research proposals and findings directly related to the issue
- Identify other pertinent information or questions that are relevant to the topic at hand

Membership

- The team is composed of experts and/or professionals highly qualified in terms of knowledge, training, and experience in the subject area, and possessing an intellectual interest in the scientific and technical questions to be addressed. The Bureau of Natural Heritage Conservation will try to identify, at the outset, the specific areas of expertise that will be needed (e.g., Conservation Biology, Wildlife Ecology, Fisheries/Aquatic Ecology, Population Dynamics, Genetics, Statistics, Human Dimensions, taxonomic experts). Participants on science advisory groups will most often include DNR staff along with individuals from universities, science-based conservation organizations, and other scientific institutions. Note that in some cases, individuals from scientific fields slightly outside of the specific topic may be able to provide a valuable perspective and check on often accepted assumptions.
- The Bureau of Natural Heritage Conservation will appoint members. The Bureau will work to ensure that the knowledge, experience, and perspectives represented on the committee are both adequate and balanced to address the issue at hand. All members must have demonstrated a high level of scientific integrity.
- The Bureau of Natural Heritage Conservation will work to ensure that no individual appointed to serve on the science advisory group has a **conflict of interest** that is relevant to the topic being considered. In some cases, however, conflicts of interest are unavoidable (e.g., there is a particularly small pool of individuals with the expertise needed, and all have conflicts of interest). When this occurs, the participant will be required to promptly and publicly disclose the conflict of interest to the group and to the Bureau of Natural Heritage Conservation, and to refrain from participating in decision-making on matters related to the conflict. This is an ongoing participant responsibility – if new conflicts of interest arise for a participant during the process, the participant must promptly disclose the conflict(s) in a similar manner.
- The Bureau of Natural Heritage Conservation will work to ensure that no individual appointed to serve on the science advisory group has a substantial **bias** that would affect his or her contributions to the group (see 'Participant guidelines for science and stakeholder advisory groups', p. 33).
- As the process progresses, additional individuals may be needed to provide expertise either on a temporary or ongoing basis. Individuals brought into the process at a later date should be fully briefed on the process and information covered to date, including being provided with a copy of the minutes and materials from each of the previous meetings.

<u>Decision-making within the science advisory group</u>

The group is not expected to vote or reach consensus on all points, but the group will establish a preferred process for doing so if requested (see 'Process and meetings for science and stakeholder advisory groups', p. 31). Documents and testimony provided by the group should represent the facts and technical expertise that was requested and indicate when consensus has been reached (or explain why it could not be reached). Documents and/or testimony should

also identify data or studies that may suggest alternate hypotheses or conclusions, and identify uncertainty associated with conclusions whenever possible.

Stakeholder advisory groups

Stakeholder input can provide critical information for Bureau of Natural Heritage Conservation decision-making. The Bureau is committed to working in partnership with stakeholders, regularly seeking and taking into account their knowledge, experience and perspectives.

Role

Provide input to the decision-making process through verbal input or written documents to the decision-making/oversight team. Input is anticipated to focus on non-technical social, cultural, ethical and economic aspects of the issue, but may also include conservation and other areas.

Membership

- The team is composed of individuals (typically representing organizations, agencies, local units of government, etc.) with an interest in the issue and/or who may affect or be affected by the issue. Stakeholders may include industry, other management or regulatory agencies, local units of government, conservation groups, affected landowners, and the interested public. The Bureau of Natural Heritage Conservation will work to identify all relevant and interested stakeholders at the outset, to minimize the need for any subsequent changes to the composition of the group. Group composition should consider geographic representation, if relevant.
- The Bureau of Natural Heritage Conservation will appoint members. The Bureau will work to ensure that the composition of the group is balanced, adequate to address the issue at hand, and reflective of a diversity of perspectives and areas of knowledge and expertise.
- The Bureau of Natural Heritage Conservation, as the resource manager, is a stakeholder in all decisions and will lead and participate in the stakeholder advisory group.
- Participants in stakeholder advisory groups are expected to be willing and able to represent the interests of other similar individuals, businesses, organizations, communities, etc., as applicable.
- Conflicts of interest, financial and otherwise, are in some ways unavoidable in stakeholder advisory groups. Stakeholders by definition may affect and be affected by the decision at hand (e.g., one stakeholder may harvest the species being considered, another may have been contracted to assess habitat for the species, and another may own land whose future use may be affected by the management plan being developed for the species). Stakeholders will be required to promptly and publicly disclose to the group and to the Bureau of Natural Heritage Conservation potential conflicts of interest at the first meeting. If conflicts of interest exist or arise that are detrimental to the functioning of the group, the individual may be precluded from (or asked to discontinue) participation in the group. This is an ongoing participant responsibility – if new conflicts

of interest arise for a participant during the process – the participant must promptly disclose the conflict(s) in a similar manner.

Decision-making within the stakeholder advisory group

The group is not expected to vote or reach consensus on all points, but the group will establish a preferred process for doing so if requested (see 'Process and meetings for science and stakeholder advisory groups', below). Documents produced by the group should reflect the input requested, indicate when consensus has been reached (or explain why it could not be reached), and identify conflicting or alternate views expressed within the group.

Role and responsibilities of the Bureau of Natural Heritage Conservation

- Appoint members of the decision-making/oversight team, science and stakeholder advisory groups, and a project leader. Designate liaisons to facilitate effective communication between teams.
- Work to ensure that individuals appointed to the science and stakeholder advisory groups collectively possess a balanced mix of knowledge, experience, and perspectives needed to address the topic being considered.
- Share the names of individuals the Bureau appoints or intends to appoint to the science and stakeholder advisory groups with stakeholders and/or the public as is most appropriate for the issue being considered, providing an opportunity for broader input on appointments.
- Approve any changes to the composition of the advisory groups.
- Lead and participate in the stakeholder advisory group.
- Provide support for the science and stakeholder advisory groups (e.g., meeting space, recorder [a role separate from the group leader], web posting, and a facilitator if needed or requested).
- In some cases, provide policy/procedural guidance and conflict resolution assistance (including issues related to participant bias or conflicts of interest) to the project leader and advisory groups (in some cases, this may be done by the decision-making/oversight team).

Process and meetings for science and stakeholder advisory group

- A DNR staff person will participate on all stakeholder and science advisory groups. A DNR staff person will lead each stakeholder advisory group. Science advisory groups will most often be lead by a DNR staff person, but may be lead by a member from another organization or institution. The DNR staff person on each advisory group will serve as liaison with the Bureau of Natural Heritage Conservation and decision-making/oversight team.
- Meetings will follow standard procedural rules of order, with the primary goals being to insure that: 1) participants are informed ahead of time of topics to be addressed, 2) all participants are treated fairly and respectfully and given ample opportunity to provide

input, and 3) meetings and discussions move forward on schedule. If procedural questions arise, the group may reference Robert's Rules of Order and/or request guidance from the Bureau of Natural Heritage Conservation.

- Minutes will be recorded at each meeting and circulated for approval by the group prior to being finalized.
- The advisory groups will meet on an as-needed basis determined by the project leader. A tentative timeline and schedule of meetings will be established at the outset of the process to inform prospective advisory group members of the approximate time commitment anticipated.
- Advisory group meetings most often will include non-DNR individuals. As such, the DNR is required by the state Open Meetings Law (s. 19.84, Wis. Stats.) to provide public notice of the meetings.
- Members of the public may attend and listen to meetings of stakeholder and science advisory groups as observers. Names of observers may be requested. Observers will not participate in any decision-making or voting that may occur.
- Advisory groups may at times wish or need to invite guests to provide information or expertise to the group. Guests will not participate in any decision-making or voting that may occur.
- Decision-making within the group, whether it be by consensus, voting, or other means, may only be initiated by the group leader.
- At the first meeting (and annually thereafter if the process is ongoing), advisory groups will be asked to:
    - Discuss the issues of group composition and balance, potential sources of bias[9] and conflicts of interest[11], and the relevant circumstances of individual members.
    - Discuss and agree upon a preferred process for group decision-making if asked to vote or reach consensus on a particular issue. The default process will be a simple majority show of hands.
    - Document this information in the minutes.
- If questions or conflicts arise (including issues of bias or conflicts of interest), individuals or the group as a whole may request assistance from the project leader, Bureau of Natural Heritage Conservation, or decision-making/oversight team in addressing and

[9] Bias: A partiality that prevents objective consideration of an issue or situation.

[10] Conflict of interest: 1) A situation that has the potential to undermine the impartiality of a person because of the possibility of a clash between the person's self-interest and professional-interest or public-interest. Source: BusinessDictionary.com. 2) A situation in which a person has a private or personal interest sufficient to appear to influence the objective exercise of his or her official duties as, say, a public official, an employee, or a professional. Source: Chris MacDonald, Michael McDonald, and Wayne Norman, "Charitable Conflicts of Interest", *Journal of Business Ethics* 39:1-2, 67-74, August 2002. (p.68)

resolving the issue (for more regarding decision-making/oversight teams, see section 'II. Science and decision-making in the Bureau of Natural Heritage Conservation, p. 7). Prompt communication is encouraged between participants and the project leader to answer questions and resolve minor issues in the interest of moving forward and building shared understanding between all parties. If the issue cannot be resolved at this level, the a team member may bring the issue to the attention of the decision-making/oversight team or Bureau of Natural Heritage Conservation, which will take the lead in resolving the issue. The resolution will be communicated to the group and to other parties as warranted.

Participant guidelines for science and stakeholder advisory groups

Members of science and stakeholder advisory groups are expected to conduct themselves in a manner that is responsible and respectful of others throughout the process, including following these guidelines:

- Attendance is required at all meetings to provide continuity to the stepwise process. Alternates may be named when necessary. It is the responsibility of the participant to fully brief the alternate.
- Constructive, good-faith participation and full support of the process is needed. In exchanging information and views, members should make fact-based statements and refrain from personal criticisms. Disruptive behavior will not be tolerated and may result in removal from the group.
- An individual may participate in only one advisory group (either stakeholder or science, not both). Organizations that feel they should be involved in both groups will need to discuss this with the project leader.
- Members of science and stakeholder advisory groups may serve as liaisons to, but not participate on, the decision-making body/oversight team.
- All advisory group members agree not to represent the State, department or advisory group as a whole in any communications with the media, unless specifically authorized to do so.
- Potential sources of bias are not necessarily disqualifying for purposes of serving on an advisory group. However, in cases where bias is detrimental to the functioning of the group, (e.g. where an individual is totally committed to a particular point of view and unwilling, or reasonably perceived to be unwilling, to consider other perspectives or relevant evidence to the contrary), the individual may be precluded from (or asked to discontinue) participation in the group.

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