**Importance and Application of Conservation Targets**

**in an Era of Rapid Environmental Change:**

**A White Paper for the LCC Community**

**I. Introduction**

The beginning of the 21st century is a time characterized by massive and rapidly accelerating environmental changes, many of which are creating unprecedented challenges to the conservation community, and which will require new and innovative solutions to ensure the sustainability of natural resources. In North America, large challenges such as climate change, increasing urbanization, energy extraction and the development of new energy sources, and large-scale land use changes, are all creating pressures on our natural resources and ecosystems that challenge their very sustainability during this century. It was within the context of these challenges to system sustainability and viability, and the need for landscape-scale solutions, that the network of 22 Landscape Conservation Cooperatives (LCCs) was established in 2010. It is also recognized that the development of solutions to these problems will require a science-based conservation planning framework, grounded in an adaptive capacity for evaluation and revision. The identification of effective and appropriate conservation targets is an important component of an adaptive conservation planning framework.

Individuals within agencies and organizations participating as members of LCCs continue to have rich and lively discussions about goals, objectives, performance measures, and other indicators of “success”. With literally over 100 different agencies and organizations in three nations contributing “time, talent, and treasure” to the establishment of the National Network of Landscape Conservation Cooperatives (LCC), conversations often revolve around the context –the “science for what” questions, the relative importance of one project over another, and how to measure the progress, cumulative effect, and success. This white paper offers the extended and extensive Landscape Conservation Cooperative community with some “common language” and conceptual ideas to help form a more coherent foundation on which to promote conversations that advance and strengthen conservation and sustainable management of natural and cultural resources; while also promoting and respecting the individual agencies and organizations responsible for establishing conservation targets and managing their respective resources.

Hence, in the interest of promoting constructive dialog this paper seeks to address the following broad objectives:

* Provide the Landscape Conservation Cooperative Network with a philosophical basis for, and characteristics of a consistent yet flexible (recognizing the uniqueness of each LCC) approach for establishing or supporting conservation targets to inform science priorities and indicators of system change. While not delving into each application comprehensively, the paper explores the concept of conservation targets, their importance to a conservation management framework (such as adaptive management.), and the relevance of establishing and/or supporting conservation targets in a changing ecological environment. It describes various approaches to deriving conservation targets such as population objectives, ecological process descriptors, and desirable characteristics of functioning systems (e.g., connectivity); and suggests approaches on how LCCs may utilize existing conservation targets from within the LCC partnership. The paper also introduces methods for measuring progress in achieving targets and discusses how regional targets might be “rolled up” into national targets. This paper does not discuss conservation targets as they may relate to cultural resources. [[1]](#footnote-1)
* Raise awareness that terms such as goals, objectives, conservation features, conservation targets, performance measures, ecological indicators, surrogate species, and many other similar words are often used loosely and interchangeably, causing confusion and sometime unnecessary discord. While this paper does not attempt to fully resolve this short-coming in the conservation lexicon, we distinguish **“conservation targets” from other terms as meaning “measurable outcomes of system viability and sustainability.”** In this context, conservation targets can be measured, modeled, tracked, and monitored. Conservation goals (e.g., to protect, restore, and manage) are valued based on the conservation outcomes they produce relative to the conservation target. The conservation target can be quantified, the level of uncertainty can be expressed statistically, and progress measured and monitored. The majority of this document explores this concept.

* Emphasize that individual agencies (state, federal, tribal, and international) and organizations, by virtue of their mission and mandates, have the responsibility and authorities for establishing conservation targets.
* Clarify that an LCC is a collaborative partnership comprised of state, federal, tribal, and private agencies and organizations, as well as international partners, who individually and collectively are responsible for the future of most of North America’s natural and cultural resources.
* While honoring and respecting individual agency mandates and authorities, as well as tribal and international authorities, offer some philosophical rationale as to why and how the Network of LCCs, comprised of state, federal, tribal, international, and private organizations, might compile existing conservation targets; or where none exist, promote and foster their development through proper venues and legal processes.
* Relate the concept of conservation targets and their importance to an adaptive management framework as well as relevant considerations in a changing ecological environment.
* Provide an overview of various approaches used to derive conservation targets such as population objectives, ecological process descriptors, and desirable characteristics of functioning systems (e.g., connectivity).
* Offer that there need to be considerations in the dynamic tension between the importance of ecological continuity across scales (e.g., LCCs) and the flexibility to accommodate the uniqueness of individual Cooperatives in the Network.

**II. What is meant by the term “conservation target” in the context of conservation management goals?**

The concept of “conservation target” means different things to different people and different organizations. For some, the term is equated with a “goal” or a “desired condition”, whereas for others the term is more equated with an “objective”, or a “measurable outcome.” Various organizations have defined conservations targets in the most appropriate terms for that organization’s mission:

The Nature Conservancy, for example, defines Focal Conservation Targets as “a limited suite of species, communities and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area. They are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. In theory, conservation of the focal targets will ensure the conservation of all native biodiversity within functional landscapes.” (TNC 2007)[[2]](#endnote-1)

In a similar vein, the developers of the Marxan computer program for identifying priority areas for protection defines “conservation feature” as a “measurable, spatially definable component of biodiversity that is to be conserved within a reserve network. Conservation features can be defined at different levels of ecological scale, e.g. it is possible to protect species, communities, habitat types, populations, and genetic subtypes. In a Marxan analysis, each conservation feature is given a target, which is the amount of the conservation feature to be included within the reserve network, e.g. 10,000 ha of a habitat, or 30% of its original extent, or one occurrence” (MARXAN Handbook (Ardron et al. 2010[[3]](#endnote-2)).

For conservation planners focused on climate change effects, it may be useful to consider the Climate Change Adaptation for Conservation Targets (ACT) Framework[[4]](#endnote-3) approach for addressing conservation features, developed by the Climate Change and Wildlife Conservation working group[[5]](#footnote-2). This framework is designed for collaborative application in a given landscape or seascape by a multidisciplinary group of natural resource managers, conservation practitioners, scientists, and local stakeholders. The framework draws on collective knowledge of conservation partners to translate climate change projections into a portfolio of potential adaptation actions. These actions can then be implemented by parties who need updated resource management information that includes climate change projections. (See fig. 1)

The U.S. Fish & Wildlife Service (FWS) has institutionalized adaptive management for conservation through their Strategic Habitat Conservation (SHC) framework for resource conservation. The key to SHC, and all outcome-based adaptive management approaches to conservation is the setting of conservation targets, which are characterized as a “measurable expression of a desired outcome” (NEAT Final Report 2006)[[6]](#endnote-4). SHC requires its practitioners to establish biological objectives (i.e., conservation targets) in the context of sustaining populations of fish and wildlife at levels desired by the public thus supporting strategic decisions and priority setting that relates to available resources. These targets ultimately guide decision-making.

More recently, the FWS has promoted a surrogate species approach for enhancing its SHC conservation planning framework, and to facilitate the conservation of functional landscapes and ecosystems. Surrogate species are defined as “species that are used to represent other species or aspects of the environment” (Caro 2010) [[7]](#endnote-5). Through this approach, the surrogate species are selected to represent many other species within a selected landscape or ecosystem, and biological planning and outcomes are applied to this smaller set of species. The expectation is that applying SHC to a limited number of surrogate species will result in increased efficiencies and more effective conservation planning and outcomes.

In the Department of the Interior’s adaptive management context, a conservation target might be equated with the term “objective,” meaning “some desired outcome or performance measure that can be used to guide decision making and measure success” (DOI Adaptive Management Technical Guide 2008). Targets typically are expressed in terms of management performance over a given timeframe. For example, performance measures “might be harvest yield, population size, water flows, or the probability of a negative impact on resource status, with an objective of maximizing accumulated harvest, achieving a desired population size, maintaining water flow, or minimizing a probability of extinction” (DOI Adaptive Management Technical Guide 2008). These last two definitions (SHC and AM) share two key characteristics: that a target is a “desired outcome” or a desired future condition of a conservation feature, and that a target is an explicit “measurable entity.” Desired outcomes might be based on a variety of factors, from legal or regulatory mandates (e.g., endangered species recovery) to social mandates (e.g., maintaining harvestable populations of fish and wildlife; maintaining biological diversity).

Landscape Conservation Cooperatives (LCC) operate at landscape scales, and thus, conservation targets for LCCs should reflect a landscape-scale context. The various methods and concepts described above for defining conservation targets provide an excellent foundation on which to develop and further the thinking for LCC-specific conservation targets. Given that LCCs operate at large, landscape scales, and that the sustainability of natural and cultural resources is inherent in the mission of the LCC network, we offer the viewpoint that system sustainability and viability represent an appropriate scale on which to base conservation targets for LCCs. Therefore, within the context of this white paper, we consider conservation targets to be “measurable outcomes of system viability and sustainability”. For clarity, we emphasize that a conservation target in this context is not a specific priority resource / conservation feature itself (i.e., not a species, habitat type, or similar biotic or abiotic attribute of a system), but rather the “target” measurable amounts, levels, etc., for that priority resource / conservation feature.  We assume that the essential step of identifying the priority resources / conservation features that will be the focus of the LCC’s conservation efforts has occurred via a separate exercise among the Cooperative’s partners.

**III. Why are conservation targets important?**

The answer to this question is at the core of using adaptive management for conservation. With all due respect to Lewis Carroll, modern resource managers do not have the time or agency resources to wander down just any path in the woods. Natural resource challenges today are as difficult as any ever faced by our nation, the time we have to solve them is shorter than ever and our natural resources are experiencing new and increasing stressors, including climate change. We need to be efficient with our time and resources, and to do that requires that we have an explicit definition of our targets and strategies to achieve them. Setting, or adopting, conservation targets is a process in planning. Just as management actions require plans, plans require a focal point for which the plan is developed. Conservation targets set the basis for the types and scope of actions developed in plans from prioritizing science to informing trade-offs to alternative conservation actions to achieve targets most effectively and efficiently.

Setting measurable targets for individual resources also provides a foundation for ‘multiple-use’ management. Given competing demands on public and private lands, some conflict is inevitable among mutually desirable outcomes. By clearly stating conservation targets, trade-offs among competing conservation actions can be more rigorously mediated for a managed area. While “multiple-use” does NOT imply accommodating all uses on every parcel of land or water, by setting conservation targets, the efficient configuration of uses and investments can be most defensibly supported.

Conservation features and/or targets provide the necessary contextual foundation for assessment and monitoring, which is especially important given the potential magnitude of uncertainties facing decision-makers responsible for the future and long-term viability of natural resources. Establishing and measuring conservation targets facilitates learning. The exercise of defining conservation targets reveals what is known and unknown about a system and helps identify strategic information needs.

By identifying targets we convey to our partners, our constituents, and our funders what we plan to accomplish and perhaps how long it will take to get there and what resources are needed. Clearly-articulated conservation targets are valuable when communicating management decisions before Congress and public. Conservation targets can also be a performance management tool. The Government Performance and Results Act (GPRA) require federal agencies to develop performance management through the preparation and implementation of strategic plans, annual performance plans, and annual performance reports. Under this condition-based approach to resource management, measurable outcomes, in the form of conservation targets, are imperative.

Targets provide transparency and accountability. These two attributes are even more important for new collaborative efforts such as LCCs when members are understandably cautious about an unproven track record to improve conservation delivery. High degrees of transparency and accountability are essential to the process of inspiring the change necessary to meet the challenges confronting the future of our nation’s natural resources. Using existing conservation targets, where they exist, and establishing common and robust conservation targets can lower the anxiety associated with a new idea by integrating additional levels of transparency and accountability not unlike a catalyst in a chemical reaction lowering the energy it takes for that reaction to take place.

**IV. What are the characteristics of good conservation targets?**

Good conservation targets share a suite of basic characteristics. First, conservation targets should be based on the best available science[[8]](#footnote-3), with a mechanism and the flexibility to improve them as new science and data become available. This is particularly important in a world where climate change and ongoing habitat loss will create conditions that require predictive models of alternative futures with varying levels of uncertainty.

Conservation targets should be specific, measurable, and achievable. They should be relevant to the landscape goals of the LCC partners, and associated with an appropriate spatial and temporal scale. They should be linked to LCC science strategies and the management actions of LCC partners (including on-the-ground protection, restoration and management) that have benefited or can benefit from the sharing of science, information and tools. They may also be linked to policy formulation, communication strategies, and other applicable activities that influence the ability of resource managers to achieve the targets. Again, in an era of rapid environmental change, being specific, measurable and achievable may be challenging, but these characteristics are necessary for practitioners to use in adaptive management frameworks, or as thresholds for decision-making under scenario planning. The adaptive management framework includes steps to re-evaluate objectives as new information becomes available.

Conservation targets, as developed by different stakeholders, may conflict with each other. In such situations, an LCC, through its partners and its science-driven products, may develop processes allowing the partners to arrive at consensus on mutual conservation targets. Science should inform prioritization of the conservation targets, and prioritization should be related to both their applicability across the LCC, and to how well they reflect the shared landscape goals and objectives of the partners in the cooperative. By examining the various conservation targets together, LCCs can help partners develop an understanding of the greatest conservation needs, and inform partners with science and information as they address their specific conservation targets. Where appropriate, LCCs should establish a goal of establishing conservation targets that describe system viability and sustainability.

Conservation targets should be collaboratively developed, or reviewed, within LCCs; however they should also be coordinated and linked at a national level where appropriate. Ideally, they should be applicable at a variety of scales. Conservation targets identified by an LCC will typically reflect the unique geography and resource issues facing that LCC. However, there is also a need for conservation targets that can be rolled up regionally or nationally, reflecting the regional or national scope of many resource conservation issues. Recommendations for conservation efforts in response to climate change, biological invasions, and fragmentation all focus on the need for managers to think beyond their unit boundaries. This is where member agencies and organizations working as part of a LCC Network bring added value to conservation.

**V. What are some possible categories of conservation targets? What are the pros and cons of each? What targets are appropriate in an era of climate change and how are they set?**

As used herein, conservation targets describe categories of metrics that can be used as a measurable outcome of system sustainability and viability. For LCCs, conservation targets span a wide range of categories that represent the types of environmental features relevant to the mission of member organizations of each LCC. The types of conservation targets described should reflect the desired outcome.

Population or Species-based conservation targets are important for fish, wildlife and plant management:

1. Population targets represent the desired numbers of individuals or characteristics for a species within a specific geographic area. Population targets can reflect population parameters such as sex or age ratios, genetic characteristics or a numerical range of the desired number of individuals within the population. For invasive species, the objective could be a reduction in the numbers of individuals, a reduction in their spatial distribution, or eradication. They could also be reflected in a target that describes the desired increase in the species most affected by the presence of the invasive organism. Habitat objectives can be tiered from population targets.

Example - Maintain densities of Lesser Scaup on the “Fictional Plains” within a range of variation from 1.85-3.93 birds/km2 during June breeding surveys. Targets could include things like: create an additional X hectares of lakes and ponds with water depths preferred by Lesser Scaup for foraging; or Determine if the migratory pathway of this population of Lesser Scaup exposes them to unusual levels of contaminants that affect breeding success.

Provide science (e.g., 1-2 peer-reviewed publications, 1 science synthesis with best management practices) that yields decision support to enhance re-introductions of 2-3 new endangered humpback chub fish populations along the lower Colorado River.

1. Species targets are similar to the above except that the target should reflect the desired outcome for the entire range of the species. Where appropriate species targets should be developed across LCCs, and inform the strategic development of more localized population targets, such as at range edges, source and sink habitats.

Example - Ecoregion-based plans developed by TNC stated numerical representation targets for a given at-risk species, often utilizing Natural Heritage Element Occurrences as the base unit of measurement. These targets could include a given desired number of ‘viable’ occurrences stratified across ecoregions of their known range. Since targets relate to relative conservation status – as encapsulated in NatureServe G/S ranks - practical targets may be expressed as the number of localities needed to shift status categories; i.e., a G2 (globally imperiled) species may typically have only 10-20 known localities, but to shift one step up to a more G3 (vulnerable) status, one might require securing or restoring 30-50 additional occurrences.

1. Species targets may also express the desired spatial configuration of habitat components for migratory species.

Example - In the Great Northern LCC, pronghorn will migrate unharassed through distinct corridors of contiguous habitat patches of sage-flats and inter-montane grasslands from Grand Teton / Elk Refuge to wintering areas of the Wyoming Red Desert in Sept – Oct and return during the periods of May – June).

Ecosystem-level conservation targets have at least 2 different but intertwined subcategories (i.e. biotic and abiotic components that function together as a unit):

1. Ecosystem-integrity targets: These are clear, measurable descriptions of systems that support and maintain a balanced, integrated, adaptive assemblage of organisms having species composition, diversity, and functional organization comparable to that of natural habitat of the region. Indicators with quantitative measures for ecosystems will be drawn from species, community, abiotic, or process attributes of the system, allowing for climate change induced transition of an ecosystem.

Example - The “High Integrity Mountain Range” will support naturally occurring populations of species at different trophic levels with at least two meso-predators, vegetation community and patch dynamics sufficient to support healthy populations of large herbivores, a species richness index of X (comparable to, say 1975 estimates), and hydrological dynamics indicative of temperate rainforests. With this sort of conservation target, we could have underlying objectives associated with stream flow or lake/pond stability, population objectives etc.

Provide science (e.g., 1-2 peer-reviewed publications, 1 science synthesis with best management practices) that yields decision support to enhance the restoration of ≥ 200 acres annually of Colorado River historical riparian backwaters (e.g., marshlands, inlets, outlets, willow swales, etc…) to increase watershed storage capacity, to enhance ecosystem function and resilience, and to restore rare wetland habitats for species of concern and Threatened and Endangered Species (e.g., Southwestern Willow Flycatcher, Humpbacked Chub, Yuma Clapper Rail, California Black Rail).

1. Ecosystem occurrence target: Often associated with general “habitat” representation, these targets focus on redundancies of and connectivity among the unique components or community structures that comprise the ecosystem (e.g. tall grass prairie occurrence or alpine areas within a particular biome).

Example - Within the Colorado Plateau, maintain or restore xx km of high quality Rocky Mountain Lower Montain-Foothill Riparian woodland and shrubland[[9]](#footnote-4), xx sq kilometers of Colorado Plateau Pinyon-Juniper Woodland, and 34 high quality occurrences of Colorado Plateau Hanging Gardens.

1. Ecosystem-service conservation targets reflect the desired level of an ecosystem component that would both meet conservation goals for natural systems/species AND the human use component.

Example – in the Lower Mississippi Alluvial Valley, restore 4 million acres of bottomland hardwood (BLHW) forests, through strategically located tracts to provide core forest habitat benefits for forest interior birds. Ecosystem service benefits include 300 metric tons of sequestered carbon per acre of restored BLHW forest (total of 1.2 billion MT over a 90 year period), thus returning the Lower MAV to one of the nation’s most significant carbon sinks. Other ecosystem services include improvement of water quality through retention of soil and nutrient runoff, increase in flood retention capacity, and defragmentation and linkage of forest corridors as part of a climate change adaptation strategy.

Provide science (e.g., 1-2 peer-reviewed publications, 1 science synthesis with best management practices) that yields decision support to enhance the restoration of ≥ 200 acres annually of Colorado River historical riparian backwaters (e.g., marshlands, inlets, outlets, willow swales, etc…) to enhance ecological resilience and sustainability of ecosystem services (e.g., water quality and quantity, rare wildlife habitats, flood mitigation, recreational areas, hunting and fishing).

**Meeting partner needs – develop LCC wide networks of goals and targets**

Within each of the LCCs we are focused on the shared conservation needs of the partnership. Identifying or developing conservation targets that are in common for the cooperative’s partners, across their different mandates, rationales and desires, will allow the LCC to deliver the science support needed to help multiple partners achieve their desired conservation goals. Each of the conservation targets categories described above are likely to produce benefits for the diversity of partners within the Cooperative.

Ecosystem-level conservation targets can clearly provide benefits to the other conservation targets, but they will not, necessarily, produce the same outcome. For example, a population conservation target for pintail may be (hypothetical): *“Increase northern pintail populations within the Platte River Basin by an average of 2% over the next 10 years by increasing the amount of suitable nesting habitat by 10% in the Basin.”*  Assume for the moment that “suitable habitat” means freshwater wetlands with shallow water ponds. The LCC may agree on a landscape-level target that is something like *“Increase wetlands in the lower Platte River Basin by 5% in the next 20 years to benefit wetland species and water storage capacity during flood events.”* The actions needed to achieve the two different targets would result in an increase of wetlands along the Platte River, but not necessarily result in an increase in suitable habitat for northern pintail ducks. The LCC actions under the first conservation target may be designed to provide relevant information about suitable nesting habitat for northern pintails, while under the second target the LCC actions would be more generic in addressing science needs related to establishing wetlands of any type in the lower Platte River Basin.

The more focused the conservation target, the easier it will be for the LCC to focus its work on science needs that will make a difference for the LCC partners in achieving that target, and the higher probability that the information produced by the LCC will be used. As an LCC Network where linkages across LCCs occur, the conservation targets would likely be at species- or ecosystem-levels since these are the two spatially largest conservation target categories.

**What targets are appropriate in an era of climate change and how are they set?**

Landscape Conservation Cooperatives (LCCs) were established in 2009 as part of a coordinated, national response to address the impacts of climate change on “America’s water, land, and other natural and cultural resources” (DOI Secretarial Order No. 3289, September 14, 2009). LCC’s, along with the National Climate Change and Wildlife Science Center and 8 Regional Climate Science Centers, hold specific responsibilities to determine the impacts of climate change on natural and cultural resources, and to develop adaptation strategies to combat those impacts and promote resilience to expected changes where possible. Climate change is not the only large-scale stressor impacting landscapes within LCCs, nor is it the most pervasive stressor in some cases; nevertheless LCCs have a specific responsibility to consider climate change impacts in their conservation planning, including the establishment of conservation targets that are robust, and provide for scientific evaluations of system sustainability and viability under changing environmental conditions.

Any of the conservation target categories described above may be appropriate under changing climatic conditions. Targets should emphasize science, what stakeholders jointly desire and find most practicable for biodiversity and ecosystem function, and caution must be used in relying upon historical conditions when targets are developed. It is important to include an appropriate temporal scale in the establishment and application of conservation targets as they relate to climate change. As conditions change, it may not be possible to support the same level of populations, or landscape-conditions that were present historically within a defined geographic area, but it may be possible to facilitate the movement and survival of species (or populations) across areas beyond their current range. LCCs, Climate Science Centers, NOAA Regional Integrated Sciences and Assessments programs (RISAs), and numerous universities can all serve valuable roles in obtaining and applying information regarding projected climate change and effects relative to any of the proposed conservation targets. LCC’s carry an important responsibility in assisting their partners with their science needs as they make decisions to benefit the described conservation targets or their step-down objectives.

**VI. How can conservation targets be set? What is the process?**

We envision at least 3 potential processes in which LCCs can set conservation targets. With either methodology, the mandates and authorities of the LCC partners are respected and considered throughout the process, with the intent that individual partners retain complete freedom and flexibility in determining their own contribution to achieving an individual target. Given that LCCs are self-directed partnerships with no specific management authorities, it is understood that on-the-ground actions within an LCC are accomplished by the actions of its partners. Nevertheless, the development of science-based conservation targets within an LCC framework can provide a powerful basis for collaborative conservation by LCC partners.

In general, a “coarse-filter/fine-filter” approach has been demonstrated to be practical and robust. That is, all major ecosystem types of the LCC are considered focal resources. Targets designed around their representation and integrity should serve to address needs for many characteristic species and other resource values. Given this, a more specific set of resources (i.e., ecological endpoints), including ecosystem services, ecological processes (e.g., river flows, wildfire regime, watershed hydrology, ocean acidification, etc.), species and populations of concern, including surrogate species, could form the framework for setting targets.

Within this context, the first method of establishing an LCC’s conservation targets is to use the conservation targets of individual partner organizations, and develop science-based solutions to meet these multiple objectives. With this method, the LCC’s role would be to collaboratively identify the commonalities and components of the individual entities’ conservation targets to find the most effective means to address science needs that aid in accomplishing those targets. One of the key benefits of this approach is that it provides a mechanism for the LCC partnership to recognize how one partner’s work to meet their conservation target can be enhanced by other entities focused on different conservation targets. This process recognizes that all partners have different mandates and motivation for doing their work and in participating in the LCC, but they can increase their overall effectiveness by working together to accomplish multiple targets. This can also increase overall efficiency, particularly in the case of conducting climate change assessments on species, ecosystems, and ecological processes of broad/common interest to a large number of LCC partners. This would be especially true across large landscapes where more than one partner has management responsibility.

To illustrate this approach, consider the example northern pintail objectives described under the Section IV of this paper. Assume that the FWS has a population-based conservation target for northern pintails and has established the hypothetical objective as one of its means to reach the population conservation target. Meanwhile, imagine that the US Army Corps of Engineers proposed the wetlands objective to meet their wetlands landscape-level conservation target. The Bureau of Reclamation may also have a defined ecosystem services-based conservation target to provide for minimum amount of water to be available to agricultural use.

The three hypothetical targets (objectives) are:

* The US FWS has identified the following target to maintain northern pintail populations: 10,000 – 12,500 total individuals with at least 2,000 breeding females at a given time, and proposes to increase northern pintail populations within the Platte River basin by an average of 2% over the next 10 years by increasing the amount of suitable nesting habitat by 10%.
* The US Army Corps of Engineers needs to mitigate 4,267 hectares of wetlands and provide for 6 million cubic meters water storage capacity during flood events. The USACE plans to increase wetlands in the lower Platte River Basin by 5% in the next 20 years to benefit wetland species and while maintaining existing water storage capacity.
* Platte River flows are sufficient for the US Bureau of Reclamation and Nebraska Department of Natural Resources to provide 1.7 million acre feet of water for agricultural irrigation through the summer months.

The LCC’s role would be to look at these three objectives that were designed to meet two conservation targets and one agricultural target, and discuss what the science needs (including climate-related projections) are related to meeting these objectives, identify solutions to meeting the science needs, take action to address the science needs, etc. A structured decision making approach or other decision analysis process may be an appropriate tool to derive these solutions. As an outcome of these discussions, the partners should find ways that can be complementary to each other to increase the potential for any one of the objectives to be met. The products delivered by the LCC would fill a niche important to all of these partner agencies in their pursuit of meeting the conservation objectives and therefore the conservation targets. The actions, strategies and anticipated outcomes should become a component of an LCC’s science strategy and operating plan.

A second approach for setting conservation targets is to use recognized regional, national, or continental conservation targets, and determine the role of an individual LCC in helping its partner organizations to achieve those targets. This approach has been used quite effectively by joint ventures for many of the continental-scale bird conservation plans (North American Waterfowl Management Plan, Partners in Flight North American Landbird Conservation Plan, etc.). Under this approach, it could be the responsibility of each LCC, through its Steering Committee, to determine the appropriate conservation target to meet the regional, national, or continental objective. A “Divide-down” or “Step down” approach could be used for these conservation targets, although other science-based methodologies may also prove useful. A recent paper entitled “*Considerations for Establishing Bird Population Habitat Objectives to Further Conservation within Habitat Joint Ventures*” provides a synopsis of approaches employed by joint ventures in developing conservation targets to meet the population objectives established by national and continental scale bird conservation plans (Partners in Flight Technical Series No. 6, November 2010), and may prove useful to LCCs in developing useful approaches for other taxa with landscape-scale conservation objectives..

LCCs can help to reconcile conflicting conservation targets through discussions within the partnership. For instance, if the details of the 3rd hypothetical objective described above are unattainable when combined with the other objectives, the LCC provides a forum for partner entities to provide feedback and discussions that could lead the revision of an objective. It is also likely that the LCC would create conservation targets and objectives specific to the LCC region if none exist to meet the goals of the LCC.

A third potential approach for LCCs to consider in establishing conservation targets is within the context of sustaining systems of natural and cultural resources. This approach of setting targets to achieve sustainable systems will require an understanding of system functionality and minimal requirements to achieve system viability. The science of system sustainability is a rapidly growing field, and reflects a gradual move towards a more holistic approach to conservation planning. It enables practitioners to incorporate other dimensions of system functions (e.g., economic factors, human infrastructure needs, etc.) into decision making processes, thus providing a robust model for considering multiple factors in conservation planning. A systems-level approach to setting conservation targets should not preclude either of the two approaches described above, but should be capable of integrating targets set under those approaches into an over-arching scheme of setting conservation targets at multiple scales to achieve a sustainable landscape for natural resources.

**VII. How will progress and outcomes be measured and at what frequency?**

There are numerous approaches to measuring progress towards achieving conservation targets. Within an adaptive resource management framework, monitoring and evaluation are required elements in assessing progress towards objectives. Additionally, the scientific literature describes several approaches that have been advanced as part of a monitoring and evaluation process.

Foundations of Success has developed a number or resources that may be useful to the larger conservation community in developing and assessing performance metrics for conservation projects. One source of information on monitoring and evaluation is the FOS publication*, A Review of Monitoring and Evaluation Approaches and Lessons Learned in Conservation (citation).* Additional resources have been developed by the Conservation Measures Partnership (CMP), an international partnership of "conservation organizations that seek better ways to design, manage, and measure the impacts of their conservation actions.” CMP members work together on issues related to designing and implementing effective monitoring and evaluation systems. CMP has developed the *Open Standards for the Practice of Conservation*, which includes standards on monitoring and evaluation.

One approach that many conservation groups have adopted to monitor progress toward objectives is to establish a **conservation performance** process, which involves an independent review of a conservation project by an audit team. A CMP report, *Conservation Audits: Auditing the Conservation Process - Lessons Learned, 2003-2007* , acknowledges the critical importance of evaluating the effectiveness of conservation actions, and reviews 37 conservation audits of global conservation projects. The report contains a number of "lessons learned" from conservation practitioners in auditing conservation projects. In general, it is recommended that conservation audits be repeated on a 3-5 year schedule.

In North America, several approaches and timelines for monitoring/evaluation of progress have been identified. The North American Waterfowl Management Plan strives for a 5-year interval between updates, and uses a national team (National Science Support Team, NSST) to evaluate joint venture progress towards NAWMP objectives. This approach is very similar to the conservation audit approach utilized by other conservation organizations.

The Association of Fish & Wildlife Agencies (AFWA) Teaming with Wildlife Committee, recognizing the need to measure the conservation effectiveness of the State Wildlife Grants program, established an Effectiveness Measures Working Group in 2009. This group produced a report, *Measuring the Effectiveness of State Wildlife Grants: Final Report* in April 2011, which provides a framework for evaluating progress towards objectives in State Wildlife Action Plans. One recommendation is to incorporate the proposed effectiveness measures framework into the USFWS' Wildlife TRACS (Tracking and Reporting on Actions for Conservation of Species system. The Wildlife TRACS system is an online data portal that provides state-by-state information on State Wildlife Grants projects, and allows for greater access to information on those projects.

EcoChek, a partnership of the NOAA Chesapeake Bay Program and University of Maryland's Center for Environmental Science, Integration and Application Network has developed an annual report card, designed to assess progress towards a healthy Chesapeake watershed.

**VIII. How can different agency targets be rolled up into a larger regional, national or international target?**

Notable examples of how different agencies have worked together to develop conservation targets used to address larger themes include:

Migratory Bird Joint Ventures (JVs) – JVs have established a good model for the integration of multiple agency activities to achieve larger conservation goals. With the completion of the first North American Waterfowl Management Plan (NAWMP) in 1986, continental targets for waterfowl were established for the first time, and Joint Ventures composed of private, state, and federal partners came together to implement the Plan. JVs are self-directed partnerships, and as such, each partner organization works within its own mission, mandates, and capabilities to meet the plan objectives. The JVs go through periodic reviews by the NAWMP plan committee to assess their effectiveness in meeting the objectives of the Plan, and the Plan undergoes periodic updates (usually 5 years) to ensure that the established conservation (population and habitat) targets are relevant and appropriate to the state of the science.

National Fish Habitat Action Plan (NFHAP) – When NFHAP was completed in 2006 it represented the first time that a national plan for fish conservation had been developed. In 2007, the NFHAP established Interim Strategies and Targets, which were intended to serve as preliminary conservation targets for fish habitat partnerships, until a more thorough national assessment of fish habitat quality could be completed in 2010. The NFHAP completed its aquatic habitats assessment in 2011 (*Through a Fish's Eye: The Status of Fish Habitats in the United States 2010*). Thus far, the Interim Targets have not been revised based on the new information available on stream habitat quality; however, it is anticipated that this will be a next step in the assessment of the NFHAP. From this, fish habitat partnerships, composed of private, state, and federal entities, will assume responsibility to establish habitat targets.

National Fish, Wildlife and Plants Climate Adaptation Strategy – this Strategy is the first joint effort of three levels of government (federal, state, and tribal) to describe what must be done to help the nation’s living resources adapt to a warming climate, so they continue to provide sustainable cultural, subsistence, recreational, and commercial use. The *Strategy* addresses expected climate change effects across the eight major ecosystem types in the U.S., noting that climate change impacts are occurring at scales much larger than the scope of individual organizations and agencies, thus demanding strong collaboration across jurisdictions. The seven major goals of the *Strategy* describe steps to conserve ecosystems and make them more resilient, and include checklists to monitor progress. Finally, the *Strategy* highlights the importance of initiating adaptation work now, to ensure that the nation’s valuable fish, wildlife, plants, and ecosystems continue to offer important products and services to communities across the country. By providing an overall framework of goals, the *Strategy* builds upon and complements existing partnerships that can incorporate climate change response, including the JVs, NFHAP, and others.

**IX. What are some good examples of approaches to setting conservation targets?**

Examples of setting targets for biodiversity representation within and across ecoregions can be found in most TNC ecoregional plans completed sincethe late 1990s. Some approaches to target-setting were summarized (under “set goals”) at: http://conserveonline.org/workspaces/cbdgateway/era/standards/std\_8

The Ecological Integrity Assessment Framework (EIAF), as developed for TNC and numerous non-government organizations within the Conservation Measures Partnership, and as adopted by the NPS and the BLM for its Rapid Ecoregional Assessments, guides the development of metrics, measures and strategies for ecological resource management within any protected area unit through three steps:

1. ***Identifying What’s Important:*** *Determining the suite of biological and ecological resources that need to be conserved*. This step includes identifying the geographic scope of the planning effort; identifying the suite of biological and ecological resources of potential concern to a management unit; identifying stressors known, suspected, or anticipated to affect these resources; and selecting a sub-set of the unit’s ecological resources on which to focus management and science/tool development. (herein termed *focal ecological resources*).

2. ***Determining How It’s Doing:*** *Developing metrics to characterize the integrity of the focal ecological resources*. This step includes developing a conceptual model of the ecology of each focal resource and identifying the key ecological attributes for each focal resource, on which to further focus management attention; identifying indicators for these key attributes and an ecologically acceptable range of variation for each indicator; and assessing the status of each focal ecological resource based on indicator data.

3. ***Stating What We Want:*** *Shifting to the management of focal ecological resources*. This step includes identifying desired conditions for each focal ecological resource based on its key ecological attributes (and their indicators); identifying potential stressors affecting the status of each focal ecological resource; setting a timeline for action to establish or ensure the continuity of desired conditions; and establishing performance metrics or benchmarks with which to evaluate these actions. It is critical that the implementation of this framework is be guided by careful attention to existing ecological knowledge. In turn, the framework helps identify crucial gaps in that knowledge for which additional research is needed.

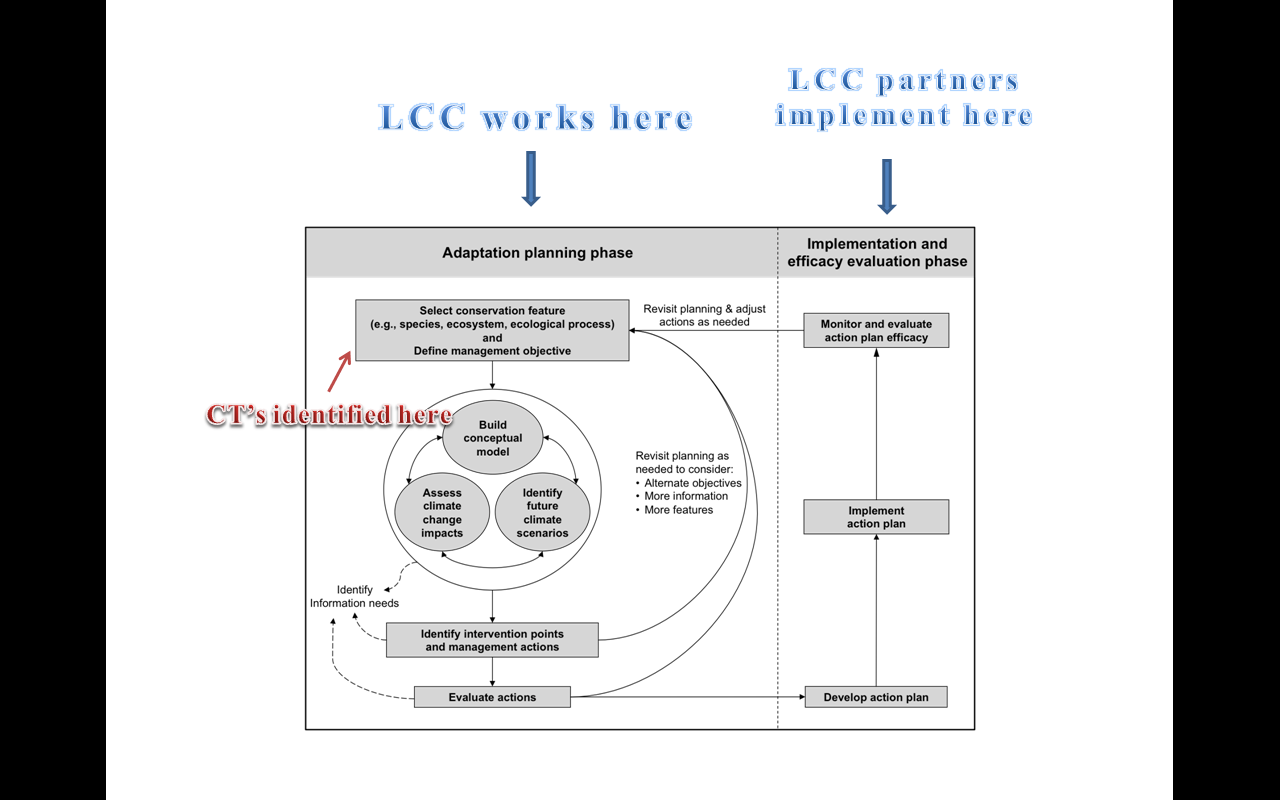
By applying the framework, managers and scientists can operate from a common platform that identifies potential threshold levels for a range of focal resources, that in total, reflect the condition of complex resource areas. For further information on the EIAF, see <http://www.natureserve.org/publications/NPS_EcologicalIntegrityFramework_January09.pdf>)

**X. Discussion and Recommendations**

This white paper is intended to provide guidance to LCCs and their partner organizations on the philosophical basis for establishing or integrating conservation targets, as a way of measuring conservation effectiveness, and achieve conservation objectives. Conservation targets, when derived through a collaborative process involving the LCC partners, should be approved by the governing body of the LCC (i.e., the Steering Committee). The white paper is also intended to provide an overview of methodologies and processes that can be used to derive conservation targets.

This guidance is not intended to be prescriptive. LCCs, as self-directed partnerships, may or may not determine to establish conservation targets as a primary business practice. However, agencies that provide significant funding for LCCs may determine their level of funding support based on a respective LCC’s willingness to engage in an adaptive management conservation framework, which may include the setting of conservation targets as a primary component. LCC conservation targets are intended to be established, or adopted, collaboratively, with full engagement and support of the Steering Committee and the organizations that they represent. The following bullets are recommendations for LCCs as they consider conservation targets.

* In an era of rapid environmental change, represented most dramatically by climate change, the LCC community should be the foremost leaders in developing robust conservation targets that express a measurable outcome of system viability and sustainability. LCC science, with collaboration from Climate Science Centers, should be focused on providing partners with the most innovative and practicable solutions to large-scale environmental stressors, including climate change.
* Conservation targets should be easy to understand and communicate. They should be tailored for use by a variety of audiences from scientists to policy makers to conservation practitioners.
* Conservation targets should be based on the best available scientific foundations, and they should be explicit, measurable, and achievable.
* Conservation targets should not be used to usurp or reduce the authority or authorities of any organization with a legal mandate to manage or conserve habitats or the species that depend on those habitats.
* Conservation targets should be used to strengthen the accountability and transparency of LCCs, through an adaptive management conservation framework, which should be used to establish explicit and transparent conservation objectives for the LCC.
* Conservation targets should be part of an appropriate adaptive conservation management framework, which includes monitoring and evaluation as primary feedback loops to evaluate progress towards objectives.
* Conservation targets should be based on an appropriate temporal and geospatial scale, to provide an appropriate scale of response to environmental change.
* Conservation targets should be reviewed and revised appropriately on a regular basis, as new information and new assessment tools are available.
* As ecological systems change, it is very likely that “targets” will undergo change as well, and the process for evaluating conservation targets should be capable of responding to those changes.
* In some situations, multiple conservation targets may overlap, or even conflict. In that scenario, an LCC should provide a forum for scientific evaluation of targets, and facilitate partner discussions aimed at deriving consensus targets. By focusing on targets that express measurable outcomes of system viability and sustainability, LCCs may be able to bridge the gaps among multiple conservation targets..



**Figure 1.** Climate change Adaptation for Conservation Targets (ACT) Framework (adapted from Cross et al. 2012)

**Appendix**

**LCC Conservation Targets Working Group:**

Greg Wathen (chair), Kurt Johnson (co-chair), Bill Uihlein, Ken Elowe, Karen Murphy, Mary Mahaffy, Greg Balough, Mike Olson, Avra Morgan, Jeremey Mikrut, Ben Thatcher, Genevieve Johnson, John Mankowski, Patrick Comer, Cat Hawkins Hoffman, and Greg Eckert (other contributors from NPS include Tanya Shenk and Susan Johnson).

**Charge for the LCC Conservation Targets Working Group:**

Develop white paper to craft philosophical basis, describe approaches, provide examples, and develop characteristics that can be employed for a consistent yet flexible approach to establishment of conservation targets. Describe and develop the importance of conservation targets to the conservation planning framework as a foundation for science needs. The paper should include a recommendation for Network guidance.

1. This white paper was originally intended to include methodologies for establishing conservation targets for cultural resources, which are also a goal of Landscape Conservation Cooperatives. However, the working group that was established to develop this white paper found that it had inadequate expertise and experience to address this issue in the depth that it deserved. Therefore, we determined to only address the issue of conservation targets for natural resources, and to recommend that a separate working group with suitable knowledge and expertise in cultural resources be tasked to address conservation targets for that issue. [↑](#footnote-ref-1)
2. TNC 2007: Conservation Action Planning: Developing Strategies, Taking Action, and Measuring Success at Any Scale: Overview of Basic Practices. Version: February 2007. 20 pp. <http://www.conservationgateway.org/topic/conservation-action-planning> [↑](#endnote-ref-1)
3. Ardron, J.A., Possingham, H.P., and Klein, C.J. (eds). 2010. Marxan Good Practices

   Handbook, Version 2. Pacific Marine Analysis and Research Association, Victoria, BC,

   Canada. 165 pages. www.pacmara.org.   [↑](#endnote-ref-2)
4. Cross, M.S. Erika S. Zavaleta • Dominique Bachelet • Marjorie L. Brooks • Carolyn A. F. Enquist •

   Erica Fleishman • Lisa J. Graumlich • Craig R. Groves • Lee Hannah • Lara Hansen • Greg Hayward •

   Marni Koopman • Joshua J. Lawler • Jay Malcolm • John Nordgren • Brian Petersen • Erika L. Rowland •Daniel Scott • Sarah L. Shafer • M. Rebecca Shaw • Gary M. Tabor. 2012. The Adaptation for Conservation Targets (ACT) Framework: A Tool for Incorporating Climate Change into Natural Resource Management. Environmental Management. DOI 10.1007/s00267-012-9893-7 [↑](#endnote-ref-3)
5. The Climate Change and Wildlife Conservation working group was convened by the Wildlife Conservation

   Society, Center for Large Landscape Conservation, and National Center for Ecological Analysis and Synthesis [↑](#footnote-ref-2)
6. U.S. Fish and Wildlife Service and U.S. Geological Survey. 2006. *Strategic Habitat Conservation:*

   *final report of the National Ecological Assessment Team.* U.S. Department of the Interior,

   Washington, D.C. 48p. [↑](#endnote-ref-4)
7. Caro, T. 2010. Conservation by Proxy: Indicator, Umbrella, Keystone, Flagship and Other

   Surrogate Species. Island Press, Washington, DC. 374 p. [↑](#endnote-ref-5)
8. Best available science is characterized by several traits, including: (1) peer reviewed science; (2) support from multiple lines of evidence; (3) Best professional judgment of qualified scientists ….emphasis on information directly applicable to the resource in question and limits to extrapolation of information from other sources. [↑](#footnote-ref-3)
9. See e.g., NatureServe classification of terrestrial ecological systems used in national mapping efforts (<http://www.natureserve.org/explorer/>; http://www.natureserve.org/getData/USecologyData.jsp) [↑](#footnote-ref-4)