Species and Habitat Acquisition

The Washington State Joint Legislative Audit and Review Committee (JLARC) conducted a review of the state's efforts to conserve habitat and expand outdoor recreation. This work included a review of existing or potential objective outcome measures that could be used to evaluate the success of 13 land acquisition and regulatory programs intended to protect and conserve habitat and expand outdoor recreation. Based on the effective outcome measures found in the peer-reviewed and gray literature, communications with managers from similar programs in the U.S., and the project team's professional opinion, it was found that there is very little literature that focuses specifically on outcome measures as they relate to land acquisition intended to protect and conserve species, habitats or to expand outdoor recreation; however a number of states and regions have implemented outcome measures for acquisition, and guidance is available from the extensive literature on restoration program and project effectiveness.

Introduction

Developing strategies to effectively measure ecological outcomes linked to specific programs and projects is an essential, but not simple, task that remains generally elusive in practice (Dale and Beyeler, 2001; Sawhill and Williamson, 2003; Niemi and McDonald, 2004; Doren et al., 2009; Margoluis et al., 2013). There are many examples of project-level effectiveness and projects that have laid out clear outcome measures linked to the project goals, such as Hartema et al. (2014). At the programmatic and regional levels, examples of these outcome measures are more difficult to find. For an example of a regional evaluation of the cumulative effectiveness of multiple projects see Diefenderfer et al. (2016). For a model-based evaluation of restoration project impacts at a watershed scale see Roni et al. (2010).

Some researchers note that the increased demand for outcome measurement, particularly ecological outcomes, does not imply that they are useful for decision making or that they are frequently used (Turnhout et al., 2007). Others argue that aligning outcome measures (indicators and metrics) with the mission and goals of an organization, program, or project can change it profoundly.

Margoluis et al. (2013) argue that to measure success in conservation three questions must be answered: (1) are we achieving our desired impact?; (2) have we selected the best interventions to achieve our desired impact?; and (3) are we executing our interventions in the best possible manner? Another question to add to this list is (4) who is the audience and who will care about the effectiveness of our program and our actions?

Outcome measurement processes are based on the selection of indicators and metrics, and the choice of indicators and metrics will directly impact the results of the process (Behan et al., 2017). To understand which indicators and metrics have been shown to effectively measure the performance of land acquisition and regulatory actions, we focused our efforts on peer-reviewed literature, agency publications, and on programs that would help provide information about 'best practices' for outcome measures that were not found in peer-reviewed or agency publications. By best practices we were looking for *outcome measures* (i.e., indicators and metrics) and programs that were effective, innovative, or promising.

Due to the complexity and nuances related to the protection and acquisition of species and their habitats in Washington,

this section is not a comprehensive compendium of the indicators and metrics used to create effective outcome measures. Rather it is a compilation of effective outcome measures and practices based on our literature search, conversations with program managers, and the opinions of the project team within the timeframe of the project. The complete report (Behan et al., 2018) provides many more details concerning the development of outcome-based indicators from the literature, along with information on all of the other related programs and subject areas evaluated in the JLARC study.

Background

The Natural Areas Program at DNR and the Habitat Acquisition Program of the Washington Department of Fish and Wildlife are the primary state efforts acquiring property for habitat protection, although the Salmon Recovery Board and occasionally the Recreation and Conservation Office provide habitat acquisition funding. The goals of these programs are straightforward – to conserve Washington's native species and ecosystems. DNR's Natural Areas Program is comprised of two categories of natural areas: Natural Area Preserves (NAPs) and Natural Resources Conservation Areas (NRCAs). NAPs, as a category, are an outgrowth of the Natural Area Preserves Act (RCW 79.70). Selection of sites for potential addition to the NAP system are guided by the State of Washington Natural Heritage Plan (Washington Department of Natural Resources, 2011). The plan identifies the species and ecosystem types that are priorities for conservation within the statewide system of natural areas. Similarly, NRCAs are an outgrowth of the Natural Resources Conservation Areas Act (RCW 79.71). Selection of potential NRCAs is guided by a broader set of conservation values (i.e., they are not limited to those priorities established in the Natural Heritage Plan), including providing for low-impact recreation opportunities. The Department of Fish and Wildlife program acquires habitat for sensitive or important wildlife or fish species, which are identified in the 2015 Washington State Wildlife Action Plan (Washington Department of Fish and Wildlife, 2015). Overall DFW priorities are detailed in an annual update of their Strategic Acquisition Priority document.

Most available funding for NAPs and NRCAs is based on specific legislative guidelines. Both NAPs and NRCAs were acquired and are managed to promote healthy ecosystems and biodiversity, and secondarily to support valuing of nature and fostering partnerships. In general, however, the NRCAs include a focus on low-impact recreation and open space. Thus, NCRAs are addressed in the recreation discussion while Natural Area Preserves, which are mostly focused on at-risk habitats and species, are addressed here. WDFW's Wildlife Areas are managed to maintain or enhance ecological integrity and to support the department's mission to preserve, protect and perpetuate fish and wildlife. The acquisition of new Wildlife Area properties is also addressed here.

Literature

There have not been many papers that specifically address outcome-based indicators for habitat and natural area

> **Outputs**
> A short list of outputs identified in agency materials, or provided by JLARC, about the programs relevant to species and habitat acquisition:
> - Acres designated or acquired as Natural Area Preserves, Natural Resources Conservation Areas, or Wildlife Areas or enrolled in a conservation easement or protected by a land trust focused on species habitat protection
> - Acres of particular habitats or ecosystems preserved
> - Acres of particular habitats or ecosystems restored or improved
>
> **Outcome statements**
> The primary outcomes the project team identified from the objectives in the enabling legislation of the program:
> - Species, habitats and ecosystems protected
> - Recreation/education opportunities
> - Sites for education and research made available

acquisition-focused protection programs, primarily because these programs are not very extensive in the U.S., and the programs that exist in most states tend to be very small. In general, it has been assumed that the number of occurrences (populations) of species, particularly those at risk of extinction, included in the lands acquired and added to a network of reserves sufficiently describes the outcome for species (Han et al., 2016, Turak et al., 2017). Similarly, either having examples of all the habitat and ecosystem types represented in the network of conservation lands, or the percentage of all of the at-risk habitats that are included is most frequently used (Heinz Center, 2008). However, as identified by JLARC, acres of protected natural areas,

specific habitats or species are more similar to outputs than outcomes, as they primarily reflect effort.

A number of papers have proposed the concept of "ecological integrity" as a way of identifying the condition of specific properties, with the idea that improving or maintaining ecological integrity will assure that species and habitats persist over time (Parrish et al., 2003). This concept has been tried in Missouri by their Natural Areas Program, in some states in the upper Midwest, and is being tested in Washington by the Natural Heritage Program, as well as by the U.S. Forest Service nationally. This idea involves measuring the condition of ecosystems based on how "natural" they are. Naturalness is based on, among other factors, the ratio of native to introduced species, the degree of other obvious disturbance, and the presence of late-seral species (those primarily found in undisturbed areas), or the similarity to what is believed to be the composition of the habitats at the time European settlement of North America began. The concept of focusing habitat acquisitions on natural or pre-settlement conditions is based on the assumption that these are what will be most limiting, and therefore a priority.

To date, ecological integrity assessments (EIA) have been evaluated on a number of individual natural areas, and could be used as an indicator of the status and trends of natural habitats. However, since it is generally used as a field-based tool applied locally to individual natural areas or wildlife areas, it is somewhat problematic as an indicator of how well the natural area acquisitions are protecting species and habitats statewide. NatureServe (Comer and Faber-Langendoen, 2013) and Washington DFW are exploring methods to apply EIA across multiple landscapes, using remote sensing tools. If the methodology can be applied statewide, it has promise as a way to evaluate habitat quality on and off protected lands, although this currently remains untested. In addition, the departure from natural or historical conditions requires a somewhat subjective decision as to what a natural condition should be in any given place. In the past, agencies and scientists have used historical or pre-settlement vegetation to define what a natural condition is in a place. Some state – including Michigan, Wisconsin and Oregon – have spent considerable resources identifying historic vegetation through reconstructing the original land surveyors' notes. Yet maintaining "natural" conditions based on historical conditions, even if they could be objectively identified, may

no longer be possible due to what appears to be irrevocable changes both climate or human development patterns.

In practice

Best Practice: Florida Forever. There are a number of states with medium to large natural area acquisition programs – most notably Massachusetts, Virginia, Minnesota, Arkansas, and Florida. The state of Florida has developed what appears to be a best practice in the implementation of "Forever Florida", a large ($1 billion over 10 years) habitat acquisition program. This website describes the outcomes of the acquisition program succinctly. The state was able to develop these indicators because, among other things, the Florida Legislature specifically listed in legislation, Florida Statute 259.105(3), a set of outcomes they wanted to achieve. The law provides acquisition funding to multiple agencies to achieve goals including protection of at-risk species; important habitats; recreational opportunities; groundwater resources; important wetlands, lakes and rivers; and sensitive coastal areas.

The legislature increased the budget of their state Natural Heritage Program (Florida Natural Areas Inventory, FNAI) housed at Florida State University by an additional $50,000 a year over the 10-year duration of Florida Forever to develop new, or complete existing, statewide datasets needed to prioritize properties for acquisition and to report on how well the goals were being met. FNAI was able to direct this funding on one or two indicators per year. It took approximately six years for all of the statewide GIS datasets to be developed with the funding being used to update each of them annually or biennially with new data within the $50,000 addition. However, it is important to note that this program was made possible by previous financial support, FNAI had been funded under the state's Wildlife Action Plan program to create baseline habitat maps for the entire state and to create and maintain a comprehensive map of all of the conservation lands in the state.

While the Florida Forever outcome statements are listed in acres (Table 1, below), they represent outcome-relevant acres. This is because the data used to target acquisitions are consistent statewide for each goal and the program only counts the acres acquired that directly provide the benefits of interest. For example, the state might acquire a 75-acre parcel to protect an endangered plant species and an endangered salamander that each occupy only a portion of the parcel. Using their methodology, only the 10 or so acres

that support the endangered plant and the 15 acres that support the endangered salamander would be counted in the indicator (Table 1, indicator #1) and not the entire 75-acre acquisition. This is a case where an intermediate indicator can be a benefit-relevant indicator.

Another example is the metric that Florida uses for the significant groundwater recharge areas (Table 5, indicator #10). The Florida Legislature has asked FNAI to evaluate acquisitions simply based on their ability to protect a significant aquifer recharge area. They could have taken the evaluation a step further by also determining how many people accessed that aquifer for water; however, this extra step would require a second, more complex analysis. Oregon has experience with more complex analyses, for example, when the Institute for Natural Resources worked with the Department of State Lands to calculate the number of people who benefit from several ecosystem services provided by wetlands that were protected or restored, particularly for flood damage minimization and water quality improvement. This type of analysis is quite a bit more expensive and time consuming than Florida's approach, since both the amount of additional services provided by each wetland and the number of people living downstream of each wetland need to be evaluated. The state of Florida decided that benefit-relevant indicators were sufficient to inform their outcomes of interest.

Because all of the data were developed statewide, reporting could include the amount of these resources acquired, the acreage included in the overall network of protected lands, or the percentage of these resources protected. Along with these indicators, FNAI annually reports on the number of archaeological or historic sites conserved and the miles of priority recreational trails created within acquired lands. If the focus of the DNR and DFW acquisition programs remained solely focused on the protection of species and habitats, only statewide distribution maps for species and habitats would be required. However, because Washington has much more natural habitat than Florida, creating these maps to evaluate program outcomes would require more effort and funds than in Florida.

Promising Practice: Virginia's land acquisition program. The state of Virginia, another state with a large acquisition program, has built a set of measures modified from the Florida program (Smith, 2017, personal communication). They are similar to the Florida Forever measures, although with a larger focus on acres protected from development,

partially because their program also includes a relatively large farmland and forestland trust program to protect these lands from development, and partially because it was not built on a statewide conservation blueprint, which Florida was able to have developed. In addition, Virginia, due to rapid and often uncontrolled sprawl, has been largely focusing on acquiring as many remnant natural areas in rapidly developing areas, which creates program outcomes that are difficult to evaluate.

Common practice. The Natural Areas Association regularly reports on the status of state natural area protection programs in the United States that focus on natural area acquisitions and management. Their most recent 2015 report identifies the diversity of these programs and their objectives (Thom and Leahy, 2015). The other primary vehicle for state habitat acquisition programs are fish and wildlife agencies, now often guided by state wildlife action plans required by the U.S. Fish and Wildlife Service. However, the project team was unable to find any examples in the literature of outcome-based indicators for land acquisition programs in these agencies or in practice.

The Association of Fish and Wildlife Agencies (2011) developed a report evaluating the effectiveness of all the State Wildlife Grants (SWG), which represent a major federal investment over the last decade, supported by AFWA's Teaming with Wildlife (TWW) program. This report describes a program to evaluate the effectiveness of the outcomes of the funding. But, early in the report it states, "There are two principal types of monitoring questions in conservation. Status monitoring identifies how populations of species as well as the habitats and natural processes on which they depend are doing over time. Effectiveness monitoring determines if conservation actions are having their intended impacts and how they can be improved are focused primarily on restoration and habitat improvement." The remainder of the report focuses on the important need to measure effectiveness, recommends the use of results chains, and makes a plea to state wildlife agencies to collect and report on effectiveness measure species as well as the habitats and natural processes on which they depend are doing over time. Effectiveness monitoring determines if conservation actions are having their intended impacts and how they can be improved are focused primarily on restoration and habitat improvement." The remainder of the report focuses on the important need to measure effectiveness, recommends the

use of results chains, and makes a plea to state wildlife agencies to collect and report on effectiveness measure outcomes. They believe this information is critical to maintain congressional support for the SWG funding, as well as assuring that adaptive management is practiced. They do not discuss status monitoring, which is the information needed to address the questions posted by JLARC regarding program outcomes.

Conclusions

Methods for developing meaningful outcome-based indicators are clearly identified in the literature. They are being put into practice successfully in a few states, but generally very sparsely across the country, and rarely for species and habitat focused land acquisition programs. When evaluating program success, most agencies tend to focus on gathering information they need for adaptive management – either data needed to determine if their actions are achieving their goals, or the information needed to develop plans or strategies. These focus on their need to understand the effectiveness of their actions to restore habitats or to address threats to species and habitats on property they manage – both important issues for agencies wanting to understand the priorities for their work. However, understanding priorities for action or the effectiveness of actions may not inform if the overall program is achieving the desired outcomes.

The most effective programs for evaluating program success in land acquisition, water quality protection, and restoration had a few commonalities. First, the legislation that created these programs was relatively specific in describing the types of outcomes desired, so designing an outcome based set of indicators was more straightforward for agencies. Second, the legislation required that indicators of program success be developed and reported on some regular schedule, and at a minimum funded the development of the indicators and their implementation, often requiring interagency cooperation, which is essential as many agencies and local or regional governments may be involved in program implementation. And lastly, they required statewide (or jurisdiction wide for regional governments such as Tahoe) evaluation of outcomes – which helps to assure the development and measurement of the indicators are not focused on plans or projects.

To understand if acquisition programs are effective at protecting habitats and species in Washington, it is critical to have a reasonable understanding of what habitats and species are in the state, where they are, and approximately how abundant they are. Without this information, it is impossible to understand if acquisitions are making a difference. Historically, programs would develop a strategy, such as "protect the last of the least and the best of the rest", which has been the guidance for natural area acquisition programs for many years; and then focus on measuring if the acquired lands had examples of high quality habitats, and the most at-risk species and habitats on them. Until recently, it has been difficult to assess the distribution and relative abundance of species and habitats across a state, especially using traditional field-based methods. Because of this, a statewide assessment of all the habitats in Washington has not been done in many years, and it is not clear if a statewide habitat assessment has ever been done that the DNR and Fish and Wildlife staff trust.

Table 1. Indicators and metrics for coastal system outcomes identified in the literature or effective practices		
Measure Categories	Indicators and Metrics (Units of Measurement)	Source(s)
Amount of Land and Water Protected For Specific Outcomes	1. Acres of rare species habitat conservation areas, along with the number of sites protected, the number of rare species protected, and how many were state and federally designated as threatened and endangered 2. Acres of unrepresented habitats or habitats of concern 3. Acres of strategic habitats and greenways as defined by their state wildlife or the statewide conservation plan 4. Acres of properties large enough to represent landscape conservation 5. Acres of floodplains and riparian habitats 6. Acres of areas which include significant lakes and rivers or are important to their functioning 7. Acres of lands conserved to minimize downstream damage from flooding 8. Acres of fragile coastlines 9. Acres of functional wetland areas 10. Acres of significant groundwater recharge areas 11. Acres of sustainable forest lands 12. Acres of land within urban boundaries	FNAI, 2016(a) and (b)

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