Landscape Conservation Design: Applications and Lessons Learned
Symposium Synthesis
International Association of Landscape Ecology, World Congress
July 2015
Portland, Oregon

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The 2015 World Congress was a joint meeting between the **International Association of Landscape Ecology World Congress (WC)** and the **U.S. chapter of IALE (US-IALE)**, held at the **Hilton Portland & Executive Tower in Portland, Oregon, July 5 - 10, 2015**. The theme was: **Crossing Scales, Crossing Borders: Global Approaches to Complex Challenges**. The meeting brought together nearly 1,000 leaders in landscape ecology from around the globe, including educators and practitioners in the fields of geology, ecology, biology, geography, and landscape preservation and design, dedicated to preserving and protecting our natural resources.

Overview
Landscape Conservation Design (LCD) represents the interface between the science of landscape ecology and the practice of conservation planning to meet societal goals for sustainable, resilient, and ecologically-functional landscapes. LCD provides a multi-scale, cross jurisdictional, and multi-sector collaborative approach to addressing complex natural resource challenges managers face today. Landscape Conservation Cooperatives (LCCs), a North America-wide (also Caribbean and Pacific Islands) network launched by US Department of the Interior to address climate change and other landscape stressors, have developed LCD as a major focus and many LCCs have active LCD projects underway.

The goals of this symposium were to identify lessons learned and best practices from emerging LCD projects throughout North America using specific case examples, provide a forum for a community of LCD practitioners, and facilitate dialogue between land managers and landscape ecologists, planners, and other stakeholders.

This symposium relates to the conference theme, "Crossing Scales, Crossing Borders: Global Approaches to Complex Challenges," since a fundamental goal of LCD is to apply large

landscape assessments to local conservation policies and actions. LCD strives to cross jurisdictions and facilitate managers to think about resource management from an ecosystem, not political, perspective. One of the stated goals of the LCCs in relationship to LCD is to develop an "International Network of Functional Landscapes." Also, The LCC Network views LCD as a means to meet a primary goal of the National Fish and Wildlife Climate Adaptation Strategy to "identify areas for an ecologically-connected network of terrestrial, freshwater, coastal, and marine conservation areas that are likely to be resilient to climate change and to support a broad range of fish, wildlife, and plants under changed conditions."

The mix of presentations, a forum, and "world cafe" will provide a variety of levels of interaction between landscape ecologists, managers, and the broader audience.

Symposium, Part 1: Presentations

The following presentations were given during the first part of the Symposium. For copies of the presentations, go to https://griffingroups.com/file/folder/328424#328424. Abstracts are provided below.

Presentation 1: Conservation of Sustainable Landscapes by Design, Rob Campellone, USFWS

Conserving sustainable landscapes in the 21st century is a significant challenge that requires a fundamental shift in thinking and action, addressing both social and ecological systems. "Landscape conservation design" is an integrated, collaborative, and holistic landscape-scale, science-based process and product that seeks to enhance the efficiency and effectiveness of stakeholders' missions, mandates, and goals while ensuring landscape sustainability for current and future generations of Americans. It involves intentional human changes to landscape patterns to sustainably provide ecosystem services that meet societal needs and respect societal values. This paradigm is innately interdisciplinary and partner-driven, involving diverse stakeholders, who plan, identify and implement strategies across the landscape to achieve diverse goals. This presentation will provide an overview of the policy that supports a landscape conservation design approach, as well as an overview of the process itself.

Presentation 2: The Green River LCD, John Rice, Southern Rockies LCC

The Southern Rockies LCC (SRLCC) began funding science in 2011. Since that time, the SRLCC has adopted a strategic conservation framework, focal resources and geographic focal areas. This has allowed us to strategically acquire and develop science related to partner identified needs. In 2014, the SRLCC initiated the Green River Basin Landscape Conservation Design (LCD) project in coordination with the Great Northern LCC. The project will provide significant opportunities to develop partnerships, and will promote a collaborative and organized approach to resource decision-making along a several hundred mile stretch of the Green River in Wyoming, Colorado and Utah. The landscape design will play an important role in a science

acquisition and development strategy that promotes a link to on-the-ground management decisions.

Presentation 3: Assessing the Role of Indicators and Connectivity for Conservation Planning of Southeastern U.S. Pine Woodlands and Savanna", Brad Pickens

Systematic conservation planning efforts are valuable for efficiently allocating conservation actions given the restraints of limited resources. The South Atlantic Landscape Conservation Cooperative is using this approach to develop a shared Conservation Blueprint for the region spanning from southeast Virginia to northern Florida, USA (~90 million hectares). The goals of the approach are to assess current conditions by using ecological and cultural indicators, and then to incorporate future projections of threats to optimize conservation strategies. Here, our objectives were to: 1) use indicators of pine bird index, open canopy and burned areas, priority amphibian and reptile conservation areas, resiliency, low road density, and historic places to prioritize hotspots of ecological and cultural integrity within the range of historic longleaf pine savanna; 2) use cross-validation to determine if indicators are effective and robust; 3) test the effect of boundary length penalties; 4) examine conflicts with projected urbanization by 2050. We used Zonation to conduct optimizations of the pine ecosystem. This software uses the concept of minimizing marginal loss to produce a spatial prioritization at a relatively fine scale. The cross-validation results showed the prioritization was relatively robust to changes in indicators, and thus, demonstrates that indicators can be effective for prioritizing pine habitats. Greater amounts of connectivity, characterized by the boundary length penalty, did improve the correlation between the full model and leave-one-out model in some cases. Finally, we demonstrate how an urbanization scenario can be integrated with the spatial prioritization to further refine the selection and location of conservation actions.

Presentation 4: The Connecticut River Watershed LCD, Scott Schwenk, North Atlantic LCC

The North Atlantic Landscape Conservation Cooperative (LCC), the U.S. Fish and Wildlife Service, and UMass Amherst led a collaborative effort in 2014-2015 to develop a landscape conservation design for the Connecticut River Watershed. The pilot effort is designed to serve as a demonstration for applying large-scale conservation design tools and processes supported by the North Atlantic LCC and other regional partners. The design is intended to reflect the common priorities of governmental and nongovernmental partners working within the 7.2 million acre watershed and, ultimately, to guide shared conservation actions to protect, restore, and manage lands and waters to sustain the species and ecosystems of the watershed. Steps in the design process have included: 1) developing overall goals for ecosystems and for species of fish, wildlife, and plants; 2) combining concepts of ecosystem integrity and resilience with mapped landscape and ecosystem features to identify ecosystem priorities; 3) translating population objectives into habitat objectives for selected representative species of fish and wildlife; 4) incorporating scenarios of future climate change and development into the design; 5) combining ecosystem and species priorities into a unified network of core areas and connectors; and 6) mapping information about ecological values and priorities outside of the core area

network. The design was developed through regular meetings of more than 30 conservation partners. Future steps include implementing and monitoring the design and extending the approach to other areas in the Northeast. More information is available at: http://northatlanticlcc.org/groups/connecticut-river-watershed-pilot.

Presentation 5: Coupling Conservation Action Planning and Marxan to identify a Landscape Conservation Design in the Columbia Plateau Ecoregion, Madeline Steele and Sonia Hall

The Arid Lands Initiative (ALI), an assemblage of public, private, and nongovernmental organizations, was convened to develop and implement a coordinated conservation strategy for the Columbia Plateau. A major component of this ongoing effort involved mapping shared conservation priority areas. We used Marxan and based model inputs on a pre-existing Conservation Action Planning (CAP) process. In the CAP, the ALI partners had agreed on biological priorities and identified Key Ecological Attributes (KEAs) that describe each target's viability. For each KEA, they selected quantifiable indicators, and identified thresholds that distinguished between poor, fair, good, and very good condition. To translate this CAP viability analysis into a Marxan assessment, we used "stacked" Marxan targets. In this approach, the entire distribution of an ecosystem is targeted by Marxan, but subsets of that area that satisfy additional KEA thresholds are targeted again. For example, the entire shrub steppe system was one Marxan target, and patches of shrub steppe exceeding 500 acres (threshold for "good" category) were treated as an additional target. With such a configuration, Marxan will typically meet its goals in areas that score well based on multiple KEA indicators, but can also select lower integrity areas if needed to satisfy overall goals. Defining targets and goals based on indicators that reflect the ecological integrity of ecosystems and species differs from the traditional use of Marxan models, and better aligns with current trends in landscape design. The resulting prioritization has been embraced by the ALI, and is being used to inform management.

Presentation 6: Characterizing recent patterns of land conservation as part of a regional land-use regime. Spencer Meyer

Landscape ecology theory provides insight about how large assemblages of protected areas (PAs) should be configured to protect biodiversity. We adapted these theories to evaluate whether the emergence of decentralized land protection in a largely private landscape followed the principles of reserve design. Our objectives were to determine: (1) Are there distinct clusters of PAs in time and space? (2) Are PAs becoming more spatially clustered through time, and (3) Does the resulting PA portfolio have traits characteristic of ideal reserve design? We developed a historical dataset of the PAs enacted since 1900 in the northern New England region of the U.S. We conducted spatio-temporal clustering, landscape pattern, and aggregation analyses at both the landscape scale and for specific classes of landownership, conservation method, and degree of protection. We found the frequency of PAs increased through time, and that area-weighted clusters of PAs were heavily influenced by a few recent large PAs focused on natural resource management. PA clustering around preexisting PAs was driven primarily by large PAs focused on natural resource management, rather than strict reserves. Since 1990, the complete

portfolio has increased in aggregation, but independently reserve patches have become less aggregated and smaller, while patches that allow extractive uses became more aggregated and larger. Our extension of landscape ecology theory to a diverse portfolio of PAs underscores the importance of prioritizing conservation in the context of existing PAs, as well as the contribution of large conservation easements to the overall conservation portfolio.

Symposium, Part 2: Manager's and Practitioners Forum

Moderator: John Mankowski, NPLCC Coordinator

The Symposium included a one-hour panel discussion of how LCD products are being or intended to be used in management planning, and recommendations for future efforts. The panel discussion will involve each panel member describing their individual organizations interest in getting involved in a collaborative landscape planning effort. Discussion topics posed to the panel will revolve around: 1) expectations of engaging in landscape planning effort. e.g., what benefits to organizational planning and implementation are expected?; 2) What are some potential pitfalls or problems that have been encountered?; and 3) how are these efforts embraced across different levels of the organization, from field to line management.

The purpose of this panel is to hear from resource managers about their organization's experiences with past or current LCD efforts. We want to garner insights on how to improve the LCD process, build internal and external support, and ultimately, use LCD to drive twenty-first century conservation. This informal forum is designed to get beyond the usual "Power Point bullet summaries" and share your experiences, insights, fears, and hopes for using LCD to address landscape-scale collaboration conservation.

The Forum Panel consisted of:

Louisa Evers, Bureau of Land Management. Research Liaison and Climate Change Coordinator, Bureau of Land Management, Oregon-Washington State Office, Portland, Oregon.

David Cohen, Program Manager, The Intertwine Alliance. His work with the Alliance is focusing on facilitating discussions and implementing efforts among the leaders in the various areas of the environmental community and leveraging that critical mass to complete strategic projects at the regional level.

Charles Houghten, USFWS. Charles is currently the Lands Division Chief for the U.S. Fish and Wildlife Service's Pacific Region, based here in Portland, Oregon. He oversees the Realty – Land Acquisition, Refuge Planning, GIS and other functions for the National Wildlife Refuge System. (The Pacific Region covers the Pacific Northwest (Washington, Oregon, Idaho) and Hawaii and the Pacific Islands)

Cathy Macdonald, TNC. Cathy is the Oregon Director of Conservation Programs for The Nature Conservancy. She leads a forty-five person team of scientists and conservation practitioners to design and advance collaborative, pragmatic solutions to conservation challenges facing nature and people in Oregon.

Key Themes Articulated by Panel Participants:

- In the Pacific Northwest, landscape planning emerged from Northern Spotted Owl and Northwest Forest Plan. This evolved into other projects such as the Interior Columbia Basin Ecosystem Management Plan (ICBEMP). However, ICBEMP never really came to "fruition". Recent efforts by the BLM with their Rapid Ecoregional Assessments (REAs) attempt to develop a landscape framework for management. Currently, Greater Sage-grouse is a dominant factor in landscape planning.
- For collaborative landscape conservation, we need a "new way of doing business". There is a need for neutral, nimble entities to be convening bodies (bridging organizations, boundary organization, backbone organization, etc).
- LCD can be seen as a "common operating system" for organizations to engage in landscape design. For example, the USFWS and their Strategic Habitat Conservation (SHC) framework has business needs to engage in collaborative landscape planning, however, would rather integrate with existing efforts than create a new one.
- Engaging a broader community, scientific language is not resonating. We need to tell stories with data, but not dumbed down; look to other diciplines for concepts that support conservation. Landscape planning in a large bureaucracy tend to put out dense reports that no one wants to read.

Symposium Part 3: World Cafe

A facilitated "World Cafe" was conducted to capture participant's perspectives on opportunities and barriers to the practice of LCD. The World Cafe consisted of 3 rotating breakout group, each facilitated by a member of the organizing committee. Each group focused on addressing the necessary elements for successful LCD around 1) scientific and technical aspects of LCD, 2) management and policy, and 3) multi-stakeholder collaboration. This World Cafe built from a similar effort conducted 9 months earlier at the Large Landscape Conference in Washington, DC (http://www.largelandscapenetwork.org/). There were 4 questions that were asked of the 3 rotating groups each related to a core element of LCD: convening, assessing, prioritizing, and implementing.

The questions are below, followed by notes that were recorded. The notes are, for the most part, as they were written by our notetakers. Thus, the notes are raw, but provide insight into the discussions at the World Cafe.

Question 1: What can convening bodies do to ensure engagement of landscape stakeholders, including development-oriented interests in LCD processes?

- We touched on this before: one carrot is the opportunity to demonstrate that an organization values conservation

- In the Maine project, they forced themselves to do this. It was difficult to identify stakeholders. It was a deliberate effort but a bit unofficial, and took advantage of existing social networks of the researchers as they weren't sure whom to invite.
- It's difficult to figure out just who should be involved
- It's very important to use language carefully
- The Maine group appealed to developer's frustrations with complex regulations. They wanted to know where they should develop
- They really appreciated the map of places that were ok for development, where they were unlikely to meet with opposition
- Once you get one or two development groups at the table, then it's easier to attract others
- The Maine group started with all the groups separated, then brought the groups back together. The dynamic was collaborative.
- You need to have a genuine interest in everyone's perspective and in helping them meet heir goals
- The business people aren't actually paid to be in meetings. It's important to really respect their time and keep the meetings short. There was more accountability with these volunteers than with government staffers who were just doing their jobs
- A good way to engage developers is to emphasize that these processes will save them time and money.
- Starting with each stakeholder segment separated gave everyone a chance to get comfortable with the process
- Developers actually preferred towns with strict zoning because it was predictable. This way they were less subject to the whim of the zoning committee
- It's so essential to get everyone at the table, because it can be easy to make incorrect assumptions about the priorities of another group. For example, the Maine group thought that developers favored areas with a low tax rate, but in fact it was the opposite.
- It's key to really respect all stakeholders. For example, the Montana DOT is so used to being attacked by combative environmental groups that are concerned about road kill that they were skeptical, but when the convening group clarified that they understood that the DOT's top priority was human safety, that they had a limited budget, etc., they were happier to participate.

Question 2: What science processes/products are essential in assessing the current landscape condition?

- use smaller extent data that may not cover entire AOI because it's still informative to areas without data; also may help discover bias in the data you do have;
- SALCC use resilience instead of ecological integrity estimates;
- also look for correspondence among disparate data sets/source to seek qualitative validation;
- Managers want fine resolution data or they suspect the data isn't useful;
- figure out what are objectives before looking for what's available;
- know what's relevant before deciding what is relevant;

- Need for modeling because everything is not measured everywhere – working at large landscapes requires models;
- working with biologists … they're concerned that modeling takes resources from monitoring; can't justify models in place of data;
- needs to be a balance; models are worse with less data so need some data, a model and resources to validate; models are important for context "is the landscape functioning well?" getting at landscape condition,
- you don't need a model … stakeholders can answer questions without models;
- Field data and models are both needed; data must be representative …
- we thought our condition was great but deeper critique showed the data had a bias; assessment of landscape condition when based on experience/expertise can be biased by access/sampling
- What aspects of landscape condition do we not have good condition for? Invasives, cultural resources, aesthetic value,
- Conservation action data; social network map of the various players – who's working together – you can get some useful information by mapping governance pattern;
- in addition to mapping landscape condition, include the social landscape; know who's working in what regions; densities of field staff and capacity; reveals unbalanced staffing … are big problems matched with appropriate staff?
- Dealing with so much complexity; DST not relying on human brains; unless you're dealing with a small geography we need products decision makers can get their heads around; simplicity (at the risk of missing some detail);
- balance need for the desire to accurately model full landscape complexity –
- what is appropriate level? In most cases, there is not one appropriate level of complexity; thoughtful and objective elimination of the complexity; how do you synthesize in a way that's meaningful;
- Synthesize most compelling information into the elevator speech because you may get only one chance; need to know what resources are the inputs to LCD and base your data search on those targets; seamlessl Not good either;
- tie models to benchmarks of progress toward achieving (or progress toward) objectives;
- How do you decide which processes are most critical? How do you identift weakest link;
- Some stakeholders will never accept a model – they don't trust them; you do the best model but nobody uses it?
- Polycentric approach toward prioritization;Lots of data – land cover, land use, imagery, computing power; GIS, expert input, expert evaluation & participatory evaluation; need on the ground data (despite reluctance … we're working on a landscape not a patch);
- work to validate data, especially ground truth coarse (i.e., land cover) for finer decision making; partner networks facilitate that validation … not always 'my favorite pixel' sometimes there's real errors; report it back in addition to applying immediate needs;
- Expert and participatory: lots of places where we don't have peer-reviewed science so we can't be averse to local and expert knowledge; local knowledge may not have expertise but not including locals into process may kill implementation of the design; implementation occurs in a plot/allotment/place so it's critical the locals are bought in;
- What is resilient, what are climate implications; when working on broad scale

- work up and down governance … how to get local buy in in a regional plan? Or body of data is growing but there are big gaps especially historical condition; can fill in with models and data integration;
- data has to have a purpose to invest in collection but now our questions are different than they used to be, so we may be more reliant on knowledge;
- Scientists don't want to admit limitations on data/models; a bit more transparency may help communicate with the public; it's a springboard to cyclic data needs and acquisition; also acknowledge that we can't make a decision if we don't have data – don't just blunder ahead if the critical data aren't available; don't over extend knowledge … admit data gap and prioritize data collection;
- Share information and build in feedback loops;
- Departure analysis an important need (reference condition and departure from reference); Is departure always a bad thing? Not inherently but the analysis sets up the discussion for whether it's a good thing.

Question 3: What qualitative and quantitative methods should be considered when identifying plausible future conditions and a desired landscape?

- Climate and land use projections
- In the western states, data from the BLMs Rapid Ecoregional Assessments.
- Ecological linkages and Connectivity
- Depends upon who the partners are.
- There should be methods for dealing with uncertainty
- Desired landscape: Future conditions.
- Logically coherent futures that are stakeholder driven arethe most effective
- What is important to our culture to maintain. Ecological functions...a sense of who we are. As our population grows. There are certain things. Narrative elicitation.
- Develop means to assess cultural values in a spatially explicit way.
- Scenario planning done in the last decade. Normative scenarios.
- Land Facet analysis
- Simulation modeling.
- Development scenarios. How development will play out across the landscape.
- Mapping out values.
- Tools like Marxan that get at existing condition.

Question #4: What challenges/opportunities lay ahead for convening bodies in their efforts to facilitate identification of multi-jurisdictional, coordinated strategies?

Opportunities:

- High level mandate to all agencies to be working on large scale collaboration. So people have the concept/conceptual framework, if not the shared language.
- Climate change, and shift in perception. E.g. Transportation agencies not ignoring climate change impacts. Pope acknowledging it, local entities acknowledging it.
- Complex challenges have implications for more stakeholders, and so more ability to build a culture of looking at landscapes.
- Internet – potential for remote connections/communications. Need to balance with face-to-face, as it doesn't fulfill the same function.
- Webex for pre-workshop designing – learn the common languages.
- Interactive web tools to engage people. More need for the interpretation/support service of the tools/maps/datasets/plans developed. Make it useful. "Extension agents".
- Funding the delivery with the project.

Coordinated strategies:

- Is the goal to develop coordinated strategies, or to point out opportunities driven by shared priorities? Many see it as the latter, so it would require a "cultural shift".
- Do you then have the right stakeholders/partners at the table?
- Also build a culture for every representative communicating within their own agency/entity… share successful efforts, develop communications materials, have some accountability.