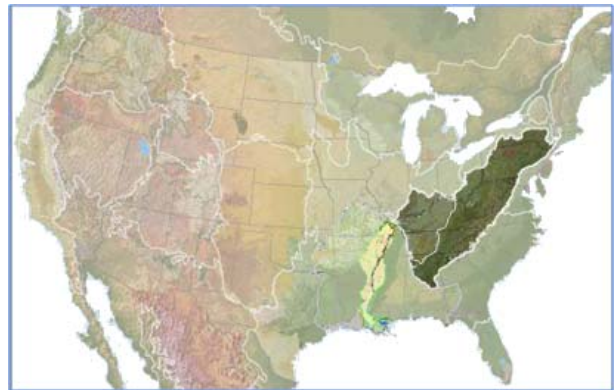




APPALACHIAN LCC

Appalachian LCC Workshop
November 29-30, 2011
December 1 (Writing Team)
Blacksburg, VA

Draft Report (Full)
December 5, 2011



317 E. Jefferson Blvd.
Mishawaka, IN 46545
574-258-0100 – phone
www.djcase.com

DJCase
& associates

Communication Specialists in Natural Resources Conservation

Prepared by:
Sarah Hughes, Project Manager / Logistics
sarah@djcase.com
Gwen White, Facilitator
gwen@djcase.com

Prepared for: Dr. Jean Brennan
Bridgett Costanzo
Megan Nagel
US Fish & Wildlife Service

Table of Contents

Overview and Process	
Purpose and process of workshop.....	3
Participant nomination and preparation process.....	3
Preparation materials.....	4
Webinars.....	4
Definition of terms.....	5
Science needs ranking guidance.....	5
Workshop Planner, Appalachian LCC Coordinator, Workshop Planning Team.....	7
Workshop Notes	
Day 1 Plenary Sessions.....	8
<i>Master of Ceremonies</i> – Bridgett Costanzo.....	8
<i>Welcome and Opening Remarks</i> – Paul Johansen.....	8
<i>The Appalachian LCC within the Regional Conservation Context</i> – Ken Elowe.....	9
<i>Landscape Planning: Examples and Lessons Learned</i> – Rob Baldwin.....	10
<i>Framing the Appalachian Challenges and the Science Needs Component</i> – Jean Brennan...12	
<i>Setting out the Workshop Process, Expectations and Outcomes</i> – Chris Burkett.....	14
Day 1 Work Group Reports.....	16
Day 2 Wrap-up / Work Group Reports.....	Error! Bookmark not defined.
Appendices	
Appendix A Workshop Agenda.....	Error! Bookmark not defined.
Appendix B. Registration List.....	38
Appendix C. Technical Leads, Note Takers & Breakout Assignments.....	42
Appendix D. Miscellaneous notes from group discussions.....	52
Appendix E. Appalachian LCC Day 1 – Portfolio across disciplines.....	78
Appendix F. Appalachian LCC Day 2 – Top Ranked Science Needs.....	Error! Bookmark not defined.
Appendix G. Appalachian LCC Day 3 - Final Ranked Program / Need Descriptions.....	180

Priority Conservation Science Needs Workshop

November 29-30, 2011; Inn at Virginia Tech

Overview and Process

The Appalachian Landscape Conservation Cooperative (LCC) is a partnership working to improve science products supporting conservation of natural resources. For more information about the Appalachian LCC, visit the website at: <http://www.applcc.org>

Purpose and process of the workshop

The workshop assembled researchers, biologists and managers from across the Appalachian region to identify a Portfolio of science needs addressing conservation challenges and opportunities across the landscape. The Portfolio will serve as a critical guiding framework to help facilitate and support the conservation planning, delivery, and applied research and monitoring efforts across the region.

Attendees identified the longer-term, comprehensive Portfolio of science needs, but were also charged with ranking top science needs for potential funding support. Prior to the November workshop, foundational materials, including webinars, were distributed to attendees to provide crucial guidance and background for participation. Appendix A contains the workshop agenda.

Products of the workshop will be:

- A Synthesis Report outlining the Portfolio of Science Needs that reflect conservation priorities across the region, and recommendations of the top ranked projects that the decision-making body may wish to consider immediately;
- The full, Final Science Needs Report of broader workshop discussions including the Portfolio of science needs that will serve as guidance to inform future conservation and science-support funding through the Cooperative.

Participant nomination and preparation process

Workshop planners knew there were many more experts in the region than the 80 participant maximum that was originally planned for the workshop. Given the unique partnership represented by the LCC, the Workshop Planning Team (WPT) wanted to ensure that the final list of attendees reflected a representative balance of technical or subject-matter expertise, across taxa and systems, regional or sub-regional expertise, a sectoral diversity across the Cooperative membership, and included a balance of both researchers and managers. Therefore, the WPT solicited names and contact information for prospective participants until October 12, 2011.

Due to the overwhelming interest in the workshop and opportunity to gather input from a broader set of constituents, workshop planners selected a larger number of participants than originally intended, accommodating up to 130 participants and expanding the number of breakout work groups to seven on the first day and six on the second. Appendix B provides complete list of workshop registrants. Appendix C indicates breakout groups for Day 1 and Day 2.

The Appalachian LCC also invited participants to attend the workshop remotely via the website: <http://applcc.org/page/workshop2011>. At the website viewers could:

- View recorded presentations about landscape level science from regional conservation leaders.
- Read the agenda and read each day’s summary notes of workshop results.
- Watch live broadcasts (these will also be archived) of the workshop plenary sessions.

Preparation materials

Materials to prepare participants were placed a few days in advance of the workshop on the website at:

<http://applcc.org/page/november-science-needs-workshop-resource-materials>

The WPT recommended that participants prioritize their reading in the following order:

- 1) Agenda – review the times and note that lunch was provided
- 2) Mission & Vision and Map of the LCC – set the boundaries for discussion.
- 3) Portfolio Schematic – set the context for the process of reviewing programmatic needs and provided consistent understanding of some terms of art that were used.
- 4) Science Needs – participants worked intensively with this list in facilitated sessions, refining program descriptions and identifying highest priority immediate needs, starting with the list that matches their expertise. Participants were in a breakout with others from their region and discipline on the first day. On the second day, groups were mixed and participants were reviewing other sets of needs.
- 5) Webinars – no more than 20 minutes each, review recorded presentations for topics that most closely matched their expertise or for those which they need a refresher.

Complete participant lists and room assignments for rotating breakouts were available at registration at The Inn on the Virginia Tech Campus, Blacksburg, VA.

Webinars

In preparation for the workshop, coordinators assembled a suite of Resource Materials. These were presented as short video presentations (~20 min.) to give a broad introduction to the products, tools, and planning framework and initiatives that have been initiated by Cooperative members, partners, and neighboring LCC communities. Participants were encouraged to take the time to review the materials that will introduce them to:

- How LCCs fit within the [Regional Conservation Framework](#) (illustrative example of the work from the North Eastern states and North Atlantic LCC; presented by Ken Elowe, USFWS NE Region) and the role of LCCs as we enter a new era in conservation, and the [SE Conservation Adaptation Strategy](#) (presented by Bill Uihlein, USFWS SE Region);
- Overview of the various [landscape planning tools](#) (Rob Baldwin, Clemson University) and the tools and approaches being developed by neighboring LCCs (North Atlantic LCC; Andrew Milliken presenting [Representative Species approach](#) and Designing Sustainable Landscapes tool) (Gulf Coast Plains and Ozark; John Tirpak presenting the [Conservation Planning Atlas](#)) (South Atlantic LCC, Rua Mordicai presenting the [Optimal Conservation Strategy](#) decision support model) (Upper Mid-West and Great Lakes LCC; presented by Olivia LeDee on the [Vulnerability Assessment and Interactive Workshop](#))

and (Peninsular Florida LCC; presentation by Juan Carlos Vargas on the [South Florida planning model](#) developed in collaboration with MIT and partners involved with Everglade conservation);

- Threats assessments and how to models to help inform and guide future land-use decisions as they relate to [energy development](#) (Nels Johnson and Tamara Gagnolet, TNC-PA) and [urbanization](#) (Todd Jones-Farrand, ABC); and
- Efforts at the [federal level to coordinate among all the agencies across the Southeast](#) with program being implemented in overlapping areas to better plan and to be more efficient and effective manner (by Rick Durbrow, EPA-Region 4.)

Two additional webinars may be recorded for future reference.

Definition of terms

Term: Portfolio

- Roughly equivalent to a Strategic Plan
- Provides a vision of research gaps and desired environmental conditions
- Limited spatially by bounds of AppLCC
- Prioritized descriptions of science needs and actions.

Term: Theme

- Broad organizational structure for Portfolio (e.g. Ecosystem Services)
- Fundamental aspects of the landscape or tools used to understand these landscape components
- Described in terms of current challenges as well as desired condition
- Initial list developed from input process (AppLCC Listening Sessions)
- Equivalent to an Objective w/in a State Strategic Plan.

Term: Program

- Subthemes that further organize the Science Needs Portfolio
- Consists of research topics (e.g. Water Quality)
- Equivalent to a Program w/in a State Strategic Plan
- Multiple Themes may share same Program(s).

Term: Science Need

- Specific research or conservation planning/design action needed to improve scientific understanding and support sound conservation management decisions under a given Program (e.g. Program: Water Quality/Science Need: predict sedimentation rates with altered precipitation events under climate change.

Science Needs Ranking Guidance

Participants were asked to consider the follow points as guidance in evaluating the adequacy of each potential activity or research investigation as they identified and built the Portfolio elements. (This list is not presented in order of importance or priority, nor does it imply that all points must be satisfied to be included within the Portfolio.)

1. **BUILDING BLOCKS OF THE PORTFOLIO:** Identified activity or research investigation fits within the broader Appalachian LCC Conservation Priorities Science Needs Portfolio, both in terms of outcomes, products, timeline and sequence (i.e., a foundational elements or components already in place and this represents the next integrative step).
2. **ADDRESSES COMMON IMPACTS/THREATS:** The activity or research investigation addresses common impacts (i.e., threats to the conservation of natural lands or resources that multiple Cooperative members are dealing with...“lift all boats”).
3. **ADDRESSES REGIONALLY UNIQUE RESOURCES OR BIOLOGICAL DIVERSITY:** The activity or research investigation addresses unique threats or addresses the needs of highly significant and unique habitats or endemic populations but safeguards resources unique to the region or sub-region (i.e., conservation units which have a more limited distribution and may not be common to all).
4. **ADDRESSES LANDSCAPE SCALE (LCC) ISSUES:** The activities or research contribute toward addressing global or regional threats which require a landscape-level (LCC-scale) spatial approach in order to formulate a coordinated response or investigation (“No single entity has the capacity or resources to address the issue alone”).
5. **ENHANCE CONSERVATION PLANNING AND DECISION-MAKING TO ENHANCE DELIVERY:** Production of a broad landscape-planning analytical or decision support tool or integration of existing data to standardize and link across administrative or state boundaries and serve the needs of multiple conservation delivery members across the LCC. Examples of this are the “Designing Sustainable Landscape” tool developed in the NE (ACJV + NALCC) or the “Optimal Conservation Strategy” tool being developed in the SE region.
6. **SUPPORTS ADAPTIVE MANAGEMENT:** Activity or research advance the LCC joint efforts to identify and incorporate effectiveness measures into landscape-level conservation planning, design, delivery, or monitoring and helps establish conservation targets. [Note: the use of the term ‘effectiveness monitoring’ as opposed to status monitoring -- effectiveness measures are defined as indicators used to assess whether a given conservation action is leading to its desired objectives and ultimate impacts (AFWA 2011 publication.)] Examples of this might include the use of representative species approach to assess habitat condition and set population objectives.
7. **SYNTHESIS AND EVALUATION:** Activities or research support strategic review, evaluation, and synthesis describing the relative merits, proper application, and bounds of uncertainty of tools, methodologies, and strategies currently being applied with the intent of providing guidance to land and resource managers across the Appalachian LCC. Example of this includes the review and guidance prepared by Katherine Hayoe on selecting appropriate climate downscale models.
8. **ENHANCE RISK MANAGEMENT:** Activity or research investigation helps remove or resolve some uncertainty that is currently an impediment to the conservation community in

planning, prioritizing, and taking action but must be integrated to manage risk to valued resources.

9. **TEST PROMISING PROOF OF CONCEPT:** Supporting the deployment of larger-scale/wider ranging system of experimental treatment or manipulation that reflect the application of promising result from a more narrow pilot study or demonstration activity.

10. **CAPITALIZE ON UNFORESEEN OPPORTUNITIES, CHANGES, and/or IMPACTS:** Activities or research investigations associated with unique, often time-sensitive opportunities or events to document and assess ecological response to impacts. Examples may include chemical spills or changes in disturbance regimes of fire, flooding, disease/pest/pathogen outbreaks.

For more information about the workshop, contact:

Bridgett Costanzo, Workshop Planner, 757-817-5803, Bridgett_Costanzo@fws.gov
Dr. Jean Brennan, Appalachian LCC Coordinator, 540-553-4337, brennanj@vt.edu

Workshop Planning Team:

Bridgett Costanzo	Tai-Ming Chang	Megan Nagel
Dr. Rob Baldwin	David Day	Patrick Pitts
Danna Baxley	Dr. Mary Foley	Dr. Brian Smith
Hugh Bevans	Dave Hartos	Rick Bennett
Dr. Gwen Brewer	Callie McMunigal	Gary Peoples
Chris Burkett	Dr. Rachel Muir	Thomas Minney

Workshop logistics and facilitation:

Sarah Hughes, Project Manager / Logistics, DJ Case & Associates, sarah@djcase.com
Gwen White, Facilitator / Note Taker, DJ Case & Associates, gwen@djcase.com

Workshop Notes

The following notes are not meant to be a transcript of the meeting but to convey the content and concepts presented during the plenary discussions. Handouts with presentation slides are provided in Appendices X – X [to be added].

DAY 1. Conservation Priorities Science Needs Workshop

Day 1 - Morning Session: PLENARY

Master of Ceremonies: Bridgett Costanzo, Acting Science Coordinator

- Five speakers today (introduced speakers).

Welcome and Opening Remarks

Speaker: Paul Johansen, Appalachian LCC Vice-Chairman, WV Natural Resources, certified wildlife biologist, BS in Wildlife Biol from Mass, MS Wildlife from VA Tech, serves on international committees.

- Excited to be here at Virginia Tech.
- Provides opportunity to meet together and work with brightest scientists and natural resource managers in Appalachian regions.
- Jean Brennan, LCC Coord, David Whitehurst, Chair and WPT building framework. During next 2 days will identify top science needs based on conservation priorities.
- Next steps for collaborative planning, design of conservation programs, will take a lot of work. Exciting effort to identify critical science to address issues that have bedeviled agencies and organizations.
- Appalachia is blessed, unique part of country. Forests, rivers, abundance of wildlife, habitats, economic resources. Managing not always easy, but should be pleased with accomplishments. Unique topography and geologic history. Richest temperate forest, hot spots of biodiversity.
- Painfully aware of problems. Not unique in declining, loss of federal funding, changing workforce with retirement. Changing land use of farming, timber, population growth demanding space, development and energy extraction threaten water quality and quantity. Energy from new and traditional sources. Invasive species, climate change that could fundamentally alter character of landscape.
- Issues too big to handle alone. So big, new and complex that won't fully understand nature of impacts for approach. Need collaborative complementary efforts. Created LCCs and Climate Science Centers to engage DOI, federal agencies, states, Tribes, local

government, public. Demonstrated what partners and agencies can do together.
Opportunity to make positive change in addressing problems.

- AppLCC created as science and management partnership to:
 - Protect resources
 - Sustain benefits
 - Help systems adapt to landscape stressors
- Helps all who are concerned about resources. Identifies and answers research questions regarding threats. Will provide with data, tools, strategies to make us more efficient managers.
- During next 2 days, will rely heavily upon you for insights, science needs, nominated by peers as experts and authorities in field. Need knowledge, input, and perspective. Determine which challenges to face first, set a course. Thank you for coming to Blacksburg

The Appalachian LCC within the Regional Conservation Context: Introduction to the NE Conservation Framework

Speaker: Dr. Ken Elowe, Assistant Regional Director, Science Applications USFWS, formerly with Maine Dept, United Nations in Jordan.

- Working with Paul for a long time (20 years). Exciting time in conservation. Not sure if we would get enough people, enough interest. Has been overwhelming interest in not just challenging, but daunting work. Neat illustration of dedication and expertise.
- Need to work together to reduce to bite sized chunks. Lots of needs. Over past year, have been compiling huge lists of science needs. How to figure out what to do next – through a conservation framework. First, history then context and future.
- Lessons learned in northeast and southeast. Workshop in June to define science needs in context, sponsored by NEAFWA and NE Atlantic LCC (13 states plus DC, lots of partnerships). Region encompasses wider area Maine to WV and NY.
- Objectives to agree on way forward (regional framework), how past work fit into that. Regional Conservation Needs program for funding needs by pooling 4% of state wildlife grant money to address regional needs with 5 years of projects.
- How framework informs science needs for future. States got together soon after creating SWAPs with hundreds of species and priorities. Decided to work as a region about 5 years ago in first Albany workshop. Thrashing for couple days, then created framework to prioritize. Common mapping scheme, combine common data, threats across states, where have overlaps, common language to work together.

- In June 2011, took conservation needs regional vision to determine how to build multispecies landscapes to sustain resources into the future. Fundamental objective to define, design, deliver landscapes that can sustain resources a hundred years from now.
- LCC role to synergize efforts, common goals to achieve in unison, strategies to get there. Partners have cooperative role to bring priorities to table for common goals, help shape what is necessary to achieve goals.
- Similar components to Strategic Habitat Conservation approach as framework to pick priorities, develop species-habitat relationships, on-the-ground, monitoring and adapting. Built around common framework developed by states as elements. Research to fill holes to get from today to landscape design.
- Population goals as production goals for society, how do we know if we are on target, what information do we need to know. In North Atlantic LCC, came up with common conservation goals and targets, who sets goals, models, landscape design, habitat change over time, translation tools to take vast array of science and make it usable on-the-ground, how to involve the public, information management, and monitoring. NA LCC organizing science around this framework.
- Southeast Conservation Adaptation Strategy – Conservation Landscape of the Future (SECAS) with targets, etc. Huge overlap with framework from NA LCC. Need vision of landscape. Looking at multitude of science needs, organized to support fish and wildlife for future, assess current condition to determine what is needed to reach vision, how much needed, where, quantify impacts of conservation and development actions, forecast alternative future conditions.
- Geography in Appalachians overlaps with NE, SE and to the West. Lots of work done already in conservation frameworks to organize science needs. Challenge is daunting but huge opportunity because of your presence and LCCs around us to change more than we could do separately. LCC is only forum addressing all species at landscape scale. Many partnerships looking at species guilds and groups, but nothing else at this scale.
- Build on history and thought around us and within us. Convert methods and build on thinking done already to charge ahead on shoulders of work done already. Use it if it is useful or modify it.

Landscape Planning: Examples and Lessons Learned

Speaker: Dr. Rob Baldwin, Professor, Clemson University, grew up in Maine, attended university in Maine, co-editor on landscape scale conservation planning

- Gave webinar on topic that was long and involved. Will do it quickly by hitting high points in new field of science in landscape scale conservation planning. Goal is to represent diversity of species, habitats, ecosystems in system of reserves that is large and

connected to support current populations, restore extirpated ones, resilient to ongoing ecological change, meet goals in future.

- Scientific evidence shows need 50% of landscape. Unattainable without private lands management. Transcending localized concerns in context of region, how they function at regional level, represent local gems in context, highly systematic spatial and temporal models, mapped data, multiple scales and levels of quality.
- Three tasks: 1) comprehensive representation; 2) connectivity; and 3) threat assessment. How do new reserves complement existing reserves? Connectivity based on theory of island biogeography for changes in multiple time scales, threats from land use, climate, deposition of atmospheric pollutants that are global in scale, corridor in variable quality matrix (private lands managed between reserves) in network. Prioritize areas for conservation with irreplaceability and vulnerability criteria for prioritization. Money may be an issue, moving priorities.
- Coarse filter representation, lacking fine scale data at suitable extents as well as uncertainty leads to coarse filter planning. Conserve the stage so you don't have to worry about the actors, individual species. May not necessarily agree. Northern Appalachian/Acadian ecoregion developed by TNC at great expense. Represent this diversity to represent species now and into the future, explained by underlying geophysical diversity.
- Modeling tools to represent core reserves – MARXAN with Zones to assign multiple uses to different zones, complex software worth the effort. Output of 60% of landscape, but set own targets and goals, process allows interaction to set features and levels of conservation. Subjective process underlies decisions, must be transparent and flexible with output. Locks in existing reserves, Tier I matrix blocks (complementarity). Need to understand other methods important groups are using. TNC Northern and Central Appalachians completed with Southern Appalachians underway.
- Habitat connectivity theories and software – Least cost path (CorridorDesigner), circuit theory (Circuitscape), centrality with multiple nodes (Connectivity Analysis Toolkit). Example of northern Appalachians with habitat patches to connect, using multiple nodes, data already exists, needs improvement. Important to understand how selection of modeling affects results with two completely different answers for where corridors should be, depending on assumptions, data and how to parameterize models.
- Climate corridors using Land Facets model to string together like land facets (e.g., south facing slopes at certain elevation) so species can move through time to new location.
- Need to validate and improve models through on-the-ground study (are animals using corridors). Work on road connectivity in West.

- Model threats with multiple methodologies and data sets. National landscape metric, human footprint both now and in future to project using census data, can check projections in iterative process. Data sets published on housing and impervious surface.
- Organize stakeholder involvement with nested groups involved in range of activities. Example of California Essential Habitat Connectivity project with 200 map users from 62 agencies and 44 technical advisors as stakeholders. Rolled out maps to stakeholders examining MARXAN output to document what experts are saying.
- Challenges: 1) data sufficient grain size and extent to be meaningful at ecoregion scales; 2) software to integrate data and models designed by modelers who understand conservation; and 3) organized participation by stakeholders to know the local and envision the big picture.
- Data context in conservation planning (uncertainty, temporal frame, data types) across geophysical diversity, bioclimatic models, land use change, habitat connectivity, species distribution, landscape resistance surfaces, naturalness indices, land use/landcover data, mapped high value ecosystems, known species location. Validate models.

Framing the Appalachian Challenges and the Science Needs Component

Speaker: Dr. Jean Brennan, Appalachian LCC Coordinator, USAID and State Department office of global change, Univ of Tennessee, Yale, Univ Penn, delegate on climate change, IPCC members that was awarded Nobel Prize for work.

- Acknowledge workshop sponsored through USFWS, USGS with expertise from states with VA supporting Chris Burkett as lead facilitator. Asked Workshop Planning Team and facilitators, note takers to stand. Work recorded and logistics by DJ Case (Gwen White).
- History of LCCs and workshop. Concept from several years of consultation as DOI looked at challenges of new millennium in era of transition. Have good models with bird Joint Ventures and Fish Habitat Partnerships. Landscape level beyond taxonomic structure gives different LCC map across taxa and drainage systems to 22 units as a seamless network with shared visions, common goals, delivery, joint identification of science needs and support to deliver. Conservation framework with delivery units at this level (e.g., Joint ventures).
- Workshop has expertise in science and management to build capacity to deliver. Governing structure with 33 members, broad representation – DOI, other federal agencies, states, Tribes, NGO, regional partnerships. LCC Coordinating Staff with Acting Science Coordinator and others joining, technical committees to inform Steering Committee in fiduciary responsibility to support science and planning.
- Watershed flow of information to rely on expertise across the landscape (e.g., water, forest, fire, cave/karst, energy, urbanization, climate change). Facilitating process and

structure to solicit information from expertise, creativity, flowing to decision-making body. Framework to support with website to sponsor groups for dialogues, webinars, to support communities of practice, networks, lessons learned, adapt methodologies, don't have time to not be efficient and effective, promote resources beyond workshop to bring forward partnership work and results.

- Goals of workshop are:
- Identify regional directory of expertise by soliciting nominations to establish database of over 180 experts representing sectors in 15 states. Know expertise so when have planning initiative, can tap into experts to advise of opportunities, solicit input for new strategies and guidance.
- Identify robust and comprehensive portfolio of science needs to guide work over many years. What need to build, how to do it in systematic and methodical way.
- Identify top needs by ranking based on criteria to prioritize for immediate funding and subsequent years for RFPs as a transparent, defensible way to look at science needs, revisit over time, solid framework year after year. Year-long listening sessions to assemble conservation priorities and science needs. Have organizing principle which workshop can reorganize.
- Day 1 breakout work groups separated in area of expertise (e.g., Aquatic northern and southern) with trajectories of threats varying across region. List of needs and structure to pursue. Similar with Terrestrial North and South. Human dimensions to promote conservation, environmental services, energy, urbanization. Climate change with some impacts woven into other topics, but will look at it at higher elevation, interface between LCC and Climate Science Centers tomorrow (Rachel Muir introduction tomorrow). IT group with biologists to inform infrastructure and information, how users will need it presented.
- Day 2 across landscape, completely mixed across expertise in 6 groups doing the same activity, re-examining lists from Day 1 at landscape level for multiple benefits across sectors to revisit priorities. End of day will have 6 profiles to see how they match up as qualitative data, expert opinion.
- Day 3 Writing Team will synthesize information, portray portfolio, represent through process, within a week will have information available for Steering Committee.
- Conscious representation of managers, researchers, multiple sectors as a social process in community of conservation science and delivery.

Our Work – Setting out the Workshop Process, Expectations and Outcomes

Speaker: Chris Burkett, VA Dept. of Game and Inland Fisheries Senior Biologist and Lead Technical Facilitator, BS Alabama, MS Wy, FWS office.

- Most of career writing plans from two aspects: first, philosophical to make things better with deep thoughts, long discussions in North Atlantic, SE, NE region; and second, technical practical application to organize people to work from theoretical to management tool.
- Workshop process over two days. Here with big issues across region, too big for agency to handle, dealing with for 100 years with others fairly new issues (historically low population density, diseases, climate change), Have great successes to maintain in moving forward to address new issues. SWAPs show can't do it alone. Need to develop comprehensive set of needs and rank them as collective practitioners (organized stakeholder involvement) to develop big picture. Need ranking due to limits of money, manpower, time so need to prioritize big list of science needs, some will come first, others later. Help sort through that.
- Terminology – Painful meetings fussing over differences in definitions. Don't want to do that here. Four terms:
 - 1) *Portfolio* as document with comprehensive list of science needs (LCC research);
 - 2) *Themes* representing aspects of landscape as drafts with a goal statement (open lands, woodland, cave/karst, human dimensions, wetlands, climate change, aquatic, human lands) with explanation of role LCC should play;
 - 3) *Programs* address discreet components (e.g., water quality, quantity, T&E species, water rights) with descriptor statement to support goal of the Theme; and
 - 4) *Science Needs* describe research questions as basic questions that need to better understand (e.g., impacts of livestock on water quality).
- Deliverables
 - Review and revise Theme and goal
 - Program
 - Description – accuracy or modification
 - Comprehensive – look for gaps
 - Science needs – research complete
 - Top-ranked Science Needs
 - Record ranking criteria – suggest modifications
 - Input on where LCC needs to move first for more efficient management
 - Connections with needs addressing multiple taxa/systems/sectors
- Day 1 – Seven groups divided by professional expertise and/or geography (designated on name tag)
 - Aquatic South/North, Terrestrial South/North, Human Dimensions, Climate Change, IT/Data Management.
 - Facilitator and Note Taker in group. Facilitator to manage time and achieve deliverables. Note taker to properly report importance and why.
 - Each will go through handful of Themes related to expertise (review and revise theme and goal statements, program description, list of Science Needs, identify top-ranked Needs (3 per group), record criteria for selection and refinements).

- Ranking guidelines based on Workshop Planning Team draft (in packet) for appropriate LCC scale project
 - Large scale, long term multi-taxa issues (think big picture)
 - Enhance ability to manage risk and reduce uncertainty
 - Proof of concept
 - Synthesis
 - Planning and decision making
 - Adaptive management
 - Foundation for future work
- Closing plenary where each work group reports brief overview.
- Writing Team debriefing to look at all work group outputs to develop modified portfolio for Day 2.
- Day 2 – Six interdisciplinary groups with mixed expertise to review with Facilitator and Note Taker to manage discussion.
 - Deliverables to go through similar process with reduced list of top-ranked Needs to understand what has been nominated as top priority and why, looking across themes to re-rank top Science Needs, identify Needs applicable to multiple taxa/system/sector.
 - Don’t leave not understanding something – ask questions and tell us what you think.
- Comments:
 - What is north and south designation? Maryland was a border state.
 - Dividing line from organizing principle historically from Man and Biosphere work with New River crossing in Eastern Kentucky. Not a state line but ecosystems.
 - Groups invited to participate was there an outreach to private sector (forest industry, corporate research) as biggest land owner besides government?
 - Association members identified. Did not have tremendous outreach but part of development with Steering Committee representation. When made call, asked for other sectors or industries invited. Would be grateful for input. Have partners representing coal industry and others through larger regional partnerships.
 - Program areas have large potential number that could be identified. In focusing on areas to look at existing ones and other potential ones, what would be desired for adding program areas?
 - Give a robust list of areas, help understand full breadth of issue, but must all be evaluated and ranked. Lump as much as you can, better than splitting.
 - Ranking difference between urgency and importance, how to balance that in rating process?
 - Work groups can provide input. Used the term as “ranking” at a point in time based on current impacts, threats whereas “prioritizing” will rest with Steering Committee to balance urgency, opportunity, guiding principles. Experts sought to create ranking with guidance from WPT but free to further articulate or expand on ranking criteria, capturing expert opinions. Group will assess that, may vary based on different programs. Product will

go forward to Steering Committee to value output, make prioritizations of funds for LCC this year and to plan next few years. Priorities will rely on governing body to integrate social, economic dynamics, status of LCC and partnerships.

- Clarification on conservation targets. Is this comprehensive, not just fish and wildlife or also plants?
 - Comes back to what is LCC with Vision Statement recognizing “valued resources” biological and cultural to sustain communities. One of first messages from Steering Committee was human component in Appalachia. Human force for good or bad needs to be engaged, understand the values, broadly has to be part. Conservation targets are part of conservation framework. Will not be able to measure everything but find systems with diagnostic representation diagnostic of status and suite of organisms (plant, animals, invertebrates). Looking at very large tools, knowing as resource managers, have shared values from legislators and constituents. Shared values move us forward, which is why Day 2 is homogenized like the landscape, broad and diverse.
- Steering Committee members are attending? Who are they?
 - There are 33 members: FWS 3 members from NE, SE, Central regions with senior research directors; DOI FWS, USGS, NPS, Office of Surface Mining, EPA, US ACOE, Forest Service (management and research stations); one of 4 Tribal representations; 15 states; several NGOs (TVA). Listed on website with member profiles. Very diverse but generally senior executive level with ability to influence program activities and funds, to do synergistic activities across landscape. Four members participating in workshop. Ten of the 15 states are represented in workshop.

Day 1 - Late Afternoon Session: PLENARY

Wrap-Up for Day 1: Briefly reaffirm workshop process and expected outcomes; set stage for Day 2. Speaker: Chris Burkett, moderator; Gwen White, DJ Case, Note Taker

Work Group Reports – top 3 priorities, justification and highlights

- North Aquatic (Anita / Angie)
 - Effect of resource extraction on aquatic
 - Environmental flow requirements
 - Relationships between contaminants and biological response
- South Aquatic (Patrick / Callie)
 - Wetlands
 - Identify and quantify the extent of naturally functioning floodplain
 - Current extent of wetland connectivity
 - Quantify ecosystem service of wetlands and contributions
 - Aquatics
 - ID key limiting factors and stressors for priority taxa

- Stressors currently politically impossible to correct, culturally viable solutions
 - ID distribution of invasives across watersheds, how and to what extent they threaten aquatic spp
- GIS/Info Mgt (Rose / Ed)
 - Working group (stewardship) to help as IT support system, governance issues, access, marketing, sharing, access
 - Content management system architecture – data upload and sharing, tools (hardware, software), knowledge shared, learn to use them, group work flow, social network integration, projects database, experts/people database, web services
 - Learning platform – requests, archived webinars, podcasts, experts in short course, how to or archives of training
- Climate Change (Chris / Jen)
 - Developing/addressing research needs for hydrology – water quality, quantity and aquatic species reaction to changes
 - Vulnerability assessments across taxonomic groups – which species or groups most vulnerable to changing climatic, tools to mitigate impacts
 - Adaptation – identify issues and move forward to address issues
- Human Dimensions (Steve / Lindsay)
 - Human dominated landscapes
 - Forecasting future spatial footprint of energy development in 20 years, changes, econometric modeling and policy
 - Forest industry/lands management – understand economics of ownership patterns to sustainably manage forested lands
 - Forecasting future spatial footprint of development of development
 - Ecosystem services
 - Map, model and measure ecosystem services at landscape scales for biophysical
 - Economic, cultural, social value of hunting, fishing, birdwatching
 - Better communicate complex technical issues to multiple stakeholders and how agencies use science in decision-making
- North Terrestrial (Linda / Todd)
 - Forest
 - [tie] Understanding species distribution across region, habitat relationships, migration corridors
 - [tie] Effects of stressors (urban development) on functionality and endemic species
 - Open lands (not just natural communities)
 - Understand historical vegetation distributions and disturbance regimes, replication with existing conditions
 - Karst/caves
 - Inventorying mapping, understanding species, communities, habitat relationships, linkage across systems
- South Terrestrial (Danna)
 - Forest

- ECAP (TNC), Landfire planning, forest block monitoring
- Ecological land unit identification
- Determining linkage between species and forest
- Climate change impacts for range-limited species
- Amphibians – status assessment, disease threats
- Cave/karst
 - Develop karst classification system
 - Biological inventory
 - Management training workshop
 - Map of springs across region
 - Understand impacts of threats on species systems
- Grasslands – not done

Add to deliverables for end of Day 2

- Identify Human Dimensions/Social Science research question(s) including associated audiences.

Concluding remarks (Ken Elowe)

- Charging ahead, idea after idea, reducing to this, hugely positive to take expertise and gut feelings to identify high priorities, huge and daunting task to accomplish a lot today
- NE region of FWS sponsors AppLCC, committed to seeing this work, real strength after throwing in facility and seed money is you. Not doing this for LCC but for us. Setting stage for conservation across huge geographic region. Tomorrow, different twist on same subject.

DAY 2. Conservation Priorities Science Needs Workshop

Final Wrap-up PLENARY

Technical Facilitators/Note-Taker/Writing Team members presented a compilation of the relative Ranking and/or descriptors generated as a composite list for the final overview of conclusions. Expert participants were thanked for their contribution and Next Steps will be shared with all.

Speakers: Chris Burkett/Ken Elowe

Group 1: Patrick Pitts & Callie McMunigal

Capacity – GIS/IT Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.

12)Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in

the landscape and the extent to which they can be replicated/restored under changing conditions.

- (11) Understanding species/population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective migration (gene flow) /dispersal corridors.
- (11) Forecasting future demands for land and water use to support energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.
- (13) Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use, recreation, industrial use, municipal use, aquatic biology, agriculture, geology, and changes in air pollution. [Incorporate Biological response]
- (15) Conduct region or range wide vulnerability assessments of species and habitats of high conservation concern (all terrestrial - forest, open land & wetland) across the App LCC of both climate and non-climate stressors (urbanization, energy development, disease). Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]

Avoid program lines – vulnerability assessments for aquatic and terrestrial systems.

Broad needs – need to be whittled down, use model from NA LCC with teams of user groups to reduce broad needs

Difficult to draw the line – don’t lose other needs that didn’t make list.

Group 2: Linda May & Todd Fearer

7.6 [Need] Forecasting future spatial footprint of energy production, mineral extraction, and associated infrastructure/transmission/transportation in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.

3.3 CAVE [Need] Classification (biological and geophysical), inventory and mapping of CKM and associated spring systems, understand species and community distributions, their habitat relationships, and linkages across systems

2.6 **AQUATIC** [Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) in order to understand minimum flow requirements and how alterations to systems will affect their sustainability (this was listed in 2.1 Habitat program)

5.7 **FOREST** [Need] Understanding species distributions across the region, their habitat relationships, and migration corridors.

186 [Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]

198 [Nat'l LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]

- Had a strong group consensus that foundational GIS content management system should happen no matter what. Such a high priority need that needs to be there before anything else can happen.
- Tried to roll needs together (cave/karst inventory and classification system in one simultaneous effort)
- Tweaking on some, tried to maintain original meaning/theme in needs. Had good representation from all Day 1 groups.
- Lot of discussion of needs that fell out in voting, not to lose them, but revisit or at worst put in reserve for next round.

Group 5: Anita Goetz & Angie Rodgers

(2) Aquatic

[Need] Rigorous understanding of the relationships between hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities.

[Need] Identify impacts of energy development and resource extraction on aquatic communities

(5) Terrestrial – Forests

[Need] Identify a connected and resilient network of forest ecosystems in the Appalachian LCC.

[Changed wording significantly. Originally building spatial network, future trends, variety of tools. Reframed as network of forest ecosystems as staging ground for lasting ecosystem function. Spatial exercise based on variety of datasets. Captured vision of network.

Methodologies to create map/network of sites developed as responsive to change over time – adaptive not a snapshot.]

(7) Human Dominated / Economic Lands (Urban, Ag, Energy)

[Need] Forecasting future spatial footprint of energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.

(8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

[Need] Map, model and measure ecosystem services at landscape scales, including: Biophysical production functions/understanding of metrics; Mapping beneficiaries; Assessment of preferences; Priority of services; Cumulative impacts

(9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

[Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]

- Sequencing actions, building projects

- Aware of needs and building on existing work

Group 6: Danna Baxley & Brian Smith

- Inventory/pre-existing status but not addressing threats in list. Glad to see that on other lists.

[Need] Capacity – GIS/IT Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use. **Notes: needs someone to spearhead—Science Coordinator, Working Group Chair? Needs to work with other partnerships/organizations to make sure efforts aren’t duplicated, can share across boundaries, etc. Define and organize disparate information coming in.**

[Need] in Aquatic and Climate Change Themes: Understand water quality, quantity, timing, and flow requirements for species, populations, and communities for the region. Need to understand the impact of precipitation and temperature change on hydrologic regime (surface-water, groundwater, floodplain, and wetland hydrology) in the context of multiple stressors and uses (recreation, industrial, municipal, aquatic biology, agriculture, geology, and changes in air pollution). **Note: don’t exclude barriers (e.g., low-head dams, reservoirs, etc.) in this thinking. Make sure to understand minimum flow requirements, temperature, seasonality, wetlands for aquatic systems. Ties into climate change with serious change in precipitation patterns, adjust conservation planning to reflect that.**

[Need] Compile existing karst geospatial datasets and analyze to (1) create datasets on karst springs, cave passage/entrance density, cave obligate/dependent species distributions, and subterranean biodiversity maps, and (2) identify data gaps that are barriers to conservation planning. Note: do we want to combine mines with this group? Used by bats and other biota, also affect groundwater/surface water, but very different. Likely first step, followed by L. Team up with Gulf Coastal Plain and Ozarks LCC?? [Assess status of data regionally, not in centralized format. Integrate and create LCC-wide datasets on caves/karst/animal distribution for effective conservation planning.]

[Need—Combine with Above] Inventory and mapping of CKM systems, understand species and community distributions, their habitat relationships, and linkages across systems. Note: do we want to combine mines with this group? Used by bats and other biota, also affect groundwater/surface water, but very different.

[Need] Understanding *representative/priority/focal* species’ and communities’ distributions across the region, their habitat relationships, and migration corridors. **Note: Terrestrial and aquatic (or combined?) approaches needed. [Amphibians as potential representative species, can’t do every species, find representative species for habitat and migratory relationships.]**

[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and develop conservation strategies to replicate reference conditions. Note:

could be part of a support project to ECAP, Landfire, etc. [open lands, grasslands, tweaking priority list. By historical, means pre-Columbian. Support project to feed landscape modeling.]

[Need] Map, model and measure multiple ecosystem services at the same time at landscape scales, including: Biophysical production functions/understanding of metrics; Mapping beneficiaries (i.e., benefits realized outside the ALCC boundary or by visitors to Appalachian region); Assessment of preferences (could really help us target efforts to what people value most, and build constituency); Priority of services; and Cumulative impacts. [Need to sell that what we are doing has value. How to represent on landscape scale, benefits of services existing beyond boundaries of LCC, benefit people in other environments.]

Collate/compile ‘meta-analysis’ of vulnerability assessments done by states and other partners. Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC, especially range-limited/endemic species. [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]. Note: coordinate with Climate Science Center. USFWS has done some of this meta-analysis, but focused more on T&E. [Not reinvent wheel. Learn from what has been done, what can be improved on, gaps filled, build on existing foundation. Vulnerability specifically related to climate change was the category. How to adjust populations models. Consideration about making sure it is heavily coordinated with Climate Science Centers.]

Group 3: Steve Faulkner & Lindsay Gardner

2.6 Ecological Flows

1.2 GIS Capacity - components and questions about support function as a true science function (workshops, training important but not necessarily true science/research)

9.5 Climate Change Vulnerability Assessment

2.7 Resource Extraction

5.7 Species Distributions

5.9 Priority Conservation Area

5.8 Forest Stressors

- Tweaked needs statements, some redundancy, combined for same concept (karst)
- Concerns over key buzz words (significant, priority, invasive). Pay attention to intent, similar use of terms.

Group 4: Chris Burkett & Jen Krstolic

[Need] To identify environmental flow and habitat requirements for species, populations, and communities for the region.

[Need] Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).

[Need] Identify social or economic barriers and develop and communicate culturally feasible solutions to address sensitive issues related to known stressors (agriculture, forestry, urban growth, mining, untreated sewage, etc) across the landscape.

[Need] Capacity – GIS/IT /”-ologist” (added) Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use. [more specificity of actions in second item]

[Need] Forecasting future spatial footprint of energy production in coming decades in light of changes to demand, technology, policy, and regulation, including econometric models.

[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing and potential future conditions. [stimulated discussion on open lands and desired future condition of forest lands – applicable to entire vegetated landscape]

-- Two items below relate strongly across themes, broader than just climate change. Climate change will exacerbate all stressors as overarching condition.

[Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to stressors including climate change in the LCC. [(Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]

[Nat'l LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]

- Clarifying, **combining, initial vote on everything. Struggle with making too broad but not too specific.**
- Noted cross-cutting issues (data needs popped up under forests, land use changes under aquatics, human dominated issues).
- Themes to help organize thinking but needs will walk around on their own. Need specific to aquatics with thematic identifier. Retained thematic specificity in most cases.

Synthesis of Top Ranked Needs (generated as an overview by Gwen White)

- Capacity – GIS/IT
- Spatial data tools - Inventory caves (geospatial data)
- Species distribution trends (forests)
- Future demands on resources that support energy development
- Precipitation/temp change impacts
- Vulnerability assessments (climate change)

- Flow, habitat, biota relationships (hydrology, wq, migration, vegetation,)
- Stressor interactions, disturbance regimes
- Connected resilient network of forests
- Ecosystem services at landscape scales
- Social/economic barriers

Next steps for LCC – Jean Brennan

- Consistent as larger group on top-ranked science needs.
- Observation of integrating across aquatic and terrestrial signals transformation in thinking, planning, dialogue. New evolution in conservation paradigm. When constructed process, was social as well as scientific and management. Next steps reflect on social process.
- Needs will not get lost. Three objectives were comprehensive and robust portfolio. All material generated constitutes portfolio. Tomorrow’s activity will make sure we have captured complete portfolio as part of Day 1 activities. Day 2 activities of ranking and synthesis, very impressed with various groups with everyone doing it very differently, but arrived at very similar points, giving great confidence that this is the agenda, have clear direction to pursue.
- Top ranked will go forward for consideration by Steering Committee meeting in one week with two reports: first, synthesis of top ranked Day 2 activities as executive summary of portfolio. Present that with thought process, qualitative data, expert opinion to inform immediate program support, as well as those in subsequent years. Will revisit, not lose them as part of social process.
- Everyone here is in database. This is only start. You are cooperative, will continue to work jointly, will revisit. Ranked at point in time. In dynamic systems managed for, dynamics do change.
- Next steps for next couple of years. Acknowledge support and community extended here extends virtually. All plenaries with IT support (Greg Thompson) here from regional office. All communications from Megan Nagel. Support means we extend our reach greatly and have communities involved to share synthesis and dialogue with colleagues back at work to understand what was done. Thanks for hard work.

Comments from group:

- Human dimensions and vulnerability an assessment was inclusion of cultural resources, cultural sites and landscapes. Didn’t see anything addressing that. Could be included under vulnerability or as mapping and inventory of important cultural sites from pre-Columbian to present day.
 - Was in climate change group that cultural resource items were. Looked at mission and vision, which didn’t say “cultural” but may have implied it. Many things needed like sea level rise would affect cultural resources, what they need is results. Need cultural liaison/contact and map of where things are. Not a cultural resource person. Need a map of where and what type they are in region and liaison to make connections with things we will do anyway to impact cultural resources.

- Was discussed, work in progress. Asking CSCs to do that as well. Not sure where it fit.
- Future demands to support energy development (reword).
- Big landscape to include everything, not focused on particular species, winners and losers, haven’t captured science needed for trade-offs, priorities and preferences. LCC concept at landscape scales to figure out way to do that, maybe not immediately. Not easy, don’t hear that thinking coming yet. Same thing we have heard at other meetings on landscape scales with biological processes, not yet integrating social/human component at landscape scale.
- Started last night with winnowing through science needs that fall into climate change. Will continue to do that, will write it up and make it available. Use venues like this to get needs to direct work of Climate Science Center.
- Would appreciate having raw list of needs available on website from first day for each group. Not there now as raw list with all things, came up with as group before they were merged, edited after the first day.
 - Comprehensive or robust portfolio with all raw data from 7 groups, many of which had 8 different files. Will bring those into like format. Intent is to put on website the videos, source material, and material generated by groups when it has been synthesized by note takers. Valuable resource that will not be lost.
- Fill out meeting evaluation form.
- Facilitators and note takers stay after this meeting to make arrangements for tomorrow.

Concluding remarks (Ken Elowe)

- Thanks to planning team, facilitators and note takers. Moral support for what you have to do over next couple of days to get this ready for the Steering Committee, which will have to absorb a lot.
- Thanks for taking 2 days to do this important work. Level of enthusiasm. Hard not to dive into conversations, level of intensity of discussion, thoughtful, purposeful, discussion, seen in results.
- Just the beginning as community of practice. Two-thirds of benefit has been building community relationship of science conservation practitioners from geographic area. Third was science results (not to diminish that but huge benefits in relationships).
- Common direction, ways to share expertise. A lot of what you see here will live on. Can’t do all this but large benefit is bringing partners together to contribute. Water flow as high priority with EPA Region 1 already doing some of that, don’t need extra funding. Synthesis of capacity and expertise to get this done. Will chip away as we can.

Adjourn & Workshop Evaluation – Participants filled out evaluation forms.

DAY 3. Writing Team

Expectations for Day 3 Writing Team products (Gwen White facilitates / Megan Nagel taking notes)

Gwen welcomes folks and sets out expectations for the day. Need to pull all material together into a cohesive set of recommendations for the steering committee. Need to put needs into the chart form we started with a few days ago. Any additional materials and notes that you may have that will help. Need to know how close you are to that structure and about how much time you need to put your notes into the chart structure.

- Put needs from Day 1 and Day 2 into the original chart form.
- List the top needs first under the Program, then list all the other needs your group identified underneath those top needs.
- Additional material that does not fit into the chart structure needs to go into a separate Word document.
- Keep the original files with the track changes, but copy the text into the chart separately.

Work on all needs, not just top six needs. Jean asks that you find the record number that corresponds with the need in the original chart and insert into what you are working on today. For needs that you created separate from that original list, do not worry about using an alphanumeric code.

You will need to create two sets of products:

- A chart of ALL needs from DAY 1 for your Theme group + additional notes in a separate Word document;
- 2) A chart of condensed needs from Day 2 + additional notes in a separate Word document

Day 1 Review

Review impressions from overall breakout progress (round robin of Facilitators/Note Takers)

Themes & Goals - Writing Team to reconcile all modifications from 6 breakouts after Day 2 (track changes from each group)

Appalachian LCC Science Needs Workshop
TOP RANKED SCIENCE NEEDS (End of Day 2)

- The RFP that the LCC would write for this general needs to include what specifically needs to be done under this general need.
- Consider: Is this truly a science need or is this a support function? There is a distinction between a science need and a fundamental support function of the LCC.
- The role of the LCC is to identify and support the management or foundational tools as well as the scientific needs.
- Before funding anything, a process will be in place to consult with researchers and leaders and experts in the field to make sure there isn't duplication or explore synergistic and collaborative efforts.

MASTER LIST

Presented in ranked order with the number of ranking votes for each topical category. Each person was asked to vote for 3 needs without indicating a ranking between the three votes.

12 votes - Resource extraction & demands for energy

Need: Forecasting future demands for land and water use to support energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.

Need: Identify impacts of energy development and resource extraction on aquatic communities.

Need: Effects of resource extraction.

10 votes - Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

Need: Rigorous understanding of the relationships between hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc), and aquatic biota/communities.

Need: To understand the impact of precipitation and temperature change on surface-water and groundwater hydrology.

8 votes - GIS/IT/”-ologist” Capacity (1.2 GIS/IT working group)

Need: Establish a working group to conduct a pilot study to identify the GIS/IT capacity within the Appalachian LCC.

6 votes - Species/habitat distribution trends (includes all terrestrial and aquatic habitats)

Need: Understanding representative/priority/focal species and population distributions.

Need: Understand historical vegetation distribution and disturbance regime.

6 votes - Vulnerability assessments (climate and nonclimate stressors)

Need: Collate/compile ‘meta-analysis’ of vulnerability assessments.

3 votes - Geospatial data tools for planning & future condition scenarios (inventory caves; forest network)

Need: Priority conservation areas integrated planning, monitoring, policy development.

Need: Downscaling and calibrating/revisiting tools necessary for spatial data planning.

Need: Cave/karst/mine classification (biological and geophysical), inventory and mapping.

Need: Identify a connected and resilient network of forest ecosystems.

1 vote - Adaptation strategies (stressor interactions, disturbance regimes)

Need: Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors.

1 vote - Ecosystem services at landscape scales

Need: Map, model and measure ecosystem services at landscape scales.

1 vote - Social/economic barriers to address known stressors

Need: Identify social or economic barriers and develop and communicate culturally feasible solutions.

Discussion of ranking:

1) GIS/IT/“-ologist” Capacity (1.2 GIS/IT working group)

Need: Establish a working group to conduct a pilot study to identify the GIS/IT capacity within the Appalachian LCC.

- Identify individuals to be in the working group, elect a coordinator to coordinate people within and outside the group and lead the charge, and some support to make that work in the LCC. Having a working group to discuss these issues: what is needed, who has information already, and how do we bring it together in a more nexus-ed way within the LCC and with the surrounding LCCs.

2) Geospatial data tools for planning & future condition scenarios (inventory caves; forest network)

Need:

- Classification (biological and geophysical), inventory and mapping of CKM and associate spring systems, understand species and community distributions, their habitat relationships, and linkages across systems.
- There are existing data and inventory, but need to make a list of items specific to the Appalachian LCC at a scale that is usable for managers. Create the data that is topically appropriate for the ALCC and at a scale that decision makers can use. Once you develop priority themes, what level of detail do you need for that theme?

3) Species/habitat distribution trends (includes all terrestrial and aquatic habitats)

4) Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

5) Vulnerability assessments (climate and nonclimate stressors)

6) Adaptation strategies (stressor interactions, disturbance regimes)

7) Ecosystem services at landscape scales

8) Resource extraction & demands for energy

9) Social/economic barriers to address known stressors

- Quite a few of these items are directed at assessments. There are a few of them that are about adaptation. How much of our effort do you want vote for identifying what we have now and what we need to get ahead. This is less a question of content but more about identifying priorities.
- Groups identified that the data and information is available but needs to be organized and made available, but if that baseline data and information is missing we need to identify this as a needs.
- What criteria does the ISC use when deciding what to fund?
- 1 – What do we have? Can that be aggregate? 2 – More than that, are there new tools that are needed. These are likely parallel track efforts. You have to know what tools exist so that you can start building some new ones.
- What is it that the LCC can contribute to this topic.
- Under the topic, illustrate what specifically the LCC can do about this topic. This is where you should highlight the origins of this topic from your theme groups.

The group then continued to revise wording for a narrative description of each need, then was asked to vote for the top 3 needs in rank order.

FINAL RANKED PROGRAM/NEED DESCRIPTIONS

Ballot Scored in the following manner:

Each WPT member ranked each of the needs as a 1, 2 or 3 from highest to lowest.

- 1 = 1 point
- 2 = .5 points
- 3 = .25 points

Below are each ranking and cumulative score, followed by the raw scoring from each WPT member. For example: Category and description of Science Need, #Ranking (cumulative score; raw WPT rankings).

Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

- **#1 (5.75 pts; 1,1,1,1,1,2,3)** - Rigorous understanding of the relationships among ecological flows and hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities to assess how alterations to systems will affect their sustainability (2.6 Aquatic - Ecological Flows; Species-Habitat Relationships at Multiple Scales; 2.1 Habitat program)

Resource extraction & demands for energy

- **#2 (3.0 pts; 1,2,2,3,3,3,3)** - Forecasting future spatial footprint of energy production, mineral extraction, and associated infrastructure/transmission/transportation in coming decades (in 20 years) in light of changes to demand, technology, policy, and regulation, including econometric models to better understand the impacts on resources. (7 Human Dominated / Economic Lands - Urban, Ag, Energy; 7.6)

GIS/IT/“-ologist” Capacity (1.2 GIS/IT working group)

- **#3 (2.75 pts; 1,1,2,3)** - Capacity – Need to contract services to build IT / GIS support tools (content management system, learning management system). Use pilot studies or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.

Species/habitat distribution trends (includes all terrestrial habitats)

- **#4 (2.25 pts; 1,2,2,3)** - Understanding representative/priority/focal species and population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective movement/dispersal linkages. [Ex. Amphibians as potential representative species, can’t do every species, find representative species for habitat and migratory relationships.] (5.7 Species Distributions – Forest; Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)

Vulnerability assessments (climate and nonclimate stressors)

- **#5 (1.75 pts; 2,2,3,3,3)** - Collate/compile ‘meta-analysis’ of vulnerability assessments done by states and other partners. Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC, especially range-limited/endemic species. [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]. Note: coordinate with Climate Science Center. USFWS has done some of this meta-analysis, but focused more on T&E. [Not reinvent wheel. Learn from what has been done, what can be improved on, gaps filled, build on existing foundation. Vulnerability specifically related to climate change was the category. How to adjust populations models. Consideration about making sure it is heavily coordinated with Climate Science Centers.]

Geospatial data tools for planning & future condition scenarios (forests)

- **#6 (2 pts; 1,1)** - Identify a connected and resilient network of forest ecosystems in the Appalachian LCC. (5 Terrestrial – Forests)

Geospatial data tools for planning & future condition scenarios (vegetation)

- **#7 (1 pt; 1)** - Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated/restored under changing conditions.

Resource extraction & demands for energy

- **#8 (1 pt; 2,2)** - Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Ex. Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).

Adaptation strategies (stressor interactions, disturbance regimes)

- **#9 (0.75 pts; 2,3)** - Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts] (198 [Nat'l LCC Network])

Species/habitat distribution trends (includes all terrestrial habitats)

- **#10 (0.5 pts; 2)** - Understanding historical vegetation distributions and historical disturbance regimes in the landscape (specifically natural open lands communities) and the extent to which they can be replicated given existing and potential future conditions. Develop conservation strategies to replicate reference conditions. (Note: could be part of a support project to ECAP, Landfire, etc.)

Social/economic barriers to address known stressors

- **#11 (0.25 pts; 3)** - For aquatic systems, conduct a social science research study to identify social or economic barriers and develop culturally feasible solutions to address sensitive issues related to known stressors (agriculture, forestry, urban growth, mining, untreated sewage, etc) across the landscape and develop tools for communicating those solutions.

Geospatial data tools for planning & future condition scenarios (caves)

- **#12 tie (0 pt; 0)** - Develop a classification (biological and geophysical) scheme for karst, inventory and mapping of cave, karsts, mines, karst related springs, and ground water. Compile existing karst geospatial datasets and analyze to (1) create datasets on karst springs, cave passage/entrance density, cave obligate/dependent species distributions, and subterranean biodiversity maps, and (2) identify data gaps that are barriers to conservation planning.

Geospatial data tools for planning & future condition scenarios (caves)

- **#12 tie (0 pt; 0)** - Understand species and community distributions, their habitat relationships, and linkages across systems (3.3 Cave)

Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

- **#12 tie (0 pt; 0)** - Need to understand the impact of precipitation and temperature change (related to climate change) on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use, recreation, industrial use, municipal use, aquatic biology, agriculture, geology, and changes in air pollution. [Incorporate Biological response]

Ecosystem services at landscape scales

- **#12 tie (0 pt; 0)** - Map, model and measure ecosystem services at appropriate landscape scales, including: biophysical production functions/understanding of metrics; mapping beneficiaries (i.e., benefits realized outside the ALCC boundary or by visitors to Appalachian region); Assessment of preferences (could really help us target efforts to what people value most, and build constituency); Priority of services; and Cumulative impacts.

Wrap-up Comments:

- Fabulous. Thanks.
- Process went well, good to see representation.
- Fun, appreciate hard work of planning group. Very difficult task, daunting challenge in short period of time. Not as nice or satisfying as would have liked, but continuing process, not a final statement. Assuming getting something about next step. Talking about need to come up with community of practice approach, not technical committees necessarily but focus on landscape level processes LCC can contribute, as priority.
- Daunting task, nice job of getting appropriate experts in room, definitely frustrating parts, but nature of pulling together large task. Ensure that all ideas gathered will be incorporated so participants can feel ownership, all captured.
- Bottom up process with expert input. Working on landscape level. Bigger you get, harder to get things put on ground. Figure out how to do conservation, not lose sight in research that people working in field see funding go to resources protection. Good job, turned out well, great feedback.
- Grateful to participate. Observation yesterday and report at end session of consistency among groups made feel like we did a good job, lots of commonality between groups. So many issues from aquatics, terrestrial, climate change. Like to continue thinking about what we can do now, what tasks set up to be successful to develop strong

- datasets, understanding of adaptation, focused management tools, instead of funding in all categories, use top categories with good reason to put efforts here for greater success.
- Pleased with where we got. This afternoon, zoned out from wordsmithing. Big picture was so much similarity. Nitpicking phrases, words, fine tuning, not working on big ideas. Good place to be on end of day three. Couple from agency were at similar meetings that said now I understand what LCC is about. At other meetings, people left shell-shocked without understanding what that was, what’s happening. Tired but pleased in condensing information from 150 people to 9-12 specific science needs.
 - Noticed strong on terms of expectations of assessment products. Front-load assessment, determining status of resource, identifying gaps. Over time will get to adaptation strategies as Strng Committee priorities. Have to get information gathered first at variety of scales. Some filling in will be taxa-specific, will take time, be more real to people (about birds, viability) as ultimate task of Climate Science Center. Were going to have more than one meeting, as many as three. Bringing more people together (140), took more effort but got there more quickly than with separate meetings. Thanks for patience and comments on refining.
 - Process went well. Wasn’t sure what to expect. Social process, always interesting to see how social process becomes research or science. Opportunity to set stage with landscape scale conservation planning as ultimate goal. That should have emphasized actually an amphibian ecologist on vernal pools, local ecosystems. Need to understand system, processes, fine-scale. On the other hand, see strength of LCC to integrate across multiple scales from local levels to multiple LCCs. Long history of Yellowstone to Yukon, Sule and Torborgen saying we should do this, finally doing it. For years, was crazy people in nonprofits, which often set stage and start process that agencies follow later. Keep in mind larger scales. Hope that stays the goal.
 - Huge effort that went really smoothly. Envisioned more chaos with number of people, different personalities, couple characters but not as unmanageable as envisioned. Organic and not methodical, but turned out well, good learning process.
 - Didn’t know what to expect. Having to communicate not just what you’re doing, research, underfunded, taking on more tasks. Things have to get really bad before they get better. Now no turning back with climate change impact on everything. Not a scientist in your sectors, but having to respond as academics to industry, other countries, everyone. All sudden government and corporations are involved because everyone is impacted by climate change. Not surprised more of rush. Work with salamander and bird hasn’t changed, not funded enough, how supposed to get into landscape environment. Landscape. Not just LCC one but 22 of them – huge. Most impressed with how everyone pulled up a little and talked about this on landscape level. Aquatic sidestep. Hope continue to have this level of conversation over time, need to communicate with one another. People working in isolation in academia, field so long, no longer, a luxury, can’t do it. When academics present to political body, can’t have 18,000 lines of bullet points. Hard to say one thing briefly, but no one will listen. Have to have one statement. Grueling but one statement, not multiple bullets to keep going with other stakeholders who will either crush you or help you work. Exercise will be repeated.

- Given how much fun have helping people get out of comfort zone, went well. Bumps, points captured. Make sure we think bigger than our LCC. Lots going on that affects outside our boundaries. Make sure we take hard looks at what is going on not to duplicate efforts as conservation funding becomes more difficult. Has been fun. Board meeting next week.
- Grateful for all input and efforts. Was my vision. You made it happen. Manage to your expectations and never exceed them. You exceeded them even though you came in not knowing what to expect. Never expected to achieve this as a community. Your vision, understanding that we need to work at this different scale across sectors. Need to have different way to look at ourselves as the community, not technical representation but include traditional partners and others to bring in. Achieve that concept of community, ground-based implementation, creative thought, problem identification, deployment. Made happen everything we want to achieve.

Appendix A. Workshop Agenda

DAY 1. Conservation Priorities Science Needs Workshop
8:30-10:30 AM Morning Session: PLENARY
Welcome and Opening Remarks Speaker: Paul Johansen, Asst. Chief in Charge of Game Management, WV Div. of Natural Resources and Appalachian LCC Vice-Chairman
The Appalachian LCC within the Regional Conservation Context: Introduction to the Northeast Conservation Framework Speaker: Dr. Ken Elowe, Assistant Regional Director, Science Applications USFWS
Landscape Planning: Examples and Lessons Learned Speaker: Dr. Rob Baldwin, Professor, Clemson University
Framing the Appalachian Challenges and the Science Needs Component Speaker: Dr. Jean Brennan, Appalachian LCC Coordinator
Our Work – Setting out the Workshop Process, Expectations and Outcomes Speaker: Chris Burkett, VA Dept. of Game and Inland Fisheries Senior Biologist and Lead Technical Facilitator
10:30-11:00 AM BREAK and then disperse out to six workgroup rooms.
11:00 AM-12:30 PM Expert Work Groups will critically review Portfolio structure of Themes and Programs, recommend revisions, and then accomplish a full review of Science Needs for their specific Theme(s) of expertise.
12:30-1:30 PM LUNCH - Provided for Attendees at Venue
1:30-4:20. Facilitation Deliverable – Recommend revisions to Portfolio Themes and Programs. Review Science Needs within Theme(s) of expertise, recommend revisions, and select top Science Needs within each Theme. BREAK – each group decides on afternoon break schedule (suggest ~3:00)
4:20-4:40 PM – All move to Plenary Room
4:40 –5:30 PM Late Afternoon Session: PLENARY Wrap-Up for Day 1: Briefly reaffirm workshop process and expected outcomes; set stage for Day 2. Speakers: Gwen White, DJ Case & Assoc./ Dr. Ken Elowe, Assistant Regional Director, Science Applications USFWS
5:30 PM Adjourn
DAY 2. Conservation Priorities Science Needs Workshop

<p>8:00 – 8:30 AM Morning Session: PLENARY</p> <p>Pulse Check and Facilitation Process Review: Overview of Day 1 output, handout of new synthesized Portfolio resulting from Day 1, review of context of process and planned activities for Day 2, directions for Day 2 facilitation process and anticipated outcomes.</p> <p style="text-align: center;">Speaker: Chris Burkett, VA Dept. of Game and Inland Fisheries Senior Biologist and Lead Technical Facilitator</p>
<p>8:30-10:00 AM Experts WorkGroups will be reconstituted from the original grouping by Technical Expertise on Day 1 to create six cross-representational Work Groups on Day 2 who will review Day 1 draft of the Portfolio, narrow field of top Science Needs recommended by Experts on Day 1 to those of most urgency, and identify opportunities for cross-cutting Science Needs to meet shared Theme or Program goals.</p>
<p>10:00-10:30 AM BREAK</p>
<p>10:30 AM-12:00 PM Facilitation Deliverable - Review list of Science Needs under each Program, recommend any final adjustments to ensure comprehensiveness (identify gaps, deletions and other edits) to provide a revised comprehensive list of Programs and Science Needs that fully represent each Theme.</p>
<p>12:00-12:45 PM WORKING LUNCH – box lunch provided for each breakout group</p>
<p>12:30-4:00 PM Facilitation Deliverable - Each Work Group delivers their completed Portfolio with top Science Needs across all Themes and Programs articulated to Gwen White, DJ Case and Assoc. contractor, who will compile a summary of top Science Needs for presentation at closing plenary.</p> <p style="text-align: center;">BREAK – each group decides on afternoon break schedule (suggest ~3:00)</p>
<p>4:00-5:30 PM Final Wrap-up PLENARY</p> <p>Technical Facilitators/Note-Taker/Writing Team members will strive to compile the relative Ranking and/or descriptors generated as a composite list for the final overview of conclusions. Next Steps will be shared with all.</p> <p style="text-align: center;">Speakers: Gwen White, DJ Case & Assoc./Dr. Ken Elowe, Assistant Regional Director, Science Applications USFWS</p>
<p>5:30 PM Adjourn</p>

DAY 3. Writing Team

Time	Topic
8:30 – 10:00	<p>Expectations for Day 3 Writing Team products (Jean / Gwen facilitates / Megan taking notes)</p> <p>Review impressions from overall breakout progress (round robin of Facilitators/Note Takers)</p> <p>Themes & Goals - Writing Team to reconcile all modifications from 6</p>

	breakouts after Day 2 (track changes from each group)
20 min.	Break
10:20 – 12:00	Programs & Descriptions - Writing Team to reconcile all 6 modifications from Day 2 (track changes from each group) to determine comprehensiveness, accuracy, fit, etc. Guidance criteria - review modifications and develop synthesis.
1-hour	Lunch

Time	Topic
1:00 – 2:30PM	Science Needs (Aquatic, Terrestrial) - wrap up portrait of top priority Needs from all work groups, verify criteria are met as an appropriate set of priorities that will move the planning process forward.
20 min	Break
2:50 – 5:00PM	Science Needs (Human Dimensions, Climate Change) – continue discussion. Feasibility Analysis – foundational resources, data, researchers, project proposals, RFP (current & future). Concluding impressions (round robin of Facilitators/Note Takers) Wrap-up & Next Steps (Jean)
5:00	Adjourned – Safe travels home!

Post-Workshop Actions

PRODUCT	[Product Due 12/6/11] Synthesis Report (short-version) originally drafted by Integrated Planning/Synthesis Team is turned over to Contractor for final writing and production (for submission to the AppLCC Interim Steering Committee on Dec 8th), following guidance developed by Planning Team & Tech. Leads and as outcome of Workshop guidance.	
ACTION	Invitations go out to researchers for pre-proposals for top ranked science needs as identified at Workshop; pre-proposals will include financials, partners, and deployment strategy.	
Post - Workshop	Dec 8th. AppLCC Interim Steering Committee Meeting. LCC Staff (and invited partners) report back to the ISC on the Workshop process, products, and recommendations.	Note: Based on ISC decisions and interest in project descriptions as part of the identified science needs and recommended Portfolio, ISC instructs staff to issue invitations to researchers/ partner organizations for prospectus with financials, partners, and deployment strategy for top ranked science needs (as identified in the Workshop).
PRODUCT	[Product Due 12/30/11] Final Science Needs Report - Full, complete summary report prepared by Contractor with oversight; includes new AppLCC Science Needs Portfolio as Outcome of Nov. Workshop.	

ACTION

Invitations go out to researchers for full proposals for FY11 funding support; proposals follow guidance developed by Workshop Planning Team and finalized through the Workshop.

Appendix B. Registration List

First Name:	Last Name:	Agency/Organization:
Mara	Alexander	U.S. Fish and Wildlife Service
Dan	Arling	U.S. Forest Service
Paul	Armsworth	University of Tennessee
Rob	Baldwin	Clemson University
Danna	Baxley	KY Dept. of Fish and Wildlife Resources
Braven	Beaty	The Nature Conservancy
Laura	Belleville	Appalachian Trail Conservancy
Joyce	Bender	KY State Nature Preserves Commission
Mark	Bennett	U.S. Geological Survey
Rick	Bennett	U.S. Fish and Wildlife Service
Doug	Besler	North Carolina WRC
Hugh	Bevans	USGS West Virginia Water Science Center
Dan	Bishop	New York State DEC
Vicki	Blazer	U.S. Geological Survey
Jean	Brennan	Appalachian LCC
Jason	Bulluck	VA Dept. of Conservation and Recreation
Chris	Burkett	VA Dept. of Game & Inland Fisheries
Geoff	Call	USFWS, TN ES Field Office
Josh	Campbell	TN Wildlife Resources Agency
Bart	Carter	TN Wildlife Resources Agency
Deb	Carter	U.S. Fish and Wildlife Service
Frank	Casey	U.S. Geological Survey
Tai-ming	Chang	USFWS Northeast Region
Joe	Clark	U.S. Geological Survey
Faye	Cooper	VA Dept. of Conservation and Recreation
Bridgett	Costanzo	U.S. Fish and Wildlife Service
John	Craynon	Virginia Tech
Marquette	Crockett	U.S. Fish and Wildlife Service
Carol	Croy	U.S. Forest Service
Steve	Croy	U.S. Forest Service
Greg	Czarnecki	Pennsylvania DCNR
Deanna	Dawson	USGS Patuxent Wildlife Research Center
Dave	Day	PA Fish & Boat Commission
Andy	Dolloff	Southern Research Station
Ken	Elowe	U.S. Fish and Wildlife Service
Mark	Endries	U.S. Fish and Wildlife Service

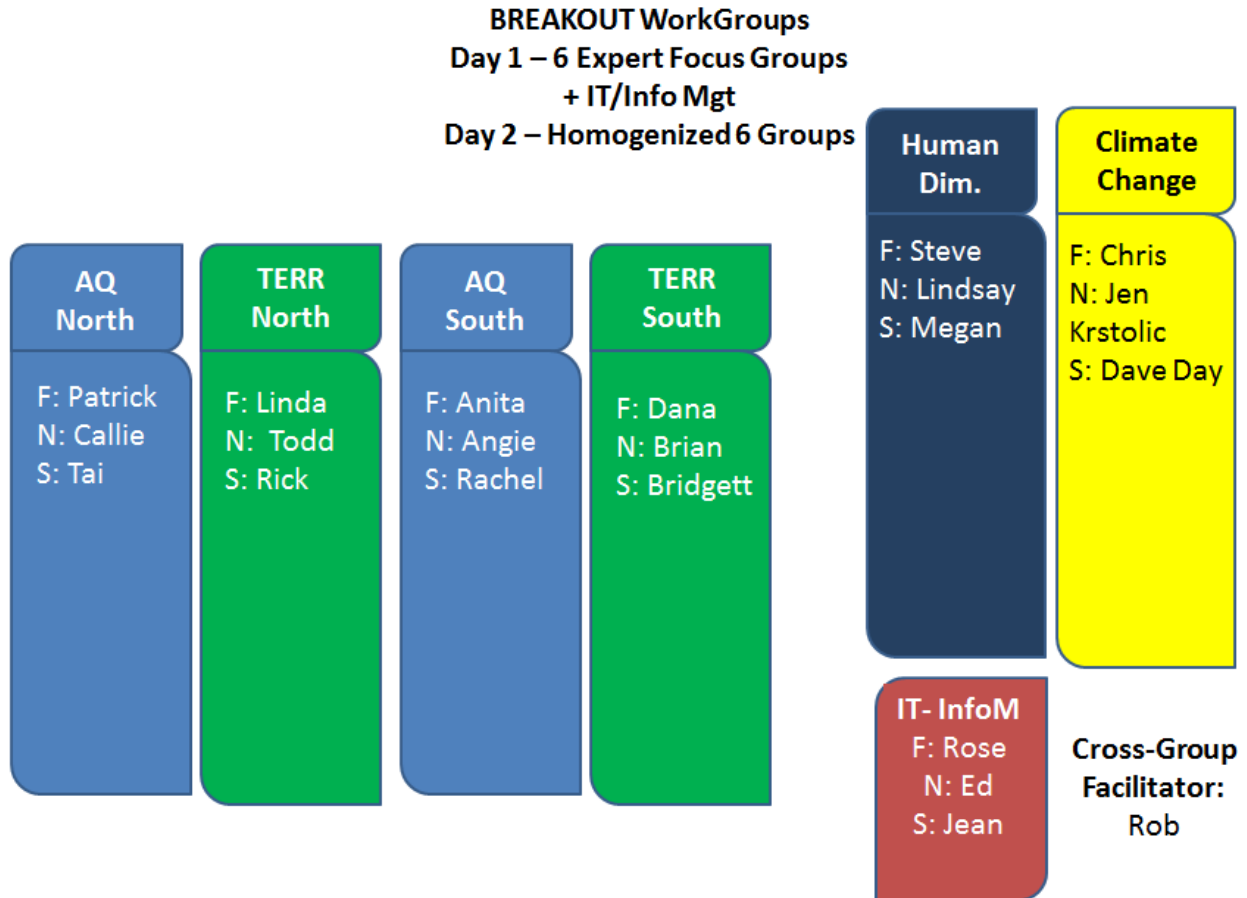
DJ	Evans	New York Natural Heritage Program
Steve	Faulkner	U.S. Geological Survey
Todd	Fearer	Appalachian Mountains Joint Venture
Daniel	Feller	Natural Heritage Program
Mary	Foley	National Park Service
Mark	Ford	U.S. Geological Survey
Steve	Fraley	North Carolina WRC
Christopher	Frye	Maryland DNR
Maureen	Gallagher	U.S. Fish and Wildlife Service
Lindsay	Gardner	Southeast Aquatic Resources Partnership
Catherine	Gatenby	U.S. Fish and Wildlife Service
Anita	Goetz	U.S. Fish and Wildlife Service
Chris	Goudreau	North Carolina WRC
Evan	Grant	USGS Patuxent Wildlife Research Center
Shane	Hanlon	U.S. Fish and Wildlife Service
Dave	Hartos	Office of Surface Mining
Cassie	Hauswald	The Nature Conservancy in Indiana
Jeff	Hepinstall-Cymerman	University of Georgia
Jeffrey	Herod	U.S. Fish and Wildlife Service
Rose	Hessmiller	Ferguson Lynch
Mark	Hudy	U.S. Forest Service
Hugh	Irwin	The Wilderness Society
Jay	Jeffreys	VA Dept. of Game & Inland Fisheries
Paul	Johansen	West Virginia DNR
Nels	Johnson	The Nature Conservancy
Christy	Johnson-Hughes	U.S. Fish and Wildlife Service
Todd	Jones-Farrand	Central Hardwoods Joint Venture
Austin	Kane	National Wildlife Federation
Kent	Karriker	U.S. Forest Service
Josh	Kelly	Western North Carolina Alliance
Patrick	Keyser	University of Tennessee
Tim	King	U.S. Geological Survey
Dawn	Kirk	U.S. Forest Service
JD	Kleopfer	VA Dept. of Game & Inland Fisheries
Leroy	Koch	U.S. Fish and Wildlife Service
Walt	Kordek	West Virginia DNR
Ginny	Kreitler	National Audubon Society
Brad	Kreps	The Nature Conservancy
Jen	Krstolic	U.S. Geological Survey
Ed	Laurent	American Bird Conservancy
David	Ledford	Appalachian Wildlife Foundation

Susan	Loeb	U.S. Forest Service
Scott	Loftis	North Carolina WRC
Jeff	Marion	U.S. Geological Survey
Lora	Mathers	U.S. Fish and Wildlife Service
Linda	May	Georgia DNR - WRD
Callie	McMunigal	USFWS / Eastern Brook Trout JV
Julie	McNamee	National Park Service
Bill	McShea	Smithsonian
Doug	Miller	Penn State University
Thomas	Minney	The Nature Conservancy
Patricia	Morrison	U.S. Fish and Wildlife Service
Rachel	Muir	U.S. Geological Survey
Pete	Murdoch	U.S. Geological Survey
Megan	Nagel	U.S. Fish and Wildlife Service
Craig	Neidig	U.S. Geological Survey
Keith	Nislow	UMASS/USDA FS Northern Research Station
Vivian	Nolan	U.S. Geological Survey
Allan	O'Connell	U.S. Geological Survey
Wil	Orndorff	VA Dept. of Conservation and Recreation
Donald	Orth	Virginia Tech
Richard	Palmer	University of MA Amherst
Sally	Palmer	The Nature Conservancy
Ross	Phillips	U.S. Forest Service
Patrick	Pitts	U.S. Fish and Wildlife Service
Greg	Podniesinski	Pennsylvania DCNR
Greg	Pond	U.S. EPA
Milo	Pyne	NatureServe
Lynn	Quattro	South Carolina DNR
Patrick	Rakes	Conservation Fisheries, Inc.
Jake	Rash	North Carolina WRC
Mike	Reynolds	Ohio DNR
Mike	Robinson	Office of Surface Mining
Scott	Robinson	SARP/Georgia DNR
Angie	Rodgers	NC Natural Heritage Program
Pat	Ruble	Wildlife Management Institute
Chuck	Sams	U.S. Forest Service
Cynthia	Sandeno	U.S. Forest Service
Charles	Saylor	Tennessee Valley Authority
Jim	Schaberl	Shenandoah National Park/NPS
Cindy	Schulz	U.S. Fish and Wildlife Service
Mike	Shingleton	West Virginia DNR

Peggy	Shute	U.S. Fish and Wildlife Service
Brian W.	Smith	American Bird Conservancy
Marek	Smith	The Nature Conservancy
Scott	Smith	Maryland DNR
Tom	Smith	VA Dept. of Conservation and Recreation
Lesley	Sneddon	NatureServe
David	Steffen	VA Dept. of Game & Inland Fisheries
Jan	Taylor	U.S. Fish and Wildlife Service
David	Terrell	U.S. Geological Survey
Kimberly	Terrell	Smithsonian Conservation Biology Institute
Greg	Thompson	U.S. Fish and Wildlife Service
Sue	Thompson	Carnegie Mellon University
Mark	Thurman	TN Wildlife Resources Agency
John	Tirpak	Gulf Coastal Plains and Ozarks LCC
Jeffrey	Wagner	Western Pennsylvania Conservancy
Tom	Waldrop	USDA FS, Southern Research Station
Richard	Warner	University of Kentucky
William	Wayman	U.S. Fish and Wildlife Service
Kendrick	Weeks	North Carolina WRC
Danny	Welsch	Canaan Valley Institute
Deborah	White	KY State Nature Preserves Commission
Gwen	White	DJ Case & Associates
Rickie	White	NatureServe
Jeb	Wofford	National Park Service
Pete	Wyatt	TN Wildlife Resources Agency
Charles	Yuill	West Virginia University
Walter	Zachritz	National Park Service
Paul	Zeph	PA Sea Grant, Penn State Univ.
Lora	Zimmerman	U.S. Fish and Wildlife Service

Appendix C. Technical Leads, Note Takers & Breakout Assignments

DAY 1: Breakout Groups: [# = Technical Facilitator; 1 = Technical Note Taker; 2 = (safety runner)]



Room	Capacity [15]	Name: New River
15-found-GIS+InfoM		

- # Rose Hessmiller, 15-found-GIS+InfoM-S-R
- 1 Ed Laurent, 15-found-GIS+InfoM-S-R
- 2
- 3 Rick Bennett (R), 15-found-GIS+InfoM-N-M
- 4 Pat Ruble, 15-found-GIS+InfoM-N-M
- 5 Jan Taylor, 15-found-GIS+InfoM-N-M
- 6
- 7 Doug Miller, 15-found-GIS+InfoM-N-R
- 8 Lesley Sneddon, 15-found-GIS+InfoM-N-R
- 9 David Terrell (D),15-found-GIS+InfoM-N-R
- 10 Mark Endries, 15-found-GIS+InfoM-S-M

- 11 John Tirpak, 15-found-GIS+InfoM-S-M
- 12 Jason Bulluck, 15-found-GIS+InfoM-S-R
- 13 Craig Neidig, 15-found-GIS+InfoM-S-R
- 14 Rickie White (R), 15-found-GIS+InfoM-S-R
- ~~15 Sally Palmer (S), 15 found GIS+InfoM S M~~

Room	Capacity [30]	Name: Solitude
Human Dimensions [14-found-HumDim; 11-driver-Energy; 12-driver-Urban]		

- # Steve Faulkner, 14-found-HumDim-N-R
- 1 Lindsay Gardner (99)
- 2
- 3 Paul Zeph, 14-found-HumDim-N-M
- 4 Paul Armsworth, 14-found-HumDim-N-R
- 5 Frank Casey, 14-found-HumDim-N-R
- 6 Daniel Feller, 14-found-HumDim-N-R
- 7 Nels Johnson (N), 14-found-HumDim-N-R
- 8 Laura Belleville, 14-found-HumDim-S-M
- 9 Faye Cooper (F), 14-found-HumDim-S-M
- 10 David Ledford, 14-found-HumDim-S-M
- 11 Thomas Minney, 14-found-HumDim-N-M
- 12 Deanna Dawson, 11-driver-Energy-N-M
- 13 Dave Hartos, 11-driver-Energy-N-M
- 14 Ginny Kreitler, 11-driver-Energy-N-M
- 15 Greg Podniesinski, 11-driver-Energy-N-M
- 16 Mike Robinson (M), 11-driver-Energy-N-R
- 17 Jeffrey Wagner, 11-driver-Energy-N-R
- 18 Jeff Marion, 14-found-HumDim-S-R
- ~~19 Christy Johnson-Hughes, 11 driver Energy S M~~
- 20 John Craynon, 11-driver-Energy-S-R
- 21 Lora Zimmerman, 12-driver-Urban-N-M
- 22 Bill McShea, 12-driver-Urban-N-R

Room	Capacity [15]	Name: Ellett Valley
10-driver-CC		

- # Chris Burkett (99)
- 1 Jen Krstolic, 10-driver-CC-S-R
- 2
- 3 Greg Czarnecki, 10-driver-CC-N-M
- 4 Dave Day, 10-driver-CC-N-M
- 5 Austin Kane, 10-driver-CC-N-M
- 6 Mark Hudy, 10-driver-CC-N-R
- 7 Pete Murdoch, 10-driver-CC-N-R

- 8 Richard Palmer (R),10-driver-CC-N-R
- 9 Kimberly Terrell (K), 10-driver-CC-N-R
- 10 Julie McNamee, 10-driver-CC-S-M
- 11 Chuck Sams, 10-driver-CC-S-M
- 12 Mark Bennett (M), 10-driver-CC-S-R
- 13 Hugh Irwin, 10-driver-CC-S-R
- 14 Charles Saylor, 10-driver-CC-S-R
- 15 Danny Welsch,11-driver-Energy-N-R

Room	Capacity [22]	Name: Drill Field
------	------------------	-------------------

Northern Terrestrial [06-terr-forest; 07-terr-managed; 08-terr-unique; 09-terr-species]

- # Linda May (99)
- 1 Todd Fearer (99)
- 2
- 3 Kent Karriker, 06-terr-forest-N-M
- 4 Mary Foley, 06-terr-forest-N-R
- 5 Tom Smith (T), 06-terr-forest-N-R
- 6 Patrick Keyser, 07-terr-managed-N-R
- 7 Walter Zachritz, 07-terr-managed-N-R
- 8 Marquette Crockett, 08-terr-unique-N-M
- 9 Cynthia Sandeno, 08-terr-unique-N-M
- 10 Marek Smith (M), 08-terr-unique-N-M
- 11 Mark Ford, 08-terr-unique-N-R
- 12 Dan Arling, 09-terr-species-N-M
- 13 Geoff Call, 09-terr-species-N-M
- 14 Christopher Frye (C), 09-terr-species-N-M
- 15 Jay Jeffreys,09-terr-species-N-M
- ~~16 Vivian Nolan, 09-terr-species-N-M~~
- 17 Wil Orndorff, 09-terr-species-N-M
- 18 Scott Smith (S),09-terr-species-N-M
- 19 Mike Reynolds, 09-terr-species-N-R
- 20 David Steffen, 09-terr-species-N-R
- 21 DJ Evans (DJ), 06-terr-forest-N-R
- ~~22 Charles Yuill, 06-terr-forest-N-R~~

Room	Capacity [21]	Name: Cascade B
------	------------------	-----------------

Southern Terrestrial [06-terr-forest; 07-terr-managed; 08-terr-unique; 09-terr-species]

- # Dana Baxley,09-terr-species-S-R
- 1 Brian Smith (99)
- 2
- 3 Mara Alexander,06-terr-forest-S-M
- 4 Pete Wyatt, 06-terr-forest-S-M
- 5 Milo Pyne, 06-terr-forest-S-R

- 6 Tom Waldrop, 06-terr-forest-S-R
- 7 Jeff Hepinstall-Cymerman, 07-terr-managed-S-R
- 8 Joyce Bender, 08-terr-unique-S-M
- 9 Steve Croy (S), 08-terr-unique-S-M
- 10 Josh Kelly, 08-terr-unique-S-R
- 11 Ross Phillips, 08-terr-unique-S-R
- 12 Josh Campbell (Jo), 09-terr-species-S-M
- 13 Todd Jones-Farrand, 09-terr-species-S-M
- 14 JD Kleopfer (JD),09-terr-species-S-M
- 15 Kendrick Weeks, 09-terr-species-S-M
- 16 Joe Clark,09-terr-species-S-R
- 17 Susan Loeb, 09-terr-species-S-R
- ~~18 Allan Oconnell, 09-terr-species-S-R~~
- 19 Deborah White (D), 09-terr-species-S-R
- 20 Evan Grant, 09-terr-species-S-R
- 21 Carol Croy(C), 06-terr-forest-S-M

Room	Capacity [21]	Name: Cascade A
Northern Aquatics [02-aq-unique-syst; 03-aq-comm; 04-aq-species; 05-watershed]		

- # Anita Goetz (99)
- 1 Angie Rodgers (99)
- 2
- 3 Shane Hanlon, 02-aq-unique-syst-N-M
- 4 Jeb Wofford, 03-aq-comm-N-M
- 5 Dawn Kirk, 03-aq-comm-N-R
- 6 Keith Nislow, 03-aq-comm-N-R
- 7 Greg Pond, 03-aq-comm-N-R
- 8 Rachel Muir, 04-aq-species-N-R
- 9 Dan Bishop, 04-aq-species-N-M
- 10 Walt Kordek, 04-aq-species-N-M
- 11 Patricia Morrison, 04-aq-species-N-M
- 12 Mike Shingleton, 04-aq-species-N-M
- 13 Braven Beaty, 04-aq-species-N-R
- 14 Vicki Blazer, 04-aq-species-N-R
- 15 Catherine Gatenby, 04-aq-species-N-R
- 16 Sue Thompson, 04-aq-species-N-R
- 17 Deb Carter (D), 05-watershed-N-M
- 18 Cindy Schulz, 05-watershed-N-M
- 19 Hugh Bevans,05-watershed-N-R
- 20 Donald Orth, 05-watershed-N-R
- 21 Jim Schaberl, 05-watershed-N-R

Room	Capacity [22]	Name: Duck Pond
------	------------------	-----------------

Southern Aquatics [02-aq-unique-syst; 03-aq-comm; 04-aq-species; 05-watershed]	
#	Patrick Pittts (99)
1	Callie McMunigal (99)
2	
3	Cassie Hauswald, 02-aq-unique-syst-S-M
4	Leroy Koch, 03-aq-comm-S-M
5	Brad Kreps, 03-aq-comm-S-M
6	Scott Loftis, 03-aq-comm-S-M
7	Doug Besler, 04-aq-species-S-M
8	Bart Carter (B), 04-aq-species-S-M
9	Steve Fraley, 04-aq-species-S-M
10	Maureen Gallagher, 04-aq-species-S-M
11	Chris Goudreau, 04-aq-species-S-M
12	Jeffrey Herod, 04-aq-species-S-M
13	Lynn Quattro, 04-aq-species-S-M
14	Mark Thurman, 04-aq-species-S-M
15	Tim King, 04-aq-species-S-R
16	Patrick Rakes, 04-aq-species-S-R
17	Jake Rash, 04-aq-species-S-R
18	Scott Robinson (S), 04-aq-species-S-R
19	William Wayman, 04-aq-species-S-R
20	Peggy Shute (P), 05-watershed-S-M
21	Andy Dolloff, 05-watershed-S-R
22	Richard Warner, 05-watershed-S-R

Unassigned:

Ken Elowe

Paul Johansen?

Technical & Support personnel -- to be assigned based on final needs:

Rob Baldwin

Tai-Ming Chang

Jean Brennan

Bridgett Costanzo

Megan Nagel

Laura Matther(sp?)

AV:

Greg Thompson

DAY 2: Breakout Groups

NUMBERS IN FRONT OF EACH NAME ARE THE DAY 2 GROUP NUMBER ROOM ASSIGNMENT

Just assign to equally distribute – or stay within the room space max (here are #s 1-6)

If your name tag NUMBER says...then your room is...

Group 1 – Duck Pond

1. Hanlon, 02-aq-unique-syst-N-M
2. Carter (D), 05-watershed-N-M
3. Shingleton, 04-aq-species-N-M
4. Goudreau, 04-aq-species-S-M
5. Dolloff, 05-watershed-S-R
6. King, 04-aq-species-S-R
7. Alexander, 06-terr-forest-S-M
8. Croy (S), 08-terr-unique-S-M
9. Zachritz, 07-terr-managed-N-R
10. Arling, 09-terr-species-N-M
11. Campbell (Jo), 09-terr-species-S-M
12. Evans (DJ), 06-terr-forest-N-R
13. Belleville, 14-found-HumDim-S-M
14. Armsworth, 14-found-HumDim-N-R
15. Hartos, 11-driver-Energy-N-M
16. Welsch, 11-driver-Energy-N-R
17. Sams, 10-driver-CC-S-M
18. Irwin, 10-driver-CC-S-R
19. Tirpak, 15-found-GIS+InfoM-S-M
20. White (R), 15-found-GIS+InfoM-S-R

Group 2 – Solitude

Group 3 – Assembly Hall

Group 4 – Drillfield

Group 5 – Cascades B

Group 6 – Cascades A

Add: Scott Klopfer,

AQUATIC-M

21. Hanlon, 02-aq-unique-syst-N-M
22. Hauswald, 02-aq-unique-syst-S-M
23. Wofford, 03-aq-comm-N-M
24. Koch, 03-aq-comm-S-M
25. Kreps, 03-aq-comm-S-M
26. Loftis, 03-aq-comm-S-M
1. Carter (D), 05-watershed-N-M
2. Schulz, 05-watershed-N-M
3. Shute (P), 05-watershed-S-M

Aquatic #2-sp-M

4. Bishop, 04-aq-species-N-M
5. Kordek, 04-aq-species-N-M
6. Morrison, 04-aq-species-N-M
1. Shingleton, 04-aq-species-N-M
2. Herod, 04-aq-species-S-M
3. Besler, 04-aq-species-S-M
4. Carter (B), 04-aq-species-S-M
5. Fraley, 04-aq-species-S-M
6. Gallagher, 04-aq-species-S-M
1. Goudreau, 04-aq-species-S-M
2. Thurman, 04-aq-species-S-M
3. Quattro, 04-aq-species-S-M
4. Robinson (S), 04-aq-species-S-R –

AQUATIC-R

5. Kirk, 03-aq-comm-N-R
6. Nislow, 03-aq-comm-N-R
- ~~1. —~~
- ~~2. —~~
3. Bevans, 05-watershed-N-R
4. Orth, 05-watershed-N-R
5. Schaberl, 05-watershed-N-R
6. Warner, 05-watershed-S-R
1. Dolloff, 05-watershed-S-R

Aquatic #2-sp-R

2. Blazer, 04-aq-species-N-R
3. Beaty, 04-aq-species-N-R
4. Muir, 04-aq-species-N-R
5. Gatenby, 04-aq-species-N-R
6. Thompson, 04-aq-species-N-R
1. King, 04-aq-species-S-R
2. Rakes, 04-aq-species-S-R
3. Rash, 04-aq-species-S-R
4. Wayman, 04-aq-species-S-R

TERRESTRIAL-M

5. Karriker, 06-terr-forest-N-M
6. Croy(C), 06-terr-forest-S-M
1. Alexander, 06-terr-forest-S-M
2. Wyatt, 06-terr-forest-S-M

3. Crockett, 08-terr-unique-N-M
4. Sandeno, 08-terr-unique-N-M
5. Smith (M), 08-terr-unique-N-M
6. Bender, 08-terr-unique-S-M
1. Croy (S), 08-terr-unique-S-M

TERRESTRIAL-R

2. Smith (T), 06-terr-forest-N-R
- ~~3. Yuill, 06-terr-forest-N-R~~
4. Pyne, 06-terr-forest-S-R
5. Waldrop, 06-terr-forest-S-R
6. Keyser, 07-terr-managed-N-R
1. Zachritz, 07-terr-managed-N-R
2. Hepinstall-Cymerman, 07-terr-managed-S-R
3. Ford, 08-terr-unique-N-R
4. Kelly, 08-terr-unique-S-R
5. Phillips, 08-terr-unique-S-R

Terr #2-sp-M

6. Orndorff, 09-terr-species-N-M
1. Arling, 09-terr-species-N-M
2. Call, 09-terr-species-N-M
3. Frye (C), 09-terr-species-N-M
4. Jeffreys, 09-terr-species-N-M
- ~~5. Nolan, 09-terr-species-N-M~~
6. Smith (S) , 09-terr-species-N-M
1. Campbell (Jo), 09-terr-species-S-M
2. Jones-Farrand, 09-terr-species-S-M
3. Kleopfer (JD),09-terr-species-S-M
4. Weeks, 09-terr-species-S-M

Terr #2-sp-R

5. Reynolds, 09-terr-species-N-R
6. Steffen, 09-terr-species-N-R
1. Evans (DJ), 06-terr-forest-N-R
2. Loeb, 09-terr-species-S-R
3. Clark,09-terr-species-S-R
- ~~4. Oconnell, 09-terr-species-S-R~~
5. White (D), 09-terr-species-S-R
6. Grant, 09-terr-species-S-R

HumDim-M

1. Belleville, 14-found-HumDim-S-M
2. Zeph, 14-found-HumDim-N-M
3. Cooper (F), 14-found-HumDim-S-M
4. Ledford, 14-found-HumDim-S-M
5. Minney ,14-found-HumDim-N-M
6. Zimmerman, 12-driver-Urban-N-M

HumDim-R

1. Armsworth, 14-found-HumDim-N-R
2. Casey, 14-found-HumDim-N-R
3. Johnson (N), 14-found-HumDim-N-R
4. McShea, 12-driver-Urban-N-R
5. Palmer (S), 12-driver-Urban-S-R

HumDim #2-Energy-M

6. Dawson, 11-driver-Energy-N-M
1. Hartos, 11-driver-Energy-N-M
2. Kreidler, 11-driver-Energy-N-M
3. Podniesinski, 11-driver-Energy-N-M
4. ~~Johnson-Hughes, 11-driver-Energy-S-M~~

HumDim #2-Energy-R

5. Wagner, 11-driver-Energy-N-R
6. Robinson (M), 11-driver-Energy-N-R
1. Welsch, 11-driver-Energy-N-R
2. Craynon, 11-driver-Energy-S-R

CC-M

3. Czarnecki, 10-driver-CC-N-M
4. Day, 10-driver-CC-N-M
5. Kane, 10-driver-CC-N-M
6. McNamee, 10-driver-CC-S-M
1. Sams, 10-driver-CC-S-M

CC-R

2. Palmer (R), 10-driver-CC-N-R
3. Hudy, 10-driver-CC-N-R
4. Murdoch, 10-driver-CC-N-R
5. Terrell (K), 10-driver-CC-N-R
6. Bennett (M), 10-driver-CC-S-R
1. Irwin, 10-driver-CC-S-R

2. Saylor, 10-driver-CC-S-R

IT-M

3. Bennett (R), 15-found-GIS+InfoM-N-M
4. Ruble, 15-found-GIS+InfoM-N-M
5. Taylor, 15-found-GIS+InfoM-N-M
6. Endries, 15-found-GIS+InfoM-S-M
1. Tirpak, 15-found-GIS+InfoM-S-M

IT-R

2. Sneddon, 15-found-GIS+InfoM-N-R
3. Miller, 15-found-GIS+InfoM-N-R
4. Terrell (D),15-found-GIS+InfoM-N-R
5. Bulluck, 15-found-GIS+InfoM-S-R
6. Neidig, 15-found-GIS+InfoM-S-R
1. White (R), 15-found-GIS+InfoM-S-R

MISSING – and just added and assigned to group

3. Foley, 06-terr-forest-N-R
4. Marion, 14-found-HumDim-S-R
5. Feller, 14-found-HumDim-N-R
6. Rose Hessmiller, 15-found-GIS+InfoM-S-R
7. Ed Laurent, 15-found-GIS+InfoM-S-M

Group Count: 1 = 21

Group Count: 2 = 21

Group Count: 3 = 21

Group Count: 4 = 21

Group Count: 5 = 20

Group Count: 6 = 20

Any groups still needing someone to balance the #s – add:

- Ken Elowe, Tai-Ming Chang, (Brennan, Costanzo, Baldwin to float)

Appendix D. Miscellaneous notes from group discussions

Group 1: Patrick Pitts & Callie McMunigal

Recommendations

- Combine forest, open land, and wetlands themes into 1 terrestrial theme.
- Create user groups / teams for each funded science need. This team should be involved from the RFP development (to refine science need because they are so broad) through completion of the project. The team should be composed of representatives from the user community that will benefit from the research.
- Vulnerability assessments must address present and future threats.

Comments & Observations

- Why do themes and programs matter? If research needs meet LCC ranking criteria, then the needs should apply to many themes / programs.
- The structure of the themes – programs – needs is a problem and folks get hung up on it.
- The landscape scale multi-taxa criteria does not work as easily for aquatics.
- Ranking guidelines are hamstringing people.
- Groundwater / springs not mentioned much in priority needs.
- There was concern that many of the science needs are very broad... too broad to immediately go to RFP process. The group hopes that the ISC will be involved in narrowing down these broad needs before they are funded.
- Final priorities tend towards modeling of future conditions rather than present habitat characterization.
- In the process of day 1 all of the organismal issues fell through the cracks. Day 2 overcame this and the end result is more balanced.
- Specific science needs were merged and over generalized. It may be difficult to fund specific needs within those broad descriptions now.

Gaps

- Adaptation strategies should be done after vulnerability assessments.
- Current and future energy development effects need to be addressed.
- Lost an entire theme (CKM) in final set of priorities.
- Assumption made that we (App LCC) wouldn't address mitigation may have resulted in a gap.

Group 2: Linda May & Todd Fearer

No additional notes provided.

Group 3: Steve Faulkner & Lindsay Gardner

Do we need to add an outreach/communications program (stakeholder identification and engagement) component under both Themes #7 and #8? It is an overall program need. Conflict resolution, consensus-building need. Outreach and engagement are key to collaboration and decision-making process. Need to understand people's/group's motivations. Human population shifts – need to understand population growth/urbanization.

What is the role of the LCC in developing guidance, decision-making role? (Put in parking lot for further discussion)

Concerned about including reserves, parks, conservation areas in mapping.

In terms of ranking, there are four categories of informational resources and only three priorities. Can we lump them? Shouldn't the geospatial information needs be a given?

Example of a project – update the 1996 (SAMAB) Southern Appalachian Man and the Biosphere report (chapter 3 – Changing Demographics and Economic Conditions in S. App.

Do we want to have other things that are not just geospatial, such as indicator species, as a means of tracking development impacts, edge effects, etc.? In the realm of NEPA law these are other considerations.

- 1) Forestry Industry/Forest Lands Management (Timber Investment Management Organizations)

Research into economics of small landowner forestry practices (example of oak forests). Can we find triggers or tipping points that enable small landowners to more sustainably manage forested lands? Ecological conditions. Ownership patterns changing. Current vs. projected status. Tract size shrinkage.

- 2) Urbanization (all aspects of infrastructure)

One could create urbanization models playing out different scenarios – future projections. Forecasting future spatial footprint of development in 20 years in light of changes to demand, technology and regulation – an appeal for an econometric model. Policy dev. Drives urban development in App. Need social science research into policy option and natural resource impacts given a particular policy direction. There are good models to help with our understanding.

Access to decision-support tools for growth assessments/projections. Need to run scenarios at a landscape level.

7.4, 7.5/7.6 combined, 7.7 – are top 3

Need to understand what's happening to land (terrestrial habitat), water (what's happening to species), atmospheric impacts. Energy dev., forestry, land dev. Activities are all impacts/stressors on the landscape. Science needs could be viewed independently from the specific stressors.

How do we account for other types of research that is going on? We need to differentiate between science needs and advocacy (how the science will be used).

Question: What's going to happen with land ownership (in light of gas production)? Ownership is key. Concern that lands will revert to local governments.

Discussion about whether or not to combine themes #7 and #8:

Two themes are interrelated. Economic and social needs overlap. Assumption that both natural and cultural resources will be considered. Should be kept separate. Number 8 affords more specificity. Need to include public/private stakeholders.

Keep categories separate to measure outcomes. Important to keep separate to target/consider specific audiences (gas industry); separate from general public audiences.

Decision #1 – keep themes #7 and #8 separate.

Questions:

What are ecosystem services that are impacted by human activity?

Need to define cultural resources.

Do we need to add an outreach/communications program (stakeholder identification and engagement) component under both Themes #7 and #8? It is an overall program need.

Conflict resolution, consensus-building need. Outreach and engagement are key to collaboration and decision-making process. Need to understand people’s/group’s motivations. Human population shifts – need to understand population growth/urbanization.

Question:

What is the role of the LCC in developing guidance, decision-making role? (Put in parking lot for further discussion)

Concerned about including reserves, parks, conservation areas in mapping.

#8 Programs:

Need to consider restoration industry and economic benefits.

Need to include carbon sequestration – possibly in 8.4 (Soil and water).

Discussion:

In terms of ranking, there are four categories of informational resources and only three priorities. Can we lump them? Shouldn’t the geospatial information needs be a given?

Example of a project – update the 1996 (SAMAB) Southern Appalachian Man and the Biosphere report (chapter 3 – Changing Demographics and Economic Conditions in S. App.

Do we want to have other things that are not just geospatial, such as indicator species, as a means of tracking development impacts, edge effects, etc.? In the realm of NEPA law these are other considerations.

How do we account for other types of research that is going on? We need to differentiate between science needs and advocacy (how the science will be used).

Other groups are addressing the stressors (aquatic, terrestrial).

Concern over limiting public audience to that within the LCC boundary (who will benefit from ecosystem services).

Concerned about losing local perspective. Need to preserve. What is meant by human resources? Need to consider “downstream” conservation perspectives.

Group 4: Chris Burkett & Jen Krstolic

Goal changes rational:

Stronger statement about the fact that there will be changes, emphasize regional and local scales and the need to be able to scale from local to regional.

We will discuss cultural resources and how that differs from natural resources for management.

Literature review is National level CSC and local too.

Include models in Data management program

Synthesis of migration/lu change habitat quality, hydrology in MODELS that give scenarios...

Group 5: Anita Goetz & Angie Rodgers

Day 1 NOTES

Aquatics North – Day 1

This document contains the original Programs under the Aquatic Theme. All notes/suggestions were recorded here. This was the document we used to change the Program names. **Red font** are changes agreed upon by participants and represent the ‘final’ decision. The information at the bottom of this document is the revised Program Names and List of Needs (these revised program names and list of needs are also in the Chart from Day1 – AquaticsNorth_Day1_Chart of all Needs.docx)

We took a quick look at the Goal Statement and made notes on it. The revised Goal Statement was put together between the facilitators/note takers for Aquatics North and Aquatics South after the Work Groups on Day 1.

Thematic-Area

(2) Aquatic

GOAL (original): Be able to quantitatively describe current and future hydrologic and structural habitat conditions and aquatic population trends, and set conservation goals for both, in order to maintain native habitats and endemic aquatic species in their current locations or support these as they migrate with land use and climate changes in the future.

Structural - take this word out – habitat is not just structural – it’s chemical, physical, etc.

Physical and biological trends – perhaps better phrase to use

Quantitatively – may be difficult, so should use qualitatively (need to revisit this later)

Goal of quantitative – quantitative is more robust than qualitative

Restoration needs to be added (“maintain or restore”)

What is a native habitat? Define this. (perhaps use “existing habitat”); perhaps use “desired”, “natural”.

Native aquatic species may have been intended

No need to break out into “endemics”

This goal was decided ‘after hours’ and was worked out between the North/South facilitators/note takers

GOAL: Be able to quantitatively and qualitatively describe current and future hydrologic and habitat conditions and aquatic population trends, and set conservation goals for both, in order to maintain and restore habitats and aquatic species in their current locations to facilitate connectivity into the future.

2.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources

- STORET, State Databases (need to know where these exist)
- any type of planning tool/assessment that has already been developed and can be used – with the hopes of not reinventing the wheel
- Include the term “model” (as a pre-existing tool)
- there are a suite of IBI models, for example – need to have an integrated approach so that states can communicate with each other

2.1. Database / Information Management

2.2. Baseline Data / GIS Layers & Standardization of Data Collection

- state data needs to be able to ‘communicate’ with each other

2.3. GeoSpatial Status Assessment

- Suggestion to combine 2.0-2.3
- 2.0-2.3 are split out too much. Data management should all be spatially referenced.
- Geospatial status assessment...of WHAT?
- GIS is a powerful tool for data storage, management, and assessment. All data could be stored in a GIS. Combine 2.0-2.2. USGS national Map could probably handle this.
- Compile data on non-native invasive species and disease

Is there a need to split out data collection and management versus analysis??

These could all be combined (2.0 through 2.3) = Foundational Tools/Materials

- Refer to Research and Monitoring Needs – need to make sure that LCC is going to include research AND monitoring
- Suggestion to use Science and Planning

2.4. Water Quality & Quantity/Availability

- Suggestion to split water quality and quantity because the stresses and sources can be very different

- Prediction/models of Marcellus Pad density and effect on water withdrawals and non-treated water entering systems (could be a Need rather than a Program??)
- Identify those threats (land use, resulting changes in water quality regarding contaminants) that are of greatest importance to the LCC (e.g. energy extraction, urban development, etc.)
- Water use conflict resolution
- STORET, State databases

Do we need to split quality and quantity?

- They are related and linked – you could not separate these 2 when looking at a particular habitat?
- Suggestion to combine quality, quantity, and habitat – can’t think about habitat without thinking about quality
 - o Some agreement because it’s hard to separate the 3
 - o Suggestion to keep them separate – physical habitat separate from quality/quantity
- The hierarchy doesn’t restrict the thinking of research needs – merely an umbrella for administrative record keeping
- Energy development/emerging threats – water quality/quantity will be under that program also – by lumping, we don’t want to lessen our priorities for science needs
- **Habitat (Program) with multiple components**
 - o **Connectivity**
 - o **Water quality**
 - o **Water quantity**
 - o **Habitat quality**
 - **Riparian habitat**
 - **Instream, structural habitat**
 - o **Habitat quantity**
[Modeling – tool to be used]

2.5. Habitat

- Possibly combine under habitat = water quality, water quantity, timing, physical/structural connectivity
- In addition to techniques to restore degraded habitat, include methods to maintain INTACT habitat
- RBP (rapid bioassessment) or surrogate, probabilistic

2.6. T&E Species - Recovery + Captive Propagation/Reintroduction

- Assessment, Distributions, and Likelihood of occurrence modeling (this is a “needs” statement)
- Include indicator species, species of concern
- Include keeping and restoring common species (not just focusing on T&E) – Remove “T&E” part (this is a legal term)
- Use “At Risk or Potential At Risk Species”
- Support recovery of priority aquatic species (not just endangered)

Need an inventory of species – perhaps a science need?

Captive propagation is a tool to be used for recovery of species

- Suggestion to have 2.6 T&E Species Recovery
 - o Landscape-level planning tools

2.6 – At Risk Species (Communities) Recovery

(this needs to include communities, not merely individual species)

Where do we have a regulatory means, etc.? Perhaps include this as a ranking factor?

2.7. (Fisheries) Population Models / Goals

- Focus on T&E, Also need to keep the common species common
- Population modeling is useful for aquatic species assessments beyond fisheries so we can drop that word.
- Use presence/absence to the extent practical (much easier to measure)
- Aquatic species population models/goals (not just fisheries)

Suggestion to change program name to: aquatic species restoration, sustainable populations, population community assessment and recovery, status

Resilient populations

(health of the) Populations and Communities

2.7 Sustainable Populations and Communities (of all aquatic species)

- legal aspect of aquatic life use (Clean Water Act); use attainability – where does this idea fit?
- where does policy fit into all this?
- science needs identified and then feed into the policy aspect
- agree that the policy piece belongs under “sustainable populations and communities”

Recreational (and Commercial) Fisheries (potentially a separate program) – fish stocking programs, altered species introductions, reservoir levels – iterates science needs;

Recreational users in general (need to be captured)

Recreational, Commercial, Subsistence Use (separate program)

2.7b. Landscape-level Species-Habitat Relationships at Multiple Scales

(Modeling / Sp-Habitat Relationships / Assessment)

Define landscape level vs. habitat

Remove landscape-level

- Develop environmental flow requirements for species, populations, and communities for the region

Modeling is a tool and it should be included in “Habitat” program; could also be put under first program (Data, etc.)

Modeling itself is a research need, depending on what it is (what needs to be modeled) – could be put under several programs - Habitat

2.8. Species/System Response to Alteration

- Major Drivers (CC, Energy/Development, Urban, etc.)
- Gaps = water demand projections; human population projections

- need “dose response” models to inform on system quality (research need)

This is response to threat (2.7b is more science – species/habitat interaction)

Hierarchy of drivers, stressors, response

Delete “major drivers”

2.9. Landscape-level Integrated Planning Tools

(Recovery / T&E / SGCN)

- Should not focus only on T&E

- Planning tools will be needed to implement thematic goal as a whole

This is a tool – it will be needed holistically

Need for the development of these tools.

This will drive science and research needs – to fill those holes; all-encompassing; there may not be a magical tool to crank out all answers

Invasive Species – where do they fit?

Keep “integrated” – needs definition – who is part of the integrated piece

Using an established protocol, systematically identify the watersheds (at a watershed scale) for protection, conservation, mitigation) of highest priority. This can be based on 1) biological & cultural value, 2) threats to the resource

Ecological Function

- intrinsic to the system

- Nutrient cycling and energy flow are higher order that are not captured under species/habitat interaction

- raw material for human dimensions

Invasive species can be incorporated into several programs.

Threats covered in 2.4 and 2.5 – redundancy?

2.6 or 2.7 – what about strategies or techniques for conservation of existing populations of priority aquatic species?

What are priority aquatic species?

Overarching:

1. Intertwining reference conditions, strict criteria needed
2. Classification of aquatic habitat – e.g. low gradient, headwater, large river
3. Available surrogates from state databases
4. Using probabilistic survey data

There is no capturing of ecosystem service understanding.

Ecological goods/services – we tend to think about the function of organisms within the system.

The human dimension (economist) element is all about economic value, money.

Does the biological response of aquatic organisms fit in water quality (2.4) or should that be a separate program?

Combine 2.6 and 2.9

Combine 2.0-2.3

Add major drivers from 2.8 to 2.4 (CC, development, etc.)

Reserves and Refugia

- Where will natural refugia occur in light of changing climate or altered environments; where is there potential for reserves? Captive holding of ESUs?
- This fits under landscape-level planning tools
- Science need

Species interdependence and interactions are not captures. Example – mussels and host fish

- Captured in existing programs

Impacts of invasives

Impacts of hybridization

(Need rather than Program?)

Lack of any indication of “Healthy” populations

Need to include CONNECTIVITY within habitat program

Public outreach to determine desires of public. Our desires may not be theirs.

Outreach /Communication

This does not have science needs to fit under Public Outreach program

Would be best under a different theme

Perhaps this is covered under Theme 8 – Human Dimensions

If it is not covered in other areas, then let’s cover it here – we cannot dictate our sequestered ideas/answers that are going to be implemented across the population

Communication/outreach strategy/stakeholder involvement/working with partners are additional elements in implementing the work of the LCC – this group is working on the science needs as component of that broader scope of work – in supporting the conservation delivery of the members

Outreach is a THEME – will hopefully be covered under Human Dimensions

This will not be included as a separate program under Aquatics;

Fisheries = ALL aquatic organisms

Consider explicit program to identify and assess threats to both biotic and abiotic factors

Seems implied among programs but might be more useful as its own program

(captured in species system response to alteration program)

These are the final Program Names and List of Needs – this information is reflected in the Day 1 Chart (AquaticsNorth_Day1_Chart of all Needs.docx)

2.0 Foundational Tools/Materials

- Need an inventory of available information, what relevant data are out there? ***Short List***
- How can these various databases talk to each other?
Need a GIS tool to manage the data
- Develop (or utilize) a portal to access primary databases
- Develop rapid assessment program and ground truthing for assessing riparian and floodplain vegetation
- Need common hydrologic models/hydrologic data (models like stream stats for ungaged streams)
- Develop a way to access privately collected monitoring data from the permitted community
- Need to develop NHD data at 1:24K

2.1 Habitat

- **Connectivity**
 - **Water quality**
 - **Water quantity**
 - **Habitat quality**
 - **Riparian habitat**
 - **Instream, structural habitat**
 - **Habitat quantity**
- Need to know the relationship between flow and habitat and aquatic life (ecological flows)
 - Need to know the dispersal abilities of aquatic animals
 - Barriers inventory – when is it desirable and undesirable to remove barriers?
 - Influence of land use on water quality/quantity
 - Loss of cold/cool water habitats in response to thermal regime shift
 - Assessing aquatic species vulnerability to changes in stream flow and temperature, water quality
 - Need to understand the effects of extreme events on habitat

- Need to know the effects of water withdrawals and return flows
- Effects of fragmentation (connectivity) on aquatic species – viability, sustainability
- Relationships between sedimentation rates and biological response
- **Relationships between contaminants and biological response***Top 3 and Short List*****
- Need for BMPs for riparian zone management
- Effects of stormwater management/impervious surfaces on aquatics
- Monitor effectiveness of BMPs/water quality standards/criteria – is it effective for target species?

2.2 Ecological Function

- Identify the role of fw mussels (aquatic organisms) in nutrient cycling, removal of suspended sediments, bioturbation, bottom stabilization and enrichment, and creating stable aquatic habitats
- effect of invasive species on ecological function (riparian zone and instream) (e.g. Japanese knotweed)
- identify impact of riparian and floodplain vegetation on aquatic community and the food chain in light of species composition and climate change on aquatic communities
- quantify, establish, and identify thresholds for ecosystem function
- relationship between benthic biodiversity and nutrient dynamics
- effects of disease and parasites
- effects of aquatic organisms dispersal on nutrient dynamics

2.3 At Risk Species (Communities) Recovery

- Need an inventory/status assessment of species
- develop efficient environmental inventory tools
- develop habitat models for at risk species
- improving, refining, testing efficiency of captive propagation techniques
- develop criteria for relocation/augmentation (genetics, disease, etc.)

- develop recovery plans for those species already identified
- identify suitable refugia for T&E species
- rigorous understanding of population dynamics/viability for fw mussels (other at risk species)
- establish a protocol to populate a genetic database for at risk species
- develop conservation genetic management plans for aquatic species

2.4 Sustainable Populations and Communities (of all aquatic species)

- develop standard protocol for establishing status and long term trends
- develop additional IBIs tailored to basins/regions/additional species
- effect of population densities on recruitment potential – (inc. minimum population size)
- **develop technology and protocols for restoring common mussel communities for their ecosystem function ***Short List*****
- need to identify and understand interspecies relationships (pollinators, host fish, etc.)
- need population viability studies

2.5 Recreational, Commercial, Subsistence Use (separate program)

- Determine the economic and social value of various fisheries
- effect of harvest on sustainable populations
- effect of judicious stocking of nonnative species on native biota
- what is the magnitude of current use and trends of recreational, commercial, subsistence use?***Short List***
- improvements to fish sterilization techniques (triploidy technology)
- identify and plan for conflicts between various user groups

2.6 Species-Habitat Relationships at Multiple Scales

- evaluation of natural channel design on ecosystems
- mussel/fish habitat models that relate occupancy and abundance to habitat characteristics

- aquatic species models that relate occupancy and abundance to habitat characteristics
- **need to develop environmental flow requirements for species, populations, and communities for the region**
- **need to know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program)**
- The above 2 needs were combined and ranked as ***Top 3 and Short List*****
- effects of headwater stream disturbance on downstream fish/mussel communities
- mapping of remaining suitable and free flowing riverine habitat for fw mussels
- temporal and spatial scale relationships to aquatic communities (headwater disturbances, land use/cover associated with aquatic communities – can be temporal component)
- defining spatial scales of populations
- habitat suitability analysis for fw mussels
- evaluation of macrohabitat features on biodiversity distribution
- impacts of density of aquatic vegetation on fish community composition

2.7 Species/System Response to Alteration

- responses of populations/communities to altered thermal /hydrologic regimes
- effects of fragmentation
- **effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to marcellus shale development in Appalachia – ID-RecNo 55) ***Top 3 and Short List*****
- develop percent impervious thresholds
- effects of invasive species
- develop toxicological criteria
- comparative assessment of relative sensitivity of biota to contaminants
- understand the effects of complex mixtures

- develop biomarkers for stress exposure
- effects of resource extraction
- effects of fire on aquatic ecosystems
- effects of atmospheric deposition

2.8 Integrated Landscape-level Planning Tools

- interactive GIS based decision support tool for reducing environmental impacts of resource extraction sitings
- developing barrier removal prioritization scheme with multiple criteria
- Where will natural refugia occur in light of changing climate or altered environments; where is there potential for reserves? Captive holding of ESUs?
- comparative analysis of effective landscape planning tools

Day 2 NOTES

We went through each Need that was given to us on morning of Day 2. We reviewed and edited the list of Needs for each Thematic Area. We did not edit the Program or Goal Names/Description. We combined Needs, as appropriate, language was simplified, etc. These changes are noted below and also in the Anita_Angie_Day2_Chart.docx. (Red Font indicates final changes and decisions made by the group. These are reflected in the Chart document.) After Needs were edited, we did sticky dot voting. Each participant received 10 dots. They could put no more than 4 dots on one science need. There were 6 top needs that had 12 or more sticky dots, so we did not do an additional round of voting.

Thematic-Area

(1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

1. [Need] Capacity – GIS/IT Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.(this is key to all themes)

2. [Need] Content management – Tools to gather and disseminate data. Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.

This need is embedded in 1st need? Can we combine these? All 3 could be combined? It could be wrapped into 1 really big need. If we combine, this could help with the final ranking.

3. [Need] Education - Learning management system (e.g., moodle) to include hardware/software demonstrations, field guides, training videos, podcasts, webinars, training material archives.

Discussion:

-“architecture” was used as a general term

-Gathering data is easy part; synthesizing is the difficult part. Circled back to need for capacity due to the previous statement.

- IT group agreed there was a need in data collection from the field, current data which are essential for inventory/monitoring. Group trusted that other groups were arriving at that critical need and IT group left that out. Bringing that point up in mixed group because it was noted as very important.

- First 4 programs were related to data gathering. With each science need identified, the GIS/data synthesis was integral to doing anything else. Concern that it is not a separate need, but is crucial to accomplishing any of the needs recommended.

- is it implied that there is a need to develop a new database? No. IT group agreed that is a huge ‘no no’. There are platforms/tools for content management; idea is to assemble a suite of tools to allow you to access data relevant to the work to be done in an efficient manner. Make best use of web and map service, linking out to information.

- Federated search – a way to have searching capability that allows you to narrow down the critical piece of information needed

- in CC, this idea was discussed, but it did not rise to the top 3. Want to make sure that this is captured within the writing team.

- Does this become a project? Appears to be a combined effort. It’s a strong logistical need, but is it a science need?

- this is a programmatic need. Need for GIS staff to conduct modeling, pull data together to answer appropriate questions. This is not a science need, but a programmatic need.

- Education – who is the target? Teaching partners and internal staff how to use this ‘thing’ , how to use it for on the ground management. This is more training than education (is not outreach).

Thematic-Area

(2) Aquatic

1. [Need] Relationships between contaminants and biological response

2. [Need] To develop environmental flow requirements for species, populations, and communities for the region.

3. [Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program)

#2, 3 should be combined.

2. Need rigorous understanding of the relationships between hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities.

3. [Need] Identify impacts of energy development and resource extraction on aquatic communities

- related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).
- water quantity is also included here
- resource extraction – includes all related infrastructure

4. [Need] Identify key limiting factors and stressors affecting at-risk species/critically imperiled aquatic taxa and communities across the LCC.

- This is the whole kitchen sink. Kind of similar to #1, but includes all stressors.
- This is very specific to specific taxa. There may be some taxa where we don’t know limiting factors and major stressors, to determine what those factors are.
- perhaps we could categorize
- suggestion to add endemic, discussion on wording
- Suggestion that #1, 2 are likely focused on at-risk species and should perhaps be an overarching consideration throughout the aquatic theme.

5. [Need] For the stressors that are currently intractable politically impossible to correct (agriculture, forestry, urban growth, mining, etc),

[Need] Develop and communicate culturally viable solutions to address intractable stressors across the landscape.

- these are politically impossible, yet we are going to address them – what does this mean?
- this is getting at a human dimensions need, infiltrate public opinion
- thought that this is not a science need. It is big picture. This belongs in Social Science Theme
- this is a value judgment; needs to be changes to an “action”
- this change waters it down
- is there a problem with communication being a science need?
- this reads as a goal, perhaps under the social science theme?

6. [Need] Identify distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or move between watersheds.

Thematic-Area

(3) Terrestrial - Cave/Karst/Mines/Groundwater

1. [Need] Map of springs throughout karst region—characterization and identification

1. [Need] Develop a classification system for karst systems in the Appalachian region (to help prioritize conservation strategies)

2. [Need] Inventory and mapping of CKM and groundwater systems, understand species and community distributions, their habitat relationships, and linkages across systems

- this is only one recognized from terrestrial north
- this should include springs
- combine #1 and #3
- karst includes springs

3. [Need] BMPs for cave/karst landscape, based on existing science.

Develop basic knowledge and understand linkages between surface activities and impacts to cave/karst/mines to aid in development of BMPs

- based on existing science infers that it already exists
-

4. [Need] Cave/karst training workshops for resource managers (e.g., provided by Karst Waters Institute)

- this seems to be outreach related
- discussion in Day 1 was for more training for users/cooperators
- workshops are already developed, but they need to be delivered
- is this a science need?
- Funding for the study of CKMG ecosystems
- building a support system to get taxonomy done
- more knowledgeable scientists are needed
- **Build capacity to be able to identify the range of species and communities within CKMG**

-hydrology is missing from these priorities (this was identified in terrestrial north as important)

Thematic-Area

(4) Terrestrial – Wetlands

1. [Need] Identify and quantify the extent of naturally functioning floodplain habitat critical to priority aquatic/terrestrial habitat and species

- in big river systems, floodplain connection is important in life of priority species
- referencing NWI maps

2. [Need] Determine current extent of wetland connectivity to perennial streams compared to historical connectivity.

3. [Need] Quantify ecosystem services of wetlands, and their contribution to nutrient cycling to both aquatic and terrestrial systems.

- ecosystem services – species? Humans? YES

Thematic-Area

(5) Terrestrial – Forests

1. [Need] Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning)

- ECAP was meant to be umbrella
- reserve and corridor design needs to be included here
- spatial data framework – connected and resilient network of conservation areas and all things listed are tools to accomplish that
- “ network of connected and resilient places
- Develop, integrate, and identify the tools necessary to identify/design/build/create a connected and resilient network of forest ecosystems (this is about getting tools together, not building the network)

Identify a process for a connected and resilient network of forest ecosystems in the Appalachian LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning)

- are you building a process to be used into the future with changes – that will serve you over time?
 - is this product too large?
 - first step would be build and gather tools; 2nd step would be put it all together
 - this needs to be adaptive and iterative – should be understood throughout the needs statement
- landscape/habitat network of conservation areas

Network of resilient forest

Forest ecosystems

- perhaps this needs to be a 2 part approach
- Identifying the process/tools

[Need] Identify a connected and resilient network of forest ecosystems in the Appalachian LCC.

- a need is overarching; need must be addressed so information is deployed/accessible
- accessible system is an overarching need (like the GIS/IT discussion)
- LCC is an opportunity to revisit the conservation model and make sure the products are being used and are getting out there.
- resilient network is not a static thing – it is revolving; process to identify is revolving also
- every theme is asking for GIS

2. [Need] Assess status of Appalachian amphibians and determine impacts of emerging amphibian diseases

3. [Need] Understanding species distributions across the region, their habitat relationships, and migration corridors.

4. [Need] Effects of stressors (urbanization, energy development) on forests integrity/functionality and endemic species.

- if endemic species is moved out, it’s more system and #6 is more species related

1st – identify network

2nd – understand stressors on the network

3rd – understand stressors on species

4th – identify status of species

- if it’s so broad (effects of stressors), does this tell the LCC what we think is important?
 - it is important to show focus, but the 4 above pieces are part of it; however we need some details.
 - we need to focus on overarching big needs; then hope there’s a process (steering committee) to filter through the specifics and make sure they are included
- impacts, plus adaptive responses, then mitigation; effects is very narrow – need adaptive response, need that management tool; do you want to only look at impacts or also include adaptation/mitigation piece
- Increase understanding of X to develop a mitigation response strategy.

5. [Need] Understand the effects of stressor on species Assessing impacts of climate change on endemics and other range-limited species (e.g. endemic salamanders).

-

6. [Need] Assessing priority species conservation areas (e.g. PARCAs) and vulnerability to stressors (e.g. climate change) in the Appalachians.

- this includes areas and could encompass multiples species

- Can 5 and 6 be combined? 5 is specific to CC; 6 is more broad in terms of stressors

- PARCAs exist within other LCCs and this need was more specific to a particular program (complementary activity in AppLCC is needed)

- conversation needs to take place about system level approach or species level approach – what is most important to start on now?

Identify a connected and resilient network of forest ecosystems in the Appalachian LCC.

2. [Need] Assess status of Appalachian amphibians and determine impacts of emerging amphibian diseases

5. [Need] Assessing impacts of climate change on endemics and other range-limited species (e.g. endemic salamanders).

3. [Need] Understanding species distributions across the region, their habitat relationships, and dispersal dynamics.

4. [Need] Effects of stressors (urbanization, energy development) on forests integrity/functionality and endemic species.

5. [Need] Understand the effects of stressor on species Assessing impacts of climate change on endemics and other range-limited species (e.g. endemic salamanders).

-

6. [Need] Assessing priority species conservation areas (e.g. PARCAs) and vulnerability to stressors (e.g. climate change) in the Appalachians.

Thematic-Area

(6) Terrestrial - Open-land Natural Community (grasslands, meadows, balds, shale barrens)

1. [Need] Understanding historical vegetation distributions and historical disturbance regimes in the landscape and the extent to which they can be replicated given existing conditions.
 - historical vegetation disturbance regimes? What does this mean? It was not defined in the group.
 - historical is not limited to recorded in history (written history) – simply means ‘the past’
 - we know much less about these systems, compared to forests, so that basic history/knowledge is needed
2. [Need] Understanding species and community distributions across the region, their habitat relationships, and dispersal dynamics.
 - should this be combined with #1?
 - getting at life history and ecology of species
3. [Need] Effects of stressors (urbanization, energy development, climate change) on open-lands integrity/functionality and associated species.
 - combined species and system level
4. [Need] Develop BMPs for grassland/open-land community maintenance, restoration, and creation.
 - difficult to develop BMPs without addressing needs 1-3
 - this was concentrated on mine lands and also the potential for taking open crop lands and converting to habitat
 - ex. You could look at golden-winged warbler and take through this process; can take out pieces and move forward. So, best not to look at these 4 needs as series of steps

1st – identify network

2nd – understand stressors on the network

3rd – understand stressors on species

4th – identify status of species

Thematic-Area

(7) Human Dominated / Economic Lands (Urban, Ag, Energy)

1. [Need] **Forecasting future spatial footprint of energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.**
 - coal, natural gas, wind, renewable energy, cumulative impact footprint
2. [Need] **Understand economics of changing land ownership patterns, including those of small landowners, and the implications to ecological conditions and the ability to sustainably manage forested lands.**
 - how to parcel ownership changes affect management changes
3. [Need] **Forecasting future spatial footprint of development in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.**
 - refers to urbanization

Thematic-Area

(8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

1. [Need] Map, model and measure multiple ecosystem services at the same time at landscape scales, including:
 - Biophysical production functions/understanding of metrics
 - Mapping beneficiaries
 - Assessment of preferences
 - Priority of services
 - Cumulative impacts
 - **must consider all services at once**, rather than looking at them individually
 - blame Paul
 - ecosystem services – in the context of human and ecological use
 - (7) identifying what impacts would be; (8) was taking context from 7 and translating it to define the values on the landscape to people and how do they use those values

2. [Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing , birdwatching, wildlife viewing.

3. [Need] To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.
 - none of this matters unless it can be translated out to people – this is a programmatic goal (not necessarily a science need)
 - this might be deeper than merely communicating, but being able to clearly define the trade offs; convey to people (through various means) services vs impacts

10th theme was developed because of this discussion on need 3

 - *perhaps this need should be placed into Theme 10 (Social Science)*

Thematic-Area

(9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

1. [Need] **Hydrologic regime change (related to climate change). Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use. Recreation, industrial, municipal, aquatic biology, agriculture), geology, and changes in air pollution. [Incorporate Biological response]**

2. [Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]
 - what is driver of first sentence? Coarse and fine scale means to look coarse scale and narrow down to a few species (most vulnerable to CC), then have fine scale analysis (e.g. brook trout), vulnerability analysis

- need for info on change (CSC), then using that to do a vulnerability assessment (LLC); focus was more on how it affects species/habitats

3. [Nat'l LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]

Thematic-Area

(10) Social science research

[Need] Develop and communicate culturally viable solutions to address intractable stressors across the landscape.

[Need] To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.

Group 6: Danna Baxley & Brian Smith

Note: Goal has an emphasis on inventory, but is there a greater need to emphasize connectivity? Focus is on habitats, but do we exclude ecosystem services or system functionality by doing that? Do we need to add in things like timber, air, water resources? Instead of ‘forest habitats’ maybe use ‘natural communities’ and/or ‘resources’. Consideration of “ecological land units” and how they might change over time, or if they haven’t been identified for the region.

Keywords to include in descriptions: Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC

we don’t have a lot of recent data (esp. for amphibians/reptiles) for many of the species/communities of interest. We are lacking a lot of basic information for many species, not to mention data on genetic diversity (e.g., cryptic species that are yet to be named/discovered).

much work already underway in this category in terms of applied techniques. LCC needs more in the way of coordination of management plans/treatments across jurisdictional and ownership boundaries to achieve broader conservation goals (e.g., regional connectivity).

Original program was too specific. Many other high priority forest communities exist, so moved High Elevation Forest issues down to needs.

Life history requirements for endemic plants/animals, where it is lacking for particular species (note: what can be pulled from existing sources and provided to practitioners in a better way?). Lacking a lot of basic information (what species like, where they are, how many there are, etc.) for many species, not to mention genetic diversity (e.g., cryptic species that are yet to be named/discovered).

See other notes in Track Changes in original files

***Group 7: N/A (Ed and Rose) – did not facilitate a group on Day 2**

Themes

1. GIS (high altitude)
2. Communications - Community of practice – Tools
3. Anticipating future info/tech needs

How do we collect, solicit and manage needs?

How do we identify and make available existing portals to the datasets? Audiences?

Where is the existing expertise located?

What models and DSTs are needed?

Training?

What are features most needed for tools?

What already exists through other LCCs and partners?

Allow commenting on references to tool links and descriptions. Also allow Amazon like ranking or rating system. Relevancy ranking.

Introductory “field guides”

<http://webtechguide.sepif.org/xwiki/bin/view/Main/>

Landscape (Lesley Sneddon to provide link)

Real-time tutorials to gauge whether or not different tools are useful to different audiences.

Some aspects of Geomatics

Data development

Data dissemination

Data applications

Portal proliferation syndrome. Need to not reinvent the wheel but also need to find something that is flexible enough to grow and expand with the LCC needs. Example: Build a platform that can access and use data from multiple portals like DataBasin, Landscape, etc.

In the beginning, need to narrow the scope to a target audience.

Consider an infrastructure that enables communities of decision makers that span multiple practices. Get something to the web browser that helps make decisions on the ground.

Security is an issue.

Mobile devices need to be considered.

Provide tools to scientists and also allow public facing

Identify some of the top tools that work for the science community and provide open access to them through the portal.

Goal statement: Create and maintain an IT architecture that enables community networks, information creation, exchange and education in a consistent manner across administrative boundaries and allows users to easily discover, access and integrate data and tools to facilitate conservation across the landscape. Support the systems modeling, GIS and other data needs of LCC partners.

Programs:

- 1) Capacity – establish a charter and working group. Identify hardware, software, and staffing needs.
 - a. Need a working group with a chair who plugs in with adjacent LCCs and leads ALCC IT discussions to consider ALCC IT needs within the context of the surrounding LCC community and specific use cases.
 - b. Committee makes recommendations for data access rules to steering committee
- 2) Content management – tools to gather and disseminate data. Backend for everything else.
 - a. Develop a web-based platform (talk to Tirpak and Mordecai)
 - b. Web services
 - c. Projects database
 - i. Conduct a survey to assess assets and regularly update to keep current
 1. Automate so that project info are archived unless updated as current
 - ii. Identify gaps in capacity
 - d. Group work flow
 - i. Versioning, scheduling
 - ii. Social Networking – casual communications
 - iii. Presentation warehouse
 - e. People (experts database)
 - i. Conduct a survey to assess assets and regularly update to keep current
 - ii. Identify gaps in capacity
 - f. Tool inventory and use – where are they, how to get involved, how to use, can use?
 - g. Learning management (e.g., moodle)
 - i. Field guides
 - ii. Training videos
 - h. Georeferencing
 - i. Federated search
 - i. Finding any of the above
 - ii. Connectivity of all the above
 - iii. Relevancy ranked by the community to improve performance
 - j. Security –develop access levels and protocols
 - k. Capture expert opinion on maps
 - l. Podcasts
- 3) Use cases– Benefits of using IT. Identify examples of programs that are or could use information well to make decisions on the ground. Highest impact, greatest success, strong integration. Consider location(s) and stakeholders. Why people should come to the site.
 - a. Existing examples (find)
 - i. People on the ground making change

- ii. Community planners
 - iii. Conservation delivery decision makers and partners
 - iv. Industry
 - v. State agencies
 - vi. Tribes
- b. Possible new pilot case 1: Marcellus shale pipeline right-of-way fragmentation of forest (stakeholders: USWFS because endangered species, EPA because wetlands, Pennsylvania Game Commission,...). Stakeholders identify each other, form a social network to discuss, work on documents together, view maps of affected areas, add layers of different alternative pipeline routes,... Allows for quicker decisions on siting and greater credibility
 - c. Possible new pilot case 2: Examples from other committees.

Problem – doesn’t target public

Need to support any community of practice.

Goal statement (2): Communication

What is the philosophy of the LCC in regard to information architecture? Greater credibility and speed in decision making. Saves money, increases efficiency. Makes information more accessible.

Priorities:

1. Place for scientists to find and access data and tools
2. Place for the public to view information
3. Increase credibility and speed of decisions

Hire a GIS coordinator to facilitate discussions and projects that address GIS needs of the Appalachian LCC.

Hire a Chief Information Architect to organize all the data and information so they can be integrated.

Discuss data creation and benefits of LCC community in developing datasets.

What are the foundational datasets that are needed by diverse communities?

How can LCCs take the lead in processing and generating needed data?

Identifying large datasets that are open access, preferably provided as services

Providing tools to crowd-source new data

Database of experts

*****Lunch*****

Information access

Ownership

Permissions

Sense of shared use

Public/private
Audience

What are people doing and what do they need?

ALCC interest is to bring available tools together, not to build software. Provide access but not software. Users should be able to find and take data/information as well as add it.

How to invite in other stakeholders?

One backend, but multiple front ends depending on the audience.

Good examples of what we are thinking about:

Western Governors Association Southern Great Plains Crucial Habitat Assessment Tool

Focus information architecture on vision statement of LCC

Appendix E. Appalachian LCC Day 1 – Portfolio across disciplines

Group - Facilitator & Note Taker

Aquatic North – Patrick Pitts & Callie McMunigal

Terrestrial North – Linda May & Todd Fearer

Aquatic South – Anita Goetz & Angie Rodgers

Terrestrial South – Danna Baxley & Brian Smith

Human Dimensions – Steve Faulkner & Lindsay Gardner

Climate Change – Chris Burkett & Jen Krstolic

GIS/IT – Rose Hessiller & Ed Laurent

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

<p>Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)</p>		<p>GOAL: Create, maintain, and grow a GIS/ IT architecture that facilitates the development of community networks, supports systems modeling, enables information creation, exchange and education in a consistent manner across administrative boundaries allowing users to easily discover, access and integrate data and tools to facilitate conservation across the landscape over time.</p>	
	<p>Description:</p> <p>Program Level: 1.2 ...</p>		
ID-RecNo	Need Statement		
Original	<p>[Need] Capacity – GIS/IT Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.</p>		
Original	<p>[Need] Content management – Tools to gather and disseminate data. Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.</p>		
Original	<p>[Need] Education - Learning management system (e.g., moodle) to include hardware/software demonstrations, field guides, training videos, podcasts, webinars, training material archives.</p>		
North	<p>[Need] Capacity</p> <ul style="list-style-type: none"> a. ALCC Steering committee - establishes a charter for a GIS/IT Working Group and identifies group members. b. Working group chair <ul style="list-style-type: none"> i. Leads discussions of working group ii. Communicates with LCC partners and adjacent LCC staff to identify complementary resources c. GIS/IT Working group: <ul style="list-style-type: none"> i. Elects a chair 		

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

	<ul style="list-style-type: none"> ii. Determines methods of communication within the working group iii. Designs pilot study or use cases to guide the development of the architecture (Prioritize hardware, software, and functionality needed.) <ul style="list-style-type: none"> 1. Example pilot case 1: Marcellus shale pipeline right-of-way fragmentation of forest (stakeholders: USWFS because endangered species, EPA because wetlands, Pennsylvania Game Commission,...). Stakeholders identify each other, form a social network to discuss, work on documents together, view maps of affected areas, add layers of different alternative pipeline routes,... Allows for quicker decisions on siting and greater credibility. <ul style="list-style-type: none"> a. Potential pilot participants <ul style="list-style-type: none"> i. People on the ground making change ii. Community planners iii. Conservation delivery decision makers and partners iv. Industry v. State agencies vi. Tribes 2. Example pilot case 2: To be determined though outcomes of other thematic groups from Nov 29-30, 2011 conference. iv. Identifies hardware, software, functionality and staffing needs. <ul style="list-style-type: none"> 1. Review existing GIS/IT architectures to identify examples of hardware, software and functionality that use information well to make decisions on the ground. Highest impact, greatest success, strong integration. Consider location(s) and stakeholders. Highlight why people should come to the site. v. Makes recommendations to steering committee for allocating resources for architecture needs vi. Oversees the development of architecture vii. Makes recommendations for governance, data access and security rules to steering committee viii. Designs education and marketing approaches to engage 	
--	--	--

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

	<p style="text-align: center;">stakeholder use</p> <p style="text-align: center;">ix. Outlines methodology for assessment and monitoring of use</p>	
<p style="text-align: center;">North</p>	<p>[Need] Content management – tools to gather and disseminate data. Backend infrastructure.</p> <p>a. Develop a geospatial web-based platform in collaboration with other LCCs</p> <ol style="list-style-type: none"> 1. Explore solutions of other LCCs to inform APPLCC architecture 2. Offer expertise and resources from APPLCC to develop new hardware, software and functionality <p>b. News, events (calendaring) and announcements</p> <p>c. Web services – methods for communication between electronic devices over the web.</p> <p>d. Content library - Upload/store/use/download large datasets such as maps, databases, videos. Links to external tools and applications (e.g., EBM tools).</p> <p>e. Projects and people databases – Conduct a survey to assess assets and regularly update to keep current</p> <ol style="list-style-type: none"> 1. Establish metadata fields 2. Automate so that project info are archived unless updated as current 3. Identify gaps in capacity <p>f. Group work flow</p> <ol style="list-style-type: none"> i. Collaborative document editing ii. Scheduling ii. Social networking and social media integration – casual communications iii. Group communication iv. Public and private sharing v. Communities of practice <p>g. Allow expert opinion and anecdotal evidence to be added to content, as appropriate. Requires login.</p>	

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

	<p>h. Allow public commenting, as appropriate. Does not require login.</p> <p>i. Hardware and software inventory and shared use – where are they, how to get involved, how to use, can use?</p> <p>j. Georeferencing – documenting the location of any document, map, video, project, person, database, ...</p> <p>k. Mobile applications – allow the flow of data to and from mobile devices</p> <p>l. Federated search – advanced search of internal ALCC databases as well as external partner databases. Relevancy ranked by the community to improve performance</p> <p>m. Integrate external applications with the APPLCC website. Example: members might work together to review and test different applications in order to develop a new generation of applications that address current science needs.</p>	
North	<p>[Need] Education - Learning management system (e.g., moodle)</p> <p>i. Hardware and software demonstrations (short courses)</p> <p>ii. Field guides</p> <p>ii. Training videos</p> <p>iii. Podcasts</p> <p>iv. webinars</p> <p>v. Training material archives</p>	

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

All added by North	Examples of Portals and Data Sets
ID-RecN	Thematic-Area (2) Aquatic
1	1. [Pre-Existing] Freshwater Mussel Conservation Planning GIS/database tool (TNC-TN). Build upon existing tool: expanding it to other states in an effort to standardize and support a common aquatics database for conservation planning. TNC developed a database and spatial mapping tool to manage the large amounts of data on Species of Greatest Conservation Need (SGCN), their habitats, and problems affecting these species and habitats as the foundational materials to help info. <i>molluskconservation.org/Library/.../TN_FM_StratPlan_database.doc</i>
RecN ID-o	Thematic-Area (4) Terrestrial -Wetlands
901	2. [Pre-existing] The National Wetlands Inventory Geospatial Data port: http://www.fws.gov/wetlands/Data/WebMapServices.html
ID-RecN o	Thematic-Area (5) Terrestrial -Forests
902	3. [Pre-existing] Forest Inventory and Analysis (FIA) Program. FIA reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership. http://www.fia.fs.fed.us/tools-data/ As the Nation's continuous forest census, our program projects how forests are likely to appear 10 to 50 years from now. This enables us to evaluate whether current forest management practices are sustainable in the long run and to assess whether current policies will allow the next generation to enjoy America's forests as we do today. FIA reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership. The Forest Service has significantly enhanced the FIA program by changing from a periodic survey to an annual survey, by increasing our capacity to analyze and publish data, and by expanding the scope of our data collection to include soil, under story vegetation, tree crown conditions, coarse woody debris, and lichen community composition on a subsample of our plots.
930	4. USFS Southern Forests Futures Project: http://www.srs.fs.usda.gov/futures/
931	5. Eastern Forest Environmental Threat Assessment Center http://www.forestthreats.org/
932	6. USFW Climate Change Adaptation and Mitigation Management Options (CCAMMO) http://www.forestthreats.org/current-projects/project-summaries/ccammo/
ID-RecN	Thematic-Area (7) Human Dominated / Economic Lands (Urban, Ag, Energy)

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

907	7. [Pre-existing] U.S. Environmental Protection Agency data port: http://www.epa.gov/mrlc/data.html
908	8. [Pre-existing] USGS GAP Analysis Program http://biology.usgs.gov/bio/gap.html (Biological Informatics Program) This data is one of most useful landcover data layer. The current data available for download is a combination of the Southeast GAP analysis project and Landfire data in areas not covered by the Southeast GAP. It is available in 30 meter resolution. The data was created at the same resolution, used the same habitat categories, and the same techniques to create the data. Habitat types are more specific than what is in the National Landcover Dataset. Habitat types are also available in three level. The most specific has nearly 100 different habitat types.
909	9. [Pre-existing] National Conservation Easement Database: http://nced.conservationregistry.org/
910	10. Pre-existing] Southeast GAP Analysis Project http://basic.ncsu.edu/segap/
911	11. [Pre-existing] Abandoned Mineland Acid Mine Drainage (AML AMD) Inventory: System. Appalachian Region; OSMRE http://www.osmre.gov/aml/amlis/Description.shtm
912	12. [Pre-existing] National Geospatial Management Center: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/ngmc ; NRCS.
920	13. [Pre-Existing] EPA Southeastern Ecological Framework Project http://www.geoplan.ufl.edu/epa/index.html
RecN ID	Thematic-Area (9) Climate Change – Impacts, Downscale/Coupled Modeling, Adaptation
903	14. [Pre-Existing] TNC’s Climate Wizard: http://www.climatewizard.org
904	15. [Pre-Existing] SimClim’s Climate change modeling system: http://www.climsystems.com/simclim
905	16. [Pre-existing] Central Appalachians Resiliency Maps ver2. Resiliency analysis for the Central Appalachians: TNC did a series maps of what they consider the major drivers for resiliency. (via link below) www.conservationgateway.org/.../central-appalachians-whole-system...
921	17. [Pre-Existing] NaturePeople.org (TNC) (and see CC Adaptation & Regional Planning Resources http://conserveonline.org/workspaces/climateadaptation/documents/incorporating-cc-adaptation-into-regional index link page to: Incorporating Climate Change Adaptation Into Regional Conservation Assessments; Incorporating Climate Change Adaptation Into National Conservation Assessments; <i>Conserving the Stage: Climate Change and the Geophysical Underpinnings of Species Diversity</i> ; Central Appalachians Whole-System Landscape Vision, August 16, 2011
940	18. NatureServe Climate Vulnerability Index: http://www.natureserve.org/prodServices/climatechange/ccvi.jsp
933	19. Fish and Wildlife Information Needs System (FWINS) http://www.fws.gov/policy/m0042.html [draft data entry form from: Database Layout link within page]
934	20. iPac IpaC – Information, Planning, and Conservation System. Georeferenced database housed at USFWS for assessing development impacts to federally listed species. http://ecos.fws.gov/ipac/

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

935	21. ECOS. Environmental Conservation Online System. USFWS database tracking system for habitat protection and restoration accomplishments conducted and/or funded by the agency. http://ecos.fws.gov/ecos/indexPublic.do
936	22. Northeast Regional Conservation Network (RCN) Grant Program – Products. http://www.wildlifemanagementinstitute.org/index.php?option=com_content&view=article&id=247&Itemid=110 (Grants http://rcngrants.org/) The terrestrial data referenced here was created similar to the Southeast GAP analysis and Landfire projects. The aquatic habitat information is much more detailed than what is in the SE GAP and Landfire. It includes shapefiles for flowlines, catchments, and lakes. There are also layers included that symbolize the data according to geology, gradient, size, temperature, and taxonomy. Downloaded the data to our G: drive and looked at it. It may be useful; however, it is only available in a portion of the Appalachian LCC. To be able to use it, we would need the same information collected throughout the rest of the area. GIS products including flowlines, catchments, and lakes encompass 6 AppLCC states.
937	23. National Conservation Easement Database: http://nced.conservationregistry.org/
938	24. WV GIS Clearinghouse application: http://wvgis.wvu.edu/data/dataset.php?ID=402
941	25. NatureServe http://www.natureserve.org/
950	26. National Geospatial Management Center: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/ngmc ; NRCS National Geospatial Management Center (NGMC) has long been respected for the quality of maps it produces to support various Natural Resource Conservation Service (NRCS) projects and programs. In addition to producing maps, NGMC is a major distributor of geospatial data to support NRCS, National, State and local field needs. NGMC strives to: 1) Optimize and standardize geospatial data and related technology and services; 2) Perform geospatial governance – the coordination necessary to guide the evolution of geospatial data and services; and 3) Enhance geospatial planning and investment – capture business requirements and translate those into business processes, and identify investments necessary to meet the Agency’s geospatial business needs.
951	27. National Geographic Foundation: Landscape Projects: http://www.landscape.org/ “LandScope America—a collaborative project of NatureServe and the National Geographic Society—is a new online resource for the land-protection community and the public. By bringing together maps, data, photos, and stories about America’s natural places and open spaces, our goal is to inform and inspire conservation of our lands and waters.”
916	28. National Geographic Foundation: FieldScope. http://www.fieldscope.org/ National Geographic FieldScope is a web-based mapping, analysis, and collaboration tool designed to support geographic investigations and engage students as citizen scientists investigating real-world issues -both in the classroom and in outdoor education settings. FieldScope enhances student scientific investigations by providing rich geographic context -through maps, mapping activities, and a rich community where student fieldwork and data is integrated with that of peers and professionals, adding analysis opportunities and meaning to student investigations.

THEMATIC AREA (2) Aquatic

Thematic-Area (2) Aquatic	GOAL: Be able to quantitatively describe current and future hydrologic and structural habitat conditions and aquatic population trends, and set conservation goals for both, in order to maintain native habitats and endemic aquatic species in their current locations or support these as they migrate with land use and climate changes in the future.	South comment: This goal stmt needs to be updated to consensus stmt from Tues night.
Added by North	Program Level: 2.0 Foundational Tools/Materials	
	Need Statement	
North	Need an inventory of available information, what relevant data are out there	Short List
North	Need a GIS tool to manage the data (how can these various databases talk to each other?)	
North	Develop (or utilize) a portal to access primary databases	
North	Develop rapid assessment program and ground truthing for assessing riparian and floodplain vegetation	
North	Need common hydrologic models/hydrologic data (models like stream stats for ungaged streams)	
North	Develop a way to access privately collected monitoring data from the permitted community	
North	Need to develop NHD data at 1:24K	
South	Develop a phone book or list of data, expert advice, etc. and make it available to all partners. (GL LCC is already doing this)	Short List
South	Synthesis and review of available information.	
	<p>Description: Develop and compile data to help partners and stakeholders better understand the types of aquatic habitats that occur within the LCC, the distribution and condition of those habitats, issues threatening the quality of those habitats, the relative importance of those habitats for species conservation within each of the states, and techniques that can be used to restore those habitats after they have been degraded.</p> <p>Program Level: 2.1. Habitat</p> <ul style="list-style-type: none"> • Connectivity • Water quality 	

THEMATIC AREA (2) Aquatic

	<ul style="list-style-type: none"> • Habitat quality <ul style="list-style-type: none"> ▪ Riparian habitat ▪ Instream, structural habitat • Habitat quantity • Hydrology <ul style="list-style-type: none"> ▪ Water quantity ▪ Timing ▪ Distribution 	
ID-RecNo	Need Statement	
Original	[Need] Relationships between contaminants and biological response	
North	[Need] Relationships between contaminants and biological response	Top 3 (Day 1) and Short List
North	Need to know the relationship between flow and habitat and aquatic life (ecological flows)	
North	Need to know the dispersal abilities of aquatic animals	
North	Barriers inventory – when is it desirable and undesirable to remove barriers?	
North	Influence of land use on water quality/quantity	
North	Loss of cold/cool water habitats in response to thermal regime shift	
North	Assessing aquatic species vulnerability to changes in stream flow and temperature, water quality	
North	Need to understand the effects of extreme events on habitat	
North	Need to know the effects of water withdrawals and return flows	
North	Effects of fragmentation (connectivity) on aquatic species – viability, sustainability	
North	Relationships between sedimentation rates and biological response	
North	Need for BMPs for riparian zone management	
North	Effects of stormwater management/impervious surfaces on aquatics	
North	Monitor effectiveness of BMPs/water quality standards/criteria – is it effective for target species?	

THEMATIC AREA (2) Aquatic

South	Hydrology & Water Quantity – Review existing information. Compile and make information available. Develop flow-ecology relationships to enable states to redirect or change their flow standards to better protect aquatic ecosystems. Demonstrate / evaluate the relative effectiveness of various riparian protection measures across different scales and landuse practices to protect water quality and habitat.	Ranked 6 th and Short List
South	Stream habitat and riparian corridor assessment at fine scale to allow modeling that can be expanded to the landscape scale. Have adequate data at the catchment scale. Link models to GIS to make the data more visual and available to partners. (stream classification)	Short List
South	Quantify the amount of critical habitat occupied by invasive species and identify which invasive species they are.	Short List
South	Develop a regional comprehensive description of seasonal and diurnal thermal and flow characteristics of surface waters including effects of climate change.	
South	Identify temp and flow tolerance limits of species and appropriate management technologies to improve the management of controlled systems to reduce impacts on downstream communities.	
South	Develop a method to evaluate the effect of barriers (chemical, physical, and biological) and the interaction between those barriers.	
South	What dissolved ion / ions and or metals actually cause toxicity to benthic macro invertebrates downstream of surface and underground mining.	
South	Develop a rigorous predictive understanding of the net water quality outcomes from aquatic species restoration / augmentation.	
South	ID factors and elements of unsuccessful and successful restoration techniques. Develop a protocol using these factors to identify areas for restoration.	
South	Understand the influence of hydrology and sediment transport around dams.	
	Description: Program Level: 2.2 Ecological Function	
ID-RecNo	Need Statement	
North	Identify the role of fw mussels (aquatic organisms) in nutrient cycling, removal of suspended sediments, bioturbation, bottom stabilization and enrichment, and creating stable aquatic habitats	
North	effect of invasive species on ecological function (riparian zone and instream) (e.g. Japanese knotweed)	
North	identify impact of riparian and floodplain vegetation on aquatic community and the food chain in light of species composition and climate change on aquatic communities	

THEMATIC AREA (2) Aquatic

North	quantify, establish, and identify thresholds for ecosystem function	
North	relationship between benthic biodiversity and nutrient dynamics	
North	effects of disease and parasites	
North	effects of aquatic organisms dispersal on nutrient dynamics	
South	Identify key limiting factors for priority aquatic taxa and communities across the LCC.	Rank 1 st and Short List
	Description: Program Level: 2.3 At Risk Species (Communities) Recovery	
ID-RecNo	Need Statement	
North	Need an inventory/status assessment of species	
North	develop efficient environmental inventory tools	
North	develop habitat models for at risk species	
North	improving, refining, testing efficiency of captive propagation techniques	
North	develop criteria for relocation/augmentation (genetics, disease, etc.)	
North	develop recovery plans for those species already identified	
North	identify suitable refugia for T&E species	
North	rigorous understanding of population dynamics/viability for fw mussels (other at risk species)	
North	establish a protocol to populate a genetic database for at risk species	
North	develop conservation genetic management plans for aquatic species	
South	Develop a framework for appropriate standardized sampling design methodologies for the long term monitoring of priority aquatic species.	Short List

THEMATIC AREA (2) Aquatic

	Description:		
	Program Level: 2.4 Sustainable Populations and Communities (of all aquatic species)		
ID-RecNo	Need Statement		
North	develop standard protocol for establishing status and long term trends		
North	develop additional IBIs tailored to basins/regions/additional species		
North	effect of population densities on recruitment potential – (inc. minimum population size)		
North	develop technology and protocols for restoring common mussel communities for their ecosystem function		Short List
North	need to identify and understand interspecies relationships (pollinators, host fish, etc.)		
North	need population viability studies		
South	For the stressors that are currently politically impossible to correct (agriculture, forestry, urban growth, mining, etc), develop and communicate culturally viable solutions to address these stressors across the landscape.		Rank 2 nd and Short List
	Description:		
	Program Level: 2.5 Recreational, Commercial, Subsistence Use (separate program)		
ID-RecNo	Need Statement		
North	Determine the economic and social value of various fisheries		
North	effect of harvest on sustainable populations		
North	effect of judicious stocking of nonnative species on native biota		
North	what is the magnitude of current use and trends of recreational, commercial, subsistence use?		Short List
North	improvements to fish sterilization techniques (triploidy technology)		
North	identify and plan for conflicts between various user groups		

THEMATIC AREA (2) Aquatic

South	Determine direct and intrinsic socioeconomic benefits of aquatic species.	Rank 5 th and Short List
	Description: Program Level: 2.6 Species-Habitat Relationships at Multiple Scales	
ID-RecNo	Need Statement	
Original	[Need] To develop environmental flow requirements for species, populations, and communities for the region.	
Original	[Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program)	
North	evaluation of natural channel design on ecosystems	
North	mussel/fish habitat models that relate occupancy and abundance to habitat characteristics	
North	aquatic species models that relate occupancy and abundance to habitat characteristics	
North	need to develop environmental flow requirements for species, populations, and communities for the region need to know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program) (These were originally listed as 2 separate needs, but after the first round of voting, we lumped them into one need related to ecological flows)	Top 3 and Short List
North	effects of headwater stream disturbance on downstream fish/mussel communities	
North	mapping of remaining suitable and free flowing riverine habitat for fw mussels	
North	temporal and spatial scale relationships to aquatic communities (headwater disturbances, land use/cover associated with aquatic communities – can be temporal component)	
North	defining spatial scales of populations	
North	habitat suitability analysis for fw mussels	
North	evaluation of macrohabitat features on biodiversity distribution	
North	impacts of density of aquatic vegetation on fish community composition	

THEMATIC AREA (2) Aquatic

<p>Description: [Partial] Develop and compile climate change models for the LCC that can: help managers predict likely impacts to the region's water resources, aquatic species, and human systems that rely upon those resources; facilitate the development of more robust regional mitigation and management plans; and help managers provide meaningful input to future revisions of state and Federal water regulations.</p> <p>Program Level: 2.7 Species/System Response to Alteration</p>		
ID-RecNo	Need Statement	
Original	[Need] Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).	
Original	[Need] Identify key limiting factors and stressors for priority aquatic taxa and communities across the LCC.	
Original	[Need] For the stressors that are currently politically impossible to correct (agriculture, forestry, urban growth, mining, etc), develop and communicate culturally viable solutions to address these stressors across the landscape.	
Original	[Need] Identify distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or move between watersheds.	
North	responses of populations/communities to altered thermal /hydrologic regimes	
North	effects of fragmentation	
North	effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to marcellus shale development in Appalachia – ID-RecNo 55)	Top 3 and Short List
North	develop percent impervious thresholds	
North	effects of invasive species	
North	develop toxicological criteria	

THEMATIC AREA (2) Aquatic

North	comparative assessment of relative sensitivity of biota to contaminants	
North	understand the effects of complex mixtures (contaminants)	
North	develop biomarkers for stress exposure	
North	effects of resource extraction	
North	effects of fire on aquatic ecosystems	
North	effects of atmospheric deposition	
South	Determine the effectiveness of various stream restoration techniques for their ability to restore both function and structure. Need to identify reference reaches to properly design and evaluate restoration projects.	
South	Data on toxic effects on reproduction and growth of pharm, chemicals that are unregulated, ions, etc on priority aquatic species.	
South	Identify the effects of chemicals constituents associated with coal processing and storage, fly ash, and discharges from settling ponds on survival, condition and reproduction of fish and aquatic invertebrates.	Short List
South	ID distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or move between watersheds.	Rank 3 rd and Short List
South	Projecting effects of waste water effluent on aquatic species and populations in light of continued human population growth projections.	
South	Identify the effects on water quantity and quality of gas extraction and the impacts on aquatic communities.	Short List
South	Identify the effects on water quantity and quality of energy development and the impacts on aquatic communities. ID risks associated with pathways for introduction and spread of invasive species as well as the techniques to manage the risks.	
South	Impacts of energy extraction, projected on habitat fragmentation, restoration potential and implications for aquatic species.	Short List
South	Develop methods to rank resistance and resiliency to climate change using generic traits.	
South	Project the impact of landuse and climate change on the delivery of key aquatic ecosystem services.	Short List

THEMATIC AREA (2) Aquatic

Program Level: 2.8 Integrated Landscape-level Planning Tools		
ID-RecNo	Need Statement	
North	interactive GIS based decision support tool for reducing environmental impacts of resource extraction sitings	
North	developing barrier removal prioritization scheme with multiple criteria	
North	Where will natural refugia occur in light of changing climate or altered environments; where is there potential for reserves? Captive holding of ESUs?	
North	comparative analysis of effective landscape planning tools	
South	Science based methodology for priority habitats (due to threats or values associated with watershed) at multiple scales. (Provides a science based argument to address threats)	
South	Develop models / analytical tech to bridge the gap between downscaled GCMS and watershed based projections of climate change effects on aquatic species and habitats.	Short List
South	Develop a method to utilize mussels and their habitat as an indicator to identify multi species refugia, restoration sites for priority species, monitoring watershed restoration.	Rank 4 th and Short List
South	Support and add value to ongoing efforts to establish methods for assessing cumulative watersheds impacts.	
Description: Program Level: 2.9 Aquatic Biodiversity (This program was added after the North and South Aquatics Group leaders convened after hours on Day 1) – Aquatics North Work Group did not work with this program and therefore had no identified needs.		
ID-RecNo	Need Statement	
South	Develop range-wide genetic assessment of keystone aquatic species.	
South	Assess levels and patterns of most fundamental form of biodiversity from the intra-specific to the community level.	Short List
South	Assess aquatic species diversity utilizing eDNA and contemporary monitoring tools.	

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

<p>Thematic-Area (3) Terrestrial - Cave/Karst/Mines</p>	<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage cave/karst/mine (CKM) communities across jurisdictions by inventorying significant regional CKM communities and evaluating the condition, importance, and regional threats impacting these communities.</p> <p>South edit: GOAL: Inventory significant regional subterranean/cave/karst communities (systems? Environments?), evaluate the condition and importance of those communities, and identify regional threats impacting these so that LCC partners and stakeholders can develop and implement cohesive regional strategies to protect and manage those resources across jurisdictions.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository recognizing the sensitivity and legal limitations of these data.</p> <p><u>Foundational Resources:</u> 3.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 3.1. Database / Information Management 3.2. Baseline Data / GIS Layers & Standardization of Data Collection</p>	
	<p>Needs Statement:</p>	
Original	[Need] Map of springs throughout karst region—characterization and identification	
Original	[Need] Develop a classification system for karst systems in the Appalachian region (to help prioritize conservation strategies)	
South (3.0)	Compilation and integration of cave data, some of which is sensitive or ‘not owned’ by LCC partners.	High w/in theme.
	<p><u>Foundational Resources:</u> 3.2. Baseline Data / GIS Layers & Standardization of Data Collection</p>	
South	Map of springs throughout karst region—characterization and identification	High w/in theme. Selected as Top 5
South	Develop a classification system for karst systems in the Appalachian region (to help prioritize conservation strategies)	High w/in theme. Selected as Top 5

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

	Description: Program Level: 3.3. GeoSpatial Status Assessment		
ID-RecNo	Need Statement		
Original	[Need] Inventory and mapping of CKM systems, understand species and community distributions, their habitat relationships, and linkages across systems		
North	[Need] Classification (biological and geophysical), inventory and mapping of CKM and associated spring systems, understand species and community distributions, their habitat relationships, and linkages across systems	Top 6	
North 154	[Need] Inventory and geo-referencing of restorable caves post-WNS.		
South 154	[Need] Inventory/monitoring and geo-referencing of caves with highest potential of supporting bat populations post-WNS.	Low w/in theme. Not selected as Top 5	
South	Biological inventory of animal communities, and compile species information from each state into a centralized database across the region	High w/in theme. Selected as Top 5	
	Description: Develop and compile data regarding the status and distribution of subterranean resources, threats impacting associated species, and work with partners to develop management strategies needed to address habitat threats and assist in the recovery of threatened and endangered species. Program Level: 3.4. T&E Species - Recovery		
ID-RecNo	Need Statement		
North 16	[Need] Assesses the efficacy of utilizing electronic monitoring systems as a potential WNS “early warning” indicator.		
North	Etiology, response, and management of WNS.		
South	Develop predictive models for cave/karst high-biodiversity systems	Low w/in theme. Not selected as Top 5	
South 16	[Need] Assesses the efficacy of utilizing electronic monitoring systems as a potential WNS “early warning” indicator.	Low w/in theme. Not selected as Top 5	
	Description: Develop and compile data regarding the status and distribution of subterranean resources, threats impacting priority cave species or other resources, and work with partners to develop management strategies		

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

	needed to address those threats and assist in the recovery of those species. Program Level: 3.5. Other Priority Cave Species	
ID-RecNo	Need Statement	
North 17	[Need] Understanding of impact on groundwater (as it relates to Cave/Karst systems).	
South	Develop process to prioritize taxonomic descriptions of described species (to understand their conservation status, population level)	High w/in theme. Not selected as Top 5
	Description: Program Level: 3.6. Management recommendations for sinkhole/cave/karst South edit: 3.6. Sinkhole/cave/karst management	
ID-RecNo	Need Statement	
Original	[Need] BMPs for cave/karst landscape, based on existing science.	
Original	[Need] Cave/karst training workshops for resource managers (e.g., provided by Karst Waters Institute)	
North	[Need] BMPs that include a monitoring/evaluation component for cave/karst landscape based on existing science and associated training workshops for resource managers and other relevant stakeholders (e.g., provided by Karst Waters Institute).	
South	BMPs for cave/karst landscape, based on existing science.	High w/in theme. Selected as Top 5
South	Cave/karst training workshops for resource managers (e.g., provided by Karst Waters Institute)	High w/in theme. Selected as Top 5
	Description: Program Level: 3.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)	
	Needs Statement:	
South	Predictive models for cave species to assist with targeted monitoring efforts	Low w/in theme. Not

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

		selected as Top 5
	<p>Program Level: 3.8. Species/System Response - Major Drivers (CC, Energy/Development, Urban, etc.)</p> <p>Description:</p>	
	Needs Statement:	
North	Effects of stressors (human use, urbanization, energy development, climate change) on stability and functionality of CKM systems and associated species	
North	Linkages of above ground processes and management regimes to cave/karst/mine systems.	
North	Understanding of hydrology, recharge, and quality of ground water as it relates to cave/karst/mine systems.	
South	[Need] Understanding of impact on groundwater (as it relates to Cave/Karst systems), and identify/understanding of threats/diseases and their impacts on species of greatest conservation need	High w/in theme. Selected as Top5
	<p>Program Level: 3.9. Landscape-level (Integrated) Planning Tools (Recovery / T&E / SGCN)</p> <p>Description:</p>	
	Needs Statement:	

Thematic-Area (4) Terrestrial – Wetlands

<p>Thematic-Area (4) Terrestrial – Wetlands (Aquatics South)</p>		<p>GOAL: Work to inventory significant regional wetland habitats, evaluate the condition and importance of these habitats, and identify regional threats impacting those resources so that LCC partners and stakeholders can develop and implement cohesive regional management strategies to protect and manage wetlands across jurisdictions.</p>	
	<p>Description:</p> <p>Program Level: 4.0 – 4.3 Foundational Resources</p>		
ID-RecNo	Need Statement		
	<p>Description:</p> <p>Program Level: 4.4. Wetland Community, hydrology (incl. contaminants)</p>		
ID-RecNo	Need Statement		
Original	[Need] Identify and quantify the extent of naturally functioning floodplain habitat to priority habitat and species		
Original	[Need] Determine current extent of wetland connectivity to perennial streams compared to historical connectivity.		
South	[Need] Identify and quantify the extent of naturally functioning floodplain habitat to priority habitat and species		Top 3
South	[Need] Determine current extent of wetland connectivity to perennial streams compared to historical connectivity.		Top 3
South	Develop wetland IBI for LCC region.		
South	Develop restoration of hyporheic exchange (subsurface flow) techniques to connect wetlands to perennial streams.		
South	Use of groundwater and effects on wetland hydrology.		
	<p>Description:</p> <p>Program Level: 4.5. Ecological Function</p>		
ID-RecNo	Need Statement		

Thematic-Area (4) Terrestrial – Wetlands

South	Assess presence of rare and invasive wetland species using contemporary genetic techniques.	
South	Evaluate success of created or restored wetlands.	
South	Assess meta-population structure among vernal pool species.	
South	Identify wetland persistence as it relates to habitat fragmentation	
	Description: Program Level: 4.6 Human Dimensions	
ID-RecNo	Need Statement	
Original	[Need] Quantify ecosystem services of wetlands and their contribution to nutrient cycling to both aquatic and terrestrial systems.	
South	Quantify ecosystem services of wetlands and their contribution to nutrient cycling to both aquatic and terrestrial systems.	Top 3
South	Determine how and if conversion of wetland types effects ecosystem services associated with aquatic species.	
	Description: Program Level: 4.7 Landscape –level species-habitat (modeling / species habitat relationships / assessment)	
ID-RecNo	Need Statement	
South	Identify areas for bog restoration.	
	Description: Program Level: 4.8 Species / System Response – Major Drivers (CC, Energy / Development, Urban, etc)	
ID-RecNo	Need Statement	
South	Determine relative impacts of various land uses to all wetland communities/ecosystems, including naturally functioning floodplains.	
South	Document ephemeral wetlands as sites of concentration and transfer of heavy metals through amphibian reproduction and immigration.	

Thematic-Area (4) Terrestrial – Wetlands

South	Determine characteristics that make wetlands vulnerable to invasion and invasive species establishment.	
South	Model effects of cc on wetland habitats and species. Identify wetlands vulnerability to climate change.	
South	For the stressors that are currently politically impossible to correct (agriculture, forestry, urban growth, mining, etc), develop and communicate culturally viable solutions to address these stressors across the landscape.	
South	Identify and quantify effects of urbanization and impervious surfaces on the viability of vernal pools.	
	Description: Program Level: 4.9 Landscape – level (integrated) planning tools (recovery/t&e/SCGN)	
ID-RecNo	Need Statement	

Thematic-Area (5) Terrestrial – Forests

<p>Thematic-Area (5) Terrestrial – Forests (original)</p>	<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage forest communities across jurisdictions by inventorying significant regional forest communities, evaluating the condition, importance, and regional threats impacting these communities.</p>	
<p>South</p>	<p>GOAL: Work to inventory significant regional forest habitats, evaluate present and future condition, importance, and connectivity of these habitats, and identify regional threats impacting those resources so that LCC partners and stakeholders can develop and implement cohesive regional management strategies to protect and manage forest resources across jurisdictions.</p> <p>Note: Goal has an emphasis on inventory, but is there a greater need to emphasize connectivity? Focus is on habitats, but do we exclude ecosystem services or system functionality by doing that? Do we need to add in things like timber, air, water resources? Instead of ‘forest habitats’ maybe use ‘natural communities’ and/or ‘resources’. Consideration of “ecological land units” and how they might change over time, or if they haven’t been identified for the region.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p>South added: Keywords to include in descriptions: Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC</p> <p><u>Foundational Resources:</u> 5.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources</p>	
<p>ID-RecNo</p>	<p>Need Statement</p>	
<p>Original</p>	<p>[Need] Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning)</p>	
<p>North</p>	<p>Identify needs for resources based on programmatic needs Based on #1, identify availability/scale/format/source of existing resources, provide access to those resources, and identify gaps for addressing existing science needs.</p>	
<p>South</p>	<p>Compilation of data resources that exist in various forms, and provide it in usable/accessible format for LCC partners (e.g., Comprehensive minelands layer, Regional Conservation Database of protected/easement lands, Invasive species</p>	<p>High w/in theme</p>

Thematic-Area (5) Terrestrial - Forests

	maps and their use/accessibility [Regional and local scale])	
(North grouped these like this)	5.1. Database / Information Management 5.2. Baseline Data / GIS Layers & Standardization of Data Collection 5.3. GeoSpatial Status Assessment	
ID-RecNo	Need Statement	
North	[Need] Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning)	
North 88	[Need] Population trend assessments for Appalachian salamanders	
North 89	[Need] Chytrid fungus: incidence and impact on Appalachian amphibians	
North 90	[Need] Investigate safe methods for control of exotic plants that impact amphibian and reptile populations.	
North 93	[Need] (Impacts due to) Disturbance (fire, pests, pathogens, erosion). NPS.	
North 21	[Need] Transitioning from nest-box surveys to acoustical surveys for the endangered Carolina and Virginia northern flying squirrel	
South (5.1)	Need to develop statistically-sound inference methods to be able to use existing data sources, develop models, etc. E.g., methods that would allow us to relate detection probability to a process	High w/in theme
South (5.2)	These all fall under 1 broad need, listed in sequential order... 1. Ecological Land Units completed for entire Appalachian region (TNC has lead). Will provide “common terminology” for partners 2. Crosswalk ELU above to other initiatives (LandFire, etc.). Ecological Zone Modeling. 3. Need for LIDAR 4. Agreed upon “sub-LCC” framework (e.g., ILP, Southern Apps, No. App. Plateau, etc.)	High w/in theme. Selected as Top 5
South (5.2)	5. Develop finer-scale conservation objectives that are based on existing regional data/layers	Lower priority w/in theme
	Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders. <u>Foundational Resources:</u> 5.3. GeoSpatial Status Assessment South Note: we don’t have a lot of recent data (esp. for amphibs/reptiles) for many of the species/communities of interest. We are lacking a lot of basic information for many species, not to mention data on genetic diversity (e.g.,	

Thematic-Area (5) Terrestrial - Forests

cryptic species that are yet to be named/discovered).		
ID-RecNo	Need Statement	
Original	[Need] Assess status of Appalachian amphibians and determine impacts of emerging amphibian diseases	
South	Baseline population and distribution data is lacking for many taxa, especially amphibians: need to ‘lump’ many of their science/research needs b/c of their importance to system, representativeness to forest communities, and their unique requirements. Note: Is this the correct Program for this to be in???? <ul style="list-style-type: none"> Population trend assessments for Appalachian salamanders. Definite need for Cumberlands region. Emerging Amphibian diseases: incidence and impact on Appalachian amphibians Investigate safe methods for control of exotic plants that impact amphibian and reptile populations. 	High w/in theme. Selected as Top 5
South 88	[Need] Population trend assessments for Appalachian salamanders	Note: combined with need above
South 89	[Need] Emerging diseases: incidence and impact on Appalachian amphibians	Note: combined with need above
South 90	[Need] Investigate safe methods for control of exotic plants that impact amphibian and reptile populations.	Note: combined with need above
South 93	[Need] (Impacts due to) Disturbance (fire, pests, pathogens, erosion). NPS.	Low priority w/in theme (mostly b/c it was vaguely worded)
South 21	[Need] Develop more efficient monitoring techniques for species of greatest conservation need (e.g., Transitioning from nest-box surveys to acoustical surveys for the endangered Carolina and Virginia northern flying squirrel, plant surveys)	High w/in theme
South	Need: Enhanced Conservation Action Planning (TNC product with partners) <ul style="list-style-type: none"> Complete ECAP for entire region—what is the natural range of variability in forested systems, and where are we now in relation to reference? Review of Landfire reference conditions and models to identify the various conditions that we are shooting for. Complete and compare forest block modeling/prioritization (note: TNC connectivity/flow models, Atl. Flyway Initiative with Audubon and Joint Ventures). Identify minimum area requirements. Need for up-to-date landcover data and refined modeling techniques for determining the appropriate amount of each 	High w/in theme. All highly inter-related. Selected as Top 5

Thematic-Area (5) Terrestrial - Forests

	seral stage within each community type. Must be able to down-scale to local area to incorporate species-specific needs/data.	
	<p>Description: Develop and compile data regarding the utility of silvicultural tools, invasive species management, and especially prescribed burning as restoration and management tools for a full complement of forest communities. Research how these practices might facilitate habitat conservation and coordination of forest conservation actions across regional boundaries under changing conditions.</p> <p>Program Level: 5.4. Sustaining <u>Forests</u></p> <p>South: Program Level: a. Forest Management (incl. Prescribed Burning)</p>	<p>South: NOTE: much work already underway in this category in terms of applied techniques. LCC needs more in the way of coordination of management plans/treatments across jurisdictional and ownership boundaries to achieve broader conservation goals (e.g., regional connectivity).</p>
ID-RecNo	Need Statement	
North	Understanding disturbance regimes in the Appalachians	
North 24	[Need] BMPs for use of prescribed fire for forest restoration.	
North 25	[Need] Improvement of existing smoke prediction models for rugged terrain.	
North 23	[Need] Use of prescribed fire in the presence of and control of invasive fauna, flora, and pathogens	
North	[Need] (Impacts due to) Disturbance (fire, pests, pathogens, erosion). NPS.	
South 24	[Need] BMPs for use of prescribed fire for forest restoration.	Low w/in theme
South 25	[Need] Improvement of existing smoke prediction models for rugged terrain.	Low w/in theme
South 23	[Need] Use of prescribed fire in the presence of and control of invasive fauna, flora, and pathogens	Low w/in theme
	<p>Description: Develop and compile information about the LCC's rare species and communities (e.g. high elevation forests), work with partners to better estimate their current degree of imperilment, and coordinate the development of regional management strategies that will help conserve these species and communities in the face of changing conditions.</p>	<p>Note: Original program was too specific. Many other high priority forest communities exist, so moved High Elevation Forest</p>

Thematic-Area (5) Terrestrial - Forests

	<p>Program Level: 5.5. Rare and Unique Species and Forest Communities (Terrestrial)</p> <p>South edits: Program Level: b. High Priority Forest Communities</p> <p>Description: Develop and compile information about the distribution and status of existing high priority forest communities and work with partners to develop management strategies that will either conserve existing forest types under changing climatic conditions or will facilitate successional transition to other forest types, if appropriate to public and management needs.</p>	issues down to needs.
ID-RecNo	Need Statement	
North 60	[Need] Conduct water value case study to show the ecological, economic, and human health importance of water coming from the high elevations of Central Appalachian forests to large population centers on the East Coast.	
North 27	Inventory remnant patches of spruce/fir and identify important areas for restoration (Bird Habitat).	
North 26	[Need] High elevation conservation and restoration of red spruce-northern: Identify spruce forest reference conditions for restoration purposes	
North 82	Determine linkages between northern flying squirrel habitat preferences for conifer-dominated, i.e., red spruce systems.	
South 60	[Need] Conduct water value case study to show the ecological, economic, and human health importance of water coming from the Appalachian forests to large population centers on the East Coast.	Low w/in theme
South 27	High Priority Forest communities (ex., Red Spruce-Fir, etc.): Inventory remnant patches, such as spruce/fir, and identify important areas for restoration (Note: originally identified as “bird habitat” need, but group did not want it limited only to birds).	<u>High w/in theme</u>
South 26	[Need] High elevation conservation and restoration of red spruce-northern: Identify spruce forest reference conditions for restoration purposes	Combined needs 26 and 27
	<p>Program Level: 5.6 Endemics and Rare/T&E (Terrestrial)</p> <p>Description: Develop and compile information about the LCC's terrestrial endemic species, work with partners to better estimate their current degree of imperilment, and coordinate the development of regional management strategies that will help conserve these species in the face of changing land-use and climatic conditions.</p>	

Thematic-Area (5) Terrestrial - Forests

ID-RecNo	Need Statement	
South 82	Determine linkages between species of greatest conservation need and natural communities.	<u>High w/in theme, as now written. Was too specific originally. Selected as Top 5</u>
South	Identify and inventory natural community types that are supporting or are able to support species of greatest conservation need and rare/T&E species (3% of the landscape that supports 85% of the T&E species)	<u>High w/in theme</u>
South	Life history requirements for endemic plants/animals, where it is lacking for particular species (note: what can be pulled from existing sources and provided to practitioners in a better way?). Lacking a lot of basic information (what species like, where they are, how many there are, etc.) for many species, not to mention genetic diversity (e.g., cryptic species that are yet to be named/discovered).	<u>High w/in theme</u>
	<p>Description: Work with partners and stakeholders to develop and compile information about priority species and priority conservation areas within the LCC, their habitat requirements, and changes in the distribution of those species and habitats to facilitate the regional management of those resources.</p> <p>Program Level: 5.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)</p>	
ID-RecNo	Need Statement	
Original	[Need] Understanding species distributions across the region, their habitat relationships, and migration corridors.	
North 20 (generalized)	[Need] Understanding species distributions across the region, their habitat relationships, and migration corridors.	TOP 6
North	Understanding impediments to migration	
North	Develop/adapt standardized approach for developing at risk wildlife and plant species/community list and create the list, & cross walk this list with the priority list to integrate the two	
North 94	[Need] (Predictive information required to) Set canopy targets for the region's forest to reduce storm water flows (i.e., canopy targets). .	

Thematic-Area (5) Terrestrial - Forests

North 29	[Need] Utilize existing intact ecosystems/communities to identify important functional, structural, compositional (species composition), and distributional ties/relationships with other ecosystems/communities necessary for the sustained health of one or both of those systems.	
South 94	[Need] (Predictive information required to) Set canopy targets for the region's forest to reduce storm water flows (i.e., canopy targets).	Low w/in theme
South 29	[Need] Utilize existing intact ecosystems/communities to identify important functional, structural, compositional (species composition), and distributional ties/relationships with other ecosystems/communities necessary for the sustained health of one or both of those systems.	Low w/in theme
South 20	Focal species habitat modeling that allows for assessments of current habitat capacity (e.g., Birds and bats).	Low w/in theme
South	Develop and overlay taxa-specific priority areas (e.g., terrestrial salamanders, priority birds, etc.)	Low w/in theme
	Description: Work with partners and stakeholders to develop and compile information about how stressors individually and cumulatively impact forest sustainability and rare and unique species and communities. Program Level: 5.8. Species/System Response – Major Stressors	
ID- RecNo	Need Statement	
Original	[Need] Effects of stressors (urbanization, energy development) on forest integrity/functionality and endemic species.	
Original	[Need] Assessing impacts of climate change on range-limited species (e.g. endemic salamanders).	
North 33 & 92 (generalized)	[Need] Effects of stressors (urbanization, energy development, diseases, invasive species) on forest integrity/functionality and priority species.	
North 91	[Need] Assessing impacts of climate change on range-limited species (e.g. endemic salamanders).	
North	Incidence/cumulative impacts of forest pest/pathogens/invasives on forest/wildlife species	
North	Understanding the dynamics and extent of potential carbon sequestration for forest systems	
North 95	[Need] Altered biochemical cycles in forest systems (due to climate change): changing forested ecosystem functions, perhaps decreasing value in ecosystem services.	
North 54	[Need] Climate change impacts to forests and avian faunal community	

Thematic-Area (5) Terrestrial - Forests

North 128	[Need] Air Quality impacts due to acid deposition, mercury, sulfur, and ozone.	
North 28	[Need] Impacts of loss of needle leaf conifers in fog prone areas to other (endemic, rare, sensitive) species.	
South 33	[Need] Effects of energy development (Marcellus shale, wind, coal) on forest integrity/functionality, and specific taxa.	High w/in theme
South 81	[Need] Deer overbrowsing impacts exacerbated by climate change.	Low w/in theme
South 91	[Need] Species' distributional changes under changing climate -- understanding climate change impacts on range-limited species (e.g., ectothermic salamander species, gastropods).	High w/in theme. Selected as Top 5
South 92	[Need] Evaluating impacts of energy development (M. Shale-fracking) on Appalachian endemics (salamanders).	Note: needs 33 and 92 are similar so were combined in 33
South 95	[Need] Altered biochemical cycles in forest systems (due to climate change): changing forested ecosystem functions, perhaps decreasing value in ecosystem services.	Low w/in theme
South 54	[Need] Climate change impacts to forests and avian faunal community	Low w/in theme. Note: need is similar to 91 but was not combined
South 128	[Need] Air Quality impacts due to acid deposition, mercury, sulfur, and ozone.	Low w/in theme
South 28	[Need] Impacts of loss of needle leaf conifers in fog prone areas to other (endemic, rare, sensitive) species.	Low w/in theme
South 156	Assessing Priority Amphibian & Reptile Conservation Areas (PARCAs) and vulnerability to climate change in the Appalachians.	Low w/in theme. Note: need is similar to 91 but was not combined
South	Interaction among identified threats (e.g., fragmentation and invasive species/disease introduction, spread, etc.) on communities and species	High w/in theme
	Description: Work with partners and stakeholders to develop scientifically based landscape-level planning, monitoring, and policy development tools that address the conservation needs of the LCC. Program Level: 5.9. Landscape-level (Integrated) Planning, Monitoring, and Policy Development Tools	
ID-RecNo	Need Statement	
Original	[Need] Assessing priority species conservation areas (e.g. PARCAs) and vulnerability to stressors (e.g. climate change) in the Appalachians.	

Thematic-Area (5) Terrestrial - Forests

<p>North 156 (generalized)</p>	<p>[Need] Assessing vulnerability of priority species conservation areas (e.g. PARCAs) to stressors (e.g. climate change).</p>	
<p>North</p>	<p>Develop/adapt standardized inventory and monitoring protocols for Appalachian flora/fauna</p>	

Thematic-Area (6) Terrestrial - Open-land Natural Community

Thematic-Area (6) Terrestrial - Open-land Natural Community (grasslands, meadows, balds, shale barrens)

<p>Thematic-Area (6) Terrestrial - Open-land Natural Community (grasslands, meadows, balds, shale barrens)</p>		<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage natural and non-natural (e.g. restored minelands) grassland/open-land communities across jurisdictions by inventorying significant regional grassland/open-land communities and evaluating the condition, importance, and regional threats impacting these communities.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders. <u>Foundational Resources:</u> 6.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 6.1. Database / Information Management 6.2. Baseline Data / GIS Layers & Standardization of Data Collection 6.3. GeoSpatial Status Assessment</p>		
	<p>Description: Develop and compile data to help partners and stakeholders better understand the types of open land habitats that occur within the LCC, the distribution and condition of those habitats, issues threatening the quality of those habitats, the relative importance of those habitats for species conservation within each of the states, and techniques that can be used to restore those habitats after they have been degraded. Program Level: 6.4. Faunal Habitats in Open Lands</p>		
ID-RecNo	Need Statement		
Original	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing conditions.		
Original	[Need] Understanding species and community distributions across the region, their habitat relationships, and migration corridors.		
North	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing conditions.		
North	[Need] Understanding species and community distributions across the region, their habitat relationships, and migration corridors.		
	<p>Description: Develop and compile information about the LCC's terrestrial endemic species, work with partners to better estimate their current degree of imperilment, and coordinate the development of regional management strategies that will help conserve these species in the face of changing land-use and climatic conditions. Program Level: 6.5. Terrestrial - Endemics / T&E Management, Recovery</p>		

Thematic-Area (6) Terrestrial - Open-land Natural Community

ID-RecNo	Need Statement	
North 31	[Need] Carrying Capacity of early successional habitats for birds.	
	<p>Description: Work with partners and stakeholders to develop and compile information about species within the LCC, their habitat requirements, and changes in the distribution of those species and habitats to facilitate the regional management of those resources.</p> <p>Program Level: 6.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)</p>	
ID-RecNo	Need Statement	
North 83	Community-based habitat restoration and rehabilitation and population response modeling.	
	<p>Description:</p> <p>Program Level: 6.8. Species/System Response - Major Drivers (CC, Energy/Development, Urban, etc.)</p>	
ID-RecNo	Need Statement	
Original	[Need] Effects of stressors (urbanization, energy development, climate change) on open-lands integrity/functionality and associated species.	
North 96	[Need] Effects of stressors (urbanization, energy development, climate change) on open-lands integrity/functionality and associated species.	
North	Understanding the dynamics and extent of potential carbon sequestration for grassland/open-land systems	
	<p>Description:</p> <p>Program Level: 6.9. Landscape-level (Integrated) Planning Tools (Recovery / T&E / SGCN)</p>	
ID-RecNo	Need Statement	
Original	[Need] Develop BMPs for grassland/open-land community restoration and creation.	
North	[Need] Develop BMPs for grassland/open-land community restoration and creation.	
North	Assessing vulnerability of priority species conservation areas to stressors (e.g. climate change).	
North	Understanding impact of agricultural practices on grassland/open-land wildlife and communities and development of BMPs for those systems.	

Thematic-Area (7) Human Dominated / Economic Lands (Urban, Ag, Energy)

<p>Thematic-Area (7) Human Dominated / Economic Lands (Urban, Ag, Energy)</p>	<p>GOAL: To collaboratively meet economic development and conservation management goals through the understanding of potential land use changes, economic impacts and pressures on the resources of the App. LCC region to improve decision-making and management.</p> <p><u>Revised Goal #7: To collaboratively meet economic development and conservation management goals through the understanding of potential land use changes, economic impacts and pressures on the resources of the App. LCC region to improve decision-making and management.</u></p> <p>Need to identify the drivers of change. Need to define around multiple sectors (forest products industry).</p> <p>What are the impacts/drivers, what changes are being imposed on the landscape, how do we balance changes and still accomplish conservation goals?</p> <p>Focus should not be on understanding economic interests, but to focus on the natural resource impacts. Example, what is coal mining or gas production going to impact or change?</p> <p>Concern is who gets to decide where we want to go? – human dimensions.</p> <p>Do we need to add an outreach/communications program (stakeholder identification and engagement) component under both Themes #7 and #8? It is an overall program need.</p> <p>Conflict resolution, consensus-building need. Outreach and engagement are key to collaboration and decision-making process.</p> <p>Need to understand people’s/group’s motivations.</p> <p>Human population shifts – need to understand population growth/urbanization.</p> <p>What is the role of the LCC in developing guidance, decision-making role? (Put in parking lot for further discussion)</p> <p>Concerned about including reserves, parks, conservation areas in mapping.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p><u>Foundational Resources:</u> 7.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources</p>	

Thematic-Area (7) Human Dominated / Economic Lands

	<p>7.1. Database / Information Management 7.2. Baseline Data / GIS Layers & Standardization of Data Collection 7.3. GeoSpatial Status Assessment/Remote Sensing In terms of ranking, there are four categories of informational resources and only three priorities. Can we lump them? Shouldn't the geospatial information needs be a given?</p> <p>Example of a project – update the 1996 (SAMAB) Southern Appalachian Man and the Biosphere report (chapter 3 – Changing Demographics and Economic Conditions in S. App.</p> <p>Do we want to have other things that are not just geospatial, such as indicator species, as a means of tracking development impacts, edge effects, etc.? In the realm of NEPA law these are other considerations.</p>	
	<p><u>Foundational Resources:</u> 7.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources</p>	
ID-RecNo	Need Statement	
204	[Need] Building (from: Workshop proposal - Completed in Oct 2011 by USGS) Adaptive Management Framework for Marcellus Shale Development in the Appalachian Landscape Conservation Cooperative.	
44	[Need] A Landscape-scale Approach for Evaluating Cumulative Impacts using satellite imagery, aerial photography, and geographic information systems.	
	<p><u>Foundational Resources:</u> 7.1. Database / Information Management</p>	
ID-RecNo	Need Statement	
40	Need] Abandoned Mine Land Assessments (AML) – some existing materials to build off of [see Pre-Existing data sheet.]	
	<p>Description: Develop and compile information about the ongoing/future conversion of agricultural land to urban and suburban uses within the LCC and the impacts these changes are having on the character and distribution of human communities and fish and wildlife habitats so that partner agencies may be better able to understand system dynamics and recommend alternatives to minimize future land-use conflicts involving human communities, wildlife, and ecosystem service functions. Land Use Changes/impacts – land conversion is a consideration for all</p> <p>Program Level: 7.4. Landscape-level Land Conversions – Urbanization and Ag-land Conversion/Conversion of forested land 3) Forestry Industry/Forest Lands Management (Timber Investment Management Organizations)</p>	

Thematic-Area (7) Human Dominated / Economic Lands

	<p>Research into economics of small landowner forestry practices (example of oak forests). Can we find triggers or tipping points that enable small landowners to more sustainably manage forested lands? Ecological conditions. Ownership patterns changing. Current vs. projected status. Tract size shrinkage.</p> <p>4) Urbanization (all aspects of infrastructure) One could create urbanization models playing out different scenarios – future projections. Forecasting future spatial footprint of development in 20 years in light of changes to demand, technology and regulation – an appeal for an econometric model. Policy dev. Drives urban development in App. Need social science research into policy option and natural resource impacts given a particular policy direction. There are good models to help with our understanding.</p> <p>Access to decision-support tools for growth assessments/projections. Need to run scenarios at a landscape level.</p> <p>7.4, 7.5/7.6 combined, 7.7 – are top 3</p> <p>Need to understand what’s happening to land (terrestrial habitat), water (what’s happening to species), atmospheric impacts. Energy dev., forestry, land dev. Activities are all impacts/stressors on the landscape. Science needs could be viewed independently from the specific stressors.</p> <p>How do we account for other types of research that is going on? We need to differentiate between science needs and advocacy (how the science will be used).</p>	
42	[Need] Forecasting land-use/land-cover changes. Includes climate change models, but incorporates other LULC changes (urbanization).	
45	[Need] Modeling land use change -urban growth.	
98	[Need] Use remote sensing technology to identify areas where development has altered the ecosystem and associated impacts.	
161	[Need] Evaluation of water supply demand and meeting future needs.	
	<p>Description: Develop and compile information about new, traditional or expanding energy developments within the LCC and the opportunities and impacts these industries have on the character and distribution of fish and wildlife habitats so that partner agencies may be better able to develop collaborative opportunities and anticipate future land-use conflicts involving human energy needs, wildlife, and ecosystem service functions.</p>	

Thematic-Area (7) Human Dominated / Economic Lands

	<p>Program Level: 7.5. Energy Development – New or Expanding Markets - Marcellus Shale, Wind, Biomass</p> <p>7.6. Mineral/Energy Development – Traditional Market - Coal & AMLs</p> <p>Description: Develop and compile information about new or expanding energy developments within the LCC and the opportunities and cumulative impacts these industries have on fish and wildlife so that partner agencies may be better able to develop collaborative opportunities and anticipate future land-use conflicts involving human energy needs, wildlife, and ecosystem service functions.</p> <p>Decision made to include effects on migratory birds and bats. Cumulative added to address the fact that agencies are not singularly doing this well.</p> <p>Program Level: 7.5. Energy Development – New or Expanding Markets - Marcellus Shale, Wind, Biomass</p> <p>1) Energy Development – investigation into conservation value of lands (mitigation banking, carbon sequestration, monetizing ecosystem services) applicable for themes 7 and 8. Effects of M. shale on aquatic communities and industry activity, similar research on avian impacts. Thresholds of ecological impacts as it relates to energy sector activity.</p> <p>Forecasting future spatial footprint of energy development in 20 years in light of changes to demand, technology and regulation – an appeal for an econometric model. Policy dev. Drives energy development in App. Need social science research into policy option and natural resource impacts given a particular policy direction. There are good models to help with our understanding.</p> <p>Question: What’s going to happen with land ownership (in light of gas production)? Ownership is key. Concern that lands will revert to local governments.</p> <p>Description: Develop and compile information about traditional energy developments within the LCC and the opportunities and impacts these industries have on the character and distribution of fish and wildlife habitats so partner agencies may be better able to understand system dynamics and recommend alternatives to minimize future land-use conflicts involving human energy needs, wildlife, and ecosystem service functions.</p> <p>Program Level: 7.6. Mineral/Energy Development – Traditional Market - Coal & AMLs</p>	
--	---	--

Thematic-Area (7) Human Dominated / Economic Lands

ID-RecNo	Need Statement		
Original	[Need] Forecasting future spatial footprint of energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.		
	Description: Program Level: 7.7. Agland Management (sustainable ag and forest land management)		
ID-RecNo	Need Statement		
Original	[Need] Understand economics and ecological conditions of changing ownership patterns, including those of small landowners, to sustainably manage forested lands.		
	Description: Develop and compile information about the ongoing conversion of agricultural land to urban and suburban uses within the LCC and the impacts these changes are having on the character and distribution of human communities and fish and wildlife habitats so that partner agencies may be better able to understand system dynamics and recommend alternatives to minimize future land-use conflicts involving human communities, wildlife, and ecosystem service functions. Program Level: 7.4. Landscape-level Land Conversions – Urbanization and Ag-land Conversion (conversion of forested lands)		
ID-RecNo	Need Statement		
Original	[Need] Forecasting future spatial footprint of development in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.		
	Description: Develop and compile information about the LCC's changing human distributions and the impacts these changes are having on the character and distribution of fish and wildlife habitats so that partner agencies may be better able to understand system dynamics and recommend alternatives to minimize future land-use conflicts involving human communities, wildlife, and ecosystem service functions. Program Level: 7.8. Species/System Response - Major Drivers (CC, Energy/Development, Urban, etc.)		
157	[Need] Develop guidance for water withdrawals for natural gas, AML and other energy uses.		
149	[Need] Demand in energy use with increased temperatures: increases in electricity use and heat island effect.		

Thematic-Area (7) Human Dominated / Economic Lands

	Description: Program Level: 7.9. Landscape-level (Integrated) Planning Tools (Hum. Dim.)	
200	[Pre-Existing] Assessment of Landscape Changes across the Appalachian LCC: Decision-Support Tools (DST) for Conservation (this builds off the Pre-Existing North Atlantic LCC).	
	7.10 Alternative Industries (Restoration/mitigation banking, creation of jobs for restoration has same economic benefit as road works)	
	7.11 Recreation (impacts of)	
	7.12 Communications/Outreach (stakeholder identification and engagement). There are agencies with jurisdictional decision-making power that we hope to influence	

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

<p>Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations</p>	<p>GOAL: To meet public and local resident needs/preferences and conservation goals through better understanding, valuation and management of ecosystem services.</p> <p><u>Day 1 Discussion</u></p> <p>Discussion about whether or not to combine themes #7 and #8:</p> <p>Two themes are interrelated. Economic and social needs overlap. Assumption that both natural and cultural resources will be considered. Should be kept separate. Number 8 affords more specificity. Need to include public/private stakeholders.</p> <p>Keep categories separate to measure outcomes. Important to keep separate to target/consider specific audiences (gas industry); separate from general public audiences.</p> <p>Decision #1 – keep themes #7 and #8 separate.</p> <p>Questions:</p> <p>What are ecosystem services that are impacted by human activity?</p> <p>Need to define cultural resources.</p> <p>Do we need to add an outreach/communications program (stakeholder identification and engagement) component under both Themes #7 and #8? It is an overall program need.</p> <p>Conflict resolution, consensus-building need. Outreach and engagement are key to collaboration and decision-making process. Need to understand people’s/group’s motivations. Human population shifts – need to understand population growth/urbanization.</p> <p>Question:</p> <p>What is the role of the LCC in developing guidance, decision-making role? (Put in parking lot for further discussion)</p> <p>Concerned about including reserves, parks, conservation areas in mapping.</p>
--	--

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	<p>#8 Programs:</p> <p>Need to consider restoration industry and economic benefits. Need to include carbon sequestration – possibly in 8.4 (Soil and water).</p> <p>Discussion:</p> <p>In terms of ranking, there are four categories of informational resources and only three priorities. Can we lump them? Shouldn't the geospatial information needs be a given?</p> <p>Example of a project – update the 1996 (SAMAB) Southern Appalachian Man and the Biosphere report (chapter 3 – Changing Demographics and Economic Conditions in S. App.</p> <p>Do we want to have other things that are not just geospatial, such as indicator species, as a means of tracking development impacts, edge effects, etc.? In the realm of NEPA law these are other considerations.</p> <p>How do we account for other types of research that is going on? We need to differentiate between science needs and advocacy (how the science will be used).</p> <p>GOAL: To meet public and local resident needs/preferences and conservation goals through better understanding, valuation and management of ecosystem services.</p> <p>Revised Goal #8: To meet public and local resident needs/preferences and conservation goals through better understanding, valuation and management of ecosystem services.</p> <p>Two general issues – how does public use resources? stressors – what are impacts to the resources? Other groups are addressing the stressors (aquatic, terrestrial).</p> <p>Concern over limiting public audience to that within the LCC boundary (who will benefit from ecosystem services).</p> <p>Concerned about losing local perspective. Need to preserve. What is meant by human resources? Need to consider “downstream” conservation perspectives.</p>	
--	--	--

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p><u>Foundational Resources:</u> 8.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 8.1. Database / Information Management 8.2. Baseline Data / GIS Layers & Standardization of Data Collection 8.3. GeoSpatial Status Assessment</p>	
	<p><u>Foundational Resources:</u> 8.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources</p>	
ID-RecNo	Need Statement	
	<p><u>Foundational Resources:</u> 8.1. Database / Information Management</p>	
ID-RecNo	Need Statement	
	<p><u>Foundational Resources:</u> 8.2. Baseline Data / GIS Layers & Standardization of Data Collection⁶</p>	
ID-RecNo	Need Statement	
162	[Need] Documenting regional public attitudes, values, and opinions related to wildlife and natural resource conservation across the Appalachian LCC.	
	<p><u>Foundational Resources:</u> 8.3. GeoSpatial Status Assessment</p>	
ID-RecNo	Need Statement	
67	[Need] Mapping ecosystem services in the Appalachia.	
	<p>Description: Work with partners and stakeholders to identify existing foundational resources that describe the quality and supply of the LCC's freshwater resources, the human uses of those resources, and current or future conflicts between human and fish and wildlife needs for water, so that partners may identify collaborative management opportunities and better anticipate future conflicts.</p> <p>Program Level: 8.4. Ecosystem Serv. – Water</p>	

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

ID-RecNo	Need Statement		
Original	<p>[Need] Map, model and measure multiple ecosystem services at the same time at landscape scales, including:</p> <ul style="list-style-type: none"> - Biophysical production functions/understanding of metrics - Mapping beneficiaries - Assessment of preferences - Priority of services - Cumulative impacts 		
	<p>Map, model and measure multiple ecosystem services at the same time at landscape scales. Use (MEA) Millennium Ecosystem Assessment; cross-cutting nature of ecosystem services</p> <ul style="list-style-type: none"> - Biophysical production (need an understanding of metrics) - Mapping beneficiaries - Assessment of preferences - Priority of servies. <p>Identify priority services.</p>		
57	[Need] Protect drinking water supplies in the Southeast.		
68	[Need] Economic evaluation of goods and services provided by native bivalves		
71	[Need] Long-term monitoring of air quality parameters across Appalachian LCC due to acid deposition, mercury, sulfur, ozone.		
	<p>Description: Work with partners and stakeholders to identify: existing natural and social science tools that describe the character and aesthetic conditions of sites/regions within the LCC; identify circumstances that either improve or limit their quality, and describe likely future trends considering changing human needs, habitat succession, and climate change.</p> <p>Program Level: 8.5. Envr Benefits - Aesthetics / Viewshed / Soundscape</p>		
ID-RecNo	Need Statement		
62	[Need] Degradation of Soundscape. NPS.		
61	[Need] Degradation of Viewshed. NPS.		
	<p>Description: Develop and compile natural and social science tools to describe the LCC's human population's participation in hunting and fishing, estimate trends in such participation, describe issues driving trends, and other information that will help partners develop new recruitment of hunters and/or develop new strategies to manage species if human harvest becomes insufficient to meet management</p>		

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	<p>goals.</p> <p>Program Level: 8.5. Envr/Social/Cultural Benefits - Recreation / Harvesting</p> <p>HD Edit: Program Level: Priority #2 8.5. Envr/Social/Cultural Benefits - Recreation / Harvesting Need to understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing. Should these be addressed in one program or split? How do we account for cultural values, access issues, of rec. activities such as hunting?</p> <p>Description: To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing. Should these be addressed in one program or split? How do we account for cultural values, access issues, of rec. activities such as hunting?</p> <p>Program Level: 8.5. Envr Benefits - Recreation / Harvesting</p>	
ID-RecNo	Need Statement	
Original	[Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing.	
69	[Need] Integrating ecosystem services and adaptive management: Focus on brook trout and freshwater mussels.	
58	[Need] Evaluation of management activities and socioeconomic values: the relationship between brook trout and socioeconomic benefits.	
158	[Need] Economic analyses to demonstrate the opportunity cost of losing our natural resources.	
	<p>Description: Develop and compile natural and social science tools to describe ongoing and potential human/wildlife conflicts involving game, imperiled or invasive species and work with partners to develop regional outreach and management strategies that will help address conflicts.</p> <p>Program Level: 8.7. Hum. Dim. - as Predator (+ H-W Conflict)</p>	
ID-RecNo	Need Statement	
65	[Need] Examine predators sustainability/population status will be impacted by climate change and potential human-wildlife conflict/interactions increase.	
	<p>Description: Work with partners and stakeholders to develop and identify existing natural and social science tools that describe the attitudes, conditions, economic considerations, and needs of human communities and develop a mechanism to</p>	

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	<p>share those data sources so that agencies and partners will better understand the social, economic, and political considerations that influence natural resource management.</p> <p>Program Level: 8.9. Landscape-level (Integrated) Planning Tools (Hum. Dim.)</p>	
ID-RecNo	Need Statement	
165	[Need] Quantifying & communicating ecosystem services. (develop a better understanding of how conservation practices affect ecosystem services).	
163	[Need] Development of science-based metrics for measuring, reporting and verifying environmental performance for a suite of ecosystem services.	
	<p>Description:</p> <p>Program Level: 8.10 Communications/Outreach (stakeholder identification and engagement). There are agencies with jurisdictional decision-making power that we hope to influence. Need to communicate technical issues to multiple stakeholders. Science needed for information provision in stated preference methods. How do we communicate science in a way that is understandable to various public audiences and decision-makers? Priority #3 There are a lot of foundational resources out there. Existing information needs to be accounted for.</p>	
ID-RecNo	Need Statement	
Original	[Need] To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.	
	<p>(Not sure if this was a need or description)</p> <p>8.10 To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.</p>	

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

<p>Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation</p>	<p>GOAL: Work to apply the best available predictions of how the regional climate will change, estimate the impacts those changes will have on the region's natural and cultural resources, and work with partners and stakeholders to determine climate change adaptation and mitigation strategies that can be implemented and coordinated across multiple scales.</p> <p>HD Edit: GOAL: Work to provide the best available predictions of how the regional climate might change, estimate the impacts those changes might have on the region's natural and cultural resources, and work with partners and <u>stakeholders to determine adaptation and mitigation strategies</u> that can be implemented and coordinated at a regional scale.</p>	
<p>CC edit</p>	<p>Description: (Foundational Resources) Work with partners to identify existing foundational resources and develop a standardized data storage and management framework methodology toward an “integrated data enterprise system” to make those resources universally available to partners and stakeholders.</p> <p>Foundational Resources: Below groups should be combined into one 9.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 9.1. Database / Information Management 9.2. Baseline Data / GIS Layers & Standardization of Data Collection 9.3. GeoSpatial Status Assessment</p>	
<p>HD edit</p>	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p>Foundational Resources: 9.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 9.1. Database / Information Management 9.2. Baseline Data / GIS Layers & Standardization of Data Collection 9.3. GeoSpatial Status Assessment</p>	
<p>ID-RecNo</p>	<p>Need Statement</p>	
<p>CC Group: New 51 elements</p>	<p>Develop a data catalog “Database of databases” to document work done in the region.</p>	

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

recorded in the DB		
CC Group: New Generalized 182 / 178	Participate in national enterprise systems that will compile information from multiple sources. "Don't build your own".	
CC Group: New	Archive important regional data that may be lost. Such as SAMAB, or University research data sets.	
CC Group: New Generalized 171/ 167	Develop a catalog of important climate publications. Subset of the national work.	
CC Group: New	Periodic Report—State of Appalachians ALL THEMES	
CC Group: 190	[Nat'l LCC Network] Landscape genetics-mine data from multi-species, multi-organizations to add as layers on landscape level spatial analysis. This will allow the identification of "genetic corridors" for obvious or cryptic movement of organisms, and "genetic hot-spots," or areas that multiple species have high levels of genetic diversity to facilitate biological planning.	Seemed more like a project than a need
CC Group: 187	[Nat'l LCC Network] Updated comprehensive population surveys-what are the current distributions, habitat preferences, and community /ecological necessities for organisms.	Seemed more like a project than a need
CC Group: 184	[Nat'l LCC Network] Use/availability of LIDAR technology and infra-red mapping in water/land thermal mapping (temporal/spatial applications for aquatic, wetland terrestrial habitat etc).	Seemed more like a project than a need
CC Group: 183	[Nat'l LCC Network] Stream classification system and subsequent geospatial data used to quantify the amount and types of streams and rivers allowing conservation partners to better allocate conservation actions and resources, and recommend flow and hydrology policies and management actions for streams that lack site specific data.	Seemed more like a project than a need
CC Group: 180	[Nat'l LCC Network] Comprehensive/validated road/transportation maps/data layers (for use in corridor, connectivity, invasive species analyses etc).	Seemed more like a project than a need
CC Group: 179	[Nat'l LCC Network] Updated, complete and coordinated land cover data (NLCD, NWI, etc).	Seemed more

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

		like a project than a need
CC Group: 176	[Nat'l LCC Network] Consistent managed lands spatial database that allow for an assessment of how public and private lands are being managed. Could potentially be combined with secured lands database.	Seemed more like a project than a need
CC Group: 175	[Nat'l LCC Network] Consistent secured (protected) lands spatial data system that allow assessment of lands and habitat types in the conservation estate. Should include conservation easements. Should be updated annually. Needed for analysis of how well habitats are represented in the conservation estate.	Seemed more like a project than a need
CC Group: 174	[Nat'l LCC Network] Consistent landuse-landcover classification and mapping using common Ecological Systems or similar nationally consistent classification system, ideally with 5 year updates.	Seemed more like a project than a need
CC Group: 173	[Nat'l LCC Network] Common set of parameters and data standards to facilitate integration of multi-agency/organization restoration, protection, and management (geo)databases into a more comprehensive conservation tracking system to: monitor land use land cover changes, refine decision support tools, serve as sampling universe to test underlying assumptions.	Seemed more like a project than a need
CC Group: 181	[Nat'l LCC Network] Index of technology and availability of ecologically scalable habitat-type focused imagery data (veg/forest types, talus, boulder or ground types, wetlands/water body) for application in species/habitat range and habitat modeling/shifts.	Seemed more like a project than a need
CC Group: 12	[Need] Changes in snow pack and effects on high elevation species.	Seemed more like a project than a need
CC Group: 51	[Need] Identify effect of changing climate on hydrology, soils, disturbance events, mercury methylation, zoonotic and wildlife diseases, exotic plant and animal distribution in forests.	Seemed more like a project than a need

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

HD edit	Description: Program Level: 9.4. CC – Impact – Cultural /Historic Resources / Infrastructure	
HD edit	Description: Develop and compile scientific tools to project likely impacts climate change will have on the LCC, how those changes could affect the region's hydrologic resources, and work with partners to develop strategies to help human communities, industry, aquatic species and other conservation management interests, plan for, and adapt to those changes. Program Level: 9.4. CC - Impact - Hydrology	
ID-RecNo	Need Statement	
CC Group: 64 moved into hydrology from Cultural resources	[Need] Hydrologic regime change (related to climate change). Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use Recreation, industrial, municipal, aquatic biology, agriculture), geology, and changes in air pollution.	High Ranked need
HD edit	Description: Develop and compile scientific tools to project likely impacts climate change will have on the LCC, how those changes could affect the region's terrestrial species and habitat resources, and work with partners to develop strategies to help government, industry, terrestrial species and other conservation management interests, plan for, and adapt to those changes. Program Level: 9.4. CC- Impact - Terr Sp / Comm	
ID-RecNo	Need Statement	
CC Group: 188	[Nat'l LCC Network] Climate change impacts on endemic and other native communities within the LCC including disease, range/habitat, breeding/spawning locations, migration routes.	
CC Group: 189	[Nat'l LCC Network] Climate change impacts on invasive species within the LCC.	
CC Group: 63	[Need]Soil processes and chemistry changes due to changes in temperature and precipitation/moisture (as related to climate change). Identify parameters for highly vulnerable soils and map these areas (soil type, slope, position, elevation, land-use)	
HD edit	Description: Develop and compile scientific tools to project likely impacts climate change will have on the LCC, how those changes could affect the region's aquatic species and habitats, and work with partners to develop strategies to help aquatic species and other conservation management interests, plan for, and adapt to those changes.	

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

	Program Level: 9.4. CC - Impact -Aq Sp / Comm		
ID-RecNo	Need Statement		
CC Group: 115	[Need] Climate change impacts on endemic and other native communities within the LCC including disease, range/habitat, breeding/spawning locations, migration routes. <Hope the Aq Species Group details the most vulnerable taxa>.		
CC Group: 6	[Need] Biological Monitoring Component to determine and sustain community health		
Original	<p>Description: Develop and compile scientific tools to project likely impacts climate change will have on the LCC, how those changes could affect the region's hydrologic resources including water quantity, quality, and timing, and work with partners to develop strategies to help human communities, industry, aquatic species managers and other conservation management interests, plan for, and adapt to those changes.</p> <p>Program Level: 9.4. CC - Impact - Hydrology</p>		
ID-RecNo	Need Statement		
Original 64	[Need] Hydrologic regime change (related to climate change). Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use. Recreation, industrial, municipal, aquatic biology, agriculture), geology, and changes in air pollution. [Incorporate Biological response]		
Original	<p>Description: Develop, compile and evaluate scientific tools for managers that assess the vulnerability of species, habitats, landscapes (includes aquatics) across multiple scales to changing climate conditions.</p> <p>Program Level: 9.5. CC - Vulnerability /Risk Assessment</p>		
HD edit	<p>Description: Develop and compile scientific tools that assess the vulnerability of species, habitats, and human resources to changing climatic conditions within the LCC and work to make those tools available to partners to make findings known within the LCC community, provide an opportunity for others to improve upon existing efforts, and limit the duplication of effort.</p> <p>Program Level: 9.5. CC - Vulnerability /Risk Assessment</p>		
ID-RecNo	Need Statement		

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

Original 186	[Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]	
CC Group 186	[Nat'l LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale). [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]	HIGH Ranked Goal
CC Group	Vulnerability Assessment evaluation meeting/training	
CC Group 192	[Nat'l LCC Network] Species-habitat models that allow for the assessment of the capability of habitats to support populations at objective levels at present and in the future. Most existing species-habitat models do not allow for assessments of capacity, abundance or persistence.	Moved from modeling
Original	Description: Work with partners to develop regional climate adaptation strategies that will, to the extent possible, help ensure the persistence of healthy human and fish and wildlife communities through manager-scientist partnerships in the face of changing climatic conditions. Program Level: 9.6. CC - Adaptation (incl. Management Response)	
HD edit	Description: Work with partners to develop regional climate adaptation strategies that will, to the extent possible, help ensure the persistence of healthy human and fish and wildlife communities in the face of changing climatic conditions. Program Level: 9.6. CC - Adaptation (incl. Management Response)	
ID-RecNo	Need Statement	
Original 198	[Nat'l LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]	
198	[Nat'l LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]	HIGH Ranked need

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

	Identify natural sources/examples of adaptation. Species that are less sensitive to climate change serve as an example of strategies to manage throughout the LCC.	
HD edit	<p>Description: Develop and compile climate science tools that describes future climatic conditions within the LCC and work to make those tools available to partners to make findings known within the LCC community, provide an opportunity for others to improve upon existing efforts, and limit the duplication of effort.</p> <p>CC GROUP: Note: Modeling to be considered a TOOL to help other programmatic science Needs – not an individual program. Large scale GCM modeling should be done by CSC level. LCC should use products or downscaled information to address management needs in the LCC.</p> <p>Program Level: 9.7. CC - Modeling (Coupled / Downscale)</p>	
HD edit	<p>Description:</p> <p>Program Level: 9.8.</p>	
ID-RecNo	Need Statement	
HD edit	<p>Description:</p> <p>Program Level: 9.9. Landscape-level (Integrated) Planning Tools (Climate Change)</p>	
CC Edit	<p>Description: Support the innovative and appropriate use of tools to assess climate change impacts in the LCC region.</p> <p>Write Description</p> <p>Program Level: 9.9. Landscape-level (Integrated) Planning Tools (Climate Change)</p>	
ID-RecNo	Need Statement	
CC Group Lumped specific needs into new need	Develop tools specific to resource manager needs in the Appalachian region to assess climate change impacts.	
CC Group 43	[Need] [Pre-Existing] Mega-Transect type large-scale, multi-agency / research for CC monitoring and impact studies: support large-scale monitoring efforts to document and track impacts of climate change on Appalachia.	Seemed like a project rather than need

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling,
Adaptation

CC Group 191	[Nat'l LCC Network] Landscape simulation models (e.g., LANDIS) that predict spatial and temporal dynamics of land-use/land cover under alternative scenarios (e.g., climate change, urban growth, energy development).	Seemed like a project rather than need
CC Group 195	[Nat'l LCC Network] Coarse-filter assessments of ecological integrity and resilience to complement priority species approach. Examples include CAPS in Massachusetts and Geophysical and Resilient System Approach to Climate Change Adaptation proposed by TNC in the Northeast.	Seemed like a project rather than need
CC Group 196	[Nat'l LCC Network] Assessment of assumptions related to use of focal or representative species approach to guide development of decision support tools, i.e. do these approaches adequately represent larger sets of species and how do they compare to coarse-filter approaches.	Seemed like a project rather than need
CC Group 197	[Nat'l LCC Network] Develop comprehensive models that consider terrestrial and aquatic conservation needs by incorporating an aquatic component (e.g. stream and river networks) into terrestrial landscape models.	Seemed like a project rather than need
CC Group 50	[Need] Develop phenological index of ecological health using high elevation communities.	Seemed like a project rather than need
CC Group 97	[Need] Use remote sensing technology to identify impact of climate change on edge habitat and migration corridors.	Seemed like a project rather than need

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

Thematic-Area (10) Social science research

Thematic-Area (10) Social science research		GOAL: [Identify the social science research needed to achieve affective communications and stakeholder outreach and the specific audiences associated with that information need. Not outreach and communications activities but the science that supports those efforts.]	
	Description: Program Level: 8.10 ...		
ID-RecNo	Need Statement		
	[Need] ...		

Appendix F. Appalachian LCC Day 2 – Top Ranked Science Needs

Key:

Group 1: Patrick Pitts & Callie McMunigal

Group 2: Linda May & Todd Fearer

Group 3: Steve Faulkner & Lindsay Gardner

Group 4: Chris Burkett & Jen Krstolic

Group 5: Anita Goetz & Angie Rodgers

Group 6: Danna Baxley & Brian Smith

*Group 7: N/A (Ed and Rose) – did not facilitate a group on Day 2

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

<p>Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)</p>	<p>GOAL: Create, maintain, and grow a GIS/ IT architecture that facilitates the development of community networks, supports systems modeling, enables information creation, exchange and education in a consistent manner across administrative boundaries allowing users to easily discover, access and integrate data and tools to inform conservation across the landscape over time.</p>	<p>Note from Group 2: RANKS APPEAR IN THIS COLUMN FOR TOP SCIENCE NEEDS</p>
	<p>Description:</p> <p>Work with partners to develop a GIS and content management system – Tools to gather and disseminate data. Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.</p> <p>Review other thematic area needs to develop an online learning management system (e.g., moodle), providing instructional and educational program support to all aspects of the Appalachian LCC to include hardware/software demonstrations, field guides, training videos, podcasts, webinars, training material archives.</p> <p>Program Level: 1.2 ...</p>	

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

ID-RecNo	Need Statement		
Original	[Need] Capacity – GIS/IT Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.		
Group 1	Kept Same		# 1 Ranked Need And Short List
Group 2	Kept Same		TOP but not voted. Group felt this too foundational plus a WG would have little cost
Group 3	Kept Same		Top 6
Group 4	[Need] Capacity – GIS/IT /-ologist Working group that: designs pilot study or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.		High Rank Need CSC promote This task; needs to include field-level scientist.
Group 5	Kept Same (this is key to all themes)		
Group 6-A	Kept same Notes: needs someone to spearhead—Science Coordinator, Working Group Chair? Needs to work with other partnerships/organizations to make sure efforts aren't duplicated, can share across boundaries, etc.		

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

Original	[Need] Content management – Tools to gather and disseminate data. Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.	
Group 1	Kept Same	
Group 2	Kept Same	TOP but not voted. Group felt this too foundational to vote on.
Group 3	[Need] Content management – Tools to gather, analyze and disseminate data. Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.	0
Group 4	[Need] Content management – Apply tools to gather and disseminate data (ex. Landscape, Databasin, USGS Seamless data clearing house) Backend infrastructure. Develop a geospatial web-based platform in collaboration with other LCCs, calendaring, web services, large files, projects and people database, group work flow, public commenting, hardware/software inventory, georeferencing, mobile applications, federated search.	Linded to CC discussion? Aq Sth
Group 5	Kept Same This need is embedded in 1 st need? Can we combine these? All 3 could be combined? It could be wrapped into 1 really big need. If we combine, this could help with the final ranking.	
Group 6 – B	Kept Same Note: security of information and proprietary information a concern	

Thematic-Area (1) Pre-Existing Tools, Portals, Datasets, Resources (GIS / Information Management)

Original	[Need] Education - Learning management system (e.g., moodle) to include hardware/software demonstrations, field guides, training videos, podcasts, webinars, training material archives.	
Group 1	Kept Same	
Group 2	Kept Same	
Group 3	Kept Same Links to Theme #10 – Communications & Outreach	0
Group 4	Kept Same	
Group 5	Kept Same	
Group 6 – C	Kept Same Note: Essentially, a distance-learning platform	

Aquatic

Thematic-Area (2) Aquatic

<p>Thematic-Area (2) Aquatic</p>	<p>GOAL: Be able to quantitatively describe current and future hydrologic and structural habitat conditions and aquatic population trends, and set conservation goals for both, in order to maintain native habitats and endemic aquatic species in their current locations or support these as they migrate with land use and climate changes in the future.</p>	<p>Group 6 - Crosswalk with CC hydrology section??</p>
<p>Group 1 Added:</p>	<p>Program Level: 2.0 Foundational Tools / Materials</p>	
<p>ID-RecNo</p>	<p>Need Statement (left blank)</p>	
	<p>Description: Develop and compile data to help partners and stakeholders better understand the types of aquatic habitats that occur within the LCC, the distribution and condition of those habitats, issues threatening the quality of those habitats, the relative importance of those habitats for species conservation within each of the states, and techniques that can be used to restore those habitats after they have been degraded.</p> <p>Program Level: 2.1. Habitat</p> <ul style="list-style-type: none"> • Connectivity • Water quality • Habitat quality <ul style="list-style-type: none"> ▪ Riparian habitat ▪ Instream, structural habitat • Habitat quantity • Hydrology <ul style="list-style-type: none"> ▪ Water quantity ▪ Timing ▪ Distribution 	

Aquatic

ID-RecNo	Need Statement		
Original	[Need] Relationships between contaminants and biological response		
Group 1	Kept Same		
Group 2	Kept Same	II	2
Group 3	Kept Same	0	
Group 4	Kept Same		
Group 5	[Need] Rigorous understanding of various contaminants on aquatic biota. This belongs under Program 2.7 Pharmaceuticals, coal, etc.		
Group 6 - D	Kept Same		
	Description: Program Level: 2.6 Species-Habitat Relationships at Multiple Scales		
ID-RecNo	Need Statement		
Original	[Need] To develop environmental flow requirements for species, populations, and communities for the region.		
Group 1	Removed		
Group 2	Removed		
Group 3	Kept Same	Top 6	
Group 4	[Need] To identify environmental flow and habitat requirements for species, populations, and communities for the region.	High Rank Need Two needs within this Program were lumped	
Group 5	Removed		
Group 6	Removed		

Aquatic

Original	[Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program)	
Group 1	[Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) (this was listed in 2.1 Habitat program in order to develop environmental flow requirements for species, populations, and communities for the region.	Short List
Group 2	[Need] To know the relationship between flow, habitat, and aquatic life (ecological flows) in order to understand minimum flow requirements and how alterations to systems will affect their sustainability (this was listed in 2.1 Habitat program)	TOP 6
Group 3	Kept Same Note: Flow needs statements were previously combined.	0
Group 4	Removed	
Group 5	Kept Same Above 2 needs should be combined. [Need] rigorous understanding of the relationships between hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities.	
Group 6 – F	Kept Same	Within 2.6, we combined the 1 st and 2 nd needs listed in the master document (the black&white printout provided on day 2), the 2 nd need in 4.4, and the 1 st need in 9.4. (listed as E, F, Q, and ID-RecNO 64/JJ in this document)
Group 5 (New-Added)	Develop aquatic classification. Identify priority species. Develop species habitat models that are applicable across the App LCC.	New Need Added Day 2

Aquatic

<p>Group 6 – E (added)</p>	<p>[Need] in Aquatic and Climate Change Themes: Understand water quality, quantity, timing, and flow requirements for species, populations, and communities for the region. Need to understand the impact of precipitation and temperature change on hydrologic regime (surface-water, groundwater, floodplain, and wetland hydrology) in the context of multiple stressors and uses (recreation, industrial, municipal, aquatic biology, agriculture, geology, and changes in air pollution). Note: don't exclude barriers (e.g., low-head dams, reservoirs, etc.) in this thinking.</p>	<p>Within 2.6, we combined the 1st and 2nd needs listed in the master document (the black&white printout provided on day 2), the 2nd need in 4.4, and the 1st need in 9.4. (listed as E, F, Q, and ID-RecNO 64/JJ in this document)</p>
	<p>Description: [Partial] Develop and compile climate change models for the LCC that can: help managers predict likely impacts to the region's water resources, aquatic species, and human systems that rely upon those resources; facilitate the development of more robust regional mitigation and management plans; and help managers provide meaningful input to future revisions of state and Federal water regulations.</p> <p>Program Level: 2.7 Species/System Response to Alteration</p>	<p>Group 3 comment – Question about relevancy of this description Group 4 comment - Perhaps more appropriate program for the CSC? Links to a program/need within CC theme</p>
<p>ID-RecNo</p>	<p>Need Statement</p>	
<p>Original</p>	<p>[Need] Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).</p>	
<p>Group 1</p>	<p>Kept Same</p>	<p>Short List</p>
<p>Group 2</p>	<p>Kept Same</p>	
<p>Group 3</p>	<p>Kept Same</p>	<p>Top 6</p>
<p>Group 4</p>	<p>Kept Same</p>	<p>High Rank Need</p>
<p>Group 5</p>	<p>[Need] Identify impacts of energy development and resource extraction on aquatic communities</p>	<p>Top 6</p>
<p>Group 6 – G</p>	<p>[Need] Effects of resource extraction(forest products, dredging, shale oil & gas, etc.) – related to energy development and resource (energy) extraction; sitings; physical landscape; effects</p>	<p>Re-worded from original handout.</p>

Aquatic

	of fragmentation, sedimentation (Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).	
--	---	--

Aquatic

Original	[Need] Identify key limiting factors and stressors for priority aquatic taxa and communities across the LCC.	
Group 1	Kept Same	
Group 2	Kept Same	
Group 3	Kept Same Note: (concerned about use of term priority, as priority aquatic taxa will vary according to states/agencies; refer to Great Lakes LCC survey of states, limiting factors also raises some concern, priority could be understand to include T&E, sensitive species, keystone species, indicator species)	
Group 4	Kept Same	
Group 5	Kept Same	
Group 6 – H	Kept Same Note: Coordinate with USGS closely on all shale gas research needs!!! Much is already underway.	

Aquatic

Original	[Need] For the stressors that are currently politically impossible to correct (agriculture, forestry, urban growth, mining, etc.), develop and communicate culturally viable solutions to address these stressors across the landscape.	
Group 1	[Need] Determine effective incentive design to encourage voluntary compliance and beyond to address stressors that are not effectively addressed through regulatory means (agriculture, forestry, urban growth, mining, etc. for both terrestrial and aquatic themes).	Applies across themes. Can We Move to Human Dimension Theme?
Group 2	Kept Same	
Group 3	Kept Same Note: The science need is more about investigation of solutions, rather than coming up with the solutions. Link to Theme 10: Social science need.	0
Group 4	[Need] Identify social or economic barriers and develop and communicate culturally feasible solutions to address sensitive issues related to known stressors (agriculture, forestry, urban growth, mining, untreated sewage, etc.) across the landscape.	High Rank Need
Group 5	[Need] Develop and communicate culturally viable solutions to address intractable stressors across the landscape.	
Group 6 – I	[Need] Develop and communicate culturally viable solutions to address stressors (agriculture, forestry, urban growth, mining, etc.) across the landscape. Note: Wording for this was NOT GOOD. Terms such as “Compatible uses”, “sustainable development” should be used/incorporated instead.	Re-worded from original handout.

Aquatic

Original	[Need] Identify distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or move between watersheds.	
Group 1	[Need] Collect and make available data on current and potential distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic & terrestrial species. Complete a threats analysis of invasive species on aquatic and terrestrial species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or movement among watersheds.	Short List – Applies across themes. Can we move this to GIS Theme?
Group 2	Kept Same	
Group 3	[Need] Identify distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or move between watersheds. Concern over regulatory definition of invasive by states vs. biological definition. Note: these types of terms like priority, significant, etc. need to be well-defined. Cross-walk with Theme 10: re: social implications.	0
Group 4	[Need] Identify distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic species. Complete a threats analysis of invasive species on aquatic species. Gather data on how states regulate exchange between states or intra-state movement of species.	Links to programs and needs within the Terr & Aquatic themes
Group 5	Kept Same	
Group 6 – J	Kept Same Note: Coordinate with Aquatic Nuisance Panels	

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

<p>Thematic-Area (3) Terrestrial - Cave/Karst/Mines *Group 5 added “/Groundwater” here</p>		<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage cave/karst/mine (CKM) communities across jurisdictions by inventorying significant regional CKM communities and evaluating the condition, importance, and regional threats impacting these communities.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository recognizing the sensitivity and legal limitations of these data.</p> <p><u>Foundational Resources:</u> 3.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 3.1. Database / Information Management 3.2. Baseline Data / GIS Layers & Standardization of Data Collection</p>		
	Needs Statement:		
Original	[Need] Map of springs throughout karst region—characterization and identification		
Group 1	[Need] Inventory, mapping and classification of CKM systems including springs and hydrology to understand species and community distributions, their habitat relationships, and linkages across systems		Short List
Group 2	Removed		
Group 3	Removed??		
Group 4	[Need] Map and develop a geodatabase of karst features including springs utilizing a standardized classification system. (incorporate elements within Federal Cave Resources Protection Act) (biology, geology/mineralogy, paleo, hydrology, recreation, science and education, cultural)		Two needs in this program were lumped
Group 5	Removed		

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

Group 6 – K	[Need] Compile existing karst geospatial datasets and analyze to (1) create datasets on karst springs, cave passage/entrance density, cave obligate/dependent species distributions, and subterranean biodiversity maps, and (2) identify data gaps that are barriers to conservation planning. Note: do we want to combine mines with this group? Used by bats and other biota, also affect groundwater/surface water, but very different. Likely first step, followed by L. Team up with Gulf Coastal Plain and Ozarks LCC??	Top 6: keep. Combined with 1 st need in 3.3 below (referred to as M below)
Original	[Need] Develop a classification system for karst systems in the Appalachian region (to help prioritize conservation strategies)	
Group 1	Removed	
Group 2	Removed	
Group 3	Kept Same	0
Group 4	Removed?	
Group 5	Kept same	
Group 6-L	[Need] Develop a classification system for karst systems in the Appalachian region (to help prioritize conservation strategies, ensure representativeness, etc.)	Re-worded from original handout.

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

	Description: Program Level: 3.3. GeoSpatial Status Assessment		
ID-RecNo	Need Statement		
Original	[Need] Inventory and mapping of CKM systems, understand species and community distributions, their habitat relationships, and linkages across systems		
Group 1	Removed		
Group 2	[Need] Classification (biological and geophysical), inventory and mapping of CKM and associated spring systems, understand species and community distributions, their habitat relationships, and linkages across systems	TOP 6	
Group 3	[Need] Inventory, mapping and classification of CKM systems, understand species and community distributions, their habitat relationships, and linkages across systems. Cross-check with second need to see if they can be combined.	0	
Group 4	Kept Same		
Group 5	[Need] Inventory and mapping of CKM and groundwater systems, understand species and community distributions, their habitat relationships, and linkages across systems		
Group 6 – M	[Need] Inventory and mapping of CKM systems, understand species and community distributions, their habitat relationships, and linkages across systems. Note: do we want to combine mines with this group? Used by bats and other biota, also affect groundwater/surface water, but very different.	Combined with 1 st need listed under 3.0/.1/.2 (referred to as K above)	
	Description: Develop and compile data regarding the status and distribution of subterranean resources, threats impacting associated species, and work with partners to develop management strategies needed to address habitat threats and assist in the recovery of threatened and endangered species. Program Level: 3.4. T&E Species - Recovery		
	Description: Develop and compile data regarding the status and distribution of subterranean resources, threats impacting priority cave species or other resources, and work with partners to develop management strategies needed to address those threats and assist in the recovery of those species. Program Level: 3.5. Other Priority Cave Species		

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

Description:		
Program Level: 3.6. Management recommendations for sinkhole/cave/karst		
ID-RecNo	Need Statement	
Original	[Need] BMPs for cave/karst landscape, based on existing science.	
Group 1	[Need] Develop or improve adoption of existing BMPs for cave/karst landscape conservation, based on existing science. Cave/karst training workshops for resource managers and stakeholders (e.g., provided by Karst Waters Institute).	
Group 2	[Need] BMPs that include a monitoring/evaluation component for cave/karst landscape based on existing science and associated training workshops for resource managers and other relevant stakeholders (e.g., provided by Karst Waters Institute).	
Group 3	[Need] Evaluating the efficacy of BMPs for cave/karst landscape, based on existing science.	0
Group 4	[Need] Do research to develop BMPs for cave/karst landscapes (silvicultural practices prescribed burning, energy development)	
Group 5	[Need] Develop basic knowledge and understand linkages between surface activities and impacts to cave/karst/mines to aid in development of BMPs	
Group 6 – N	[Need] BMPs for cave/karst landscape, based on existing science. [Need] Cave/karst training workshops for resource managers (e.g., provided by Karst Waters Institute)	The 2 needs under 3.6 were combined (referred to as N and O here)

Thematic-Area (3) Terrestrial - Cave/Karst/Mines

Original	[Need] Cave/karst training workshops for resource managers (e.g., provided by Karst Waters Institute)	
Group 1	Removed	
Group 2	Removed	
Group 3	Kept Same Note: Conducting the workshop not seen as a science need.	0
Group 4	Kept Same	
Group 5	[Need]Build capacity to be able to identify the range of species and communities within CKMG	
Group 6 - O	Kept Same	The 2 needs under 3.6 were combined (referred to as N and O here)
Group 3 (new)	Need – Better understanding of karst flow systems and linkages of above ground processes, below ground resources and land use.	0

Thematic-Area (4) Terrestrial – Wetlands

<p>Thematic-Area (4) Terrestrial - Wetlands</p>	<p>GOAL: Work to inventory significant regional wetland habitats, evaluate the condition and importance of these habitats, and identify regional threats impacting those resources so that LCC partners and stakeholders can develop and implement cohesive regional management strategies to protect and manage wetlands across jurisdictions.</p>	
<p>Group 1 (added)</p>	<p>Description: Program Level: 4.0 Foundational Resources</p>	
<p>ID-RecNo</p>	<p>Need Statement</p>	
<p>Group 1 (added)</p>	<p>[Need] Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated/restored under changing conditions.</p>	<p># 2 Ranked Need Short List Duplicated to other themes</p>

Description:		
Program Level: 4.4. Wetland Community, hydrology (incl. contaminants)		
ID-RecNo	Need Statement	
Original	[Need] Identify and quantify the extent of naturally functioning floodplain habitat to priority habitat and species.	
Group 1	[Need] Identify and quantify the current and future extent of naturally functioning floodplain / wetland habitats to priority habitat and species and determine the connectivity to perennial streams compared to historical connectivity.	Short List
Group 2	[Need] Identify and quantify the characteristics (hydrology, seasonality, connectivity to streams) of naturally functioning wetlands (e.g. floodplains, vernal pools, bogs, etc.) to develop an understanding of requirements for priority habitat and species and how alterations to systems will affect their sustainability.	
Group 3	[Need] Identify and quantify the extent of naturally functioning floodplain habitat to priority habitat and species. Concern about the use of floodplain, as it does not include bogs, etc. Wetland may be better, more inclusive.	0
Group 4	Kept Same	
Group 5	[Need] Identify and quantify the extent of naturally functioning floodplain habitat critical to priority aquatic/terrestrial habitat and species	
Group 6 – P	[Need] Identify and quantify the extent of wetland habitat (esp. 'connected' floodplains and isolated/small wetlands) to priority habitat and species Notes: drop "floodplain" and include all wetlands? Forested wetlands, vernal pools, and bogs very important and under-represented too. Essentially, improve and expand upon National Wetlands Inventory, but also to survey/inventory biota.	Reworded from original. High priority for theme

Thematic-Area (4) Terrestrial – Wetlands

Original	[Need] Determine current extent of wetland connectivity to perennial streams compared to historical connectivity.	
Group 1	Removed	
Group 2	Removed	
Group 3	Kept Same	0
Group 4	Kept Same.	
Group 5	Kept Same	
Group 6 – Q	Kept Same	Within 2.6, we combined the 1 st and 2 nd needs listed in the master document (the black&white printout provided on day 2), the 2 nd need in 4.4, and the 1 st need in 9.4. (listed as E, F, Q, and ID-RecNO 64/JJ in this document)

	Description: Program Level: 4.5. Ecological Function		
ID-RecNo	Need Statement		
Original	[Need] Quantify ecosystem services of wetlands and their contribution to nutrient cycling to both aquatic and terrestrial systems.		
Group 1	[Need] Quantify ecosystem services of wetlands and their contribution to elemental cycling.		
Group 2	Kept Same		
Group 3	[Need] Quantify ecosystem services of wetlands, including their contribution to nutrient cycling to both aquatic and terrestrial systems. Note: Cross-walk with Theme 8 – Ecosystem Services.	0	
Group 4	Kept Same		
Group 5	[Need] Quantify ecosystem services of wetlands, and their contribution to nutrient cycling to both aquatic and terrestrial systems.		
Group 6 – R	Kept Same Note: need to assemble Appalachian wetland experts together to fully develop priorities for this Theme!! Flood storage and water release is very important...need to quantify for floodplains and isolated wetlands.		Crosswalk with Human Dimensions Group?
Group 1 Added:	Description: Program Level: 4.7 Landscape –level species-habitat (modeling / species habitat relationships / assessment)		
ID-RecNo	Need Statement		
Group 1 Added:	[Need] ID habitat requirements for rare wetland species as well as distribution and status of rare wetland community types (i.e. bogs).		New Need Added Day 2
Group 1 Added:	[Need] Determine effective incentive design to encourage voluntary compliance and beyond to address stressors that are not effectively addressed through regulatory means (agriculture, forestry, urban growth, mining, etc. for both terrestrial and aquatic themes).		Duplicated across themes

Thematic-Area (4) Terrestrial – Wetlands

<p>Group 1 Added:</p>	<p>[Need] Collect and make available data on current and potential distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic & terrestrial species. Complete a threats analysis of invasive species on aquatic and terrestrial species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or movement among watersheds.</p>	<p>Short List - Applies across themes. Can we move this to GIS Theme?</p>
<p>Group 1 Added:</p>	<p>[Need] Understanding species/population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective migration (gene flow) /dispersal corridors.</p>	<p>#3 Ranked Need Short List Duplicated in other themes</p>

Thematic-Area (5) Terrestrial – Forests (original)

<p>Thematic-Area (5) Terrestrial – Forests (original)</p>	<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage forest communities across jurisdictions by inventorying significant regional forest communities, evaluating the condition, importance, and regional threats impacting these communities.</p>	
<p>Group 6 reword</p>	<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage forest/working forest communities across jurisdictions by inventorying significant regional forest communities, evaluating the condition, importance, and regional threats impacting these communities.</p>	<p>Note: need to bring in other stakeholders, esp. forest products</p>
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p><u>Foundational Resources:</u> 5.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 5.1. Database / Information Management 5.2. Baseline Data / GIS Layers & Standardization of Data Collection 5.3. GeoSpatial Status Assessment</p>	

Thematic-Area (5) Terrestrial – Forests (original)

ID-RecNo	Need Statement		
Original	[Need] Spatial data framework; tools necessary for spatial data planning and future condition scenarios w/in the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning)		
Group 1	[Need] Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated/restored under changing conditions.		# 2 Ranked Need Short List Duplicated to other themes
Group 2	Kept Same		
Group 3	Kept Same Note: Cross-walk with Theme 1: GIS.		0
Group 4	Kept Same		
Group 5	[Need] Identify a connected and resilient network of forest ecosystems in the Appalachian LCC.		Top 6
Group 6 – S	Kept Same Note: Avoid duplication by working with existing project leads (e.g., TNC) and supporting efforts to fill in gaps		

Thematic-Area (5) Terrestrial – Forests (original)

	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p><u>Foundational Resources:</u> 5.3. GeoSpatial Status Assessment</p>	
ID-RecNo	Need Statement	
Original	[Need] Assess status of Appalachian amphibians and determine impacts of emerging amphibian diseases	
Group 1	Removed	
Group 2	Kept Same	
Group 3	Kept Same	0
Group 4	Kept Same	
Group 5	Kept Same	
Group 6 – T	Kept Same	
	<p>Description: Develop and compile data regarding the utility of silvicultural tools, invasive species management, and especially prescribed burning as restoration and management tools for a full complement of forest communities. Research how these practices might facilitate habitat conservation and coordination of forest conservation actions across regional boundaries under changing conditions.</p> <p>Program Level: 5.4. Sustaining Forests</p>	
	<p>Description: Develop and compile information about the LCC's rare species and communities (e.g. high elevation forests), work with partners to better estimate their current degree of imperilment, and coordinate the development of regional management strategies that will help conserve these species and communities in the face of changing conditions.</p> <p>Program Level: 5.6. Rare and Unique Species and Forest Communities (Terrestrial)</p>	
	<p>Description: Work with partners and stakeholders to develop and compile information about priority species and priority</p>	

Thematic-Area (5) Terrestrial – Forests (original)

	conservation areas within the LCC, their habitat requirements, and changes in the distribution of those species and habitats to facilitate the regional management of those resources. Program Level: 5.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)	
ID-RecNo	Need Statement	
Original	[Need] Understanding species distributions across the region, their habitat relationships, and migration corridors.	
Group 1	[Need] Understanding species/population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective migration (gene flow) /dispersal corridors.	#3 Ranked Need Short List Duplicated in other themes
Group 2	Kept Same	TOP 6
Group 3	[Need] Understanding species distributions across the region, their historic, current and predictive habitat relationships, and movement corridors, and connectivity. Note: The group recognizes that adding predictive is important, but may be altering the initial intent.	Top 6
Group 4	Kept Same	
Group 5	[Need] Understanding species distributions across the region, their habitat relationships, and dispersal dynamics.	
Group 6 – U	[Need] Understanding <i>representative/priority/focal</i> species' and communities' distributions across the region, their habitat relationships, and migration corridors. Note: Terrestrial and aquatic (or combined?) approaches needed.	Top 6: keep; we combined conceptual need listed under 5.3 and the first under 5.7.

Thematic-Area (5) Terrestrial – Forests (original)

Group 1 Added:	[Need] Determine effective incentive design to encourage voluntary compliance and beyond to address stressors that are not effectively addressed through regulatory means (agriculture, forestry, urban growth, mining, etc. for both terrestrial and aquatic themes).	Duplicated across themes
Group 1 Added:	[Need] Collect and make available data on current and potential distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic & terrestrial species. Complete a threats analysis of invasive species on aquatic and terrestrial species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or movement among watersheds.	Short List - Applies across themes. Can we move this to GIS Theme?
	Description: Work with partners and stakeholders to develop and compile information about how stressors individually and cumulatively impact forest sustainability and rare and unique species and communities. Program Level: 5.8. Species/System Response – Major Stressors	
ID-RecNo	Need Statement	
Original	[Need] Effects of stressors (urbanization, energy development) on forest integrity/functionality and endemic species.	
Group 1	Removed	
Group 2	[Need] Effects of stressors (urbanization, energy development, diseases, invasive species) on forest integrity/functionality and priority species.	
Group 3	Kept Same	Tied for Top 6
Group 4	Kept Same	
Group 5	[Need] Effects of stressors (urbanization, energy development) on forest integrity/functionality.	
Group 6 – V	[Need] Effects of stressors (e.g., urbanization, energy development, etc.) on forest integrity/functionality and endemic species. Note: short-term/medium-term stressors. Possibly could be merged with W????	Re-worded slightly

Thematic-Area (5) Terrestrial – Forests (original)

Original	[Need] Assessing impacts of climate change on range-limited species (e.g. endemic salamanders).		
Group 1	Removed		
Group 2	Kept Same		
Group 3	Kept Same		
Group 4	Kept Same		
Group 5	[Need] Assessing impacts of climate change on endemics and other range-limited species (e.g. endemic salamanders).		
Group 6 – W	[Need] Assessing impacts of climate change on range-limited species (e.g. endemic salamanders, gastropods). Note: long-term stressors		Incorporated with ID-RecNO 186.
	Description: Work with partners and stakeholders to develop scientifically based landscape-level planning, monitoring, and policy development tools that address the conservation needs of the LCC. Program Level: 5.9. Landscape-level (Integrated) Planning, Monitoring, and Policy Development Tools		
ID-RecNo	Need Statement		
Original	[Need] Assessing priority species conservation areas (e.g. PARCAs) and vulnerability to stressors (e.g. climate change) in the Appalachians.		
Group 1	Removed		
Group 2	[Need] Assessing vulnerability of priority species conservation areas (e.g. PARCAs) to stressors (e.g. climate change).		
Group 3	Kept Same		Tied for Top 6
Group 4	Kept Same		
Group 5	Kept Same		
Group 6 – X	[Need] Assessing priority species conservation areas (e.g. PARCAs, Matrix Forest Blocks, JV Focal Areas) and vulnerability to stressors (e.g. climate change) in the Appalachians.		Re-worded from original

Thematic-Area (6) Terrestrial - Open-land Natural Community

Thematic-Area (6) Terrestrial - Open-land Natural Community (grasslands, meadows, balds, shale barrens)

<p>Thematic-Area (6) Terrestrial - Open-land Natural Community (grasslands, meadows, balds, shale barrens)</p>	<p>GOAL: Develop and implement comprehensive regional strategies to conserve and manage natural and non-natural (e.g. restored minelands) grassland/open-land communities across jurisdictions by inventorying significant regional grassland/open-land communities and evaluating the condition, importance, and regional threats impacting these communities.</p>	
	<p>Description: (Foundational Resources) #s _0 - _3 Work with partners to identify existing foundational resources and develop a centralized repository to make those resources universally available to partners and stakeholders.</p> <p>Foundational Resources: 6.0. Pre-Existing: Tools, Portals, Datasets, Data layers, Resources 6.1. Database / Information Management 6.2. Baseline Data / GIS Layers & Standardization of Data Collection 6.3. GeoSpatial Status Assessment</p>	
<p>ID-RecNo</p>	<p>Need Statement</p>	
<p>Group 1 Added:</p>	<p>[Need] Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated/restored under changing conditions.</p>	<p># 2 Ranked Need Short List Duplicated to other themes</p>

Thematic-Area (6) Terrestrial - Open-land Natural Community

<p>Description: Develop and compile data to help partners and stakeholders better understand the types of open land habitats that occur within the LCC, the distribution and condition of those habitats, issues threatening the quality of those habitats, the relative importance of those habitats for species conservation within each of the states, and techniques that can be used to restore those habitats after they have been degraded.</p> <p>Program Level: 6.4. Faunal Habitats in Open Lands</p>		<p>Group 6 comment: Note: needs are in sequential order, Y-BB. Also, remember that LCC includes ILP with lots of altered openlands!</p>
ID-RecNo	Need Statement	
Original	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing conditions.	
Group 1	Removed	
Group 2	Kept Same	
Group 3	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing and future conditions.	
Group4	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated given existing and potential future conditions.	High Rank Need Applicable to multiple themes, entire vegetated landscape
Group 5	Kept Same	
Group 6 – Y	[Need] Understanding historical vegetation distributions and disturbance regimes in the landscape and develop conservation strategies to replicate reference conditions. Note: could be part of a support project to ECAP, Landfire, etc.	Top 6: keep

Thematic-Area (6) Terrestrial - Open-land Natural Community

Original	[Need] Understanding species and community distributions across the region, their habitat relationships, and migration corridors.	
Group 1	Removed	
Group 2	Kept Same	
Group 3	[Need] Understanding species and community distributions across the region, their current, historic and future habitat relationships, and movement. Note: science needs at the LCC level should be broad and comprehensive. Note: The group recognizes that adding future is important, but may be altering the initial intent.	
Group 4	Kept Same	
Group 5	[Need] Understanding species and community distributions across the region, their habitat relationships, and dispersal dynamics.	
Group 6 – Z	Kept Same	
	Description: Develop and compile information about the LCC's terrestrial endemic species, work with partners to better estimate their current degree of imperilment, and coordinate the development of regional management strategies that will help conserve these species in the face of changing land-use and climatic conditions. Program Level: 6.5. Terrestrial - Endemics / T&E Management, Recovery	
	Description: Work with partners and stakeholders to develop and compile information about species within the LCC, their habitat requirements, and changes in the distribution of those species and habitats to facilitate the regional management of those resources. Program Level: 6.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)	
	Description: Program Level: 6.8. Species/System Response - Major Drivers (CC, Energy/Development, Urban, etc.)	
ID-RecNo	Need Statement	

Thematic-Area (6) Terrestrial - Open-land Natural Community

Group 1 added these and group them under 6.7	Program Level: 6.7. Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)	
Group 1 (add)	[Need] Determine effective incentive design to encourage voluntary compliance and beyond to address stressors that are not effectively addressed through regulatory means (agriculture, forestry, urban growth, mining, etc. for both terrestrial and aquatic themes).	Duplicate across themes
Group 1 (add)	[Need] Collect and make available data on current and potential distribution of invasive species across watersheds and identify how and to what extent they threaten aquatic & terrestrial species. Complete a threats analysis of invasive species on aquatic and terrestrial species. Gather data on how states regulate exchange between states or intra-state movement of species in relation to non-indigenous species or movement among watersheds.	Short List - Applies across themes. Can we move this to GIS Theme?
Group 1 (add)	[Need] Understanding species/population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective migration (gene flow) /dispersal corridors.	##3 Ranked Need Short List Duplicated in other themes
Original	[Need] Effects of stressors (urbanization, energy development, climate change) on open-lands integrity/functionality and associated species.	
Group 1	Removed	
Group 2	Kept Same	
Group 3	Kept Same	
Group4	Kept Same	
Group 5	Kept Same	
Group 6 – AA	Kept Same	Within Openlands theme, this is considered 2 nd highest need

Thematic-Area (6) Terrestrial - Open-land Natural Community

Description:		
ID-RecNo	Need Statement	
Program Level: 6.9. Landscape-level (Integrated) Planning Tools (Recovery / T&E / SGCN)		
Original	[Need] Develop BMPs for grassland/open-land community restoration and creation.	
Group 1	[Need] Develop BMPs and restoration techniques for grassland/open-land community restoration and creation throughout the App LCC. (we may want to expand this to other community types)	
Group 2	Kept Same	
Group 3	[Need] Evaluate the effectiveness of BMPs for grassland/open-land community restoration and creation. There are many existing resources on BMPs.	
Group 4	Kept Same	
Group 5	[Need] Develop BMPs for grassland/open-land community maintenance, restoration, and creation.	
Group 6 – BB	Kept Same	

Thematic-Area (7) Human Dominated / Economic Lands (Urban, Ag, Energy)

<p>Thematic-Area (7) Human Dominated / Economic Lands (Urban, Ag, Energy)</p>		<p>GOAL: To collaboratively meet economic development and conservation management goals through the understanding of potential land use changes, economic impacts and pressures on the resources of the App. LCC region to improve decision-making and management.</p>	
	<p>Description: Develop and compile information about new, traditional or expanding energy developments within the LCC and the opportunities and impacts these industries have on the character and distribution of fish and wildlife habitats so that partner agencies may be better able to develop collaborative opportunities and anticipate future land-use conflicts involving human energy needs, wildlife, and ecosystem service functions. Program Level: 7.5. Energy Development – New or Expanding Markets - Marcellus Shale, Wind, Biomass 7.6. Mineral/Energy Development – Traditional Market - Coal & AMLs</p>		
ID-RecNo	Need Statement		
Original	[Need] Forecasting future spatial footprint of energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.		
Group 1	[Need] Forecasting future demands for land and water use to support energy production in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.	#4 Ranked Need And Short List	
Group 2	[Need] Forecasting future spatial footprint of energy production, mineral extraction, and associated infrastructure/transmission/transportation in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.	TOP 6	
Group 3	Kept Same		
Group 4	Kept Same	High Rank Need	
Group 5	Kept Same	Top 6	
Group 6 - DD	Kept Same Note: DD, EE, and FF are all trying to forecast, but not sure efforts can be combined easily. Changing forestry/ag land ownership patterns makes it difficult to combine them.	High for theme b/c of rapid dev. of tech. and expans. of shale gas Note: check on TNC models for PA & potential expans.	

Thematic-Area (7) Human Dominated / Economic Lands

	Description:		
	Program Level: 7.7. Agland Management (sustainable ag and forest land management)		
ID-RecNo	Need Statement		
Original	[Need] Understand economics and ecological conditions of changing ownership patterns, including those of small landowners, to sustainably manage forested lands.		
Group 1	Kept Same		
Group 2	[Need] Understand economics and ecological conditions of changing ownership patterns, including those of small landowners, to sustainably manage forested lands and agricultural lands.		
Group 3	Kept Same		
Group 4	Kept Same		
Group 5	[Need] Understand economics of changing land ownership patterns, including those of small landowners, and the implications to ecological conditions and the ability to sustainably manage forested lands.		
Group 6- EE	Kept Same		

Thematic-Area (7) Human Dominated / Economic Lands

<p>Description: Develop and compile information about the ongoing conversion of agricultural land to urban and suburban uses within the LCC and the impacts these changes are having on the character and distribution of human communities and fish and wildlife habitats so that partner agencies may be better able to understand system dynamics and recommend alternatives to minimize future land-use conflicts involving human communities, wildlife, and ecosystem service functions.</p> <p>Program Level: 7.4. Landscape-level Land Conversions – Urbanization and Ag-land Conversion (conversion of forested lands)</p>		
ID-RecNo	Need Statement	
Original	[Need] Forecasting future spatial footprint of development in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.	
Group 1	[Need] Forecasting future spatial footprint of urban and rural development in 20 years in light of changes to demand, technology, policy, and regulation, including econometric models.	Short List
Group 2	Kept Same	
Group 3	Kept Same	
Group 4	Kept Same	
Group 5	Kept Same	
Group 6 – FF	Kept Same	

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations		GOAL: To meet public and local resident needs/preferences and conservation goals through better understanding, valuation and management of ecosystem services.	
	Description: Program Level: 8.4. Ecosystem Serv.		
ID-RecNo	Need Statement		
Original	[Need] Map, model and measure multiple ecosystem services at the same time at landscape scales, including: <ul style="list-style-type: none"> - Biophysical production functions/understanding of metrics - Mapping beneficiaries - Assessment of preferences - Priority of services Cumulative impacts		
Group 1	Kept Same		
Group 2	Kept Same		Tied for Top 6, voted out in tiebreaker
Group 3	Kept Same		
Group 4	Kept Same		
Group 5	Kept Same		Top 6
Group 6 – GG	[Need] Map, model and measure multiple ecosystem services at the same time at landscape scales, including: <ul style="list-style-type: none"> - Biophysical production functions/understanding of metrics - Mapping beneficiaries (i.e., benefits realized outside the ALCC boundary or by visitors to Appalachian region) - Assessment of preferences (could really help us target efforts to what people value most, and build constituency) - Priority of services - Cumulative impacts 		Top 6: keep. Reworded from original

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	<p>Description: Develop and compile natural and social science tools to describe the LCC’s human population’s participation in hunting and fishing, estimate trends in such participation, describe issues driving trends, and other information that will help partners develop new recruitment of hunters and/or develop new strategies to manage species if human harvest becomes insufficient to meet management goals.</p> <p>Program Level: 8.5. Envr/Social/Cultural Benefits – Recreation / Harvesting</p>		
ID-RecNo	Need Statement		
Original	[Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing.		
Group 1	[Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing including threats to these activities.		
Group 2	[Need] To better understand the economic/cultural/social benefits/costs of recreational activities (hunting, fishing, birdwatching, wildlife viewing, ecotourism) and human-wildlife interactions and increased health risks (disease transmission, etc.).		
Group 3	[Need] To better understand the economic/cultural/social value/non-market valuation of recreational activities such as hunting, fishing, birdwatching, wildlife viewing. Cross-walk with Theme: Ecological Services. Need to consider non-market valuation.		
Group 4	Removed		
Group 5	[Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing.		
Group 6 - HH	Kept Same Note: USFWS does a bunch of this, as do many States/Commonwealths, but may need additional attention. Decreasing state revenues from hunting/fishing will impact future conservation efforts. Need to understand this better, especially with regard to increase in diversity of recreational activities.		

Thematic-Area (8) Human Dimensions - Environmental Benefits, Ecosystem Services, Social Expectations

	Description: Program Level: 8.10 Communications/Outreach (stakeholder identification and engagement).		
ID-RecNo	Need Statement		
Original	[Need] To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.		
Group 1	Kept Same		
Group 2	[Need] To understand how to better communicate complex technical issues (health issues, rural wastewater treatment, nuisance wildlife, jurisdictional issues) to multiple stakeholders, decision-makers, and how science is used in decision-making.		
Group 3	Kept Same Cross-walk with Theme 10: Communications & Outreach may be redundant.		0
Group 4	Kept Same		
Group 5	Kept Same		
Group 6 – II	Kept Same		Moved to Thematic Area 10

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

<p>Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation</p>		<p>GOAL: Work to apply the best available predictions of how the regional climate will change, estimate the impacts those changes will have on the region's natural and cultural resources, and work with partners and stakeholders to determine climate change adaptation and mitigation strategies that can be implemented and coordinated across multiple scales.</p>	
<p>Description: Develop and compile scientific tools to project likely impacts climate change will have on the LCC, how those changes could affect the region's hydrologic resources including water quantity, quality, and timing, and work with partners to develop strategies to help human communities, industry, aquatic species managers and other conservation management interests, plan for, and adapt to those changes. Program Level: 9.4. CC - Impact - Hydrology</p>			
ID-RecNo	Need Statement		
Original – 64	[Need] Hydrologic regime change (related to climate change). Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use. Recreation, industrial, municipal, aquatic biology, agriculture), geology, and changes in air pollution. [Incorporate Biological response]		
Group 1 – 64	[Need] Need to understand the impact of precipitation and temperature change on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use, recreation, industrial use, municipal use, aquatic biology, agriculture, geology, and changes in air pollution. [Incorporate Biological response]	#5 Ranked Need And Short List	
Group 2 -64	Kept Same	Tied for Top 6, voted out in tiebreaker	
Group 3 – 64	Kept Same Note: Need to know if there is baseline data available.		
Group 4 – 64	Kept Same		
Group 5 – 64	Kept Same		
Group 6 – 64JJ	Kept Same	High for Theme. Incorporpo E & F above	

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

	<p>Description: Develop, compile and evaluate scientific tools for managers that assess the vulnerability of species, habitats, landscapes (includes aquatics) across multiple scales to changing climate conditions.</p> <p>Group 4 note: HH and II are complimentary. It's important for managers, LCC, and CSC to collaborate to address these two needs.</p> <p>Program Level: 9.5. CC – Vulnerability /Risk Assessment</p>	
--	--	--

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

ID-RecNo	Need Statement		
Original	<p>[Nat'I LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale).</p> <p>[notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]</p>		
Group 1 - 186	<p>[Nat'I LCC Network] Conduct region or range wide vulnerability assessments of species and habitats of high conservation concern (all terrestrial - forest, open land & wetland) across the App LCC of both climate and non-climate stressors (urbanization, energy development, disease). Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC. (Coarse and fine scale).</p>		#6 Ranked Need And Short List
Group 2 - 186	Kept Same		TOP 6
Group 3 - 186	<p>[Nat'I LCC Network] Support a multi-scale vulnerability/resiliency assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable/resilient to climate change in the LCC. (Coarse and fine scale).</p> <p>Note: Northeast (RCN) states are doing this type of study. U. of GA V.A. on salamanders. App. Salamander Initiative.</p>		Top 6
Group 4 – 186	<p>Identified as HH [Nat'I LCC Network] Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to stressors including climate change in the LCC.</p> <p>[(Coarse and fine scale).</p>		High Rank Need COMBINE HH WITH II
Group 5 - 186	Kept Same		Top 6
Group 6 – 186 KK	<p>Collate/compile 'meta-analysis' of vulnerability assessments done by states and other partners. Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC, especially range-limited/endemic species.</p> <p>Note: coordinate with Climate Science Center. USFWS has done some of this meta-analysis, but focused more on T&E.</p>		Top 6: keep. Incorporated with the 2 nd need listed in 5.8. All re-worded.

Thematic-Area (9) Climate Change - Impacts, Downscale/Coupled Modeling, Adaptation

	<p>Description: Work with partners to develop regional climate adaptation strategies that will, to the extent possible, help ensure the persistence of healthy human and fish and wildlife communities through manager-scientist partnerships in the face of changing climatic conditions.</p> <p>Group 4 Note: HH and II are complimentary. It's important for managers, LCC, and CSC to collaborate to address these two needs.</p> <p>Program Level: 9.6. CC - Adaptation (incl. Management Response)</p>	
ID-RecNo	Need Statement	
Original – 198	[Nat'I LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]	
Group 1 – 198	Kept Same	
Group 2 – 198	Kept Same	TOP 6
Group 3 - 198	Kept Same Cross-walk with Theme 10: Human Dimensions.	
Group 4 - 198	Identified as II [Nat'I LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]	High Rank Need
Group 5 - 198	[Nat'I LCC Network] Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]	
Group 6 – 198LL	Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts]. Note: coordinate with Climate Science Center. Emphasis is on evaluating interactions among ALL of these, but uncertainties cause issues.	

Thematic-Area (10) Social science research

Thematic-Area (10) Social science research		GOAL: [Identify the social science research needed to achieve affective communications and stakeholder outreach and the specific audiences associated with that information need. Not outreach and communications activities but the science that supports those efforts.]	
	Description: Program Level: 8.10 ...		
ID-RecNo	Need Statement		
Group 2 (new)	[Need] Test/compare/rank the effectiveness of available and conceivable techniques/protocols/methods to inform specific audiences.		
Group 3 (new)	[Need] ... Value of ecosystem services/wildlife (research and evaluation) (market vs. non-market trade-offs) stakeholder evaluations – gaining knowledge about stakeholders, legislators engage policy scientists in the LCC process Synthesizing existing social science research in this area Cognitive science for decision-making and communications Research into how to best communicate/market the LCC to various audiences Survey research about gaining buy-in from local officials and other groups, research on conservation language that’s most effective Research into demographics of communication to determine how to best reach specific audiences Web statistics/analytics of various communications tools	0	
Group 6 – MM (new)	[Need] ...Identify private partners and datasets they possess, and work to engage/involve them in LCC		Identified as a new need.
	Description: Develop and compile natural and social science tools to describe the LCC's human population's participation in hunting and fishing, estimate trends in such participation, describe issues driving trends, and other information that will help partners develop new recruitment of hunters and/or develop new strategies to manage species if human harvest becomes insufficient to meet management goals.		

	Program Level: 8.5. Envr/Social/Cultural Benefits - Recreation / Harvesting		
ID-RecNo	Need Statement		
Group 4	[Need] To better understand the economic/cultural/social value of recreational activities such as hunting, fishing, birdwatching, wildlife viewing.		Moved from Program 8.5
	Description: Program Level: 8.10 Communications/Outreach (stakeholder identification and engagement).		
ID-RecNo	Need Statement		
Group 4	[Need] To understand how to better communicate complex technical issues to multiple stakeholders, decision-makers, and how science is used in decision-making.		
Group 5	Kept Same Note: (this Need is captured above in Human Dimensions Theme, but the group thought it likely fit more appropriately into this Theme)		
Group 6 – II (new)	Kept Same Note: also need to understand and integrate Appalachian culture and needs into products, process, etc.		Likely Highest for Theme. Moved from 8.10
Group 4 (new)	[Need] Identify social barriers and develop and communicate culturally feasible solutions to address sensitive issues related to known stressors (agriculture, forestry, urban growth, mining, untreated sewage, etc.) across the landscape.		Cross cutting issue that address more than aquatic issues.
Group 5 (new)	[Need] Develop and communicate culturally viable solutions to address intractable stressors across the landscape. (this Need is captured above in Aquatic Theme, but the group thought it likely fit more appropriately into this Theme)		

Appendix G. Appalachian LCC Day 3 - Final Ranked Program / Need Descriptions

Ballot Scored in the following manner:

Each WPT member ranked each of the needs as a 1, 2 or 3 from highest to lowest.

- 1 = 1 point
- 2 = .5 points
- 3 = .25 points

Below are each ranking and cumulative score, followed by the raw scoring from each WPT member. For example: Category and description of Science Need, #Ranking (cumulative score; raw WPT rankings).

Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

- **#1 (5.75 pts; 1,1,1,1,1,2,3)** - Rigorous understanding of the relationships among ecological flows and hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities to assess how alterations to systems will affect their sustainability (2.6 Aquatic - Ecological Flows; Species-Habitat Relationships at Multiple Scales; 2.1 Habitat program)

Resource extraction & demands for energy

- **#2 (3.0 pts; 1,2,2,3,3,3,3)** - Forecasting future spatial footprint of energy production, mineral extraction, and associated infrastructure/transmission/transportation in coming decades (in 20 years) in light of changes to demand, technology, policy, and regulation, including econometric models to better understand the impacts on resources. (7 Human Dominated / Economic Lands - Urban, Ag, Energy; 7.6)

GIS/IT "ologist" Capacity (1.2 GIS/IT working group)

- **#3 (2.75 pts; 1,1,2,3)** - Capacity – Need to contract services to build IT / GIS support tools (content management system, learning management system). Use pilot studies or use cases to guide the development of the architecture; identifies hardware, software, functionality and staffing needs; makes recommendations to steering committee for allocating resources for architecture needs; oversees the development of architecture; makes recommendations for governance, data access and security rules to steering committee; designs education and marketing approaches to engage stakeholder use; outlines methodology for assessment and monitoring of use.

Species/habitat distribution trends (includes all terrestrial habitats)

- **#4 (2.25 pts; 1,2,2,3)** - Understanding representative/priority/focal species and population distributions (all terrestrial – forests, open land and wetlands) across the region, their habitat relationships, and effective movement/dispersal linkages. [Ex. Amphibians as potential representative species, can't do every species, find representative species for habitat and migratory relationships.] (5.7 Species Distributions)

– Forest; Landscape-level Species-Habitat (Modeling / Sp-Habitat Relationships / Assessment)

Vulnerability assessments (climate and nonclimate stressors)

- **#5 (1.75 pts; 2,2,3,3,3)** - Collate/compile ‘meta-analysis’ of vulnerability assessments done by states and other partners. Support a multi-scale vulnerability assessments (that incorporate species-specific physiological data) to identify habitats and species that would be most vulnerable to climate change in the LCC, especially range-limited/endemic species. [notes: physiology includes Environmental physiology species specific data- what are the thermal tolerances, and seasonal cues for organisms, and when plugged into population models, the predicted impact on the population level processes.]. Note: coordinate with Climate Science Center. USFWS has done some of this meta-analysis, but focused more on T&E. [Not reinvent wheel. Learn from what has been done, what can be improved on, gaps filled, build on existing foundation. Vulnerability specifically related to climate change was the category. How to adjust populations models. Consideration about making sure it is heavily coordinated with Climate Science Centers.]

Geospatial data tools for planning & future condition scenarios (forests)

- **#6 (2 pts; 1,1)** - Identify a connected and resilient network of forest ecosystems in the Appalachian LCC. (5 Terrestrial – Forests)

Geospatial data tools for planning & future condition scenarios (vegetation)

- **#7 (1 pt; 1)** - Downscaling and calibrating/revisiting tools necessary for spatial data planning and future condition scenarios of vegetation (all terrestrial – forests, open land and wetland) specific to the LCC (e.g. ecological land units, LandFire, LIDAR, Enhanced Conservation Action Planning). Understanding historical vegetation distributions and disturbance regimes in the landscape and the extent to which they can be replicated/restored under changing conditions.

Resource extraction & demands for energy

- **#8 (1 pt; 2,2)** - Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (Ex. Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia – ID-RecNo 55).

Adaptation strategies (stressor interactions, disturbance regimes)

- **#9 (0.75 pts; 2,3)** - Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to develop guidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts] (198 [Nat'l LCC Network])

Species/habitat distribution trends (includes all terrestrial habitats)

- **#10 (0.5 pts; 2)** - Understanding historical vegetation distributions and historical disturbance regimes in the landscape (specifically natural open lands communities) and the extent to which they can be replicated given existing and potential future conditions.

Develop conservation strategies to replicate reference conditions. (Note: could be part of a support project to ECAP, Landfire, etc.)

Social/economic barriers to address known stressors

- **#11 (0.25 pts; 3)** - For aquatic systems, conduct a social science research study to identify social or economic barriers and develop culturally feasible solutions to address sensitive issues related to known stressors (agriculture, forestry, urban growth, mining, untreated sewage, etc) across the landscape and develop tools for communicating those solutions.

Geospatial data tools for planning & future condition scenarios (caves)

- **#12 tie (0 pt; 0)** - Develop a classification (biological and geophysical) scheme for karst, inventory and mapping of cave, karsts, mines, karst related springs, and ground water. Compile existing karst geospatial datasets and analyze to (1) create datasets on karst springs, cave passage/entrance density, cave obligate/dependent species distributions, and subterranean biodiversity maps, and (2) identify data gaps that are barriers to conservation planning.

Geospatial data tools for planning & future condition scenarios (caves)

- **#12 tie (0 pt; 0)** - Understand species and community distributions, their habitat relationships, and linkages across systems (3.3 Cave)

Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations

- **#12 tie (0 pt; 0)** - Need to understand the impact of precipitation and temperature change (related to climate change) on surface-water and groundwater hydrology in the context of regional characteristics such as land use, water use, recreation, industrial use, municipal use, aquatic biology, agriculture, geology, and changes in air pollution. [Incorporate Biological response]

Ecosystem services at landscape scales

- **#12 tie (0 pt; 0)** - Map, model and measure ecosystem services at appropriate landscape scales, including: biophysical production functions/understanding of metrics; mapping beneficiaries (i.e., benefits realized outside the ALCC boundary or by visitors to Appalachian region); Assessment of preferences (could really help us target efforts to what people value most, and build constituency); Priority of services; and Cumulative impacts.