**Top Ranked Science Needs – 2011**

Writing Team members worked on Day-3, following the large-group workshop, to rank each of the top needs identified during the workshop as a 1, 2 or 3 from highest to lowest. They were instructed to vote to represent their individual workgroup discussions on Day 1 and 2 of the workshop. The Workgroups were also asked to provide a “goal” statement for each thematic area represented in the Portfolio, and Goals were then adjusted accordingly in the Portfolio.

1. **Top (5) Ranked (Day-3: Synthesis/Writing Team Ranking) Needs**

**Thematic-Area (2) Aquatic**

**GOAL:** 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.

**Ranked #1. [Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations] (**Assemble the necessary scientific information or conduct the necessary studies required to develop a) (r)igorous understanding of the relationships among ecological flows and hydrology (discharge, seasonal, etc.), habitat (temp, geology, physical space, etc.), and aquatic biota/communities (in order) to assess how alterations to systems will affect their sustainability.

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

**GOAL:** (C)ollaboratively (identify ways and opportunities to) meet economic development and conservation management goals through the understanding of potential land use changes, economic impacts and pressures on the resources of the AppLCC region to improve decision-making and management.

**Ranked #2.** [**Resource extraction & demands for energy] (**Using a suite of analytical tools,) **(**f)orecast 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 (species and habitats).

**Thematic-Area (1) GIS / Information Management**

**GOAL:**  Develop a GIS and content management system/ IT architecture that facilitates the development of community networks, supports landscape planning and systems modeling, enables exchange of information and tools to gather and disseminate data.
[***Backend infrastructure and functionality*** to include: a geospatial web-based platform in collaboration with LCC members and neighboring LCCs, calendar/event planning function, web services, large files transfer, projects and people database, group work flow, public commenting, hardware/software inventory, geo-referencing, mobile applications, and federated search *(reworded)*.]

**Ranked #3.** **[GIS/IT Capacity]** – (Based on the input provided by a GIS/IT Working group assembled by the LCC): design pilot study or use case studies (1) to define the necessary architecture (to support the work and products of the LCC community); (2) identify hardware, software, functionality and staffing needs; and (3) makes recommendations to steering committee for allocating resources for architecture needs.

[(The Workshop Participants offered the follow-up process to utilize the advisory Work Group to support LCC staff efforts to) oversee the development of architecture; makes recommendations for governance, data access and security rules to steering committee; design education and (outreach) approaches to engage stakeholder use; outline methodology for assessment and monitoring of use.]

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

**GOAL:** (Assemble the necessary information or conduct studies necessary to) (d)evelop 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 *(reworded)*.

**Ranked #4.** (repeated) **[Species/habitat distribution trends (includes all terrestrial habitats =** forests, open land and wetlands**)]** 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. [Recommendation/Approach: find representative species for habitat and migratory relationships - can’t do every species (ex. amphibians as potential representative species)]

**Thematic-Area (4) Terrestrial – Wetlands**

**GOAL:** (I)nventory 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.

**Ranked #4.** (repeated) **[Species/habitat distribution trends (includes all terrestrial habitats =** forests, open land and wetlands**)]**

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

**GOAL:** (I)nventory significant regional grassland/open-land communities and evaluating the condition, importance, and regional threats impacting these communities (to) (d)evelop and implement comprehensive regional strategies to conserve and manage natural and non-natural (e.g. restored minelands) grassland/open-land communities across jurisdictions.

**Ranked #4.** (repeated) **[Species/habitat distribution trends (includes all terrestrial habitats =** forests, open land and wetlands**)]**

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

**GOAL:** Work with partners and stakeholders to determine climate change adaptation and mitigation strategies that can be implemented and coordinated across multiple scales (by) apply(ing) the best available (projections) of how the regional climate will change (and) estimates (of) the impacts those changes will have on the region's natural and cultural resources.

**Ranked #5.** **[Vulnerability assessments (climate and non-climate stressors)]** Support 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. [Collate/compile ‘meta-analysis’ of vulnerability assessments done by states and other partners. (Do not) reinvent wheel. Learn from what has been done, what can be improved on, gaps filled, build on existing foundation (e.g., how to adjust populations models.) USFWS has done some of this meta-analysis, but focused more on T&E. Making sure it is heavily coordinated with Climate Science Centers *(reworded)*.]

**II. Remaining (below top-5 ranked) Needs: (Compiled Day-3 Synthesis Team)**

**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.

(1 vote). [**Social/economic barriers to address known stressors]** 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

(0 Vote): **[Ecological flows, Species-Habitat Relationships at Multiple Scales & Effects of Alterations]** 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]

**Thematic-Area (3) Terrestrial - Cave/Karst/Mines / (incl. Groundwater)**

**GOAL:** (Assemble the necessary information or conduct studies necessary to) (d)evelop 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.

(1 vote). [**Geospatial data tools for planning & future condition scenarios (inventory caves]** 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.

(0 Vote) [**Geospatial data tools for planning & future condition scenarios (inventory caves)**] 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.

(0 Vote) [**Geospatial data tools for planning & future condition scenarios (inventory caves)**] Understand species and community distributions, their habitat relationships, and linkages across systems.

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

**GOAL:** (Assemble the necessary information or conduct studies necessary to) (d)evelop 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 *(reworded)*.

(2 votes) [**Geospatial data tools for planning & future condition scenarios (inventory forest network)]** Identify a connected and resilient network of forest ecosystems in the Appalachian LCC.

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

**GOAL:** (I)nventory significant regional grassland/open-land communities and evaluating the condition, importance, and regional threats impacting these communities (to) (d)evelop and implement comprehensive regional strategies to conserve and manage natural and non-natural (e.g. restored minelands) grassland/open-land communities across jurisdictions.

 (1 vote) 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.)

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

**GOAL:** (C)ollaboratively (identify ways and opportunities to) meet economic development and conservation management goals through the understanding of potential land use changes, economic impacts and pressures on the resources of the AppLCC region to improve decision-making and management.

 (2 votes) [**Resource extraction & demands for energy]** Effects of resource extraction – related to energy development and resource (energy) extraction; sitings; physical landscape; effects of fragmentation, sedimentation (e.g. Vulnerability of aquatic species and communities to Marcellus shale development in Appalachia.)

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

**GOAL:** To (assemble the necessary information required to help) meet public and local resident needs/preferences and conservation goals through better understanding, valuation and management of ecosystem services.

(0 Votes) [**Ecosystem services at landscape scales]** 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 AppLCC 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.

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

**GOAL:** Work with partners and stakeholders to determine climate change adaptation and mitigation strategies that can be implemented and coordinated across multiple scales (by) apply(ing) the best available (projections) of how the regional climate will change (and) estimates (of) the impacts those changes will have on the region's natural and cultural resources.

 (2 votes). [**Adaptation strategies (stressor interactions, disturbance regimes)]** Evaluate the interaction among land use, climate change, invasive species, and/or other environmental stressors to developguidelines and principles for adaptation strategies. [Strategies: human interactions, biological augmentation, genetic banking, restoration efforts.] [Nat'l LCC Network]

**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.

No specific top ranking needs identified.