

**DRAFT LIST OF INDICATORS FOR TERRESTRIAL, AQUATIC AND HUMAN DIMENSIONS MEASURES FOR THE
APPLACHIAN LCC – DRAFT 2.0, DATED 9-20, 2015**

Handout #05							
Indicator Type or Community of Practice¹	Potential Indicator	Target Resource (what natural resource does this measure inform us about and how will it assist in formulating conservation targets?)	Criteria (1) Science-based (Scale of 1 to 3, 1 being best for all criteria)	Criteria (2) Serves planning needs	Criteria (3) Cost effectiveness -are there existing networks of data available? What is the data source?	Criteria (4) Aligns with Partners	Overall Rating & Comments?
Terrestrial							
Terrestrial – landscape integrity	Total forest cover	Forest-dependent wildlife and plant communities					
Terrestrial Landscape integrity and trends	Forest type – by percent – with trends	Tracks forest communities and species that utilize forest type for habitat					
Terrestrial – Landscape integrity	Measures of edge habitat and effects	Edge species, vulnerability of stenotypic species to invasive species, (example, starlings and hole-nesting native birds)					
Terrestrial – landscape	Measure of urbanization	Species affected by fragmentation; changes wildlife population and zoonotic disease					Crosswalk with Human Dimensions COP

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		factors					
Terrestrial – landscape integrity; ecosystem services	Patch size - Patch size/fragmentation and/or connectivity	Landscape-level indicator, therefore generalized targets					
Terrestrial – landscape integrity	Percent impervious surface	Landscape-level indicator, therefore generalized targets; likely greatest effect on aquatic species					Crosswalk with Aquatic COP
Terrestrial – landscape integrity; ecological services	Road density	Landscape-level indicator, therefore generalized targets					Species react differently, and act differently with road type and density
Population viability	Breeding Bird Surveys (BBS)	Bird populations					Low density of BBS in LCC, especially high elevations
Population viability	Status of forest-dependent neotropical birds	Sensitive habitat-types (ridge-top forests, old growth, large patch size)					
Population viability; landscape integrity	Status for Amphibian surveys	Principally frogs, toads and salamander sps.					COP recommended consultation with Aquatic group
Population viability at community an	Status of Selected rare, declining or threatened habitats	Target is dependent on selection of					Value as indicator of climate change; high percentage

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species level -- landscape integrity	and associated biological communities (montane balds; cliffs, springs and limestone seeps, oak savannahs, cave and karst, others)	habitat type; no single method or approach to cover all such communities,					of endemics; important to key partners.
Population status with implications of habitat status	Measure of population status of surrogate bird species for selected habitats or ecosystem types (e.g., Breeding Bird Survey trends, fecundity, juvenile survival to independence); potential species include: wood thrush, Louisiana waterthrush, blackburnian warbler, eastern towhee, field sparrow	Target species are sensitive to changes in specific habitat types.					Of course, with all migratory species we cannot measure changes in wintering grounds and their role in population changes.
Measure of population status of surrogate bat species (e.g., eastern red bat, Indiana bat)	Measure of population status of surrogate bat species (e.g., eastern red bat, Indiana bat)	Bats					Accounts for significant portion mammal biodiversity; Ongoing severe threats, conservation priority for partners.

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Population status with implications of habitat status	Measure of population status of surrogate mammal species (e.g., bobcat, black bear)	Wide-ranging species					Wide-ranging species indicator of conductivity in larger ecosystem types.
Population status with implications of habitat status	Measure of population status of surrogate herptile species	Herptiles, including reptiles, (Timber rattlesnake, for example)					
Aquatic (including wetland or riparian areas)							
Aquatic -- Landscape and watershed integrity	Conductivity	Landscape-level indicator, therefore generalized targets					Widespread; a surrogate for suspended sediment, and potential signal for energy development impacts
Aquatic -- landscape integrity; population viability	Water temperature	Cold-water communities; also Landscape-level indicator, therefore generalized targets					Continuous temperature measurements are relatively common through NWIS data system; WATER ALERT can automatically provide extreme temperature which are important and relate to fish kills, algal

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							blooms, etc.
Aquatic landscape integrity	total nitrogen	Nitrogen is a key contributor to eutrophication that degrades most aquatic communities					Measured at most gage stations, also modeled regionally. Indicator of disturbance, ag practices, etc.
Aquatic -- landscape integrity	Flow	Both extreme events and averages are Landscape-level indicator, therefore generalized targets					Network in place, trends data available, models available; critical for water management and determining environmental flows.
Aquatic – landscape integrity,	Freshwater mussel diversity and status	Mussels are a functional guild of filter feeders that provide environmental services (habitat and water quality)					Important indicators and important biodiversity, ESA status. Most applicable to western drainages.
Aquatic – indicator species or guild	Brook Trout	Indicator for coldwater stream water quality and temperature regime					Rich information base with key partners (EBTJV). Distribution throughout coldwater habitats in the entire LCC
Aquatic – indicator species or guild	Hellbender	Indicator for coldwater stream water quality					Drawbacks are distribution principally in large order

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							streams and rarity.
Aquatic -- Indicator Guilds	Indices of aquatic invertebrates and/or fishes	“IBIs” and EPT indices are among the metrics used as indicators of water quality and status of biological community					EPA data base, but state methods and sampling density varies greatly, (example, strong in Ohio, weak in WV).
Aquatic – landscape indicator	Species richness	Species richness has been applied as an indicator of intact and undisturbed ecosystems					Metrics vary widely and species richness varies by stream order.
Aquatic – indicator or species guild	Population measures of key species of widespread and well-studied warm water species such as smallmouth bass	Indicator of water quality; population and factors such as disease reflect perturbations in water quality and community health.					Valued by public and partners, and covers warm-water habitats. Data sources are generally with State fish and game agencies and vary.
Aquatic – landscape indicator	Composite Natural Habitat Integrity Index	A synthetic measure of habitat quality applied to lentic and lotic waters and wetlands.					Based on methods developed by Ralph Tiner (2004) – information intensive and has not been applied to ApLCC watersheds.

1 Categories of conservation planning are 1) population viability, 2) landscape integrity and 3) ecosystem services. Each indicator should fit into one or more of these categories; principal category is listed in table. \

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Current List from Socio-Economic Group – remains to be integrated into indicators from other working groups.

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Ecosystem Services: Regulating							
Climate Regulation	Total Carbon Stock	climate					
Water quality regulation	BOD; Suspended Solids; Total organics, N and P	water					
Water flow regulation	Forest cover Avg daily/annual flow in rivers/streams	water					
Erosion Control	Sedimentation in streams/turbidity Percent bare soil Vegetation Cover Erosion rates	Soil/water					
Biological Pest control	Pop/density of pest and pest control species	Biodiversity					
Ecosystem Services: Supporting/							
Habitat	Species diversity; Endemism, T&E species; % cover of invasive species	Biodiversity					
Ecosystem Services: Cultural							
Recreation	Number/area of national, state,						

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	local and private recreation areas; total recreation visitor days						
Aesthetics: scenery	Number/miles of scenic roads, views; population and housing density						