



USDA Forest Service National Forest System Briefing Paper

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Topic: Crosswalk of LUCID indicators with National Framework for Land Management Plan Monitoring (MET)

Issue: Results from comparison of LUCID indicators and measures and MET Themes and sub-elements

Background: As part of validating the current MET Framework (a draft working version), we have compared the Forest Service's Local Unit Criteria and Indicators Development (LUCID) indicators and measures with the Monitoring and Evaluation Team (MET) Framework elements. In 2002, the agency's LUCID project produced an extensive working list of indicators and associated measures for monitoring forest management at the unit scale. In 2006, the Director of EMC-WO chartered the MET to develop a framework for Monitoring and Evaluation that would apply to Land Management Plan (LMP) efforts.

The two projects have distinct purposes. LUCID was intended to demonstrate how the Forest Service might assess progress towards sustainability by linking sustainability concepts to viable, unit-level indicators and measures. MET was chartered to develop a Framework for monitoring the 'vital few' indicators of progress towards desired conditions, indicators with relevancy at local, regional, and national scales. Relevant details of the two projects are found in the table attached to this briefing paper.¹

The comparison occurred by assigning each LUCID indicator to a MET sub-element if possible (there are 9 MET sub-elements that indicate priority topics under the 6 MET Themes). Assignment occurred based on the criterion of 'reasonable association'. Reviewers of the attached results are encouraged to challenge the validity of the assignments. No attempt was made to filter assignments based upon consideration of economic or methodological feasibility of LUCID indicators, LUCID measures, or MET elements. All LUCID elements in the attached table are taken verbatim from the LUCID report.

Key Points:

- There are no gaps between the LUCID suite and the MET Framework: Every Theme in the MET Framework has at least one analogous indicator and measure in the LUCID suite of criterion, indicators, and measures.
- Some MET Themes have as many as 30 or more LUCID measures that can be associated.
- The LUCID project defined good indicators and measures as free of suggested directional intention or preference because such preferences are stated in "reference value" or are reflected by a gap between the reference and measured value.
- Some MET sub-elements may have terminology that suggests directional intention, preference, or negative connotation when considered in light of the LUCID definition (the few cases of this possibility are noted in the 'comment' column of the attached table).

Contact: ~~Al Abec, Project Team Leader, EMC~~ 202-205-1720
Peter Williams, LUCID/MET comparison, EMC-FC 970-295-5708

¹ The table lists the MET Framework Themes and sub-elements with associated LUCID criterion, indicators, and measures. Those are not repeated here.

M&E Theme	M&E sub-Element	Relevant LUCID Criterion	Relevant LUCID Indicator	Relevant LUCID Measure (M=Recommended in LUCID) (MO=Optional in LUCID)	Comment
Conservation of Biological Diversity	Ecosystem diversity	C2.2 Landscape structure/composition	I2.2.1 Landscape diversity	M2.2.1.1 Assessment of vegetation community types including permanent conversions (e.g., acres or relative proportion of each type)	
				M2.2.1.2 Horizontal and vertical structural diversity of vegetation (e.g., number of vegetation layers present)	
	Species Diversity	C2.2 Landscape structure/composition	I2.2.2 Landscape patterns	M2.2.2.1 Patch size and patch shape metrics (e.g., mean patch size and edge to interior ratios etc., by forest/non-forest area; by successional stage; by community type)	
				C2.4 Ecosystem structure/composition	I2.4.4 Species richness
		C2.5 Population function	I2.5.1 Population viability	M2.5.1.1 Population viability analysis of selected species (e.g., index based on measures of population dynamics, population genetics, environmental variation, metapopulation structure, and habitat suitability, etc.)	
		C2.6 Population structure/composition	I2.6.1 Populations of indigenous species	M2.6.1.1 Populations of selected species (e.g., population size, density, age class, sex ratio)	
Maintenance of Land Health and Vitality	Invasive Species	C2.3 Ecosystem function	I2.3.3 Invasive species	M2.3.3.1 Presence of exotic species (e.g., number of exotic plant species)	LUCID indicator focuses on terrestrial species.
				M2.3.3.2 Areas affected by invasive species (e.g., acres invaded, rate of spread)	LUCID avoids term 'infestation' so as to remove directional intention and preference
		C2.4 Ecosystem structure/composition	I2.4.1 Air, soil and water quality	M2.4.1.2 Index of biotic integrity for aquatic systems (e.g., index biotic integrity by stream segment or watershed)	Effect of invasive aquatic species on biotic integrity
	Resilience to Fire Disturbance	C2.8 Organism structure/composition	I2.8.1 Genetic diversity	M2.8.1.1 Assessment of areas converted to nonnative gene pool (e.g., acres converted, proportion of landscape converted)	Spread of invasive species
		C1.3 Social equity	I1.3.5 Community & environmental health	M1.3.5.2 Fire hazard or risk index	
				C2.1 Landscape function	I2.1.1 Disturbance processes
				MO2.1.1.2 Risk assessment of disturbance processes (e.g., area at high risk of mortality due to insects or disease, fire risk condition class)	

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	Native Insects and Pathogens	C2.1 Landscape function	I2.1.1 Disturbance processes	M2.1.1.1 Intensity/extensity/frequency of disturbance processes (e.g., degree of organic matter removal by fire, proportion of landscape disturbed by wind annually, return interval for fire)	LUCID doesn't explicitly refer to insects and pathogens as disturbance processes
				MO2.1.1.2 Risk assessment of disturbance processes (e.g., area at high risk of mortality due to insects or disease, fire risk condition class)	LUCID assessment addresses 'susceptibility'.
		C2.3 Ecosystem function	I2.3.2 Functional diversity	M2.3.2.1 Areas impacted by hyper/hypo species abundance (e.g., acres where deer exceed carrying capacity)	M&E Framework assesses 'outbreaks'. This term has a negative connotation worth removing.
		C2.6 Population structure/composition	I2.6.1 Populations of indigenous species	M2.6.1.2 Assessment of species' metapopulations (e.g., size, number and distribution of metapopulations)	
Conservation and Maintenance of Soil, Water, and Air Resources	Watershed Health	C2.1 Landscape function	I2.1.2 Hydrologic function	M2.1.2.1 Watershed condition index (e.g., hydrologic condition assessment)	M&E measure refers to 'aquatic ecosystem potential'. Phrase may imply directional intention and preference.
Maintenance and Enhancement of Social Systems	Diversity of Opportunities and Settings	C1.1 Collaborative stewardship	I1.1.1 Contribution of local and traditional and ecological knowledge	M1.1.1.1 Projects with traditional ecological knowledge or local knowledge component (e.g., number of projects)	Measure of contributions to sustaining social systems (?)
			I1.1.2 Collaborative decision-making	M1.1.2.2 Participation in public review opportunities (e.g., number, representativeness, satisfaction with)	Refers to 3 rd M&E LMP performance measure which relates to perceived need for change
			I1.1.3 Stewardship activities	M1.1.3.1 Participation in stewardship activities (e.g., number of volunteer days, number of individuals involved)	
		C1.2 Institutional and Community Capacity	I1.2.1 Community Resiliency	M1.2.1.1 Community capacity index	
			I1.2.2 Institutional Adequacy	M1.2.2.1 Areas with sustainable management plans, policies or commitments (e.g., acres by ownership and type of agreement)	

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			I1.2.4 Government to government relationships	M1.2.4.1 Assessment of government-to-government Agreements or plans (e.g., number of by Tribe, State, etc.)	
	C1.3 Social equity		I1.3.1 Environmental justice and civil rights	M1.3.1.2 Small business/minority set asides (e.g., number, dollar value, extent by program area)	"Opportunities" and 'contributions to social sustainability, not economic valuation
			I1.3.2 Disabled access	M1.3.2.1 Accessible facilities (e.g., proportion/number facilities available by activity)	
	C1.4 Social and cultural values		I1.4.1 Gathering	MO1.4.1.1 Availability of subsistence use programs (e.g., number by type, knowledge of availability)	
			I1.4.2 Aesthetics and Solitude	M1.4.2.1 Scenic quality index (e.g., acres by visual quality objective class, acres needing rehabilitation by visual quality objective class)	
				M1.4.2.2 Availability of places for solitude (e.g., acres of forest buffered from collector or arterial roads, acres of forest not under flight paths, etc.)	
			I1.4.3 Education and research	M1.4.3.1 Interpretive facilities available (e.g., number of by type)	
				M1.4.3.2 Interpretation, education, and research participation (e.g., number of contacts by type)	
			I1.4.4 Cultural values and historic features	M1.4.4.1 Protection of cultural and historic sites (e.g., total number, number with minimum buffer protection widths or other protective mechanisms)	
				M1.4.4.2 Cultural and historic sites that have been negatively impacted (e.g., number of sites impacted)	
			I1.4.5 Spiritual values and special places	M1.4.5.1 Areas managed for special places/values (e.g., acres/proportion old growth, deer management, wetland areas, etc.)	
			I1.4.6 Access and use rights	M1.4.6.2 Access restrictions (e.g., acres of forest with restricted access by restriction type)	
				MO1.4.6.2 Access restrictions (e.g., special acts/closure orders; number permits denied due to access concerns; restrictions by in-holdings; number of non-access days)	
		M1.4.6.3 Special use permits (e.g., number of special use permits by type)			
		I1.4.7 Recreation and tourism	MO1.4.7.3 Recreation supply (e.g., Persons at One Time by Recreation Opportunity Spectrum)		

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			I1.4.8 Customs and culture	M1.4.8.1 Public satisfaction with management for sense-of-place (e.g., public survey, interviews, etc.)	
	C3.1 Capital and wealth	I3.1.1 Natural capital – forests		M3.1.1.1 Compare productive forest to total forest (e.g., proportion by ownership, forest type, species, etc.)	'Opportunity' instead of realized potential reflected in economic theme
				MO3.1.1.1 Total amount of forest (e.g., acres)	
				M3.1.1.2 Amount of productive forest (e.g., timber volume by ownership, forest type, species, etc.)	
			I3.1.2 Natural capital – recreation	M3.1.2.1 Areas available for recreation (e.g., Scenery Management System by Recreation Opportunity Spectrum)	
				M3.1.2.2 Areas of wilderness	
			I3.1.3 Natural capital - wildlife/fish	M3.1.3.1 Wildlife populations	
				MO2.6.1.1 Assessment of suitable habitat for selected species (e.g., habitat suitability models)	
				MO3.1.3.2 Assessment of fish bearing streams (e.g., stream miles)	
			I3.1.4 Natural capital – range	M3.1.4.1 Amount of productive range (e.g., acres by forage condition class)	
			I3.1.5 Other natural capital	M3.1.5.1 Special management areas (e.g., acres of research natural areas, special interest areas, wild scenic rivers, etc.)	
				M3.1.5.2 Water resources (e.g., volume available)	
				M3.1.5.4 Areas of oil, gas and mineral potential (e.g., assessment of proven reserves)	
Maintenance and Enhancement of Economic Systems			Provision of Goods and Services	C1.2 Institutional And Community Capacity	
	C1.4 Social and cultural values	I1.4.1 Gathering		M1.4.1.1 Participation in harvest for personal use (e.g., number of persons participating in harvest for consumption/cultural purposes)	
				M1.4.1.2 Participation in harvest for Native American use (e.g., number of persons participating in harvest for consumption/cultural purposes)	
		I1.4.3 Education and research	MO1.4.3.3 Interpretation, education, research expenditures (e.g., total expenditures or proportion of total expenditures on educ/interp/research materials)		

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			I1.4.7 Recreation and tourism	M1.4.7.1 Recreation use (e.g., Recreation Visitor Day by Recreation Opportunity Spectrum)				
	C3.2 Flows of products and services	I3.2.1 Production of marketed goods and services		M3.2.1.1 Timber harvested (e.g., million board feet by type)				
				MO3.2.1.1 Value of timber produced				
				M3.2.1.2 Recreation use (e.g., recreation visitor day by recreation opportunity spectrum)				
				MO3.2.1.2 Value of recreation produced				
				M3.2.1.3 Wildlife harvested				
				MO3.2.1.3 Value of wildlife harvested				
				M3.2.1.4 Fish harvested				
				MO3.2.1.4 Value of fish harvested				
				M3.2.1.5 Animal unit month used				
				MO3.2.1.5 Value of animal unit month produced				
				M3.2.1.6 Oil, gas and minerals produced (e.g., volume by type/grade)				
				MO3.2.1.6 Value of minerals produced				
				M3.2.1.7 Electrical power generated (e.g., kw hours)				
				MO3.2.1.7 Value of energy produced				
				M3.2.1.8 Water withdrawals (e.g., volume)				
				MO3.2.1.8 Value of water withdrawals				
					I3.2.2 Production of non-marketed goods and services		M3.2.2.1 Special forest products harvested (e.g., lbs of mushrooms)	
							MO3.2.2.1 number of special forest product permits issued	
	M3.2.2.2 Wilderness/backcountry permits (e.g., number of permits issued per year)							
	M3.2.2.3 Special use permits (e.g., number of permits issued per year)							
	C3.3 Trade and distributional equity	I3.3.2 Workforce diversity		M3.3.2.3 Assessment of contracts to minority-owned or small businesses (e.g., proportion/value of contracts)	Realization of opportunities for minority contracts			
				I3.3.3 Income		M3.3.3.1 Size distribution of income (e.g., percent by tenure type)	Contribution to economic systems	
						M3.3.3.2 Technical distribution of income (e.g., by factor type)	Ditto	

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				M03.3.3.2 Technical distribution of employment	Ditto
				M3.3.3.3 National Forest System total program expenditures	Ditto
Infrastructure Capacity	Roads and Trails	C1.3 Social equity	I1.3.4 Public health and safety	M1.3.4.1 Public safety incidents (e.g., number of incidents by type/severity)	Safety of roads
		C1.4 Social and cultural values	I1.4.6 Access and use rights	M1.4.6.1 Road access (e.g., miles by road class)	
				M1.4.6.2 Access restrictions (e.g., acres of forest with restricted access by restriction type)	
		C3.1 Capital and Wealth	I3.1.6 Built infrastructure – roads and trails	M3.1.6.1 Roads and trails (e.g., miles of roads/trails by use type and capacity)	
				M3.1.6.2 Condition of roads and trails (e.g., miles to standard)	
				MO3.1.6.2 Asset value of roads and trails (e.g., \$ value of roads/trails by use type)	
				MO3.1.6.3 Roads and trails maintenance cost	
		MO3.1.6.4 Roads and trails maintenance backlog			