BUILDING CONSISTENCY THROUGH HIERARCHICAL CLASSIFICATION SYSTEMS FOR ECOSYSTEM SERVICES

PRESENTED BY:

George Van Houtven

ACES 2016 Conference

Jacksonville, FL

December 6, 2016

Why Classification?

- Organizing framework for grouping items with similar properties

- Common language and system for communication

- Infrastructure for developing accounting systems

- Examples
  - Natural science: Taxonomy of living organisms
  - Library science: Dewey decimal system
  - Health science: Classification of disease (ICD-10)
  - Economics: North American Industry Classification System (NAICS)

Ecosystem Services Classification

- Daily (1997) and others have developed lists

- Millennium Ecosystem Assessment (MA)
  - 4 main categories (provisioning, cultural, regulating, supporting)

- Common International Classification System for Ecosystem Services (CICES)
  - Hierarchical system expanding on MA

- Final Ecosystem Goods and Services Classification System (FEGS-CS)
  - Hierarchical and "Combinatorial" system with 2 components

- National Ecosystem Service Classification System (NESCS)
 - Hierarchical and Combinatorial system with 4 components

Objectives of NESCS

- ES classification system consistent with principles of
  - Final ecosystem services
  - Total economic value (TEV) framework
  - NAICS and NAPCS (product classification system)
- Organizing framework for economic analyses of ES
  - Support <u>identification</u> of ES pathways from management action to human benefits
    - First step toward <u>quantification</u> and <u>valuation</u> of benefits
  - Provide structure that can be used for ES accounting

Conceptual Framework
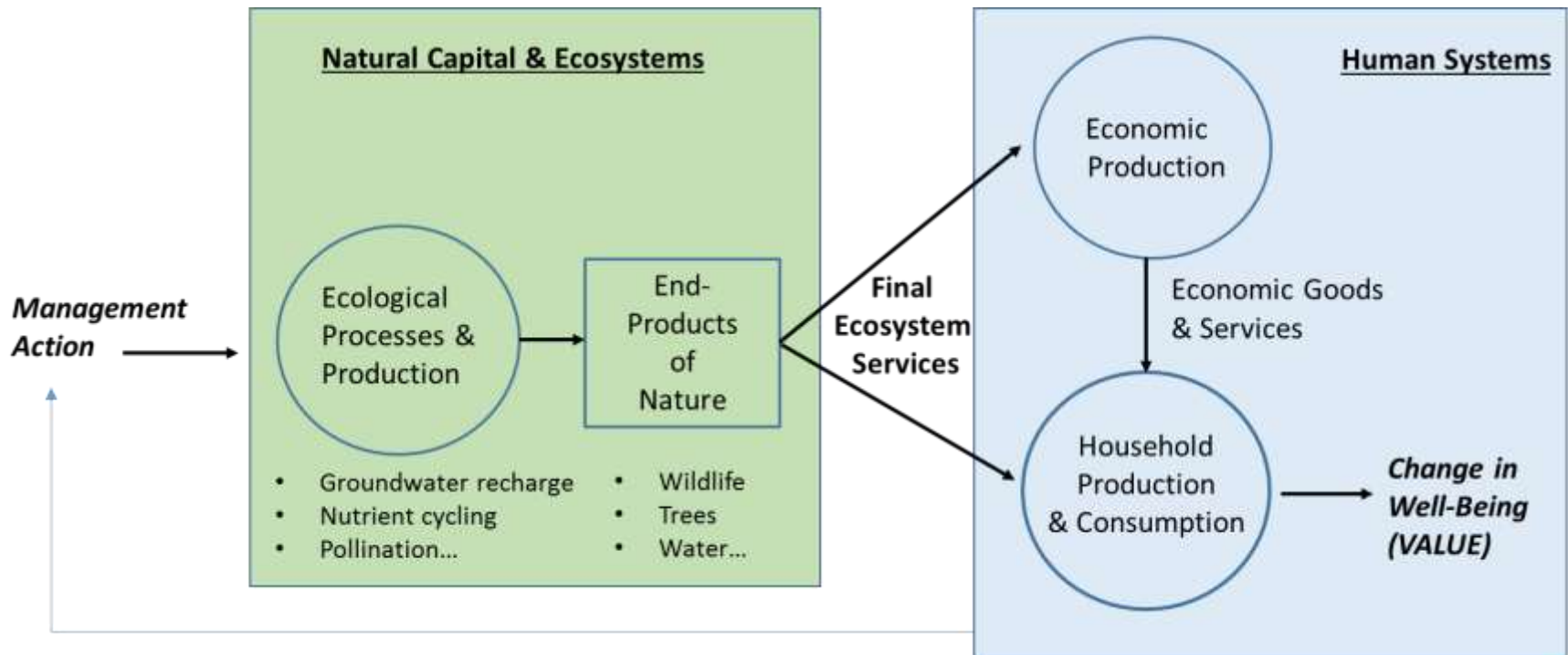
NESCS 4-Component Structure
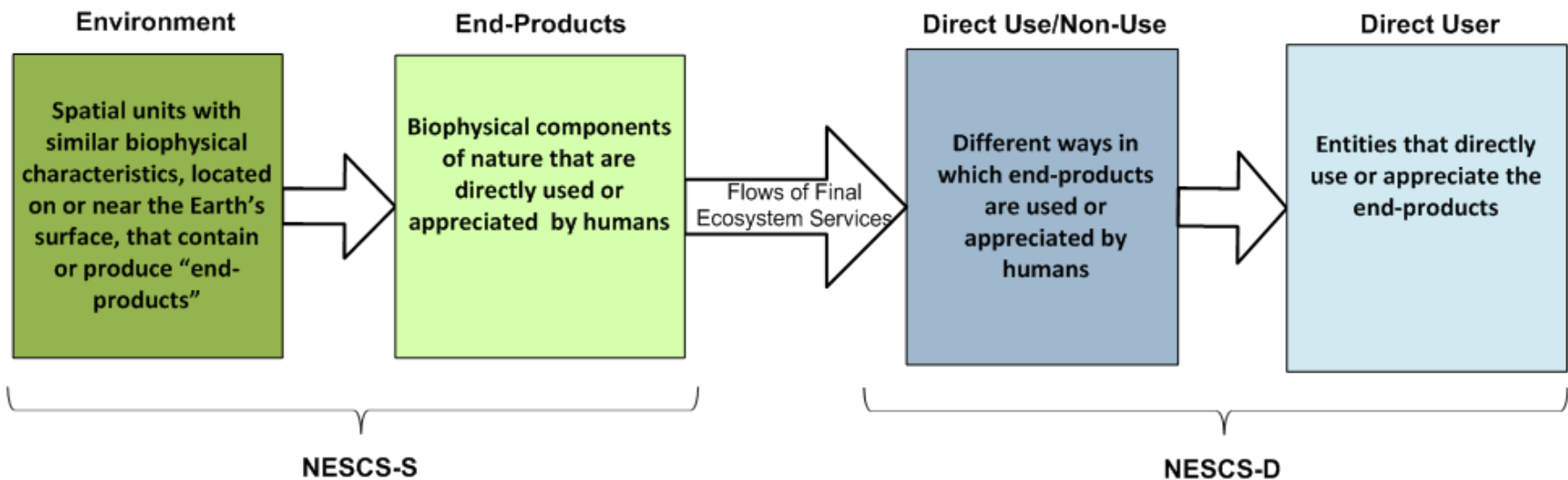
ES Supply Side Hierarchies

Environmental Class		
Environmental Sub-Class		
1. Aquatic		
	11. Rivers and Streams	
	12. Wetlands	
	13. Lakes and Ponds	
	14. Near Coastal Marine	
	15. Open Ocean and Seas	
	16. Groundwater	
2. Terrestrial		
	21. Forests	
	22. Agroecosystems	
	23. Created Greenspace	
	24. Grasslands	
	25. Scrubland / Shrubland	
	26. Barren / Rock and Sand	
	27. Tundra	
	28. Ice and Snow	
3. Atmospheric		
	31. Atmospheric	

Source: Landers and Nahlik (2013).

End-Product Class	
End-Product Sub-Class	
1. Water	
	11. Snow/Ice
	12. Liquid water
2. Flora	
	2x. Specific classes/species of flora
3. Fauna	
	3x. Specific classes/species of fauna
4. Other Biotic Components	
	4x. Specific types of natural material
5. Atmospheric Components	
	51. Air
	52. Solar light/radiation
6. Soil	
	6x. Specific types of soil
7. Other Abiotic Components	
	7x. Specific types of natural material
8. Composite End-Products	
	81. Scapes
	82. Regulation of extreme events
	83. Presence of environmental class/sub-class
9. Other End-Products	

Total Economic Value (TEV) Framework
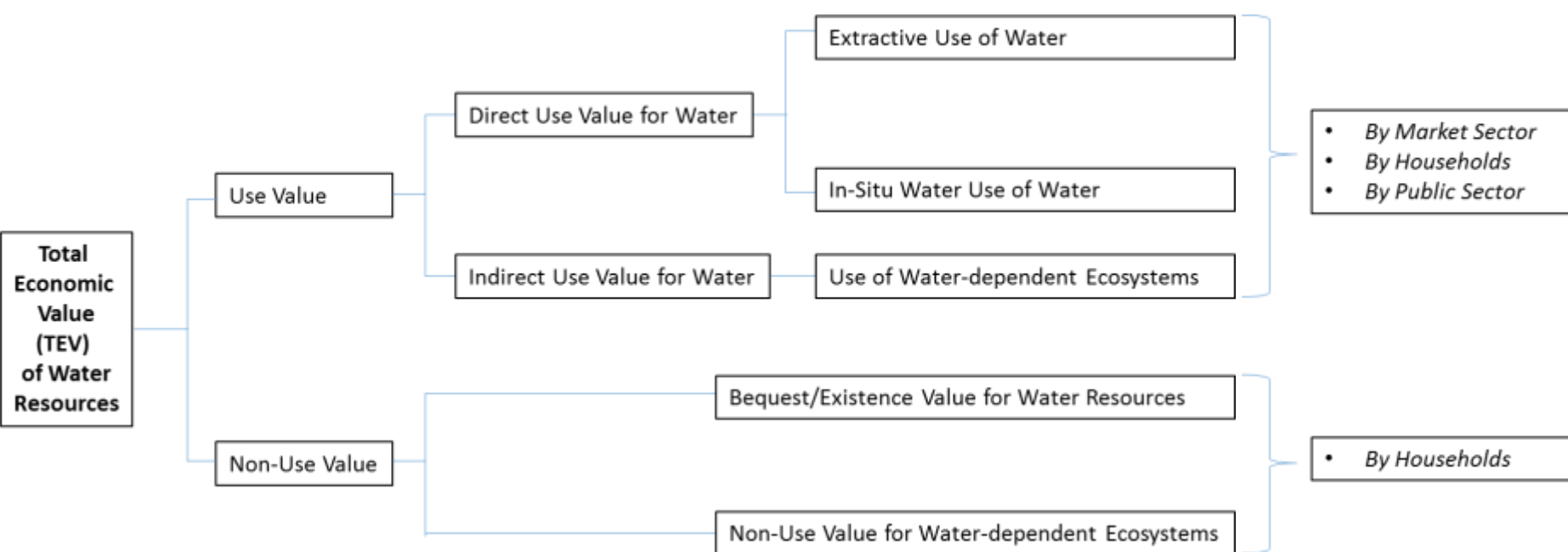
ES Demand-Side Hierarchies

Direct Use/Non-Use Class
Direct Use/Non-Use Sub-Class
Direct Use/Non-Use Detail

1. Direct Use

    11. Extractive Use
- 1101. Raw material for transformation
- 1102. Fuel/energy
- 1103. Industrial processing
- 1104. Distribution to other users
- 1105. Support of plant or animal cultivation
- 1106. Support of human health and life or subsistence
- 1107. Recreation/tourism
- 1108. Cultural/spiritual activities
- 1109. Information, science, education, and research

    12. In-situ Use
- 1201. Energy
- 1202. Transportation medium
- 1203. Support of plant or animal cultivation
- 1204. Waste disposal/assimilation
- 1205. Protection or support of human health and life
- 1206. Protection of human property
- 1207. Recreation/tourism
- 1208. Cultural/spiritual activities
- 1209. Aesthetic appreciation
- 1210. Information, science, education, and research

2. Non-use

    21. Existence

    22. Bequest

Direct User Class
Direct User Sub-Class

1. Industry
- 111. Agriculture, Forestry, Fishing and Hunting
- 121. Mining
- 122. Utilities
- 123. Construction
- 131–33. Manufacturing
- 142. Wholesale Trade
- 144–45. Retail Trade
- 148–49. Transportation and Warehousing
- 151. Information
- 152. Finance and Insurance
- 153. Real Estate Rental and Leasing
- 154. Professional, Scientific, and Technical Services
- 155. Management of Companies and Enterprises
- 161. Educational Services
- 162. Health Care and Social Assistance
- 171. Arts, Entertainment, and Recreation
- 172. Accommodation and Food Services
- 181. Other Services (except Public Administration)
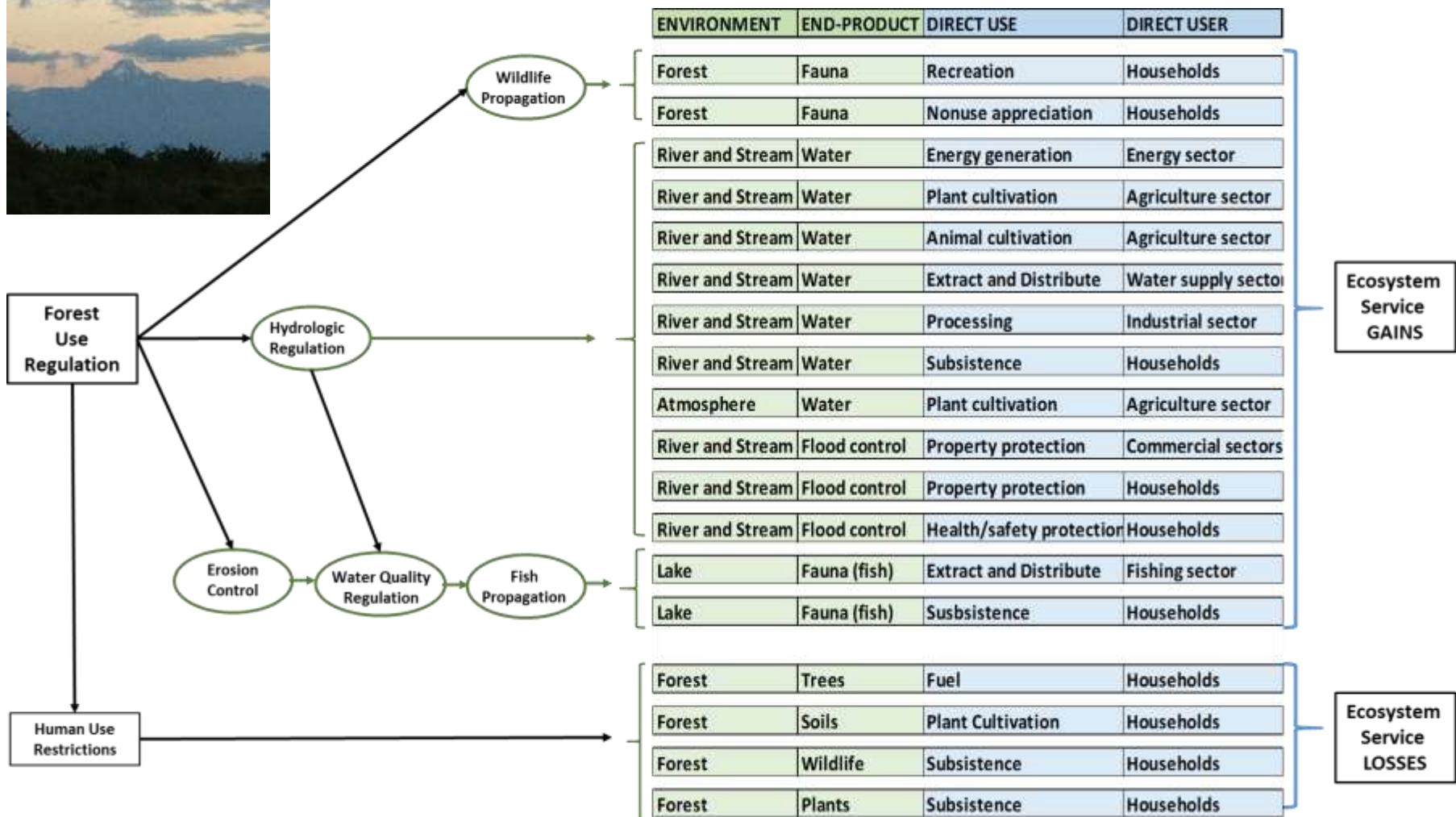- 192. Public Administration

2. Households
- 201. Households

3. Government
- 301. Government

Potential Roles for NESCS in ES Assessment

- Identification of distinct final ecosystem services categories impacted by a management action
  - Framework for causal chain pathways

Example for Mountain Forest Use Regulation in Kenya

Potential Roles for NESCS in ES Assessment

- Organizing framework for storing, retrieving, and summarizing existing benefit measures
  - Benefit relevant indicators
    - Which and how many BRIs have been used for each ES category across related applications?
  - Benefit transfer databases
    - What types of ES are covered by existing valuation estimates in literature?
    - How many existing valuation estimates cover specific types of ES?

Roles for NESCS in ES Assessment (Cont'd)

- Organizing framework for ES accounting
  - Summing benefit estimates within and across ES categories
  - Identifying and avoiding double counting
    - Distinguish between
      - Intermediate ecosystem services
      - Final ecosystem services
      - Economic good and services
    - Account for overlaps in benefit estimates from different valuation approaches
      - Do property value studies overlap with recreation demand studies?
      - Which ES categories are captured by stated preference methods?

Limitations of NESCS and Other ES Classification

- Combinatorial structure provides flexibility, but
  - the total number of possible combinations may be overwhelming
  - many combinations may not be relevant
    - Cautionary example from ICD-10 combinatorial classification system
      - V91 - Other injury due to accident to watercraft
      - V91.0 - Burn due to watercraft on fire
      - V91.07 - Burn due to water-skis on fire
      - V91.07XA - Burn due to water-skis on fire, initial encounter

- Even with flexibility, one size may not fit all
- Like most classification systems, there are ambiguities and situations requiring subjective judgment
  - Line between ES supply (natural systems) and ES demand (human systems) is often not well defined

Thank you. Questions?