**Biological Measurements for LTAR Network**

Committee Leaders: Betsey Boughton, David Augustine

Site Representatives:

|  |  |  |  |  |
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| **Site Name** | **Acronym** | **State** | **Biological Working Group Representatives** | **Attended DC Workshop?** |
| Central Mississippi | CMRB | MO | John Sadler |  |
| Central Plains | CPER | CO | David Augustine, Lauren Porensky | Y |
| Cook Farm | CAF | WA | David Huggins | Y |
| Jornada | JER | NM | Brandon Bestelmeyer | Y |
| Northern Plains | NP | ND | Matt Sanderson | Y |
| Southeast Coastal Plain | GACP | GA | Alisa Coffin | Y |
| Southern Plains | SP | OK | Brekke Peterson-Munks | Y |
| Upper Chesapeake Bay | UCB | PA | Peter Kleinman |  |
| Upper Mississippi | UMRB | IA | Tom Moorman |  |
| Walnut Gultch | WGER | AZ | Phil Heilman |  |
| Archbold-UF | ABS | FL | Betsey Boughton, Raoul Boughton | Y |
| Eastern Corn Belt | ECB | OH | Rocky Smiley |  |
| Great Basin | GB | ID | Fred Pierson |  |
| Kellogg Bio Stn | KBS | MI | Sieglinde Snapp | Y |
| Lower Chesapeake Bay | LCB | MD | Steve Mirsky, Jude Maul, Michael Cavigelli | Y |
| Lower Mississippi | LMRB | MS | Martin Locke | Y |
| Platte River | PRHP | NE | Brian Wienhold | Y |
| Texas Gulf | TG | TX | Phil Fay, Hal Collins | Y |

**Scale of measurements:**

The expectation is that six of the nine Core Measurements will be conducted at all LTAR sites at a scale associated with the fetch area of at least 1 EC tower and three will be collected at the farm or field scale (see table below). Measurement of most Core biological parameters at an EC fetch area scale (e.g. ANPP) will be insufficient to characterize variation related to the landscape or management practices. Replication of measurements at the EC fetch area scale across landscapes and treatments will clearly be necessary, but decisions on sampling schemes will vary by site. We recommend replication of Core biological measurements at all EC towers at each site, and across some or all replicates of the BAU/Aspirational treatments at each site, but this will vary depending on available resources, site size, etc.

Biological measurements at the watershed scale (including in aquatic habitats) are not directly addressed under the tier 1 measurements, but could be added for measurements (5,6,7,8) below under tier 2.

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|  | **Core measurements** | **Spatial Scale** | **Temporal scale (*minimum* frequency)** |
| 1 | Annual Aboveground Net primary productivity | Tower fetch area | Annually |
| 2 | Yield/Harvest Index or Livestock Production Index | Farm or field scale | Annually |
| 3 | Crop or Forage Phenology | Tower fetch area | Daily |
| 4 | Plant Tissue Chemistry | Tower fetch area | Annually |
| 5 | Soil Microbial Abundance/Diversity | Tower fetch area | Annually |
| 6 | Decomposition Index | Tower fetch area | Annually? |
| 7 | Abundance of Weedy Indicator Species | Tower or farm or field scale | Annually |
| 8 | Abundance of Biodiversity Indicator Species (plants, soil fauna, insects, and/or vertebrates) | Farm or field scale | Annually |
| 9 | Biophysical setting and LULC | Farm or field scale |  |

The following subcommittees will develop draft protocols for each core measurement, which should include protocol for both tier 1 and tier 2 measurements. Names in bold are requested to serve as the lead for each protocol.

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|  | Protocol | Crop | Range | Aquatic habitats | Protocol Status & Notes 2-10-16 |
| 1 | Cropland ANPP and Crop Production | **Brian Wienhold**, Martin Locke |  | NA | Draft Complete |
| 2 | Rangeland ANPP, forage production, and livestock production |  | **David Augustine**, Lauren Porensky, Brandon Bestelmeyer, Matt Sanderson | NA | Draft Complete, except for livestock pdn |
| 3 | Plant tissue chemistry | Brian Wienhold | **Phil Fay** |  | Field sampling draft complete; need to address lab protocols |
| 4 | Phenology | Steve Mirsky | **Dawn Browning**, David Augustine, Dana Blumenthal, John Hendrickson | NA | Draft forthcoming |
| 5 | Soil microbial abundance/diversity | Hal Collins, Jude Maul | **Brekke Peterson-Munks** | Jason Taylor | Draft complete |
| 6 | Decomposition | **Steve Mirsky**, Jude Maul | Brekke Peterson-Munks | Jason Taylor | Draft forthcoming |
| 7 | Weed indicators | Steve Mirsky | Betsey Boughton, Dana Blumenthal, Phil Fay | Jason Taylor | Draft complete |
| 8 | Biodiversity indicators | Alisa Coffin, Martin Locke | **Betsey Boughton**, Phil Fay, David Augustine | Jason Taylor | Draft complete |
| 9 | Remote sensing and LULC | **Alisa Coffin** | Lauren Porensky, David Augustine |  | Draft in progress; survey of existing resources at each site to be conducted at Archbold |