| Appendix II. Detailed List of Potential FFESC Research Topics with a list of research projects that Address the Topic (Research Project Numbers are from Appendix I). | | | Research Projects with Major Focus on this Topic | Sum Major | % of Major | Projects that provide Minor information on this Topic | Sum Minor | % of Minor |
|---|---|---|---|---|---|---|---|---|
| **1** | **Mitigation = Increasing carbon sequestration and reducing greenhouse gas emissions from forest and rangelands and the forest and range sector** | | | **20** | **14.3** | | **14** | **15.7** |
| 1.1 | Landbased research -that directly contributes to models such as CBM-CFS3 (see Black et al. 2008) | | | 20 | 14.3 | | 11 | 12.4 |
| 1.1.1 | Forest and rangeland carbon cycles across multiple scales and multiple forest types | | 12 31 34 66 100 118 119 | 15 | 10.7 | 17 58 59 60 61 62 154 | 8 | 9.0 |
| | 1.1.1.1 | Micrometerological studies in major forest types to provide better NEP and climate change sensitivity estimates for CBM-CFS3 | 3 7 | 2 | 1.4 | | 0 | 0.0 |
| | 1.1.1.2 | Remote sensing studies in major forest types to provide better NEP and climate change sensititivity estimates for CBM-CFS3 | 6 26 | 2 | 1.4 | | 0 | 0.0 |
| | 1.1.1.3 | Effect of interactions among fire suppression and forest insects & disease on carbon sequestration | 43 116 | 2 | 1.4 | | 0 | 0.0 |
| | 1.1.1.4 | Effects of MPB and MPB salvage on carbon sequestration esp. effects of secondary structure to improve CBM-CFS3 estimates | 35 98 | 2 | 1.4 | | 0 | 0.0 |
| | 1.1.1.5 | Effect of soil biological process such as mycorrhizal activity on soil carbon storage | | 0 | 0.0 | 112 | 1 | 1.1 |
| 1.1.2 | Multi-scale analysis of forest management practices to enhance carbon storage | | 65 | 5 | 3.6 | | 3 | 3.4 |
| | 1.1.2.1 | Effect of fertilization on whole ecosystem carbon sequestration, including soil carbon | 113 115 | 2 | 1.4 | | 0 | 0.0 |
| | | 1.1.2.1 high productivity coastal forest sites - already well-studied, but need more information on soil C | | 0 | 0.0 | | 0 | 0.0 |
| | | 1.1.2.2southern interior and northern interior forest types - not well studied | | 0 | 0.0 | 3 7 | 2 | 2.2 |
| | 1.1.2.2 | Effect of alternative tree species, such as nitrogen-fixing red alder, & mixtures on C sequestration (esp. long-term soil carbon), compared to traditional high yield conifer plantations | 106 114 | 2 | 1.4 | 100 | 1 | 1.1 |
| | 1.1.2.3 | Effect of alternative silvicultural practices such as variable retention on carbon sequestration (especially long term soil carbon), compared to traditional high yield plantations | | 0 | 0.0 | | 0 | 0.0 |
| | 1.1.2.4 | Effect of managing for old growth at long rotations vs high intensity management of short rotations, across stand to regional scales | | 0 | 0.0 | | 0 | 0.0 |
| | 1.1.2.5 | Ecological studies related to the application of biocharcoal to soil to enhance C sequestration | | 0 | 0.0 | | 0 | 0.0 |
| 1.2 | Industrial research -that directly contributes to carbon cycle models | | | 0 | 0.0 | | 1 | 1.1 |
| 1.2.1 | Carbon cycling and storage in the wood products lifecycle, particularly as it relates to the use of salvaged or othe novel wood products. | | | 0 | 0.0 | 114 | 1 | 1.1 |
| | 1.2.1.1 | effects of converting rapidly degrading forest biomass to recalcitrant C (biocharcoal) (from Black et al. 2008) | | 0 | 0.0 | | 0 | 0.0 |
| | | 1.2.1.1 engineering studies related to the development of biocharcoal and its potential uses | | 0 | 0.0 | | 0 | 0.0 |
| | | 1.2.1.3 economic studies of the use of biocharcoal | | 0 | 0.0 | | 0 | 0.0 |
| 1.2.2 | Research addressing carbon cycling and reduction of GHG emissions in forestry operations (eg harvesting, roads, silviculture equipment use). | | | 0 | 0.0 | | 0 | 0.0 |
| 1.3 | Mitigation-Adaptation integration | | | 0 | 0.0 | | 2 | 2.2 |
| 1.3.1 | Effect of adaptation measures to promote ecosystem resilience on carbon sequestration | | | 0 | 0.0 | | 0 | 0.0 |
| 1.3.2 | Effect of mitigation measure to promote carbon sequestration on ecosystem resilience | | | 0 | 0.0 | | 0 | 0.0 |
| 1.3.3 | Effect of adaptation measures to promote resilient, sustainable communities resilience on carbon sequestration | | | 0 | 0.0 | 65 | 1 | 1.1 |
| 1.3.4 | Effect of mitigation measure to promote carbon sequestration on community resilience & sustainability | | | 0 | 0.0 | 82 | 1 | 1.1 |
| 1.3.5 | Community sustainability and regional planning initiatives & education related to enhancing resilience through carbon forestry. | | | 0 | 0.0 | | 0 | 0.0 |
| 1.3.6 | Ensuring that national & provincial carbon mitigation policies have positive not negative effects on local communities & ecosystems | | | 0 | 0.0 | | 0 | 0.0 |
| 1.3.7 | Local or field level policy changes needed to facilitate carbon sequestration (eg silvicultural regulations) | | | 0 | 0.0 | | 0 | 0.0 |
| **2** | **Impacts = Monitoring, Predicting, & Modeling Change, Vulnerability and Risk Assessments in Forest and Range Ecosystems** | | | **71** | **50.7** | | **34** | **38.2** |
| 2.1 | Predicting Climate Change Impacts on Forest and Range Species and Ecosystems | | | 63 | 45.0 | | 29 | 32.6 |
| 2.1.1 | Genetics (see Aitken et al. 2008) | | 117 | 3 | 2.1 | | 0 | 0.0 |
| | 2.1.1.1 | Genomics of keystone species including epigenetic effects | 162 | 1 | 0.7 | | 0 | 0.0 |
| | 2.1.1.2 | Further studies using existing provenance trials for fecundity, controlled crosses etc | | 0 | 0.0 | | 0 | 0.0 |
| | 2.1.1.3 | Short-term (laboratory) common garden experiments to determine genetic variability in response to stressors, elevated C02 | 38 39 | 2 | 1.4 | | 0 | 0.0 |
| | 2.1.1.4 | Genetic studies in zones of natural hybridization | | 0 | 0.0 | | 0 | 0.0 |
| 2.1.2 | Physiology & population ecology | | | 14 | 10.0 | | 5 | 5.6 |
| | 2.1.2.1 | Development of complex species dispersal models (SDMs) that go beyond climate envelope modelling to include other ecological factors | 21 | 1 | 0.7 | | 0 | 0.0 |
| | 2.1.2.2 | Field & lab experiments to study physiological response of keystone species to to climate variables and interacting factors | 47 | 1 | 0.7 | 1 150 | 2 | 2.2 |
| | 2.1.2.3 | Field experiments that provide parameter estimates and field verfication of SDMs | | 0 | 0.0 | | 0 | 0.0 |
| | 2.1.2.4 | Field monitoring and vulnerability assessments of keystone species (trees, shrubs, grasses, forbs, vertebrates, invertebrates) | | 9 | 6.4 | | 1 | 1.1 |
| | | 2.1.2.4.1 major tree species | 1 18 19 37 160 | 5 | 3.6 | | 0 | 0.0 |
| | | 2.1.2.4.2 other vegetation | 44 | 1 | 0.7 | | 0 | 0.0 |
| | | 2.1.2.4.3 major species of wildlife & fish | 44 108 109 | 3 | 2.1 | 74 | 1 | 1.1 |
| | | 2.1.2.4.4 other animal species | | 0 | 0.0 | | 0 | 0.0 |
| | | 2.1.2.4.5 mycorrhizal fungi, other microbial life | | 0 | 0.0 | | 0 | 0.0 |
| | 2.1.2.5 | Effects of climate change on insect and disease population dynamics & host-pest interactions | 23 24 | 2 | 1.4 | 22 36 | 2 | 2.2 |
| | 2.1.2.6 | Effects of climate change on invasive alien species | 50 | 1 | 0.7 | | 0 | 0.0 |
| 2.1.3 | Community, Ecosystem & Landscape ecology | | | 27 | 19.3 | | 12 | 13.5 |
| | 2.1.3.1 | Effects of climate change on ecosystem function and dynamics, water and nutrient storage and cycling | 55 | 1 | 0.7 | 31 | 1 | 1.1 |
| | 2.1.3.2 | Effects of climate change on disturbance regimes at various scales | | 13 | 9.3 | 142 | 5 | 5.6 |
| | | 2.1.3.2.1 wildfire | 54 90 148 | 3 | 2.1 | 20 149 | 2 | 2.2 |
| | | 2.1.3.2.2 insects & disease (see Abbott et al. 2007) | 23 24 41 45 49 51 56 88 123 126 | 10 | 7.1 | 36 37 | 2 | 2.2 |
| | | 2.1.3.2.3 storms, flooding, | | 0 | 0.0 | | 0 | 0.0 |
| | 2.1.3.3 | Community to landscape level changes in forest and range ecosystems | 42 44 | 2 | 1.4 | 69 | 1 | 1.1 |
| | 2.1.3.4 | Adapting ecosystem classification (BEC) approaches to a changing climate | 73 | 1 | 0.7 | 32 | 1 | 1.1 |
| | 2.1.3.5 | Ecosystem-level consequences of assisted migration (soil organisms, invasive species, cascading effects on foodwebs) | 47 | 1 | 0.7 | | 0 | 0.0 |
| | 2.1.3.6 | Ecosystem-level consequences of altered competitive abilities among species (eg below-ground effects) | 143 | 1 | 0.7 | | 0 | 0.0 |
| | 2.1.3.7 | Ecotonal shifts -forest to grassland, timberline advance | 44 148 | 2 | 1.4 | 55 101 31 | 3 | 3.4 |
| | 2.1.3.8 | Use of backcasting and historic range of variability tools (dendrochronology, paleoecologiy, archaeology, oral history) to predict the future | 11 123 134 135 139 148 | 6 | 4.3 | | 0 | 0.0 |
| | 2.1.3.9 | Effects of climate change on wildlife habitat supply | | 0 | 0.0 | 74 | 1 | 1.1 |
| 2.1.4 | Earth sciences (Hydrology & Geomorphology) | | | 5 | 3.6 | | 3 | 3.4 |
| | 2.1.4.1 | Changes in water storage, peak flow timing etc | 4 71 94 161 | 4 | 2.9 | 79 164 170 | 3 | 3.4 |
| | 2.1.4.2 | Effects on mass movements, landslides, glacial melt effects on slope stability | 147 | 1 | 0.7 | | 0 | 0.0 |
| 2.1.5 | Aquatic Ecosystems | | 111 153 | 4 | 2.9 | | 0 | 0.0 |
| | 2.1.5.1 | Interactions of forest practices and climate change on stream temperatures and associated | 28 52 | 2 | 1.4 | | 0 | 0.0 |
| 2.1.6 | Forest and Range Growth & Yield Modeling for a changing climate | | | 5 | 3.6 | | 7 | 7.9 |
| | 2.1.6.1 | Consequences of climate change on tree growth & timber supplies | 37 40 57 104 107 | 5 | 3.6 | 1 18 70 83 85 | 5 | 5.6 |
| | 2.1.6.2 | Consequences of changing species mixes on timber supplies | | 0 | 0.0 | 143 | 1 | 1.1 |
| | 2.1.6.3 | Consequences of increased stand complexity & increased stress resistance on growth & yield | | 0 | 0.0 | | 0 | 0.0 |
| | 2.1.6.4 | Consequences of climate change on rangeland productivity and carrying capacity for wild ungulates and cattle | | 0 | 0.0 | 74 | 1 | 1.1 |
| 2.1.7 | Integrated modelling approaches that combine information from various levels of biological organization and disciplines | | | 4 | 2.9 | | 2 | 2.2 |
| | 2.1.7.1 | Metamodeling approaches and new methodologies for synthesizing & integrating results | 31 | 1 | 0.7 | | 0 | 0.0 |
| | 2.1.7.2 | Complex ecological interactions | | 3 | 2.1 | 47 | 2 | 2.2 |
| | | 2.1.7.2.1 effect of interactions between genes & pathogens on keystone species vulnerability | | 0 | 0.0 | | 0 | 0.0 |
| | | 2.1.7.2.2 effect of interactions among climate, fire regime, insects & disease on keystone species & ecosystems (see Abbott et al. 2007) | 11 22 36 | 3 | 2.1 | 31 | 1 | 1.1 |
| | | 2.1.7.2.3.effect of interactions among climate, invasive species, disturbance regimes, on keystone species & ecosystems | | 0 | 0.0 | | 0 | 0.0 |
| 2.2 | Monitoring and Risk Assessment | | | 8 | 5.7 | | 5 | 5.6 |
| 2.2.1 | Improved methods for risk assessment (rapid, multi-scale, complex interactions) | | | 0 | 0.0 | 49 | 1 | 1.1 |
| 2.2.2 | Monitoring reproduction & regeneration of species at risk to determine need for facilitated migration | | 147 | 1 | 0.7 | | 0 | 0.0 |
| 2.2.3 | Integrating climate model projections into existing or modified models | | 105 30 31 | 3 | 2.1 | 72 165 | 2 | 2.2 |

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