### Color Key:

**N/A or Not yet started**

- Objective 1.1a: Design and optimize nanoclay scaffolds (Activity 1: Prepare nanoclay scaffolds with amino acids for cancer cell growth)

**Behind Schedule**

- Objective 1.1a: (Activity 2: Assist non-RU campuses involved in Activity 1 with compliance protocols) [Approved by NSF on 7/28/21]

**On Track / In Progress**

- Objective 1.2a: Design and optimize soft polymeric scaffolds (Activity 1: Prepare soft scaffolds from Chu, Alg, and Pga, characterize the scaffolds)

**Ahead of Schedule / Complete**

- Objective 1.2a: (Activity 2: Assist non-RU campuses involved in Activity 1 with compliance protocols) [Approved by NSF on 7/28/21]

### Year 1

**Objective 1.1a:** Design and optimize nanoclay scaffolds (Activity 1: Prepare nanoclay scaffolds with amino acids for cancer cell growth)

- **Y1 ACTUAL:** Prepared 3 nanoclay scaffolds. These scaffolds will be delivered to the Cellular Team in Y2

### Year 2

**Objective 1.1a:** Design and optimize nanoclay scaffolds

- **Y1 ACTUAL:** Prepared 3 nanoclay scaffolds. These scaffolds will be delivered to the Cellular Team in Y2

**Y2 PROGRESS:** Currently only 1 team member is producing hard scaffolds. Y1 hard scaffolds will be delivered to the Cellular Team by 9/24/21

- **Y2 PROGRESS:** Assisted non-RU campuses involved in this activity with compliance protocols and MTAs. Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses [Approved by NSF on 7/28/21]

**Y2 PROGRESS:** Per NSF policy, IBC protocols are not required at non-RU researchers in this Pillar. Campuses have received information about MTAs and PROSPER will conduct a training on 10/8/21

### Year 3

**Objective 1.2a:** Design and optimize soft polymeric scaffolds

- **Y1 ACTUAL:** Prepared 3 soft polymeric scaffolds from Chu, Alg, and Pga, characterize the scaffolds

**Y2 PROGRESS:** Demonstrate growth of MDA-MB-231 and PC3 cells and compare with soft scaffolds prepared in 1.2a. Time evaluation of tumor growth on optimized scaffolds

### Year 4

**Objective 1.2a:** Design and optimize soft polymeric scaffolds

- **Y1 ACTUAL:** Prepared 3 soft polymeric scaffolds from Chu, Alg, and Pga, characterize the scaffolds

**Y2 PROGRESS:** Demonstrate tumoroid formation (critical)

- **Y2 PROGRESS:** The first generation (critical) scaffolds did not support cell growth. Studies are in progress with the pH controlled scaffolds.

### Year 5

**Objective 1.2a:** Design and optimize soft polymeric scaffolds

- **Y1 ACTUAL:** Prepared 3 soft polymeric scaffolds from Chu, Alg, and Pga, characterize the scaffolds

**Y2 PROGRESS:** Demonstrate tumoroid formation (critical)

### Responsible Parties

- **Year 1**
  - Lead: K. Katti, Co-lead: G. Du, W. Xia (Computational Approaches Pillar liaison), New Hire at NDSU [Approved by NSF 9/8/21]

- **Year 2**
  - Lead: K. Katti, Co-lead: G. Du, W. Xia (Computational Approaches Pillar liaison), New Hire at NDSU [Approved by NSF 9/8/21]

- **Year 3**
  - Lead: K. Katti, Co-lead: G. Du, W. Xia (Computational Approaches Pillar liaison), New Hire at NDSU [Approved by NSF 9/8/21]

- **Year 4**
  - Lead: K. Katti, Co-lead: G. Du, W. Xia (Computational Approaches Pillar liaison), New Hire at NDSU [Approved by NSF 9/8/21]

- **Year 5**
  - Lead: K. Katti, Co-lead: G. Du, W. Xia (Computational Approaches Pillar liaison), New Hire at NDSU [Approved by NSF 9/8/21]
| Objective 1.2b: (Activity 2: Assist non-RU campuses involved in Activity 1 with compliance protocols)  
[Approved by NSF on 7/28/21] | Year 1  
July 1, 2020-June 30, 2021 | Year 2  
July 1, 2021-June 30, 2022 | Year 3  
July 1, 2022-June 30, 2023 | Year 4  
July 1, 2023-June 30, 2024 | Year 5  
July 1, 2024-June 30, 2025 | Responsible parties |
|---|---|---|---|---|---|---|
| N/A | Assist non-RU campuses involved in this activity with compliance protocols and MTAs. Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses.  
[Approved by NSF on 7/28/21] | Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses.  
[Approved by NSF on 7/28/21] | Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses. | Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses. | Leads: K. Katti, C. Combs, S. Mallik, J. Zhao |
| Objective 1.3a: Design and develop stimuli-responsive polymeric materials as nanocarriers  
Y1 ACTUAL: Developed 5 different PSES and characterized them. Optimized one of them as the most suitable PSE. | Prepare 5 different PSES and characterize nanoparticles.  
Y1 ACTUAL: Completed | Demonstrate drug release in the tumoroids cells in scaffolds.  
Y2 PROGRESS: see 1.1a, Activity 2 | The nanoparticles release drugs within desirable time in scaffolds (critical). | Prepare 3 different polymers, demonstrate imaging in the tumor cells in 3D scaffolds | Released drugs kill majority of cancer cells in scaffold/models | Lead: G. Du, Co-leads: J. Zhao, C. Combs, B. Sui  
[Approved by NSF 7/28/21] |
| Objective 1.3b: Design and develop silicon quantum dots (QDs) and polymer-QDs hybrids for bioimaging | QDs with stable signal in cells  
Y1 ACTUAL: Completed | Demonstrate good biocompatibility with cancer cell lines | The nanoparticles release drugs within desirable time in scaffolds (critical) | Identify two polymers (critical) | Make two polymer-SiQD hybrids | Lead: J. Zhao, Co-leads: G. Du, C. Combs, B. Sui  
[Approved by NSF 7/28/21] |
| Objective 1.3c: Design and test polymer nanoparticles for vascular surrogacy (Activity 1: Design, preparation, and testing of hypoxia-responsive polymer nanoparticles)  
Y1 ACTUAL: Prepared three polymer nanoparticles | Prepare 3 polymers with different hypoxia-responsive units, characterize nanoparticles.  
Y1 ACTUAL: Prepared three polymer nanoparticles | Prepare two additional polymers, demonstrate drug release in the tumoroids on hard and soft scaffolds.  
Y2 PROGRESS: We are studying the release of metarrestin from the nanoparticles under various oxygen levels. | The nanoparticles release drugs within 2 hours in the hard and soft scaffolds (critical).  
Y2 PROGRESS: drug release data for the nanoparticles under various oxygen levels | Release drugs kill at least 80% of the breast and prostate cancer cells on the scaffolds (critical).  
Y2 PROGRESS: drug release data for the nanoparticles under various oxygen levels | Released drugs kill at least 80% of the cancer cells in the patient-derived model. | Lead: S. Mallik, Co-leads: M. Bobylev, K. Katti, G. Du, New Hire at NDSU  
[Approved by NSF 9/8/21] |
| Objective 1.3c(Activity 2): Design, preparation, and testing of pH-responsive polymer nanoparticles | Prepare 3 polymers, characterize nanoparticles  
Y1 ACTUAL: Prepared and characterized 3 pH-responsive polymer nanoparticles | Demonstrate drug release in the tumoroids on hard and soft scaffolds  
Y2 PROGRESS: No progress as the investigator redirected his efforts in preparing soft scaffolds | The nanoparticles release drugs within 2 hours in the hard and soft scaffolds (critical) | Release drugs kill at least 80% of the breast and prostate cancer cells on the scaffolds (critical) | Released drugs kill at least 80% of the cancer cells in the patient-derived model | Lead: M. Quadir, Co-leads: S. Mallik, K. Katti, G. Du, New Hire at NDSU  
[Approved by NSF 9/8/21] |
<table>
<thead>
<tr>
<th>Objective 2.1a (Activity 1)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tr>
<td></td>
<td>July 1, 2020-June 30, 2021</td>
<td>July 1, 2021-June 30, 2022</td>
<td>July 1, 2022-June 30, 2023</td>
<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
</tr>
<tr>
<td>Objective 2.1a: Increase CCBSE capacity/expertise in basic and translational use of in vivo-like 3D cell cultures (Activity 1: Validate multiple soft and hard tissue scaffolds)</td>
<td>Validation SOP creation using existing materials and 2D culture</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Color Key:</td>
<td>Objective 2.1a (Activity 1 - cont.)</td>
<td>Protocol database creation based on validation</td>
<td>Completion of secondary validation on provided 1st generation materials</td>
<td>Completion of quaternary validation, provided 2nd generation materials</td>
<td>Completion of quaternary validation, provided 2nd generation materials</td>
</tr>
<tr>
<td>Behind Schedule</td>
<td>Objective 2.1a (Activity 1 - cont.)</td>
<td>Y1 ACTUAL: Database created and protocols are being uploaded by the team.</td>
<td>Y2 PROGRESS: Validation complete since first generation materials failed initial screening.</td>
<td>Completion of quaternary validation, provided 2nd generation materials</td>
<td>Completion of quaternary validation, provided 2nd generation materials</td>
</tr>
<tr>
<td>On Track / In Progress</td>
<td>Objective 2.1a (Activity 1 - cont.)</td>
<td>Completion of preliminary validation of provided first generation materials (baseline viability and growth, initial hypoxic response and EMT/EMT signatures) e.g., 85% similar to 2D and matrigel cultures</td>
<td>Completion of tertiary validation, provided 1st generation materials</td>
<td>Completion of quaternary validation, provided 1st generation materials</td>
<td>Completion of quaternary validation, provided 1st generation materials</td>
</tr>
<tr>
<td>Ahead of Schedule / Complete</td>
<td>Objective 2.1a (Activity 1 - cont.)</td>
<td>Data exchange with Materials Design and Computational Approaches Pillars</td>
<td>Continued data exchange with Materials Design and Computational Approaches Pillars</td>
<td>Continued data exchange with Materials Design and Computational Approaches Pillars</td>
<td>Continued data exchange with Materials Design Pillar and Computational Approaches Pillar</td>
</tr>
<tr>
<td>N/A or Not yet started</td>
<td>Objective 2.1a (Activity 2: Generate heterogeneous multicellular 3D cultures with improved in vivo-like tissue)</td>
<td>A protocol for growth of multi-cellular cultures on provided hard and soft 1st generation materials</td>
<td>An optimized co-culture protocol for growth on provided hard and soft 1st generation materials</td>
<td>N/A</td>
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<tr>
<th>Objective 2.1a (Activity 2 - cont.)</th>
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<td>July 1, 2024-June 30, 2025</td>
</tr>
<tr>
<td>N/A</td>
<td>Y1 ACTUAL: Data exchange initiated and is continuing.</td>
<td>Y2 PROGRESS: Data exchange is continuous and will not be complete until year ends.</td>
<td>Continued data exchange with Materials Design and Computational Approaches Pillars</td>
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- **Objective 2.1a (Activity 2 - cont.):** Develop a high-throughput system that combines materials and modeling to create an improved culture paradigm for human in vivo relevance.
- **Objective 2.1a (Activity 3):** Establish phenotype marker criteria (e.g., morphology and proteins) for co-cultures on provided hard and soft first generation materials to compare to in vivo tumors.
- **Objective 2.1a (Activity 4):** Establish phenotype marker criteria (e.g., morphology and proteins) for co-cultures on provided hard and soft second generation materials to compare to in vivo tumors.
- **Objective 2.1a (Activity 5):** Establish phenotype marker criteria (e.g., morphology and proteins) for co-cultures on provided hard and soft third generation materials to compare to in vivo tumors.

### Year 1
- **Y1 ACTUAL:** Data exchange initiated and is continuing.
- **Y2 PROGRESS:** Data exchange is continuous and will not be complete until year ends.

### Year 2
- **Y2 PROGRESS:** Data exchange is continuous and will not be complete until year ends.

### Year 3
- **Y3 PROGRESS:** Data exchange is continuous and will not be complete until year ends.

### Year 4
- **Y4 PROGRESS:** Data exchange is continuous and will not be complete until year ends.

### Year 5
- **Y5 PROGRESS:** Data exchange is continuous and will not be complete until year ends.
<table>
<thead>
<tr>
<th>Objective 2.1a (Activity 4: Assist non-RU campuses involved in Activity 1 with compliance protocols) [New activity - Approved by NSF on 7/28/21]</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Assist non-RU campuses involved in this activity with compliance protocols and MTAs. Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all campuses. [Approved by NSF on 7/28/21]</td>
<td>Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all non-RU campuses. [Approved by NSF on 7/28/21]</td>
<td>Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all non-RU campuses. [Approved by NSF on 7/28/21]</td>
<td>Ensure that all necessary compliance protocols (IBC, MTAs) are in place at all non-RU campuses. [Approved by NSF on 7/28/21]</td>
<td>Leads: K. Katti, C. Combs, A. Dhasarathy, J. Wilkinson</td>
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</tbody>
</table>

Y2 PROGRESS: completed. IBC compliance is not required by NSF for non-RU campuses.
### Objective 3.1: Create an evolutionary in-silico platform to predict tumor growth (Activity 1: Machine learning to understand cellular and materials connections)

#### Year 1 (July 1, 2020–June 30, 2021)
- **Bone site - Classification Accuracy**: ≥0.4
- **Primary site - Datasets generation from composite data sources for ML model training & identification of best performing ML algorithms**
- **Bone site - Datasets generation from composite data sources for ML model training & identification of best performing ML algorithms**

#### Year 2 (July 1, 2021–June 30, 2022)
- **Bone site - Classification Accuracy**: ≥0.5
- **Primary site - Datasets generation for the cellular growth-material formulation using data from experimentalists and other collaborators. Identification of high performing ML algorithms on image recognition for cell migration and clustering**

#### Year 3 (July 1, 2022–June 30, 2023)
- **Bone site - Classification Accuracy**: 0.6
- **Primary site - Determination of patterns & optimal properties via ML**

#### Year 4 (July 1, 2023–June 30, 2024)
- **N/A**

#### Year 5 (July 1, 2024–June 30, 2025)
- **N/A**

**Responsible parties**

**Color Key:**
- **Behind Schedule**
- **On Track / In Progress**
- **Ahead of Schedule / Complete**
- **N/A or Not yet started**
<table>
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<tr>
<td>Objective 3.1 (Activity 2 - cont.)</td>
<td>Objective 3.1 (Activity 2 - cont.)</td>
<td>Objective 3.1 (Activity 2 - cont.)</td>
<td>Objective 3.1 (Activity 2 - cont.)</td>
<td>Objective 3.1 (Activity 2 - cont.)</td>
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<tr>
<td>M6-Finite Element Modeling - Successful model development</td>
<td>M6-Finite Element Modeling - Successful model development</td>
<td>M6-Computational Fluid Dynamics - Multi-resolution CFD model for scaffold developed; Local distribution of shear stresses in complex geometries validated</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>Y1 ACTUAL: FEM model for the scaffold currently used by other pillars is complete</td>
<td>Y1 ACTUAL: Computational model for degrading scaffold under shear flows developed; Rate of degrading validated</td>
<td>Y2 PROGRESS: Simulations will be done in Y2</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td></td>
</tr>
<tr>
<td>C1-Ab-initio/DFT Bone site - Creation of reduced models for integrin domains, nanoclay, and polymers</td>
<td>C1-Ab-initio/DFT Bone site - Validation and improvement of reduced models for nanoclay and polymers interacting with integrin domains</td>
<td>C1-Ab-initio/DFT Bone site</td>
<td>C1-Ab-initio/DFT Bone site</td>
<td>C1-Ab-initio/DFT Bone site</td>
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</tr>
<tr>
<td>Y1 ACTUAL: Integrin molecular model is identified. Clay model to be used for the study has been developed</td>
<td>Y2 PROGRESS: Modeling is progressing</td>
<td>C2-Ab-initio/DFT Primary site - Building atomistic models to model bio-interfaces</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td>C2-Ab-initio/DFT Primary site</td>
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<tr>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td></td>
</tr>
<tr>
<td>C2-Ab-initio/DFT - Building atomistic models to model bio-interfaces</td>
<td>C2-Ab-initio/DFT - Building atomistic models to represent/model bio-interfaces</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td></td>
</tr>
<tr>
<td>Y1 ACTUAL: Integrin molecular model is identified.</td>
<td>Y2 PROGRESS: Modeling is in progress</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td>C2-Ab-initio/DFT Primary site</td>
<td>C2-Ab-initio/DFT Primary site</td>
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<tr>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td></td>
</tr>
<tr>
<td>C3-Molecular Dynamics - Successful model development of actin and depolymerization genes. Integrin on surfaces.</td>
<td>C3-Molecular Dynamics - Successful model development of actin and integrin from SMD</td>
<td>C3, C9, C10-Molecular Dynamics - Determine the mechanical properties of E-Cadherin junctions; Determine the mechanical properties of the integrin molecules on PCN and polymers</td>
<td>C11-Multibody dynamics simulations integrated with Finite Element Modeling - Successful development of multibody dynamics simulations model for cell migration</td>
<td></td>
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</tr>
<tr>
<td>Y1 ACTUAL: Both tasks are completed- actin results are published in a Journal paper</td>
<td>Y2 PROGRESS: The model development of actin and depolymerization genes is completed and the results will be submitted soon to a Journal. The integrin modeling is complete and simulations are ongoing.</td>
<td>C3, C9, C10-Molecular Dynamics - Determine the mechanical properties of the additional six integrin molecules on PCN and polymers</td>
<td>C3, C9, C10-Molecular Dynamics - Determine the mechanical properties of additional six integrin molecules on PCN and polymers</td>
<td>C11-Multibody dynamics simulations integrated with Finite Element Modeling - Successful development of multibody dynamics simulations model for cell migration</td>
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<td>Objective 3.1 (Activity 3 - cont.)</td>
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<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td></td>
</tr>
<tr>
<td>C4-Coarse Graining - CFD model of integrins developed; Integrins-PCN interfacial interactions captured by CG modeling</td>
<td>C4-Coarse Graining - Continued C4-Coarse Graining - Mechanical properties of interphases obtained with CG modeling for six integrins and varying interfacial design parameters</td>
<td>C4-Coarse Graining - Mechanical properties of interphases obtained with CG modeling for additional six integrins with extended interfacial design parameters</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Y1 ACTUAL: CG modeling framework of interface is established, and CG model of integrins is under development</td>
<td>Y2 PROGRESS: Awaiting MD results for parameter development.</td>
<td>C4-Coarse Graining - Mechanical properties of interphases obtained with CG modeling for six integrins and varying interfacial design parameters</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Objective 3.1 (Activity 3 - cont.)</td>
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<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td></td>
</tr>
<tr>
<td>C5-Finite Element Modeling - Successful development of FEM cell model</td>
<td>C5-Finite Element Modeling - Successful development of FEM cell model on substrate; Incorporation of adhesion parameters from C1 through C4, calibration with experiments</td>
<td>C5-Finite Element Modeling - Successful development of FEM cell model on substrate and Cell-Cell adhesion model; Incorporation of adhesion parameters from C1 through C4, calibration with experiments</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Y1 ACTUAL: FEM model of single cells is completed and nonlinear material properties are being evaluated</td>
<td>Y2 PROGRESS: Adhesion models under development.</td>
<td>C5-Finite Element Modeling - Successful development of FEM cell model on substrate and Cell-Cell adhesion model; Incorporation of adhesion parameters from C1 through C4, calibration with experiments</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Objective 3.1 (Activity 3 - cont.)</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Year 5</td>
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<td></td>
<td>July 1, 2020-June 30, 2021</td>
<td>July 1, 2021-June 30, 2022</td>
<td>July 1, 2022-June 30, 2023</td>
<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
</tr>
<tr>
<td>C6 - Computational Fluid Dynamics - Continuum representation of actin networks in cell membrane developed. Cell adhesion model developed and validated</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>T1 ACTUAL: The DPD model for actin network of cellular membrane has been published. The result has been published in a Journal article. The adhesion model is being developed.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>C6 - Computational Fluid Dynamics - Models for cell migration on a clay substrate developed and validated</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>T2 PROGRESS: A realistic model for actin cytoskeleton has been developed. The migration model is being validated.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>C6 - Computational Fluid Dynamics - Using measures such as cell density and alignment to validate CFD models for cellular migration on the surface of scaffold</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>C6 - Computational Fluid Dynamics - Full-scale simulation of cell migration in a bio-reactor. Resolution provides from millimeter to micrometer (three order of magnitudes). Flow distribution and shear stresses will be provided in all pores of the scaffold</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Objective 3.1 (Activity 4: Machine learning to develop the in-silico platform)

<table>
<thead>
<tr>
<th>Objective 3.1 (Activity 4 - cont.)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>July 1, 2020-June 30, 2021</td>
<td>July 1, 2021-June 30, 2022</td>
<td>July 1, 2022-June 30, 2023</td>
<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
<td></td>
</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: Obtain the knowledge to design new scaffold materials for bone site.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Bone Site: Obtain the knowledge to design new scaffold materials for bone site. Classification Accuracy &gt;=0.6</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Bone Site: - Obtain the knowledge to construct fundamental rules of designing new scaffold materials for bone site; Classification Accuracy &gt;=0.7: Generate simulated datasets under perturbed conditions and use those datasets to build ML models for cell migration; ML predictive models derived; ML model predictions validated against modeling and experiments</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Bone Site: - Obtain the knowledge to construct fundamental rules of designing new scaffold materials for bone site; Classification Accuracy &gt;=0.8: ML predictive models derived; ML model predictions validated against modeling and experiments; obtain the knowledge to construct fundamental rules of designing new scaffold materials for bone site</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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Objective 3.1 (Activity 4 - cont.)

<table>
<thead>
<tr>
<th>Objective 3.1 (Activity 4 - cont.)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<tr>
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<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
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</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: Obtain the knowledge to design new scaffold materials for primary site. Statistical and reduced order models will be developed to predict where cancer cells migrate and grow</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: Obtain the knowledge to design new scaffold materials for primary site.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: - Obtain the knowledge to construct fundamental rules of designing new scaffold materials for primary site</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: - Obtain the knowledge to construct fundamental rules of designing new scaffold materials for primary site</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>C12, C14, C15, C16, C18 - Primary Site: - Obtain the knowledge to construct fundamental rules of designing new scaffold materials for primary site</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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Objective 3.1 (Activity 5: Design Rules)

<table>
<thead>
<tr>
<th>Objective 3.1 (Activity 5: Design Rules)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>July 1, 2020-June 30, 2021</td>
<td>July 1, 2021-June 30, 2022</td>
<td>July 1, 2022-June 30, 2023</td>
<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
<td></td>
</tr>
<tr>
<td>Parameter-structure-property relationships drawn for design of materials; optimized design parameters identified; model design rules (geometry, material properties) for fluid flows in degradable scaffolds</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Optimization of updated design rules for materials and scaffolds - Parameter-structure-property relationships refined for design of materials; materials design parameters finalized; validate design rules and establish optimized ranges of parameters</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Lead: M. Fries, D. Katti, M. Hoffmann, L. Liu, J. Delhommelle

[Approved by NSF 8/27/21]
## Ongoing Metric Tracking for ND EPSCoR NSF RII Track-1: New Discoveries in the Advanced Interface of Computation, Engineering and Science (ND-ACES)

**Center for Cellular Biointerfaces in Science and Engineering (CCBSE)**

### Overall

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>July 1, 2020-June 30, 2021</strong></td>
<td><strong>July 1, 2021-June 30, 2022</strong></td>
<td><strong>July 1, 2022-June 30, 2023</strong></td>
<td><strong>July 1, 2023-June 30, 2024</strong></td>
<td><strong>July 1, 2024-June 30, 2025</strong></td>
</tr>
</tbody>
</table>

### Number of new hires

- N/A, one is anticipated to be hired in Y2 at UND and one will be recruited in Y2 at NDSU
- UND - 1 hired: Binglin Sui
- NDSU - search committee has been formed

### Total number of peer-review publications

- Reported Y1: 13 (should be 10)
- Rest of Y1: 3
- 4

### Number of collaborative peer-review publications (one senior author from two or more ND-ACES institutions)

- Reported Y1: 0
- Rest of Y1: 0
- 0

### Total number of conference presentations by CCBSE senior personnel

- Reported Y1: 15
- Rest of Y1: 14
- 1

### Total number of submitted research proposals (PI/Co-PI from two or more ND-ACES institutions)

- Reported Y1: 0
- Rest of Y1: 0
- 0

### Number of submitted collaborative proposals (two or more ND-ACES senior personnel)

- Reported Y1: 2 (should be 3)
- Rest of Y1: 6
- 1

### Number of CAREER proposals submitted

- Reported Y1: 0
- Rest of Y1: 0
- 0

### Total external research funding (million $) – 5-year total is cumulative

- Reported Y1: $0
- 12* proposals (one collaborative, one PROSPER) totaling $14,386,361 have been submitted
- *one of these 12 was a duplicate reported for $2,284,605; adjusted Y1 reported total for proposals submitted is $12,083,756
- UPDATE: one was awarded for $438,862
- Rest of Y1 award year: 4 proposals submitted with combined total of $1,780,000
- UPDATE: two have been awarded for a combined total of $155,998
- Y2 reporting year: 2 have been submitted for a combined total of $10,045,306; adjusted amount after deducting duplicate proposal for $2,284,605 reported in Y1 is $7,760,701
- 5-yr goal: $25M

### Number of projects funded with private sector partners

- Reported Y1: 0
- Rest of Y1: 0
- 0

### Number of graduate students trained (some may be counted in multiple years)

- Reported Y1: 30
- Rest of Y1: 21 (3 are STTAR interns)
- Est. 55 (16 are new students)

### Number of conference presentations by graduate students (oral and poster)

- Reported Y1: 7
- Rest of Y1: 42
- Restricted due to COVID-19
- 3

### Number of undergraduate students trained (some may be counted in multiple years)

- Reported Y1: 20
- Rest of Y1: 42
- (5 are REUs, 20 are STTAR interns, 10 are new students)
- Est. 65

### Number of conference presentations by undergraduate students (oral and poster)

- Reported Y1: 0
- Rest of Y1: 10
- Restricted due to COVID-19
- 0

### 5-yr goal:

- Number of new hires: 2
- Total number of peer-review publications: 140
- Number of collaborative peer-review publications: 70
- Total number of conference presentations by CCBSE senior personnel: 90
- Total number of submitted research proposals: 50
- Number of CAREER proposals submitted: 25
- Total external research funding: $25M
- Number of projects funded with private sector partners: 12
- Number of graduate students trained: 140
- Number of conference presentations by graduate students: 80
- Number of undergraduate students trained: 70
## Center for Cellular Biointerfaces in Science and Engineering (CCBSE)
### Overall

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1 (July 1, 2020-June 30, 2021)</th>
<th>Year 2 (July 1, 2021-June 30, 2022)</th>
<th>Year 3 (July 1, 2022-June 30, 2023)</th>
<th>Year 4 (July 1, 2023-June 30, 2024)</th>
<th>Year 5 (July 1, 2024-June 30, 2025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed Funding: seed funding support of $60,000 in Translational Research Initiative Project and an additional $101,655 in other research opportunity support – 5-year total is cumulative</td>
<td>Reported Y1:4 Emerging Areas/Seed Award Request for Proposals have been issued for $103,568</td>
<td>Deadline for new call for Emerging Areas/Seed proposals was Noon, September 1, 2021 Proposals have been issued for $141,465</td>
<td></td>
<td></td>
<td>5-yr goal: 761655</td>
</tr>
<tr>
<td>Number of CCBSE research participant meetings (to be scheduled monthly)</td>
<td>Reported Y1: 5 Rest of Y1: 5</td>
<td>6</td>
<td></td>
<td></td>
<td>5-yr goal: 50-60</td>
</tr>
</tbody>
</table>
## Objective 4.1a: Retain and advance CCBSE’s early career faculty and graduate students (Activity 1: Early Career Faculty Mentoring Program)

### Year 1
- **Start Date:** July 1, 2020-June 30, 2021
- **End Date:**
- **Objective:** Develop and implement monthly pillar meetings held between CCBSE research leads and faculty as a means of providing mentoring and guidance to ECF faculty. Information gathered from ECF about their mentorship and professional development needs and implemented.

### Y1 ACTUAL:
- Monthly pillar meetings held. Information gathered about ECF professional development needs and mentoring experiences. Baselines set for sense of belonging, work-self- efficacy, professional/technical transferable skills, and turnover intentions. In the process of establishing scholarly productivity baselines.

### Y2 PROGRESS:
- New Faculty hired at UND. Two EWD Personnel trained and prepared to facilitate mentor training for CCBSE personnel. Mentor Training will be implemented in Fall 2021. Follow-up Survey will be conducted in October 2021 and May 2022. Mentor-Mentee meetings will be held in Jan 2022. ECF will develop and implement a career development plan in Spring 2022.

### Year 2
- **Start Date:** July 1, 2021-June 30, 2022
- **End Date:**
- **Objective:** Develop list of ECF professional development activities available and disseminated to ECFs (alternatively develop and implement 2 PD activities); track engagement with PD activities with goal that at least 70% of ECF participate.

### Y1 ACTUAL:
- List of ECF PD activities developed and information about these activities disseminated to ECF via email. Need to develop a more effective process of tracking participation in said activities.

### Y2 PROGRESS:
- Continue to develop list of professional development activities and disseminate information about said activities. Developing PD outreach presentations, infographics, etc. based on baseline survey where information about ECF PD needs was gathered. Developing tracking mechanism for this activity.

### Year 3
- **Start Date:** July 1, 2022-June 30, 2023
- **End Date:**
- **Objective:** Develop list of ECF professional development activities available and disseminated to ECFs (alternatively develop and implement 3 PD activities); track engagement with PD activities with goal that at least 70% of ECF participate.

### Year 4
- **Start Date:** July 1, 2023-June 30, 2024
- **End Date:**
- **Objective:** Develop list of ECF professional development activities available and disseminated to ECFs (alternatively develop and implement 3 PD activities); track engagement with PD activities with goal that at least 70% of ECF participate.

### Year 5
- **Start Date:** July 1, 2024-June 30, 2025
- **End Date:**
- **Objective:** Develop list of ECF professional development activities available and disseminated to ECFs (alternatively develop and implement 3 PD activities); track engagement with PD activities with goal that at least 70% of ECF participate.
<table>
<thead>
<tr>
<th>Color Key</th>
<th>Objective 4.1a (Activity 3, cont. Student Research Training Groups (RTG))</th>
<th>Year 1 (July 1, 2020-June 30, 2021)</th>
<th>Year 2 (July 1, 2021-June 30, 2022)</th>
<th>Year 3 (July 1, 2022-June 30, 2023)</th>
<th>Year 4 (July 1, 2023-June 30, 2024)</th>
<th>Year 5 (July 1, 2024-June 30, 2025)</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behind Schedule</td>
<td>Objective 4.1a (Activity 3, cont. Student Research Training Groups (RTG))</td>
<td>Y1 ACTUAL: 32% of the 59 RTG students published</td>
<td>80% of students present at one regional/national meeting and 75% of students publish (first author) paper prior to graduation</td>
<td>Y1 ACTUAL: 32% of the 59 RTG students published</td>
<td>Y2 PROGRESS: Data is being collected on # of students presenting work at a regional/national meeting. Data is being collected on # of students publishing a paper as first author</td>
<td>Y2 PROGRESS: Data is being collected on # of students presenting work at a regional/national meeting. Data is being collected on # of students publishing a paper as first author</td>
<td>Y2 PROGRESS: Data is being collected on # of students presenting work at a regional/national meeting. Data is being collected on # of students publishing a paper as first author</td>
</tr>
<tr>
<td>Ahead of Schedule / Complete</td>
<td>Objective 4.1a (Activity 4a: Graduate Student Cyber-infrastructure)</td>
<td>CI assistantships awarded</td>
<td>2 CI GTAs awarded</td>
<td>2 CI GRAs awarded</td>
<td>2 CI GRAs hired</td>
<td>2 CI GRAs hired</td>
<td>Lead: S. Alemadi, A. Allard, M. Bobylev, C. Combs, M. Fries [Approved by NSF 8/27/21], N. Galt, K. Hartman, K. Hossain, K. Katti, M. Parker, S. Sletten, H. van Gijssel, B. Voels</td>
</tr>
<tr>
<td>N/A Not yet started</td>
<td>Objective 4.1a (Activity 4b: STEM Teaching Assistantship)</td>
<td>THIS PROGRAM HAS BEEN MOVED TO Y2 DUE TO COVID-19</td>
<td>3-4 STEM Teaching Assistants hired</td>
<td>Y2 PROGRESS: 0 applications for September 2021 Call; Next Call closes December 1, 2021. RFA open for Fall 2022 start; RFAs due 2/28/22</td>
<td>3-4 GTAs hired</td>
<td>3-4 GTAs hired</td>
<td>3-4 GTAs hired</td>
</tr>
<tr>
<td></td>
<td>Objective 4.1b: Engage/ develop 25-30 student interest in biosciences (Activity 1: Distributed Research Experience for Undergraduates (dREU))</td>
<td>8 dREU students complete research, and present at the state conference and undergraduate research showcase</td>
<td>Y2 PROGRESS: 1 dREU student for Spring 2022. Summer applications close on December 1, 2021. RFA reopened, open until funds exhausted</td>
<td>12 dREU students complete research and present at the state conference and undergraduate research showcase</td>
<td>12 dREU students complete research and present at the state conference and undergraduate research showcase</td>
<td>8 REU students complete research, and present at the state conference and undergraduate research showcase; 50% of REU students matriculate to graduate/professional school; 8 REU students in graduate/professional school</td>
<td>Leads: S. Alemadi, S. Sletten</td>
</tr>
<tr>
<td></td>
<td>Objective 4.1b (Activity 2: Engage grade 6-12 students in NATURE/Sunday Academy)</td>
<td>SET baseline</td>
<td>Y2 PROGRESS: NATURE Sunday Academy runs from October 2021- March 2022</td>
<td>Meets/exceed prior year's numbers</td>
<td>Meets/exceed prior year's numbers</td>
<td>Meets/exceed prior year's numbers</td>
<td>Leads: R. Navarro, J. Blonigen [Approved by NSF 8/27/21], S. Alemadi</td>
</tr>
<tr>
<td></td>
<td>Objective 4.1b (Activity 2: Training of Rural and tribal K-12 teachers in the use of PROSPER bioscience modules)</td>
<td>Module 1 developed</td>
<td>Y2 PROGRESS: Two cellular modules are being finalized in Fall 2021. Training events for both modules are being planned for Spring 2022</td>
<td>Meets/exceed prior year's training numbers via Lesson plan 1 and 2</td>
<td>Meets/exceed prior year's training numbers</td>
<td>100 total teachers trained over 5-year period</td>
<td>Leads: R. Summers, S. Alemadi</td>
</tr>
<tr>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Year 5</td>
<td>Responsible parties</td>
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<td>July 1, 2020-June 30, 2021</td>
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<td>July 1, 2022-June 30, 2023</td>
<td>July 1, 2023-June 30, 2024</td>
<td>July 1, 2024-June 30, 2025</td>
<td>Leads: R. Summers, S. Alemadi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective 4.1b (Activity 4: Pre-service STEM teachers will engage in rural/tribal student teaching experiences)</td>
<td>THIS PROGRAM HAS BEEN MOVED TO Y2 DUE TO COVID-19</td>
<td>2 pre-service teachers trained each semester (Fall/Spring); 2 pre-service teachers placed each semester</td>
<td>2 pre-service teachers trained each semester; 2 pre-service teachers placed each semester</td>
<td>2 pre-service teachers trained each semester; 2 pre-service teachers placed each semester</td>
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<tr>
<td>Y2 PROGRESS: 2 student teachers placed for Fall 2021 and 1 selected for Spring 2022</td>
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## Objective 5.1: Increase the participation of all groups engaged in bioscience education and careers

### Activity 1: TCU bioscience students will conduct outreach in their local K-12 schools via bioscience lesson plans

**Year 1**
- **July 1, 2020–June 30, 2021**: Create five ND-ACES related bioscience lesson plans. 2 TCU students deliver生物科技 lessons to 40 students.

**Year 2**
- **July 1, 2021–June 30, 2022**: 5 additional ND-ACES related STEM lesson plans. 2 TCU students deliver Biology lessons to 60 students.

**Year 3**
- **July 1, 2022–June 30, 2023**: 5 additional ND-ACES related STEM lesson plans. 2 TCU students deliver STEM lessons to 60 students.

**Year 4**
- **July 1, 2023–June 30, 2024**: 5 additional ND-ACES related STEM lesson plans. 2 TCU students deliver STEM lessons to 280 students over 5 years.

### Activity 2: Support engagement in biosciences at the B.S. level (particularly for AI)

**Year 1**
- **Planning begins November 2021**: Planning begins November 2021. 4 NATURE students completing STEM degrees.

**Year 2**
- **Counts will occur in January 2022, provided K-12 facilities are open to TCU students**: 5 students will have received research assistantships as seniors and 1 student will have completed their B.S. degree.

**Year 3**
- **Exhausted**: 5 additional students will have received research assistantships as juniors and seniors and 1 additional student will have completed their B.S. degree.

**Year 4**
- **Counts will occur in January 2022, provided K-12 facilities are open to TCU students**: 10 students will have received research assistantships as juniors and seniors and 1 additional student will have completed their B.S. degree.

**Year 5**
- **Counts will occur in January 2022, provided K-12 facilities are open to TCU students**: 20 students will have received research assistantships as juniors and seniors and 1 additional student will have completed their B.S. degree.

<table>
<thead>
<tr>
<th>Year</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze</td>
</tr>
<tr>
<td>2</td>
<td>Leads: V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>3</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze</td>
</tr>
<tr>
<td>4</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>5</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
</tbody>
</table>

### Activity 3: TCU bioscience faculty will be offered research techniques and equipment training

**Year 1**
- **September 2021 Call**: TCU faculty were asked not to travel during the COVID pandemic. One TCU faculty will visit CCBSE collaborators and learn a research technique/expand knowledge in a Pillar area.

**Year 2**
- **No application in the September 2021 Call**: A new deadline was added for December 1, 2021. RFA reopened; open until funds exhausted. One additional TCU faculty will visit CCBSE collaborators and learn a research technique/expand knowledge in a Pillar area.

**Year 3**
- **5 middle school lesson plans developed over 5 years**: One additional TCU faculty will visit CCBSE collaborators and learn a research technique/expand knowledge in a Pillar area.

**Year 4**
- **5 additional ND-ACES related STEM lesson plans developed over 5 years**: Five collaborative projects using the new skills over 5 years.

**Year 5**
- **5 middle school lesson plans developed over 5 years**: Five collaborative projects using the new skills over 5 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze</td>
</tr>
<tr>
<td>2</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>3</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>4</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>5</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
</tbody>
</table>

**Color Key:**
- **Ongoing Metric Tracking for ND EPSCoR NSF RII Track-1: New Discoveries in the Advanced Interface of Computation, Engineering and Science (ND-ACES)**

**Behind Schedule**
- **N/A or Not yet started**

**On Track / In Progress**
- **Color Key: Objective 5.1 (Activity 1, cont.)**

**N/A or Not yet started**
- **Objective 5.1 (Activity 4: TCU camps for middle and high school kids at the four partnering TCUs)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leads: V. Doze, NATURE Coordinators</td>
</tr>
<tr>
<td>2</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze</td>
</tr>
<tr>
<td>3</td>
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</tr>
<tr>
<td>5</td>
<td>Leads: J. Ostrom-Blonigen [Approved by NSF 8/27/21], V. Doze, NATURE Coordinators</td>
</tr>
</tbody>
</table>
### Ongoing Metric Tracking for ND EPSCoR NSF RII Track-1: New Discoveries in the Advanced Interface of Computation, Engineering and Science (ND-ACES)

#### PROSPER Element: Partnerships and Collaborations

<table>
<thead>
<tr>
<th>Objective 6.1a (Activity 2: Support participant interactions with external collaborators with travel funding)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline established by senior personnel</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>20% increase in meaningful collaborations over prior year</td>
<td>Meeting the numbers outlined</td>
<td>Meeting the numbers outlined</td>
<td>Meeting the numbers outlined</td>
<td>Meeting the numbers outlined</td>
<td>Meeting the numbers outlined</td>
</tr>
<tr>
<td>Y1 ACTUAL: 29 collaborations with 44 academic institutions identified, 23 domestic and 1 international</td>
<td>Y2 PROGRESS: Survey being calculated now</td>
<td>Y2 PROGRESS: Travel RFP to be issued in November 2022</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Color Key

- **Ongoing**: Metric tracking for ND-ACES.
- **Complete**: Y2 PROGRESS: Target is complete.
- **Ahead of Schedule**: Y2 PROGRESS: Target is complete prior to target date.
- **Behind Schedule**: Y2 PROGRESS: Target is behind schedule.
- **N/A or Not yet started**: Y2 PROGRESS: Not yet started.

---

**Objective 6.1a (Activity 3: Support interactions with external collaborators)**

<table>
<thead>
<tr>
<th>Objective 6.1a (Activity 3: Support interactions with external collaborators)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline established using CDRs, MTAs, other efforts (grant applications, etc.)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Increase in partnership engagement or partner activities over baseline - measured by the provision of valuable resources (as defined in 4.7, Tactic 2)</td>
<td>Increase in partnership engagement or partner activities over the prior year measured by the increased provision of valuable resources</td>
<td>Increase in partnership engagement or partner activities over the prior year measured by the increased provision of valuable resources</td>
<td>Increase in partnership engagement or partner activities over the prior year measured by the increased provision of valuable resources</td>
<td>Increase in partnership engagement or partner activities over the prior year measured by the increased provision of valuable resources</td>
<td>Increase in partnership engagement or partner activities over the prior year measured by the increased provision of valuable resources</td>
</tr>
<tr>
<td>Y1 ACTUAL: 5 instate partnerships with 2 organizations</td>
<td>Y2 PROGRESS: Workshops addressing prior year's support needs have been identified</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Objective 6.1b (Activity 2: Support Partnerships)**

<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 2: Support Partnerships)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of ND support efforts based on baseline data and determination of measures (if participants) # of inquiries following communication effort, etc.)</td>
<td>Increased engagement by meeting of prior year's identified support efforts</td>
<td>Increased engagement by meeting of prior year's identified support efforts</td>
<td>Increased engagement by meeting of prior year's identified support efforts</td>
<td>Increased engagement by meeting of prior year's identified support efforts</td>
<td>Increased engagement by meeting of prior year's identified support efforts</td>
</tr>
<tr>
<td>Y1 ACTUAL: Provision for informational workshops in Y2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Objective 6.1b (Activity 3: Identify ND companies using tools like NAICS)**

<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 3: Identify ND companies using tools like NAICS)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Completed prospectus</td>
<td>Prospectus updated</td>
<td>Prospectus updated</td>
<td>Prospectus updated</td>
<td>Prospectus updated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Objective 6.1b (Activity 4: Identify partnership opportunities)**

<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 4: Identify partnership opportunities)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Identify 3-5 opportunities, 1-3 of which are actionable</td>
<td>Identify 3-5 opportunities, 1-3 of which are actionable</td>
<td>Identify 3-5 opportunities, 1-3 of which are actionable</td>
<td>Identify 3-5 opportunities, 1-3 of which are actionable</td>
<td>Identify 3-5 opportunities, 1-3 of which are actionable</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**Objective 6.1b (Activity 5: Identify IP protocols at all 10 institutions)**

<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 5: Identify IP protocols at all 10 institutions)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% protocols identified</td>
<td>100% protocols identified</td>
<td>100% protocols identified</td>
<td>100% protocols identified</td>
<td>100% protocols identified</td>
<td>100% protocols identified</td>
</tr>
<tr>
<td>Y1 ACTUAL: Protocols identified at 2 RUs, 1 MCU, and 3 PUS, which equates to 6 of 10 participating institutions (60%)</td>
<td>Regarding the handling joint IP and updated protocol document</td>
<td>Up to date protocol document and joint IP agreement</td>
<td>Up to date protocol document and joint IP agreement</td>
<td>Up to date protocol document and joint IP agreement</td>
<td>Up to date protocol document and joint IP agreement</td>
</tr>
<tr>
<td>Y2 PROGRESS: There are currently no protocols in place for invention IP at the TCU or Tribal level; however 2 of 4 TCUs are actively working on establishing this type of protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Objective 6.1b (Activity 6: Understand how tribal laws impact IP disclosures)**

<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 6: Understand how tribal laws impact IP disclosures)</th>
<th>Year 1 July 1, 2020-June 30, 2021</th>
<th>Year 2 July 1, 2021-June 30, 2022</th>
<th>Year 3 July 1, 2022-June 30, 2023</th>
<th>Year 4 July 1, 2023-June 30, 2024</th>
<th>Year 5 July 1, 2024-June 30, 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>60% identified</td>
<td>100% identified</td>
<td>Survey developed and released</td>
<td>Survey results compiled</td>
<td>Results published</td>
<td></td>
</tr>
<tr>
<td>Y1 ACTUAL: 5 identified. The COVID pandemic prevented travel and TCU personnel were busy with the change in online delivery</td>
<td>Y2 PROGRESS: 2 of 4 TCUs are working within their tribal communities to determine these impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Responsible parties**

- Year 1: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen
- Year 2: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen
- Year 3: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen
- Year 4: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen
- Year 5: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen

---

**Disclosure**

- 12/13/2021
- Understand how tribal laws impact IP disclosures
- Objective 6.1a (Activity 2: Support participant interactions with external collaborators with travel funding)
- Objective 6.1b (Activity 6: Understand how tribal laws impact IP disclosures)

---

**Color Key**

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- **Behind Schedule**: Y2 PROGRESS: Target is behind schedule.
- **N/A or Not yet started**: Y2 PROGRESS: Not yet started.
<table>
<thead>
<tr>
<th>Objective 6.1b (Activity 7: Identify commercialization protocols at all 10 participating institutions)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Y1 ACTUAL</strong>: Protocols identified at 2 RUs, 1 MCU, and 3 PUIs, which equals to 6 of 10 participating institutions (60%)</td>
<td>50% protocols identified</td>
<td>Y2 PROGRESS: 2 of 4 TCUs surveyed. There are currently no protocols in place at either institution for invention IP at the TCU or Tribal level</td>
<td>Updated protocol document, &gt;50% participants enrolled or taking part in SHARPhub activities, and 1 invention disclosure</td>
<td>Updated protocol document and &gt;50% participants enrolled or taking part in SHARPhub activities, 3+ invention disclosures, and 2+ provisional patents</td>
<td>Updated protocol document and &gt;50% participants enrolled or taking part in SHARPhub activities, 3+ invention disclosures, 2+ provisional patents, and 2+ patents</td>
<td></td>
</tr>
<tr>
<td>25% of CCBSE participants enrolled in SHARPhub</td>
<td>Y1 ACTUAL: Five of 27 CCBSE researchers enrolled in SHARPhub = 19%</td>
<td>Y2 PROGRESS: Five of 28 CCBSE researchers enrolled in SHARPhub = 18%</td>
<td></td>
<td></td>
<td>Lead: K. Rusch, Co-leads: J. Mihelich, J. Ostrom-Blonigen, identified subject matter experts at NDSU and UND</td>
<td></td>
</tr>
<tr>
<td><strong>Objective 6.1b (Activity 8: Identify workshops / conferences to attend and mentoring opportunities (SHARPhub, USPTO Denver, SBIR, etc.)</strong></td>
<td>Y1 ACTUAL: Delayed due to COVID pandemic</td>
<td>Y2 ACTUAL: One workshop was held in October and 2 more workshops have been scheduled for Y2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y1 ACTUAL: Delayed due to COVID pandemic</td>
<td>Y2 PROGRESS: Will reassess this metric following 3 workshops</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversation with 1 of 4 states</td>
<td>Conversation with all states</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objective 6.1b (Activity 9: Based on other activities, determine potential funding possibilities with other SHARPhub EPSCoR states [KS, NE, OK, SD])</strong></td>
<td>Y1 ACTUAL: Delayed due to COVID pandemic</td>
<td>Y2 PROGRESS: Will reassess this metric following 3 workshops</td>
<td>List of action items for 5 states</td>
<td>States continue to be engaged</td>
<td>1-3 sustainable goals for at least 3 of the 5 states</td>
<td>Possible partners: EPSCoR offices in KS, NE, OK, and SD</td>
</tr>
</tbody>
</table>

Possible partners (ND entities): Bismarck-Manitou Development Assoc., Campus Career Centers, Innovate ND, Jamestown/ Stutsman Development Corp., Minot Economic Development Corp., NDSU EDA Makerspace

Possible partners (SD entities):
## Ongoing Metric Tracking for ND EPSCoR NSF RII Track-1: New Discoveries in the Advanced Interface of Computation, Engineering and Science (ND-ACES)

### PROSPER Element: Communication and Dissemination

<table>
<thead>
<tr>
<th>Objective 7.1a: Provide clear communication between all participants (Activity 1: Facilitate communication through regular meetings)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting attendance</td>
<td>Meeting attendance</td>
<td>Meeting attendance</td>
<td>Meeting attendance</td>
<td>Meeting attendance</td>
<td>Meeting attendance</td>
<td>Leads: Z. Majdik, C. Shovkoplyas</td>
</tr>
</tbody>
</table>

### Behind Schedule

- **Objective 7.1a:** At least monthly outreach to participants, stakeholders, and citizens
  - **Y1 ACTUAL:** 12 newsletters
  - **Y2 PROGRESS:** 6 newsletters

### On Track / In Progress

- **Objective 7.1b:** Inform and educate stakeholders (Activity 1: Populate website and social media with relevant public-facing content)
  - **Y1 ACTUAL:** baseline established
  - **Y2 PROGRESS:** N/A until end of Y2

### Ahead of Schedule / Complete

- **Objective 7.1b:** Needs research products, sessions begin in year two
  - **Y1 ACTUAL:** 5 sessions per year completed
  - **Y2 PROGRESS:** 6 sessions per year completed

### N/A or Not yet started

- **Objective 7.1c:** 2 workshops planned annually. Workshops begin year 2
  - **Y1 ACTUAL:** 2 planned
  - **Y2 PROGRESS:** planned

### Further Details

- **Objective 7.1c:** Annual conference with attendees from each of the participating campuses.
  - **Y1 ACTUAL:** 1 annual conference, all participating institutions
  - **Y2 PROGRESS:** planned for April 22 conference

- **Objective 7.1c:** Science cafes planned annually.
  - **Y1 ACTUAL:** 1 science cafe

---

Meetings

<table>
<thead>
<tr>
<th>Year</th>
<th>Meeting Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>July 1, 2020-June 30, 2021</td>
</tr>
<tr>
<td>Year 2</td>
<td>July 1, 2021-June 30, 2022</td>
</tr>
<tr>
<td>Year 3</td>
<td>July 1, 2022-June 30, 2023</td>
</tr>
<tr>
<td>Year 4</td>
<td>July 1, 2023-June 30, 2024</td>
</tr>
<tr>
<td>Year 5</td>
<td>July 1, 2024-June 30, 2025</td>
</tr>
</tbody>
</table>

### Leads:

- Z. Majdik, C. Shovkoplyas
### Year 1

<table>
<thead>
<tr>
<th>Metric</th>
<th>Projected</th>
<th>ACTUAL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total meetings</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAB meetings</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCU visits</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual conferences</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Y1 ACTUAL:** Due to the COVID pandemic, these meetings were changed to a virtual format. Met with 4 TCU president.

**Y2 PROGRESS:** 3 of 4 TCU meetings are complete. Last annual TCU visit to be completed in November 2021.

**Y3 PROGRESS:** 1 conference - held virtually due to COVID-19.

**Y4 PROGRESS:** 1 conference scheduled for April 6, 2022.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

### Year 2

<table>
<thead>
<tr>
<th>Metric</th>
<th>Projected</th>
<th>ACTUAL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total meetings</td>
<td>12</td>
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</tr>
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<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCU visits</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual conferences</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Y2 ACTUAL:** Due to COVID pandemic, these meetings were changed to a virtual format. Met with 4 TCU president.

**Y2 PROGRESS:** 3 of 4 TCU meetings are complete. Last annual TCU visit to be completed in November 2021.

**Y3 PROGRESS:** 1 conference - held virtually due to COVID-19.

**Y4 PROGRESS:** 1 conference scheduled for April 6, 2022.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

### Year 3

<table>
<thead>
<tr>
<th>Metric</th>
<th>Projected</th>
<th>ACTUAL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total meetings</td>
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<td></td>
</tr>
<tr>
<td>TCU visits</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual conferences</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Y3 ACTUAL:** 1 conference - held virtually due to the COVID pandemic.

**Y3 PROGRESS:** Conference scheduled for April 6, 2022.

**Y4 PROGRESS:** 1 conference - held virtually due to the COVID pandemic.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

### Year 4

<table>
<thead>
<tr>
<th>Metric</th>
<th>Projected</th>
<th>ACTUAL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total meetings</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAB meetings</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCU visits</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual conferences</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Y4 ACTUAL:** 1 conference - held virtually due to the COVID pandemic.

**Y4 PROGRESS:** Conference scheduled for April 6, 2022.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

### Year 5

<table>
<thead>
<tr>
<th>Metric</th>
<th>Projected</th>
<th>ACTUAL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total meetings</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAB meetings</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCU visits</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual conferences</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Y5 ACTUAL:** 1 conference scheduled for April 6, 2022.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

**Y5 PROGRESS:** 1 conference scheduled for April 6, 2022.

**5-YEAR TOTAL:** 20 total meetings across the 5-year project.

**Total to date:** 7 meetings

---

**Color Key:**
- **N/A or Not yet started**
- **Behind Schedule**
- **On Track / In-Progress**
- **Ahead of Schedule / Complete**
<table>
<thead>
<tr>
<th>Metrics</th>
<th>Year 1 (July 1, 2020-June 30, 2021)</th>
<th>Year 2 (July 1, 2021-June 30, 2022)</th>
<th>Year 3 (July 1, 2022-June 30, 2023)</th>
<th>Year 4 (July 1, 2023-June 30, 2024)</th>
<th>Year 5 (July 1, 2024-June 30, 2025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ND-ACES Leadership meetings (to be scheduled quarterly)</td>
<td>Projected: 4 meetings</td>
<td>Projected: 4 meetings (this meeting was eliminated by a mitigation plan in August 2021)</td>
<td>N/A</td>
<td>N/A</td>
<td>15 meetings across the 5-year project; however, this meeting was eliminated by a mitigation plan in August 2021, which combined the Leadership meeting with the Management meeting</td>
</tr>
<tr>
<td>Y1 ACTUAL: 4 meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y2 PROGRESS: 1 meeting, then a mitigation plan was filed and approved by NSF to combine the Leadership Team with the Management Team. As a result, this is no longer a metric</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of ND-ACES All-Participant meetings (to be scheduled twice annually)</td>
<td>Projected: 2 meetings</td>
<td>Projected: 2 meetings</td>
<td>Projected: 2 meetings</td>
<td>Projected: 2 meetings</td>
<td>Projected: 2 meetings</td>
</tr>
<tr>
<td>Y1 ACTUAL: 2 ND-ACES All Participant meetings held (July 2020 and April 2021)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5-YEAR TOTAL: 10 meetings across the 5-year project</td>
</tr>
<tr>
<td>Y2 PROGRESS: 1 ND-ACES All Participant meeting held in October 8, 2021 (virtual) and 1 scheduled for April 5, 2022 (in-person)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total to date: 3 meetings</td>
</tr>
<tr>
<td>Number of CCBSE and PROSPER meetings (to be scheduled every other month)</td>
<td>Projected: 12 CCBSE and 6 PROSPER meetings</td>
<td>Projected: 12 CCBSE and 6 PROSPER meetings</td>
<td>Projected: 12 CCBSE and 6 PROSPER meetings</td>
<td>Projected: 12 CCBSE and 6 PROSPER meetings</td>
<td>Projected: 12 CCBSE and 6 PROSPER meetings</td>
</tr>
<tr>
<td>Y1 ACTUAL: 10 CCBSE and 6 PROSPER meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5-YEAR TOTAL: 25-30 meetings across the 5-year project</td>
</tr>
<tr>
<td>Y2 PROGRESS: 5 CCBSE and 2 PROSPER meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total to date: 14 CCBSE and 8 PROSPER meetings</td>
</tr>
</tbody>
</table>