

## Variations on Video: Proposal for a Collaborative Planning Grant

**Lead Institution: Indiana University**

**Partner: Northwestern University**

### 1. Assessment of Need

Digital audio and video are becoming increasingly important to institutions of higher education, and the management of media collections is becoming an important function for academic libraries. Digital media are being generated through a diverse set of activities, including digitization of library and archive collections, licensing of third-party digital audio and video materials, born-digital capture of university performances and events, classroom capture, student projects, and university public relations efforts. Faculty and student expectations for digital media are rising based on experience with online services such as YouTube and iTunes and with personal video capture devices such as solid-state video cameras and editing tools such as iMovie.

Academic libraries and their host institutions have needs for distributing audio and video through a variety of different venues, depending on the nature of the users and use. Downloadable podcasts, YouTube, and iTunes U are appropriate for video which may be made available for open access and use. However, access to a large percentage of institutions' digital media holdings must be restricted for compliance with copyright law, third-party license restrictions, or ethical considerations. These restrictions may be based on campus location, status of the user's affiliation with the university, course enrollment, and various other factors.

In addition, user needs for working with digital media vary depending on the nature of the content (e.g. music, theater performance, classroom capture, cinema), the discipline (e.g. anthropology, musicology, film studies), and the nature of the use (e.g. close study vs. classroom presentation). In some cases, very high quality audio or video are required, of the sort that can be supported via high-performance campus networks and Internet2. In other cases, users may require tools with specific functionality for segmenting and annotating video, viewing transcripts of spoken elements, or for creating playlists of relevant segments.

Several commercial services have emerged to support various subsets of the digital video distribution functionality required by colleges and universities, but they generally have not been flexible enough to support the full set of needs of an institution for media management and delivery, or even the needs of only libraries and archives. A few open source or community source projects have emerged to support portions of the digital media production workflow, such as the Mellon-funded Opencast Matterhorn<sup>1</sup> project, which focuses on classroom lecture capture and production. However, no open tool exists that truly serves the needs of academic libraries and the higher education enterprise for managing access to streamed video and audio collections and enabling their use by students and faculty.

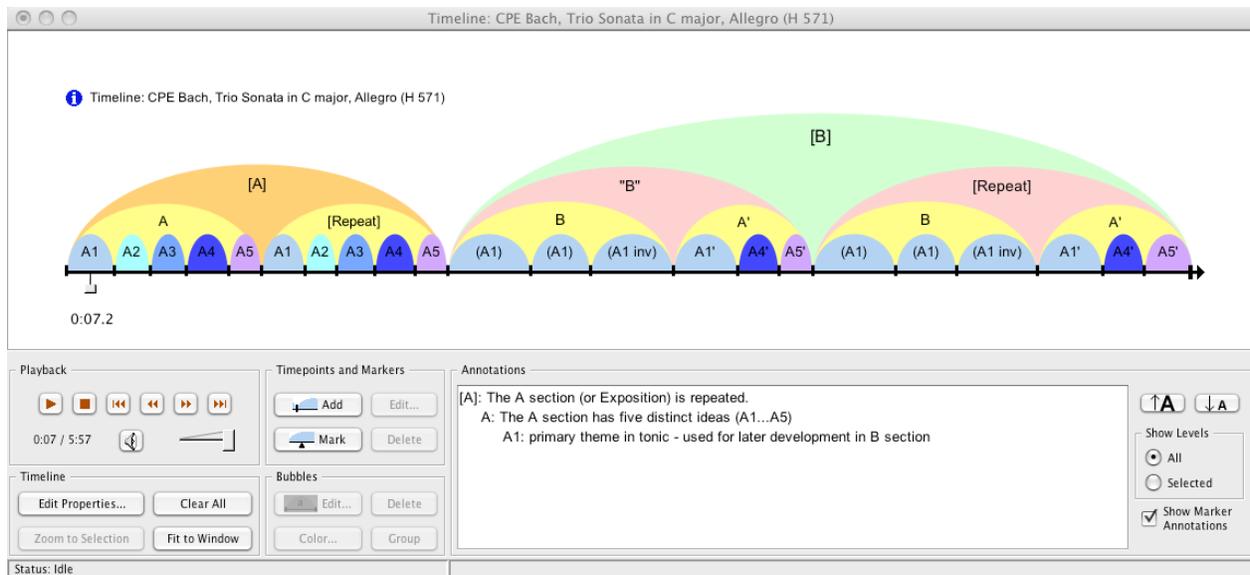
### Variations

The *Variations* digital music library and learning system was developed by Indiana University (IU) with support from a Digital Libraries Initiative – Phase 2 grant from the National Science Foundation and National Endowment for the Humanities in 2000-2005<sup>2</sup> and a National Leadership Grant from the Institute

<sup>1</sup> <http://www.opencastproject.org/>

<sup>2</sup> <http://variations2.indiana.edu/research/>

of Museum and Library Services in 2005-2009.<sup>3</sup> Building on IU's past experience in creating the original *VARIATIONS*,<sup>4</sup> one of the world's first music and streaming media digital library systems, the current Variations system offers a complete environment in which students and faculty can discover, listen to, view, annotate, and interact with music in both streaming audio and scanned score formats. Variations supports a flexible access control system that is adaptable to local policies, as well as end-user tools useful in teaching, learning, and research, including tools for saving and annotating bookmarks within audio recordings, creating playlists of audio segments from multiple recordings, and creating annotated audio "timelines" (see below).



With support from IMLS, IU released Variations as free open source software in February 2009 under a BSD license, and the system is available for download at <http://variations.sourceforge.net/>. Variations is currently in production use at eight college and university libraries (Ohio State University, New England Conservatory of Music, University of Maryland, Haverford College, Bryn Mawr College, Swarthmore College, Dartmouth College, and the University of Miami), in addition to IU. The Variations team is aware of at least ten other institutions currently evaluating or piloting Variations, including Northwestern University.

Two of the most frequent questions that the Variations team has received from both current implementers and institutions evaluating the system are 1) whether Variations can support video collections in the same way that it supports audio and 2) whether the system can be scaled to support multiple audio and video collections across a library system or larger institution. We have found that many university-based libraries and archives are increasingly getting involved with digital video and video digitization efforts. Because of this, libraries are looking for a way to more easily manage this content and the workflows used to generate it, and to provide useful integration of library-based video collections into teaching and learning. They see Variations as providing a promising basis for much of this functionality, in the same way that it does now for music audio collections.

<sup>3</sup> <http://www.dlib.indiana.edu/projects/variations3/>

<sup>4</sup> <http://www.dlib.indiana.edu/variations/>

### **Indiana University**

Beyond Variations, the IU Digital Library Program has been involved in a wide variety of efforts both within and outside the university related to digital audio and video. The EVIA Digital Archive Project,<sup>5</sup> in which the IU Digital Library Program has been a partner, is a joint effort of Indiana University and the University of Michigan, with support from the Andrew W. Mellon Foundation. EVIA has developed workflows for scholarly contribution, annotation, and editing of video, along with software tools for video segmentation, annotation, and searching. The DLP was also a key partner in the Digital Audio Archives Project—an IMLS National Leadership Grant-supported effort led by Johns Hopkins University, which worked on developing efficient workflows for preservation-level digitization of audio collections and established a preservation audio digitization lab within the Cook Music Library at IU—and on Sound Directions,<sup>6</sup> a series of NEH-supported projects in partnership with Harvard University working to define best practices in the use of digital technologies for audio preservation. IU's University Information Technology Services is a build partner in the Opencast Matterhorn project, funded by the Mellon Foundation to develop an end-to-end, open source platform that supports the scheduling, capture, managing, encoding and delivery of educational audio and video content, focusing on classroom lecture capture.

A major survey of media collections on the IU Bloomington campus in 2009<sup>7</sup> identified over 80 campus units with collections of over 560,000 audio and video recordings and film reels or cores, 41% of which are either unique (one-of-a-kind) or rare, and recommended that the campus move forward on systematic digitization of these materials in order to assist with their preservation and improve access. IU's new strategic plan for information technology,<sup>8</sup> also developed in 2009, identifies media collection digitization and delivery services as a key area of need and recommended action.

### **Northwestern University**

Northwestern University (NU) has been providing audio and video digitization and delivery services to its community since the late 1990's. The University Library, in conjunction with partners in NU Information Technology, offers these services free of charge to faculty, and is currently responsible for some 35,500 streamed media assets. A substantial majority of these were prepared in response to specific faculty requests and are delivered by means of links from the campus course management system. Scholars from disciplines as diverse as Dance, Religion, Law, Education, and Industrial Engineering integrate video in their classes. Segments of feature films, recordings of Shakespeare and opera performances, and documentary works have all been employed in widely diverse ways by Northwestern scholars. Faculty in Northwestern's Bienen School of Music are particularly heavy users, and the Library has been in early stages of evaluating the current version of Variations for local deployment.

Like many other college and university libraries, Northwestern is experiencing an explosion of demand for digital video services from its faculty. Among the needs that have been articulated are the desire to integrate locally digitized with commercially licensed content, ability to create and share playlists, to create and export segments as portable files for presentation and other offline use, and desire for a full range of annotation, custom grouping and presentation tools. Northwestern's IT (NUIT) division is also in the process of

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<sup>5</sup> <http://www.eviada.org/>

<sup>6</sup> <http://www.dlib.indiana.edu/projects/sounddirections/>

<sup>7</sup> Casey, Mike. *Indiana University Bloomington Media Preservation Survey*, 2009.

[http://www.research.iu.edu/resources/media\\_preservation/](http://www.research.iu.edu/resources/media_preservation/)

<sup>8</sup> *Empowering People: Indiana University's Strategic Plan for Information Technology*, 2009, pp. 27-28.

[http://ep.iu.edu/ITSP2\\_Final\\_120408.pdf](http://ep.iu.edu/ITSP2_Final_120408.pdf)

developing a media publishing tool, MediaSpace, for faculty and staff to publish short locally created video and audio pieces to Blackboard and other distribution channels including YouTube, and iTunes U. Conversations about integrating library-managed and MediaSpace-managed content in the Fedora digital repository are underway.

With support from the Andrew W. Mellon Foundation, Northwestern recently completed a “Mounting Books” project to develop a workflow management and publishing system for digitized books. The Book Workflow Interface<sup>9</sup> software, released as open source in summer 2009, incorporates an engine to manage requests and digitization jobs, move page image files through the digitization and post-processing phases, combine them with their metadata and rights statements, perform file conversions and integrity checks, and publish digitized books via a Fedora repository. Northwestern is in the process of extending these workflow management and publishing systems to include the 75,000 images in the campus Digital Image Library. Its experience with these two projects will enhance Northwestern’s contributions to the Variations project, and will bring, in particular, a focus on workflow management, event monitoring and messaging, and server-based conversion services.

We propose to leverage the extensive experience of both IU and NU in digital audio and video services, alongside input from additional institutions with significant experience in these areas, to extend Variations to become a digital media management and delivery system that can serve the needs of other media collections and services within a library system or its larger home institution.

## 2. National Impact and Intended Results

The principal outcome of this project will be a detailed plan to build on an internationally-recognized streaming media management and delivery system, Variations, to support additional needs of college and university libraries for management and delivery of video collections for teaching, learning, and research.

A preliminary, but not exhaustive, list of potential functional and technical requirements to be explored for inclusion in this plan is given below.

- Extending Variations to support delivery of video content
- Adapting Variations to support Flash and other streaming platforms in addition to its current support for QuickTime Streaming
- Developing a baseline set of Web-based media access tools, including media player, playlists, and annotation, to support use cases across a variety of content types and disciplines
- Developing an embeddable version of the Variations media player to support delivery of content within various Web contexts
- Supporting audio and video delivery on the expanding array of capable devices, including mobile devices and tablet computers.
- Providing a simple metadata-based Web search interface for video and audio content
- Support for integration with existing and custom search interfaces for specific applications
- Support for open programming interfaces whenever possible, so that audio and video served by Variations may be delivered through other tools and user interfaces developed to be more specific to a particular need

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<sup>9</sup> <http://books.northwestern.edu/about>

- Support for integration with a wide variety of enterprise and cross-realm authentication and authorization schemes, including Shibboleth/InCommon
- Developing direct support for integration of Variations access-controlled media into course management systems, including Sakai, Moodle, and Blackboard
- Support for integration with Opencast Matterhorn for delivery of classroom video capture and use of Matterhorn tools
- Support for integration with Fedora and DSpace repositories for video preservation
- Support for integration with workflow management systems
- Support for integration with existing metadata repositories, including library catalogs, via SRU and other protocols
- Leveraging of existing and emerging open source tools as much as possible

We expect that this plan will be the basis for one or more funding proposals to appropriate federal agencies (likely including IMLS) and private foundations to support development of the system, and will be used to solicit needed multi-institutional commitment for local contributions to these funding proposals as well as the ongoing maintenance and development of the system in the future. For Variations to be successful as free software beyond a period of grant funding, a community of committed institutions willing to contribute financial and/or human resources on an ongoing basis must exist. By extending the usefulness of Variations to address a wider set of institutional needs, the possibilities of developing such a community increase substantially. During the course of the planning project, as well as the subsequent development project, we will continue to actively promote, support, and solicit new Variations implementers and contributors from both its traditional community of use (i.e., music libraries, music schools) and the extended community (libraries and college/university IT organizations with a variety of media distribution needs), and will develop a business plan for the ongoing development and support of Variations as a community source project.

The system to be developed with future funding will have national and international impact by enabling libraries, colleges, and universities to better manage their growing digital media collections; controlling access to items in these collections according to license agreements, copyright, and local institutional policies; and providing appropriate end-user tools and integration with other systems to support the effective use of digital media collections in teaching, learning, and research activities. The interest and demand that we have received from implementers and evaluators of Variations, as well as from additional institutions whom we have contacted in developing this proposal, demonstrate the significance of the issues that we are seeking to address with this project.

### **3. Project Design and Evaluation Plan**

#### **Project Goals**

The goals of this planning project are:

1. To engage a group of librarians and technologists from 5-6 colleges and universities, as well as several related international collaborative open source efforts, to identify key functional and technical needs for a digital media collections delivery and management system, as well as scope for such a system.
2. To conduct user research involving students, faculty, and librarians to inform functional needs for such a system

3. To conduct technical investigation, evaluation, and proof-of-concept development to inform the technical specifications
4. To develop a scope statement, functional requirements, technical requirements, and basic technical architecture for a digital media collections delivery and management system based on Variations
5. To form a partnership of 2-3 institutions to collaborate on the development and ongoing maintenance of this system, plus additional institutions to participate in testing and evaluation, with the intent of submitting one or more grant proposals in early 2011 to help fund development work.

### **Project Activities**

To achieve the goals listed above, we plan to engage in a number of project activities:

IU, with support from IMLS funding, will host a meeting in September or October 2010 inviting select librarians and technologists from IU, NU, and 5-6 additional college and university libraries and IT divisions with needs or existing experience in digital media collection management and delivery. At this meeting, we will seek input from the participants on functional and technical requirements for a video-enabled Variations system, as well as information on existing systems, tools, workflows, and experience in place at the participating institutions that might be leveraged as part of a development effort. These participants will serve as an ongoing informal advisory board and potential collaborators in development of later grant proposals.

IU and NU project staff will also contact past and current recipients of IMLS funding for development of digital audio and video projects, in order to incorporate their experiences into functional and technical requirements and explore whether any technology developed in these projects could be leveraged.

Simultaneously, project staff at IU, in consultation with staff at NU, will identify and test existing open source and commercial technologies related to digital audio/video management and delivery that might be useful in the architecture of a video-enabled Variations system.

From these efforts, project staff at IU and NU will collaborate to develop draft functional and technical requirements documents to be shared back to the project participants for feedback, through conference calls and online tools such as a listserv and Wiki. The Project Director and Partner Lead will also solicit involvement of planning project partners and potentially other institutions as partners in the submission of an IMLS National Leadership Grants project grant proposal and/or other federal or foundation grants in early 2011 to develop the system. The partners involved must have shared needs, technical requirements, and schedules, as well as commitment to provide matching funds and support for ongoing maintenance and development of the system.

### **Investigation of User Needs**

A major motivation for adding video support to Variations is to leverage the teaching and learning emphasis of Variations. The Variations audio teaching and learning tools such as annotatable bookmarks, the timeline tool, and the listening drill tool have been a strong factor in the adoption of Variations by other institutions. However, we should not assume that teaching and learning with video requires tools identical or analogous to those needed for teaching and learning with audio. The Variations audio tools were successfully developed by studying how faculty and students worked with audio recordings in an educational context. Strong support for existing pedagogical practice with online tools has sped adoption of Variations.

To ensure that Variations support for pedagogical use of video is likewise successful, we plan to investigate current practices surrounding video use in higher education settings. In particular, we plan to observe classes, interview faculty, examine course assignments, and talk with students, so that we can build out a suite of interactive tools for video superior to the common video players on the web that allow only limited interaction and control. We anticipate that the requirements emerging from these user studies will differ significantly from the interaction required for other applications of video, such as entertainment viewing or the viewing of captured classroom lectures.

Functional and technical requirements will also be informed by a survey already planned for Spring 2010. This survey will collect data from colleges and universities regarding their current and planned delivery systems for and usages of streaming video. A presentation based on the results of this survey is being proposed to the EDUCAUSE 2010 conference.

### **Planning Participants**

At the time of this proposal, we have commitments from New York University, University of Miami, and Ohio State University to participate in the planning process in addition to IU and NU. At the start of the project in August 2010, we plan to identify approximately three more participating institutions. These participants will be selected by the Project Director and Partner Lead based on multiple criteria, including institution type (e.g. inclusion of both large research universities and small liberal arts colleges), having common needs for media collections management and delivery, and potential for involvement in a future development grant either as a development partner or testing and evaluation partner.

### **Relationship to Other Projects**

In addition to serving the needs of multiple institutions, we also want to engage and collaborate with related open source efforts as much as possible, both to avoid duplication of effort and to be able to potentially contribute new tools and services to these existing communities. To this end, we have commitments for participation in our planning process from both the DuraSpace<sup>10</sup> organization (representing the open source Fedora and DSpace repository systems) and from the Opencast Matterhorn project, noted earlier.

We also plan to engage with other appropriate open source efforts in the library and higher education communities as we move forward with planning for a video-enabled Variations system. These include, but are not limited to:

- The Sakai<sup>11</sup> collaboration and learning system, through which we plan to provide access to media for use in teaching and learning
- Kual Open Library Environment,<sup>12</sup> to integrate digital media collections management into larger library collections management functions
- Emerging integrated discovery systems, such as Blacklight<sup>13</sup> and the eXtensible Catalog,<sup>14</sup> through which Variations content should be discoverable alongside other collections.

Besides community-based projects, we will also engage in discussions with commercial entities involved with open source software in libraries and higher education, in order to explore the potential for use of their

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<sup>10</sup> <http://www.duraspace.org/>

<sup>11</sup> <http://www.sakaiproject.org/>

<sup>12</sup> <http://www.kuali.org/ole>

<sup>13</sup> <http://projectblacklight.org/>

<sup>14</sup> <http://www.extensiblecatalog.org/>

tools and services in the context of Variations. These include Kaltura,<sup>15</sup> which has developed a number of open source components supporting Web-based video, and open source software support providers such as rSmart, Unicon, and LibLime.

### **Evaluation Plan**

The outcome of the early phases of work and the partners meeting in September or October 2010 will be a set of functional and technical requirements for a video-enabled Variations system, as well as a complete matrix indicating how its features will integrate with and complement other systems such as Opencast and Sakai. These instruments will be integrated into the interviews with potential faculty and student users, and will be shared with key additional partners and refined over a period of two months.

Throughout and in response to the requirements development phase, developers at IU and Northwestern will articulate their areas of technical expertise and focus, so that a joint development effort can be planned with discrete areas of activity for each group. The outcome of this work will be a project plan for implementation with clearly delineated timelines and specific deliverables, which will be included in a final project proposal. At the conclusion of these activities, the project team will develop a full implementation proposal for submission to IMLS and other funders in early 2011.

The primary criteria for evaluation of the success of this six-month planning project will be:

- The successful engagement of interested partners and alignment of partners' needs to define functional and technical requirements for a video-enabled Variations system
- The commitment of multiple institutions involved in the planning effort to move forward in seeking grant funding to support the development of the system and to commit their own resources towards development and ongoing support

## **4. Project Resources**

### **Project Management**

The planning project will be managed by the Indiana University Digital Library Program. The Digital Library Program is a partnership between the IU Libraries and University Information Technology Services, and is able to leverage the resources and expertise of both of these organizations to support the work of this project. The Digital Library Program has a long history of successful grant projects, including five prior IMLS NLG project grants as lead institution and two as a major partner.

The project will be carried out in close collaboration with staff from the Northwestern University Libraries, with Claire Stewart of Northwestern serving as Partner Lead for Northwestern. Northwestern's digital library program is collaboratively led by the Digital Collections department and the Library Technology Division, with close ties to the staff in the Academic & Research Technologies unit of NUIT, who will make a developer available for participation in the December meeting of the Variations project team.

### **Personnel**

Existing Indiana University and Northwestern staff will play a major part in the project:

**Jon Dunn**, Associate Director for Technology in the IU Digital Library Program, will serve as Project Director, responsible for overall project direction and financial management of the project, as well as

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<sup>15</sup> <http://www.kaltura.com/>, <http://www.kaltura.org/>

recruitment of project participants and organization of the project planning meeting in September/October 2010. He has worked with digital libraries at IU since 1994, first in the Music Library, and since 1997, in the Digital Library Program. He has served as Project Director or Project Manager for numerous grant projects funded by IMLS, NSF, NEH, and the Andrew W. Mellon Foundation, including the IMLS-funded *Variations3* project (Project Director), NSF/NEH-funded *Variations2* project (Project Manager), and Mellon-funded *Integrating Licensed Library Resources with Sakai* project (Project Director). He also served as Lead Technical Investigator for the Mellon-funded *Ethnomusicological Video for Instructional Analysis Digital Archive* project.

**M. Claire Stewart**, Head of Digital Collections in the Northwestern University Library, will serve as Partner Lead, responsible for Northwestern's activities in support of the project, as well as assisting with recruitment of project participants and organization of the core project partners meeting in December 2010. Stewart managed the IMLS-funded *Winterton Collection of East African Photographs, 1860 – 1960* project, as well as the Mellon-funded *Mounting Books* project. She is administratively responsible for the team of library staff providing media production and delivery services, training, and support, and for management of all special library digitization projects.

**Mark Notess**, Software Development Manager in the IU Digital Library Program, will serve as Project Manager, overseeing functional and technical requirements gathering and development, user needs analysis, and communication with project participants. Mark served as Development Manager for both the *Variations2* and *Variations3* projects, as project manager for the IU Libraries web site, and previously worked in development management and usability roles at Hewlett-Packard, Agilent Technologies, and UNext, an online education company.

**Steve DiDomenico**, Head of Enterprise Systems in the Northwestern University Library, will participate in planning meetings at IU and Northwestern. He serves as technical lead on the Library's overall Fedora repository implementation, on the *Mounting Books* and security architecture projects.

**Stu Baker**, Associate University Librarian for Library Technology, will participate in planning meetings at IU and Northwestern and serve as primary liaison to central Information Technology at Northwestern. He has broad responsibility for development and implementation of technology services at the libraries, including the library management system, federated search and open URL resolvers, interlibrary loan and reserve services, all web services, staff and public computing, and digital repository implementation.

### **Budget**

The budget for the project will be managed by Indiana University, but all expenditures will be made in consultation with the Partner Lead at Northwestern University. Participation by existing staff from the IU Digital Library Program will be cost-shared. Staff at Northwestern will not be cost shared, but are committed through the Partnership Statement signed by Northwestern.

Partial (.3 FTE) funding for a temporary programmer/analyst at IU is requested to support technical investigation and evaluation activities to help inform the technical requirements and technical architecture to be developed as part of the project. IMLS funding is also requested for an hourly Project Assistant to assist with meeting logistics, partner communications, and project documentation, and to conduct user studies under the supervision of the Project Manager.

We are also requesting funding for travel and meeting costs to support a two-day project participants meeting at IU in September or October 2010, attendance by project leadership at the EDUCAUSE 2010 Annual Conference to present on the survey results and talk with additional potential partners and relevant vendors, and a two-day meeting in December 2010 at Northwestern of representatives from IU, NU, and other institutions collaborating to submit IMLS or other grant proposals for development of the system in early 2011. We have also designated funding for travel to additional conferences or institutions to investigate relevant technologies, engage in discussions with representatives of related projects or companies, recruit additional partners, or collaborate on planning work as needed. Additional detail is provided in the Budget Justification.