Evaluation Plan for NSF EPSCoR Track-2 RII Project
Cyberinfrastructure Development for the Western Consortium (ID, NV, and NM)

PREFACE

This document presents the evaluation plan developed by the project's External Evaluator, the project's Management Team (MT) and the Component Teams (Connectivity/Bandwidth, Model/Data Operability, and Cyberlearning). The foundation for this evaluation plan is the funded proposal Award #0919123, *Collaborative Research: Cyberinfrastructure Development for the Western Consortium of Idaho, Nevada, and New Mexico*. This is the project description in the abstract available on the National Science Foundation website:

> Idaho, Nevada, and New Mexico have NSF EPSCoR Track-1 Research Infrastructure Improvement (RII) awards that share a common theme of global challenge. Collectively, the project teams are studying climate change and its effects on water resources, ecosystems, and the environment. Subsequently, the three states formed a consortium to pursue cyberinfrastructure (CI) improvements that would leverage their resources so that the cumulative impact of NSF RII investments in the three states could exceed the sum of the parts. The impetus for this Track-2 award was the recognition of the complexity and scale of the scientific challenge and subsequent ramifications for science, education, and economic development.
>
> The NV-ID-NM consortium proposed three high priority objectives: 1) to increase connectivity and bandwidth; 2) to enhance data and model interoperability; and 3) to utilize CI to integrate research with education.

During the strategic planning meeting November 5, 2009 in Reno, Nevada the Component Teams developed metrics after they reviewed the activities, outputs and outcomes provided them by the Nevada PI. Management Team and Component Team members commented on the drafted evaluation plan and editing continued through December 2009.

The first project year is September 15, 2009 through August 31, 2010. Years 2 and 3 will start on September 1st and will end August 31st. Not all metrics include baseline numbers; baseline data are for the time period September 1, 2008 through August 31, 2009.

EVALUATION PLAN STRUCTURE

The evaluation plan is structured around the project's three high priority objectives:

1. **Increase connectivity and bandwidth**. Significant effort will focus on promoting communication and collaboration by improving connectivity infrastructure within the Consortium. Proposed and future Consortium efforts related to improving research competitiveness, STEM education, and economic development rely on this basic infrastructure.
2. **Enhance data and model interoperability**. The Consortium will promote discovery by supporting community-based climate change science through enhanced interoperability between models and other software components, improved access to and usability of Consortium data products through the adoption of standards-based data management and aces models and new data assimilation, analysis and visualization capabilities.
3. **Utilize CI to integrate research with education**. The Consortium will enhance learning by focusing particularly on graduate student and postdoctoral researcher development; extending cyber-enabled science education into middle and high schools and extracurricular programs; and improving outreach to business and industry.

This evaluation plan draws extensively from information in the report[1] from the Engineering Advisory Committee's Subcommittee on Cyberinfrastructure which includes example success metrics for Cyberinfrastructure. Table 2 on page 15 of *A Process-Oriented Approach to Engineering Cyberinfrastructure* is copied below.

Metric Type	What it Assesses	Example Metrics
Usage	Amount of use of resource by user community	Number of users of resource: Utilization, throughput (computation); Number of collections (data); Number of hits (web); Number of downloads (software), etc.
Usability	"Ease of use" of resource by user community	Turnaround time (computation); User satisfaction as assessed by surveys; Informal feedback from users; Software productivity measures
Deep impact	Importance of science and engineering enabled by resource	Publication in peer-reviewed journals and conferences; Community recognitions and awards; "Landmark" publications
Broad impact	Extensiveness of user community, accessibility of resources	Number of disciplines, communities served; Number of publications enabled, Number of courses, dissertations, and other educational vehicles enabled
Expanding Use of Cyberinfrastructure	"Growth" of Cyberinfrastructure as an enabling technology	Number of new users (great than some threshold of times) of Cyberinfrastructure components and resources
Coordination of Cyberinfrastructure	Integration and interoperability of Cyberinfrastructure components	Number or percentage of times that resources or software is used together
Technology Transfer promoted by Cyberinfrastructure	Movement of academic Cyberinfrastructure efforts to the private sector of "productization"	Number of deployed Cyberinfrastructure tools and technologies initiated with the academic community and productized within the private sector
Workforce impact	Individuals involved in the provision of Cyberinfrastructure	Number (gender, race, creed, level) of individuals involved in Cyberinfrastructure-related professions; Number (gender, race, creed, level) of individuals with Cyberinfrastructure-oriented education or training and their increase/decrease over time.

EVALUATION SCOPE

The evaluation plan does not include assessment of project compliance or cost benefit analysis. Compliance factors include financial records (including purchasing and installation of CI hardware and software) and leadership's required reporting to the National Science Foundation.

The evaluation will utilize qualitative and quantitative data to: (1) provide information to the Management Team for refining and improving project implementation at both the state and Consortium levels; (2) measure progress of the project in meeting its goals, objectives, and annual metrics; (3) assess the impact of the project in developing strong inter-jurisdiction collaborations that address regionally relevant and nationally important climate change science and education; and (4) assess the project's impact on enhancing discovery, learning, and economic development through the use of CI.

This evaluation plan includes metrics developed by the Component Teams as well as success (outcome) metrics in the publication, *A Process-Oriented Approach to Engineering Cyberinfrastructure.*

[1] *A Process-Oriented Approach to Engineering Cyberinfrastructure*, (February 2006). F. Berman, J. Bernard, C. Pancake, L. Wu, http://director.sdsc.edu/pubs/ENG

PROJECT PARTICIPATION

Table 1 is designed to display a summary of project participation by demographic groups for each of the three years of the project. Reported annually, project participants are individuals within ID, NM and NV who spend 160 hours or more over the annual twelve month period.

Table 1: Disaggregated demographics of Track-2 project participants

	Number of Men						Number of Women					
	Total	# Af.-Am.	# Hisp.	# Nat. Am	Percent URM	# with disability	Total	# Af.-Am.	# Hisp.	# Nat. Am	Percent URM	# with disability
Year 1												
Faculty												
Postdocs												
Grad students												
Year 2												
Faculty												
Postdocs												
Grad students												
Year 3												
Faculty												
Postdocs												
Grad students												

THE PROJECT'S OVERARCHING GOAL

The three Track 2 Components are Connectivity (Objective 1), Interoperability (Objective 2) and Cyberlearning (Objective 3). The project's overarching goal is to:

> Promote knowledge transfer to scientists, educators, students and citizens within and beyond the Consortium by enhancing state cyberinfrastructure, and to enable the community science that is required to address regional to global scientific and societal challenges.

The overarching outcome of this Track-2 NSF RII project is stated in the proposal:

> Track 2 investments will enhance the ability of the ID-NV-NM Consortium to better address 21st century grand scientific and societal challenges related to climate change through increased competitiveness for research funding and sustained partnerships among our jurisdictions.

Definitions from the NSF RII Reporting Guidelines

- **RII Faculty or equivalent.** RII faculty are defined as faculty at the lead or participating universities, colleges, or community colleges, who devote 160 hours or more over a twelve month period of their professional activities to one or more of the research areas of the RII or to tasks related to the RII's education, outreach or knowledge transfer missions.
- **RII Graduate Student.** RII graduate students are defined as students enrolled in a graduate degree program at one of the RII's participating universities, and colleges, who devote a 160 hours or more over a period of 12 months of their research and educational activities to one or more of the research areas at the RII program under the supervision of an RII faculty or staff member. This category includes both students who are and those are not financially supported by the RII funds so long as they meet the other criteria.
- **Publications.** Publications are journal articles, text books, monographs, chapters in books, conference proceedings, technical reports, abstracts or other formal written documents, both print and electronic.
- **Collaborator.** An RII collaborator is an individual affiliated with the RII program that does not meet the 160 hour requirement for RII participants.
- **External Collaborator.** An external institutional collaborator refers to an institution or organization outside of your jurisdiction that is involved with RII activities and events but has no contractual relationship.)
- **RII Undergraduate Student.** RII undergraduate students are defined as students enrolled in an undergraduate degree program at one of the RII's participating universities, colleges, or community colleges, who are either doing research in one or more of the research areas at the RII project under the supervision of a RII faculty. This category includes both students who are and those are not financially supported by the RII funds so long as they meet the other criteria.

Participant data will be disaggregated into STEM underrepresented racial/ethnic minority group, gender and disability status.

IDAHO

Performance Measures for the Overarching Goal and its Outcome for Idaho DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)						
IDAHO	**N**	**-1- Total # of Climate Change (CC) peer-reviewed publications**	**-2- # of CC peer-reviewed publications with authors from 2 or more Consortium states**	**-3- # of CC peer-reviewed publications with authors from 2 or more Track 2 Component Groups**	**-4- # of all CC publications (using the annual report definition of publication)**	**-5- # of all CC publications with consortium collaboration (using the annual report definition)**
BASELINE						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants				N/A		
YEAR 1						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants						

We will also highlight publications and grant applications/funding that were not possible without Track 2 enhancements and/or resulted directly out of Track 2 participation. Other research productivity metrics unique to Track 2 participants (i.e., do not include individuals who are Track 1 but not Track 2 participants) are displayed in the following table. These measures do not include baseline data so they begin with Year 1. The templates will be extended to include years 2 and 3.

Performance Measures for the Overarching Goal and its Outcome for Idaho DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)				
IDAHO	**N**	**-1- # of all (CC and non-CC) presentations resulting from Track 2 participation**	**-2- # of publications in CI journals (CC and non-CC)**	**-3- # of Track 2 authors of publications in CI journals (CC and non-CC)**
YEAR 1				
Track 2 Faculty				
Track 2 Postdocs				
Track 2 Graduate Students				

NEVADA

Performance Measures for the Overarching Goal and its Outcome for Nevada DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)						
NEVADA	**N**	**-1- Total # of Climate Change (CC) peer-reviewed publications**	**-2- # of CC peer-reviewed publications with authors from 2 or more Consortium states**	**-3- # of CC peer-reviewed publications with authors from 2 or more Track 2 Component Groups**	**-4- # of all CC publications (using the annual report definition of publication)**	**-5- # of all CC publications with consortium collaboration (using the annual report definition)**
BASELINE						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants				N/A		
YEAR 1						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants						

We will also highlight publications and grant applications/funding that were not possible without Track 2 enhancements and/or resulted directly out of Track 2 participation. Other research productivity metrics unique to Track 2 participants (i.e., do not include individuals who are Track 1 but not Track 2 participants) are displayed in the following table. These measures do not include baseline data so they begin with Year 1. The templates will be extended to include years 2 and 3.

Performance Measures for the Overarching Goal and its Outcome for Nevada DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)				
NEVADA	**N**	**-1- # of all (CC and non-CC) presentations resulting from Track 2 participation**	**-2- # of publications in CI journals (CC and non-CC)**	**-3- # of Track 2 authors of publications in CI journals (CC and non-CC)**
YEAR 1				
Track 2 Faculty				
Track 2 Postdocs				
Track 2 Graduate Students				

NEW MEXICO

Performance Measures for the Overarching Goal and its Outcome for New Mexico DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)						
NEW MEXICO	**N**	**-1- Total # of Climate Change (CC) peer-reviewed publications**	**-2- # of CC peer-reviewed publications with authors from 2 or more Consortium states**	**-3- # of CC peer-reviewed publications with authors from 2 or more Track 2 Component Groups**	**-4- # of all CC publications (using the annual report definition of publication)**	**-5- # of all CC publications with consortium collaboration (using the annual report definition)**
BASELINE						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants				N/A		
YEAR 1						
Track 2 (but not Track 1) participants						
Both Track 1 and Track 2 participants						
Only Track 1 participants						

We will also highlight publications and grant applications/funding that were not possible without Track 2 enhancements and/or resulted directly out of Track 2 participation. Other research productivity metrics unique to Track 2 participants (i.e., do not include individuals who are Track 1 but not Track 2 participants) are displayed in the following table. These measures do not include baseline data so they begin with Year 1. The templates will be extended to include years 2 and 3.

Performance Measures for the Overarching Goal and its Outcome for New Mexico DEEP IMPACT (The importance of STEM and Climate Change research enabled by the CI resources)				
NEW MEXICO	**N**	**-1- # of all (CC and non-CC) presentations resulting from Track 2 participation**	**-2- # of publications in CI journals (CC and non-CC)**	**-3- # of Track 2 authors of publications in CI journals (CC and non-CC)**
YEAR 1				
Track 2 Faculty				
Track 2 Postdocs				
Track 2 Graduate Students				

Objective 1: Connectivity

Connectivity activities are reported by state since Cyberinfrastructure connectivity needs are unique to each of the states.

- Idaho: Upgrade CI to deliver improved network connections to key university researchers' labs and desktops. Connect difficult-to-access sites within Idaho by adding to, enhancing and using the Idaho Regional Optical Network (IRON).
- Nevada: Increase connectivity into the state network and within the state through networking and video conferencing upgrades as well as networking monitoring tools.
- New Mexico: Establish a distributed computing and collaboration infrastructure of compute nodes at portals or gateways at Tribal Colleges and Hispanic-Serving Institutions.

The anticipated outputs reported at the November 5, 2009 planning meeting were:

- Idaho
  - Formalized plan for the University of Idaho to utilize IRON to access university facilities in southern Idaho.
  - Upgraded networking equipment installed at the state universities for LAN upgrades and building uplinks that provide 1 to 10 Gb/s service to several key research buildings.
  - Upgraded aggregation switch (Point of Presence) on IRON and traffic aggregated onto IRON's backbone in Twin Falls to include sites in Hagerman and Kimberly, ID.
- Nevada
  - Upgraded network connectivity from NevadaNet in the north to CENIC in Sacramento, as well as NevadaNet connectivity to Elko and other parts of the state.
  - Upgraded networking monitoring and security software and hardware.
  - Upgraded video conferencing hardware in the north and south.
- New Mexico
  - Upgraded gateways at the three large research campuses connected to six Hispanic-serving and Native American-serving campuses in New Mexico.
  - Upgraded software for integrating all components of the gateway systems into a single, user-friendly system along with compression software to minimize the amount of bandwidth needed for connectivity between the sites.

Table: Metrics for Connectivity developed by the Connectivity Team

State and Metric **Note:** These metrics do not include baseline data because they all result from Track-2 project activities.	**Annual Data**		
	2009-10	**2010-11**	**2011-12**
Idaho: Number of connections at improved speeds			
Idaho: Number of connections per site			
Idaho: Number of connections per machine			
Nevada: Utilization into the state in GB			
Nevada: Utilization within the state in GB			
New Mexico: Number of portals installed			
New Mexico: Utilization by institution in GB			

Outcomes

Improved connectivity between and within the three states will result in increased data-intensive research, scientific collaborations, distributed experiments, grid-based data analysis, IP videoconferencing, social networking and cyber-enabled learning. Network improvements on Consortium campuses will remove bandwidth bottlenecks and allow faculty involved in climate-related research at each university to fully utilize available bandwidth for research and education.

The following table displays Connectivity outcome measures pertaining to the amount of use and ease of use of Cyberinfrastructure (CI).

Table: Outcome measures for amount and ease of use

Description of Indicator by State	**Outcome Measure**
Idaho: Utilization	Percentage increase in utilization (GB) in years 1, 2 and 3 compared to 2008-09 utilization
Idaho: Bandwidth usage	Percentage increase in bandwidth usage of IRON in years 1, 2 and 3 compared to 2008-09 bandwidth use
Nevada: Into-state utilization	Percentage increase in utilization (GB) in years 1, 2 and 3 compared to 2008-09 utilization
Nevada: Within-state utilization	Percentage increase in utilization (GB) in years 1, 2 and 3 compared to 2008-09 utilization
New Mexico: Utilization	Percentages increase in utilization (GB) in years 1, 2 and 3 compared to 2008-09 utilization.
ID, NV and NM user satisfaction	Survey of Track-1 researchers satisfaction with network improvements
ID, NV and NM increased data-intensive research	External Evaluator interview of Track-2 PIs at each of the universities regarding connectivity upgrade benefits to researchers

Objective 2: Interoperability

Inoperability activities were confirmed by the Interoperability Team:

- Develop a model and data interoperability framework: Establish a model and software interoperability framework based on emerging national and international standards along with scenarios and applications that make use of that framework. The framework will allow users to specify, maintain and update – through a central user interface and a common methodology – a collection of software tools, and the interconnections between tools needed to accomplish climate research tasks.
- Build an interoperability data archive: The Consortium will implement a data archive model that is based upon open data and metadata standards and supports standard data interoperability models. The interoperable data archive will enable streamlined discovery of and access to data products generated by all three state EPSCoR programs. These activities will use web interfaces to communicate the availability of data, models, training, and activities of researchers; will leverage existing national/international resources; and will make any code that is developed available through open source outlets.

The Interoperability objective is: Enable community-based climate science through model and data interoperability solutions.

The outputs resulting from the activities were developed and confirmed by the Interoperability Team.
Activity 1 outputs:

1. User configurable interface for accessing, linking and managing process chains in support of climate science
2. Coupled Atmospheric, surface process and hydrologic models

Activity 2 outputs:

1. Climate data products are discoverable via searches against standard data and service metadata
2. Climate analysis and data products are deliverable both as individual data products and as services that may be integrated into other analysis systems

Important Interoperability milestones are:
Activity 1 milestones:

1. Completion of data/metadata format document for science teams
2. Completion of CRUD API specification
3. Completion of database schema document

Activity 2 milestones:

1. Completion of document on evaluation/assessment criteria of models to include in the prototype system
2. Completion of document on candidate models considered for adoption, modification, adaptation, or reproduction for use in the software model interoperability framework (model integration tool)
3. Completion of software framework's requirements specific document
4. Completion of software framework's design document, including API guidelines
5. Completion of Alpha version of the software model interoperability framework
6. Completion of Beta version of the software model interoperability framework
7. Deployment of web site for collaborative open source community development of the software interconnection framework (SourceForge or CodePlex)

Metrics for Interoperability do not include baseline data because all measures are generated as a result of this Track-2 project's activities.

Table: Metrics for Interoperability developed by the Interoperability Team

Activity	Metric	Annual Data		
		2009-10	2010-11	2011-12
Develop model and data interoperability framework	# of data and metadata representations (formats) in the data/metadata format document			
	# of CRUD API methods/functions in the CRUD API specification			
	# of tables in the data base schema document			
	# of table elements in the data base schema document			
	# of data services deployed for geospatial data			
	# of data services deployed for observational data			
	# of web services posted for data			
	# of geospatial data sets made available through web services			
	# of time series sites made available through web services			
	# of downloads of geospatial data			
	Quantity of downloads of geospatial data			
	# of downloads of observational data series			
	Quality of downloads of observational data series			
	# of registered users of the web services			
	# of unique IP addresses that utilize data services			
Build an interoperability data archive	# of software requirements in the tool's Software Requirement Specification (SRS) document			
	# of modules in the tool's Design document			
	# of functions/methods in the tool's API			
	# of participants involved in related software development activities (project personnel and members of the open source community)			
	# of models or model tools available for execution through the software framework			
	# of downloads and/or executions of the software model interconnection framework			
	# of registered users of the software model interoperability framework			
	# of unique IP address hits on the software model interoperability framework web site			
	# of model interconnection scenarios available through the software framework			

Outcomes

EPSCoR Track 2 investments will provide new model and data interoperability solutions and an integrative software framework that will transform exploration, experimentation, and innovation in climate research. Project activities build upon existing resources within Idaho, Nevada, and New Mexico, and are designed to leverage other major NSF-supported initiatives (including CUASHI HIS, GEON, and CSDMS). The project will significantly reduce the difficulty in finding, accessing, and using the diverse data products available in the Consortium. Consortium results (data and models) and resources (archives) will become readily accessible to the broader community of environmental scientists, decision makers, students, and the public.

The following table displays Interoperability metrics pertaining to broad impact, usage, usability and expanding use of Cyberinfrastructure (CI).

Table: Outcome measures for Interoperability broad impact, usage, usability and expanding use of CI

Description of Indicator	Outcome Measure
Users of each set of web materials when they become available on the web site	Number of consortium users as defined by computer domains
	Number of non-consortium users described by approximate geographic location using Google Analytics code and/or domain
The use of the web materials and software by Track-1 researchers in ID, NM and NV	External evaluation survey of Track-1 researchers in years 2 and 3
Use of data interoperability framework	External evaluation survey of Track-1 researchers in years 2 and 3 on how the framework is employed as a framework in their research or to adapt the framework for their own specific uses.
Use of software when it is distributed (current expectation is in the third project year)	Tracking of downloads of software from a depository – the current expected depository is the Community Surface Dynamics Modeling System (CSDMS)

Objective 3: Cyberlearning

Cyberlearning activities are described in the proposal:

- A series of training opportunities to develop cyberinfrastructure capacity and hands-on experience with climate modeling and scientific information systems will be provided for middle/high school students, undergraduates, graduate students, postdoctoral associates, and faculty. Training opportunities will include:
  - "Introduction to Climate Modeling"
  - "Introduction to the Hydrologic Information System"
  - TeraGrid workshops
- Participant support in other training opportunities will include:
  - Linux Clusters Institute (LCI) Workshop
  - The National Center for Atmospheric Research (NCAR) advanced climate modeling workshops and short courses
- New cyber-enabled curriculum and education materials will be created, implemented for middle school and high school science education and disseminated through a portal site. These will include:
  - Cyberlearning materials related to computational climate science
  - Informal education materials (e.g., GUTS, NM Supercomputing Challenge, WET)
- An Industry Cyberinfrastructure Days program will be piloted in NM with business and industry as a target audience to increase cyberinfrastructure awareness and promote economic development opportunities.

Metrics developed by the Cyberlearning Team during the November 5, 2009 strategic planning session are displayed in the table below. Metrics are grouped by the activity categories:

1) Offer and support CI training in computation and climate change
2) Develop and disseminate materials for MS/HS
3) Develop and support extracurricular CI activities
4) Develop and deliver industry CI days

New Mexico is in the state in this Consortium with extracurricular Cyberinfrastructure activities

All cyberlearning participant data will be disaggregated by state, STEM underrepresented minority status (URM), gender and disability status. The following table was developed as a template for recording cyberlearning activities' participant demographics.

Table: Broadening participation demographics for Cyberlearning trainings and programs

Name of Training or Program	Year	Total N	No. of Male		No. of Female		With Dis-ability	No. from each State		
			URM	Not URM	URM	Not URM		ID	NM	NV
Intro to Climate Modeling	2010									
Intro to Hydrologic Info System	2010									
TeraGrid Workshop										
LCI Workshop										
NCAR workshop										

Name of Training or Program	Year	Total N	No. of Male		No. of Female		With Dis-ability	No. from each State		
			URM	Not URM	URM	Not URM		ID	NM	NV
NCAR short course										
NM: GUTS*								N/A		N/A
NM Super Computing Challenge*								N/A		N/A
Gateway Consultant Trainings*								N/A		N/A
Send UNM graduate students and postdocs to trainings								N/A		N/A

*New Mexico is the state with extracurricular Cyberlearning experiences. Nevada and Idaho do not have the activities categorized as "extracurricular".

The following table is a template for recording annual Cyberlearning metric data. Baseline data will not be collected for these metrics because even within existing programs, the measures are related to new aspects of the program.

Table: Metrics for Cyberlearning developed during the strategic planning session

Activity	Metric	Annual Data		
		09-10	10-11	11-12
CI training in computation and climate change	# of trainings			
	# of participants trained			
	# of participants aggregated by degree program			
Develop and disseminate MS and HS materials	# of materials developed by category			
	# of entities to which materials are disseminated			
	# of downloads of materials (e.g., from portal)			
Develop and support extracurricular CI activities	# of new schools participating in *GUTS*			
	# of new schools participating in *Super Computing*			
	# of students participating in *GUTS*			
	# of students participating in *Super Computing*			
	# of new content modules			
	# of programs to which CI information is disseminated			
Develop and deliver Industry CI Days	# of participants			
	# of participants disaggregated by industry group			

Outcome

The outcome for Cyberlearning is: Participants of all targeted groups in cyberlearning activities will increase awareness, skills and knowledge in climate change and cyberinfrastructure.

The following table displays Cyberlearning metrics pertaining to broad impact: the extensiveness of the user community and accessibility of Cyberlearning resources.

Table: Outcome measures for broad impact of Cyberlearning

Description of Indicator	Outcome Measure
Integration of CI in New Mexico	Name of the NM course that distance delivery was integrated into, who takes the course, when was it first delivered, and what are the course ratings by students?
Geographic diversity of users	MS and HS communities geography (rural, suburban, urban)
Cultural diversity of users	Description of tribal Middle and High Schools served
Usage of materials for MS & HS use	Teachers' feedback regarding how and when materials are used
Industry partners served	Number and description of private sector participants
Quality of Cyberlearning trainings	Participants' evaluation of facilitation, content and implementation
Usefulness of training to participants	Participants' rating of job usefulness of acquired skills and knowledge
Courses enabled	Description of university courses utilizing cyberlearning resources
Integration of research with CI	Which NSF Track-1 RII faculty were involved with cyberlearning activities?
GUTS	Number of schools served that were not previously involved with this program (the goal is three schools)
GUTS	Impact on the schools assessed through surveys and/or interviews
GUTS	Documentation (e.g., course syllabi) of sustainability of the integration of materials and simulations in the three new schools
Supercomputing Challenge	Number of schools served that were not previously involved with this program (the goal is three schools)
Supercomputing Challenge	Evidence of how this program has impacted participating teachers
Gateway Consultant	Evidence of increased usage of gateway equipment at the schools served by the consultant obtained through External Evaluator interview of the Gateway Consultant

The following is a summary of the anticipated broader impact of the four types of Cyberlearning activities. The framework was developed by the External Evaluator and was completed along with the Component Lead. The information was reviewed by the Leadership Team and was then finalized.

IDAHO										
Name of State's RII Track 2 Component, Activity, or Program	**Broadening Participation**			**Workforce Develop-ment**	**Cyberinfra-structure**	**Education**	**Human Resource Develop-ment**	**Year(s) RII Institution Participates in this Activity**		
								BSU	**UI**	**ISU**
	Diversity	Outreach	Communi cation							
Develop and disseminate educational materials for MS/HS	X	X			X	X			Yrs 1, 2, and 3	
Offer and support CI training in computation and climate change	X	X		X	X	X	X		Yrs 1, 2 and 3	Yrs 1, 2 and 3

NEVADA										
Name of State's RII Track 2 Component, Activity, or Program	**Broadening Participation**			**Workforce Develop-ment**	**Cyberinfra-structure**	**Education**	**Human Resource Develop-ment**	**Year(s) RII Institution Participates in this Activity**		
								DRI	**UNLV**	**UNR**
	Diversity	Outreach	Communi cation							
Offer and support CI training in computation and climate change [LEAD]	X	X		X	X	X	X	Yrs 1, 2 and 3	Yrs 1, 2 and 3	Yrs 1, 2 and 3
Develop and disseminate educational materials for MS/HS [LEAD]	X	X			X	X			Yrs 1, 2 and 3	

NEW MEXICO										
Name of State's RII Track 2 Component, Activity, or Program	**Broadening Participation**			**Workforce Develop-ment**	**Cyberinfra-structure**	**Education**	**Human Resource Develop-ment**	**Year(s) RII Institution Participates in this Activity**		
								NM Tech	**UNM**	
	Diversity	Outreach	Communi cation							
Develop and disseminate educational materials for MS/HS	X	X			X	X		Yrs 1, 2, and 3		
Develop and deliver Industry CI Days [LEAD]	X	X	X	X	X			Yrs 1, 2, and 3		
GUTS LEAD]	X				X	X	X	Yrs 1, 2, and 3		
Super Computing Challenge [LEAD]	X				X	X	X	Yrs 1, 2, and 3		
Support CI grad student and postdoc training in computation and climate change	X	X		X	X	X	X		Yrs 1, 2 and 3	