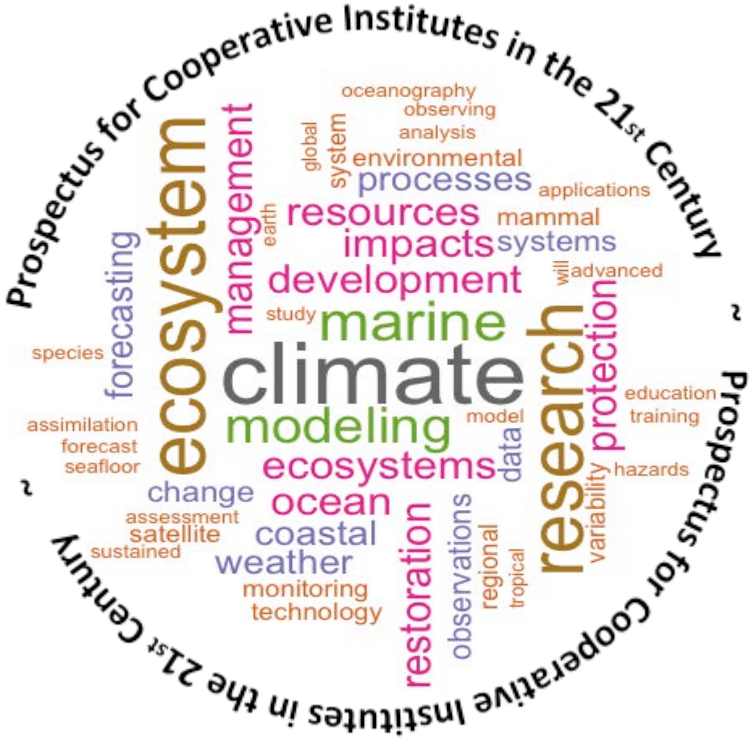

Written with major contributions from Felipe Arzayus, DaNa Carlis, Cynthia Decker, Sean Hayes, Lindsey Kraatz, Marian Westley, and Matthew Womble

FOREWORD

What does NOAA need from its Cooperative Institutes (CIs), and what do the CIs expect from the cooperative relationship with NOAA?

During my tenures as Assistant Administrator at the National Ocean Service (2003-2005) and the Office for Oceanic and Atmospheric Research (2005-2010) at the National Oceanic and Atmospheric Administration (NOAA), I came to appreciate how research and development fuel progress and provide the foundation for addressing the mission of the agency. I also developed a strong respect for the value of NOAA's research partnerships, since NOAA's scientific portfolio has always been a balance of intramural and extramural activities. Cooperative Institutes (CIs), which include scores of institutions around the country and over a thousand researchers, dominate our extramural effort.

As Chief Scientist for NOAA, I have strived to strengthen NOAA's research portfolio and the logic of its formulation and growth. The challenges of NOAA's mission responsibilities dictate a careful and regular analysis of all aspects of our research portfolio, but as of 2014, the CIs had never been assessed as an enterprise. We needed to take a careful look at how we were constructing, using, and assessing these partnerships. Consequently, NOAA's Administrator, Dr. Kathryn D. Sullivan, charged me to work with the directors of the CIs and prepare the Cooperative Institute program for the challenges we will face in the 21st century. The product of that charge is this summary report, which we call "Prospectus for Cooperative Institutes in the 21st Century", or "CI21". The findings and recommendations included herein, when fully executed, will elevate the capacity and capability of the CIs and strengthen NOAA's research enterprise. CIs will benefit from clearer direction on where to aim their resources and intellectual capital. NOAA program managers will benefit from sharing and capitalizing on best management practices to advance the agency's mission. In addition, the important dialogue about creation of new CIs will benefit from clarity of vision for where the enterprise will go.

In years to come, with the vision expressed herein embraced and accomplished, NOAA will enhance its capacity and strengthen its ability to support the needs for environmental intelligence of the United States and our partners.

Richard W. Spinrad, Ph.D. CMarSCi
Chief Scientist
October 2016

Prospectus for Cooperative Institutes in the 21st Century

Overview

The National Oceanic and Atmospheric Administration's Cooperative Institutes program helps to provide the research and development (R&D) necessary to improve the agency's weather, ocean, and climate services, living marine resource management and stewardship, and many more mission responsibilities. These activities provide the scientific basis for national policy decisions in key environmental disciplines, such as climate change, disaster risk reduction, air quality management, and aquatic habitat and species management. Since the inception of the program in 1967, CIs have evolved over time, but not necessarily through strategic direction or agency-wide coordination. Over the last several years, it became clear that the model of operating CIs needed some adjustments for the future: expectations of NOAA and each of the CIs were clearly not in alignment. Furthermore, the development of a portfolio logic for NOAA's research enterprise dictated that NOAA undertake a careful assessment of how to best use, and if need be, modify the activity of CIs. To address this need, NOAA in collaboration with the CI Directors, embarked on an exercise to develop a vision, along with short, medium, and long-term actions and recommendations that seek to strengthen and advance the research and development enterprise of NOAA and its CI partners.

Background

A NOAA CI is a partnership between NOAA and a research university or other research organizations, sustained by a cooperative agreement. The CIs provide the agency with a flexible approach for accessing scientific talent and engaging in a range of scientific efforts, including high risk, potentially transformative research essential to meeting NOAA's mission needs. Since the creation of the first CI in 1967 - by the Environmental Science Services Administration, a predecessor to NOAA - CIs have been essential to the success of NOAA's research and development (R&D) enterprise.

Currently, NOAA has 16 CIs that have grown organically through the course of time and provide a significant benefit to the agency's mission-relevant disciplines, such as meteorology, oceanography, climatology, and marine ecosystems biology. Researchers at NOAA CIs have made substantive scientific contributions, advanced NOAA's disaster/emergency response capacity, enhanced NOAA's resource management capabilities, and strengthened the agency's workforce and scientific diversity. For example, CI research efforts have improved hurricane intensity models for improved hazardous weather forecasting, ecosystem services valuations for more effective marine resource management, satellite calibration methods, and data validation techniques and algorithms for the production of environmental intelligence from NOAA's Earth observing assets. CIs also assisted NOAA in its response to Hurricane Katrina, the Deepwater Horizon oil spill, and Superstorm Sandy. The regional expertise provided by the CI programs allows NOAA to address environmental challenges on the ground in every corner of the nation.

Cooperative Institutes provide NOAA with access to a wide diversity of programs, disciplines, and expertise. Within the last 15 years alone, CIs have enabled NOAA scientists to collaborate

with dozens of universities and thousands of academic scientists, including multiple Nobel laureates. Additionally, a large number of students and early-career researchers have gained exposure to NOAA laboratories and programs through CIs, and some formed long-lasting collaborations with NOAA or even became NOAA employees.

The diversity of the CI program also extends to the management structure, communications capacity, and the types of products delivered, reflecting and respecting the cultures and styles of particular institutions and programs, and the communities in which they are situated.

However, there are some significant challenges associated with the CI enterprise.

Challenges:

Addressing the NOAA mission
Over the past few years, it has become clear that there is room for stronger mission alignment between CIs and NOAA, and across CI programs. The CIs, while pre-eminent in their research capabilities, need to become more strategic in how they shape, manage, and grow their research portfolio around NOAA's needs. Additionally, NOAA and its line offices need to rethink how to manage and assess the existing CIs, as well as the prospect of expanding the CI program.

Transitioning the research to NOAA's operations and applications
The ultimate value of NOAA's research depends on how well we transition research projects into mission-driven applications, operational services, and commercialization. Cooperative Institutes, with their close links to NOAA, help address the agency mission by ensuring that breakthroughs made by CI partners are directly transitioned into the NOAA enterprise. The challenge now is to accelerate the transition process, and to utilize CIs as an even more effective pathway for the transition of NOAA R&D, into commercialization, through connections to business incubators and the private sector.

Framing and supporting the future workforce
Finally, as the focal point for development of the next generation of environmental scientists and managers, CIs are well-positioned to build the talent for the future workforce. The challenge is to define the mechanisms and best practices to fulfill future workforce needs.

The Charge

In July of 2014, NOAA's Administrator, Dr. Kathryn Sullivan, charged the NOAA Chief Scientist to work with the directors of NOAA's Cooperative Institutes to prepare the Cooperative Institute program for the challenges indicated above. The Cooperative Institutes in the 21st Century initiative, or CI21, was undertaken to provide overall direction and recommendations for existing CI programs, as well as present guidance and a framework for institutions and/or organizations interested in establishing new programs and CIs. CI21 supports the Administrator's strategic priority of enhancing NOAA's organizational excellence.

The Process

NOAA and the CI Directors developed a shared vision by working collaboratively with stakeholders to complete a comprehensive assessment and synthesis of NOAA's CI Program. As part of this assessment, we examined other cooperative agreement vehicles, both within NOAA (Cooperative Ecosystem Studies Units (CESU), Cooperative Science Centers (CSC), Sea Grant, etc.), and outside of NOAA (e.g. Federally Funded R&D Centers, FFRDC). A summit was held in June 2015 with NOAA CI program staff, CI directors, external stakeholders, and NOAA staff to discuss specific topics, including mission alignment, workforce development, finance and management, and private sector engagement. This was followed by a retreat with NOAA's Chief Scientist and the Executive Committee of the CI Directors. These meetings resulted in an initial set of results, findings, and recommendations. The final recommendations provided herein were reviewed by NOAA's Science Advisory Board (a Federal Advisory Committee) and the Department of Commerce and NOAA General Counsel Offices.

Vision for Cooperative Institutes in the 21st Century:

NOAA's Cooperative Institutes in the 21st century will strengthen and advance the agency's research and development enterprise. The CIs will be a nimble network with an elite workforce tightly aligned to NOAA's mission needs and stakeholder requirements.

Critical factors

This new "CI21" vision seeks to reinforce the role of NOAA's CIs as authoritative brokers of information, talent, and knowledge, in order to strengthen connections between NOAA's R&D needs and extramural intellectual resources. This vision will ensure that the CIs operate efficiently and effectively while focusing on four critical factors:

- Aligning with, and enhancing NOAA's mission
- Enhancing synchronization with NOAA's programs
- Becoming a performer-of-choice for NOAA's research enterprise, and
- Complementing NOAA's workforce.

Aligning with, and enhancing NOAA's mission: CIs will serve to **advance NOAA's science, service, and stewardship mission** which is: (a) to understand and predict changes in climate, weather, oceans, and coasts; (b) to share that knowledge and information with others; and (c) to conserve and manage coastal and marine ecosystems and resources, while providing NOAA with future research recommendations.

Enhancing synchronization with NOAA's programs: CIs will show increased nimbleness and flexibility while establishing clear and well-defined coordination with NOAA laboratories and partner institutions, thus ensuring **synchronization** and **adaptability** to NOAA's changing mission needs.

Becoming the Performer-of-Choice for NOAA's research enterprise: CIs will be considered by NOAA as extramural **performers-of-choice** for the agency's research portfolio.

Complementing NOAA's Workforce: CIs will add to, strengthen, and diversify NOAA's **workforce**. CIs have the capability to increase the breadth and depth of NOAA research capacity and connect NOAA to the vast array of experts housed within the partner institutions.

The findings and recommendations resulting from the CI Summit and Retreat are found in the following pages, and are those that the assembled group determined could be accomplished over short, medium, and long-term timescales, putting NOAA and the CIs on the path towards fulfilling the vision.

General Findings:

Findings emerging from the CI21 assessment are of both a general and specific nature. Overarching findings are as follows (more specific findings are incorporated with the key recommendations below):

- Research activity amongst the CIs is not sufficiently aligned, and the mission alignments that may have existed when the individual programs were founded may have drifted; strategies are needed for coordinating NOAA and CI mission alignment.
- CIs are presumed to be cost-effective for NOAA, but a true cost analysis and effectiveness assessment has not been done to date.
- Many NOAA Line Offices (LOs) employ CIs, but there is often no clarity regarding which NOAA entity is responsible for technical and financial decisions.
- The administrative costs (Task 1) of operating CIs are not resourced adequately nor consistently.
- NOAA is increasingly dependent upon the expertise of the CI workforce due to constraints on Federal workforce management; however, high turnover in the CI workforce creates challenges.
- Federal budgets are shrinking relative to growing mission needs addressed by the CIs.
- There is a need for creative partnerships between the private sector and CIs.

Specific Findings and Recommendations

Recommended actions from the assessment fall into four key areas: **Mission Alignment and Enhancement** (MAE), **Workforce Development** (WFD), **Finance and Management** (F&M) and **Private Sector Engagement** (PS). The recommendations can be achieved over various timescales: **Short-term** [ST (6-9 months)]; **Medium-term** [MT (1-3 years)]; and **Long-term** [LT (3-5 years)].

The following series of findings and recommendations focus on a unifying core question: What does NOAA need from its CIs, and what do the CIs expect from the cooperative relationship with NOAA?

Mission Alignment and Enhancement (MAE)

NOAA's CIs must evolve to address the agency's mission as efficiently and effectively as possible. The current CI network grew and evolved to address regional and topical needs across NOAA LOs. As a result, there is overlap in the current portfolio of CI research themes; for example, nine CIs have ecosystem research themes and 10 CIs have climate research themes. How complementary or redundant are these efforts? Regional overlap also exists. For example, three CIs support NOAA's research in the California Current across a range of themes. We need to understand the benefits of each CI and examine the regional expertise and the benefits of co-location with NOAA research labs.

NOAA also has a growing need to incorporate social sciences into its mission – from public response to storm emergencies to fisheries economics – but this component is missing from the themes of most CIs.

Finally, when utilized most efficiently, NOAA's CIs, being familiar with the agency's mission-related needs and specific operations and applications, could serve more effectively in interpreting how mission needs translate into research opportunities (i.e., "Operations to Research " or O2R).

MAE Recommendations:

1. NOAA should conduct a review of CI research themes and efforts (using the NOAA annual Strategic Research Guidance Memorandum as guidance) to evaluate relevance, efficiency, and complementarity – as well as gaps – of scientific studies among the NOAA CIs in supporting NOAA's mission.
   Action: NOAA
   Time Frame: MT
2. CIs, as well as other external partners, should be encouraged to contribute (perhaps via an annual open public call) concepts and ideas for consideration of future NOAA research.
   Action: CI
   Time Frame: ST-MT
3. Both NOAA and CIs should establish a dialogue and consider possible representation by the CIs on the NOAA Regional Teams.
   Action: CI and NOAA
   Time Frame: MT
4. Recognizing that NOAA's research themes will continually evolve, CIs should work with NOAA to ensure that their themes align with the Agency's mission priorities.
   Action: NOAA
   Time Frame: MT
5. NOAA should develop thematic language that promotes social science components in CIs' plans and programs, where appropriate.
   Action: NOAA
   Time Frame: ST

Workforce Development

Cooperative Institute employees are essential to NOAA's success. It is important to note that CI employees are not contractors but instead work in partnership with NOAA to carry out the cooperative agreements awarded to their institutions by NOAA. NOAA views its blended scientific workforce of both federal and CI employees, though distinctly separate, as a coherent

and well-integrated community. To achieve this coherence and coordination, CIs require both institutional knowledge and subject matter expertise that should be stable and retained throughout the lifespan of longer projects.

The expertise provided by CIs complements that of NOAA's workforce, and CIs are instrumental in training the next generation of researchers to engage in federal research endeavors. With the both an academic and agency network, CIs offer different career path opportunities, from developing the rising work force by training students and post-docs in areas of traditional and emerging NOAA needs, to CI senior scientist positions where established university scientists work side-by-side with NOAA researchers. These CI employees are critical because often CIs are involved with NOAA on long-term projects with missions well beyond the five-year time scale of the cooperative agreement. As such, they are fully integrated into NOAA facilities.

Additionally, universities are also extremely entrepreneurial in seeking external funding and guiding graduate students and post-docs towards areas of research needs and interests. When incorporated with the CI structure, this approach creates a seamless model that trains students in research areas aligned with NOAA's ongoing needs and strategic direction.

<u>WFD Recommendations:</u>

1. NOAA and CI management should establish fair and consistent use of best practices, to help ensure that long-term CI employees can meet various success metrics for their career advancement. Approaches may vary across the CIs, encouraging explicit agreements between NOAA labs and CIs. Examples of such practices may include: establishing progressive responsibilities leading to leadership roles, and supporting the pursuit of extramural funding as principal investigators on projects aligned with the mission of NOAA, etc.
   Action: CI and NOAA
   Time Frame: MT-LT
2. NOAA and the universities should explore the possibility of creating joint/adjunct appointments that are fully integrated in both communities.
   Action: CI and NOAA
   Time Frame: MT
3. NOAA should explore the possibility of graduate student fellowships to attract outstanding students to its mission in order to build stronger connections between students and the federal research enterprise.
   Action: NOAA
   Time Frame: ST-MT
4. NOAA and CIs should recruit and train a more diverse and inclusive workforce and should explore mechanisms through CSC and Sea Grant efforts which could be better integrated with the CI employment opportunities.
   Action: CI and NOAA
   Time Frame: LT
5. NOAA should support sabbaticals and/or rotational assignments of CI personnel and/or any faculty at a CI institution as well as NOAA personnel (e.g., via Intergovernmental Personnel Act, IPA) wanting to work/collaborate with other NOAA CIs or NOAA offices

where pertinent to NOAA's mission.

Action: NOAA

Time Frame: MT

6. CIs should develop specific workforce management plans to ensure flexibility and steady state turnover of graduate students and postdocs and also promote stability for core staff/faculty that serve as the institutional knowledge and subject matter experts on the CI core themes. These core personnel should expect their positions to continue, pending successful recompetition of their CI and subject theme. CIs should develop job titles that reflect the seniority and stature of their research scientists, comparable to the Assistant, Associate, and Full professor distinctions in academia or the personnel Performance Appraisal Review System (PARS) system in the federal government, subject to availability of funds.

   Action: CI

   Time Frame: MT

7. CIs should be cognizant of, and maintain records related to, training, and support of graduate students and post-docs, as well as their placement in the CIs, NOAA Labs, and the private sector.

   Lead: CI

   Time Frame: ST

Finance and Management

A great strength of the CI program is its breadth and diversity. However, there have been challenges associated with the growth of the program, which has expanded from a few CIs managed by one LO to the scale of the enterprise today, with all LOs participating. In various combinations across the 16 CIs and 42 university partners, many have unique and specific financial and management agreements. It is appropriate to assess the many models in place and evaluate application of best practices across the full CI assemblage.

F&M Recommendations:

1. With multiple LOs contributing to multiple themes at a given CI, NOAA should establish one NOAA lead Technical Program Manager (TPM) to serve as the principal point of contact for scientific and technical issues for each CI.

   Action: NOAA

   Time Frame: ST

2. NOAA, in consultation with the CIs, should conduct an RFI (Request for Information) to define how to assess the cost versus benefit of the overall program. It is generally accepted that the contributions and benefits of a CI are greater than its cost to NOAA; however, this needs to be assessed quantitatively and confirmed.

   Action: NOAA

   Time Frame: MT

3. NOAA should codify and distribute Task 1 funding and management policies and practices both internally (to NOAA) and with the CIs and ensure they are implemented in an efficient and transparent manner. More generally, training on NOAA's portfolio of management tools and resources (specifically, for example, the NOAA Acquisition and Grants Office Financial Assistance Workshops) should be encouraged for all CI employees.

Action: NOAA
Time Frame: ST

4. NOAA should clarify policies related to mid-cycle modification of a CI's research themes and institutions and provide clear and consistent guidance.
Action: NOAA
Time Frame: ST

Private Sector Engagement (PS)

CI academic partners have established a range of successful engagements with the private sector (including corporations, foundations, and non-governmental organizations); yet there are no strategies to take advantage of these relationships and leverage resources to meet the mutual needs of the CIs, NOAA, and the private sector. Currently, many CIs are already partnering through previously established internal university-specific partnerships with external entities and thereby stimulating innovation. We know that successful partnerships are driven by effective relationships and that the interests of each partner (NOAA/CI and PS) can include:

a. New business development
b. Direct research support
c. Licensing of intellectual property
d. Workforce development

PS Recommendations:

1. NOAA should survey the CI institutions for best practice models of private sector interactions, particularly if they involve other Federal agencies.
Lead: NOAA
Time Frame: ST
2. NOAA should assess and report recent changes in law and policy regarding its ability to receive private funding in light of potential applicability to CIs. This is a new avenue for creating partnerships between industry, foundations, non-profits, CIs, and NOAA.
Action: NOAA
Time Frame: ST
3. Both NOAA and CIs should review statutorily authorized models for PS engagement among the Federal agencies (e.g. STTR, SBIR, CRADA) to establish three-way partnerships with NOAA, CIs, and PS.
Action: CI and NOAA
Time Frame: ST-MT
4. CIs should develop opportunities for students at their institutions to conduct internships and externships with the PS and for PS employees to conduct research and development activities within the CI academic institutions.
Action: CI
Time Frame: MT
5. NOAA should encourage CIs to identify PS needs that are consistent with CI themes and to establish CI-PS relationships that will benefit the CI, PS, and NOAA.
Action: NOAA
Time Frame: LT

We recognize that many of these recommendations are merely preliminary steps towards a fully revitalized CI portfolio. Clearly, there will be additional actions required to follow up on results obtained from undertaking these recommendations. Additionally, while these recommendations are not specific to particular NOAA requirements, we expect that one important result of addressing these recommendations will be the clearer definition of NOAA mission needs that might be best served by the creation of new CIs.

These findings and recommendations serve as the central element of the prospectus. By moving forward as suggested here, and realizing the vision for NOAA's Cooperative Institutes in the 21st Century, we will initiate a new era of even more effective collaboration.

Appendix I: Timeline for Recommendations

- **Recommendation Gantt Chart**
  - Categorized by the four key areas:
    - Mission Alignment and Enhancement (MAE)
    - Workforce Development (WFD)
    - Finance and Management (F&M)
    - Private Sector Engagement (PS)

- **Timescale Gantt Chart**
  - Categorized by timescale in which to achieve the recommendations:
    - Short-term (6-9 months)
    - Medium-term (1-3 years)
    - Long-term (3-5 years)

Recommendation	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Mission Alignment and Enhancement																				
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2. CIs, as well as other external partners, should be encouraged to contribute (perhaps via an annual open public call) concepts and ideas for consideration of future NOAA research.																				
3. Both NOAA and CIs should establish a dialogue and consider possible representation by the CIs on the NOAA Regional Teams.																				
4. Recognizing that NOAA's research themes will continually evolve, CIs should work with NOAA to ensure that their themes align with the Agency's mission priorities.																				
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Recommendation	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
6. CIs should develop specific workforce management plans to ensure flexibility and steady state turnover of graduate students and postdocs and also promote stability for core staff/faculty that serve as the institutional knowledge and subject matter experts on the CI core themes. These core personnel should expect their positions to continue, pending successful recompetition of their CI and subject theme. CIs should develop job titles that reflect the seniority and stature of their research scientists, comparable to the Assistant, Associate, and Full professor distinctions in academia or the personnel Performance Appraisal Review System (PARS) system in the federal government, subject to availability of funds.																			
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Recommendation	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
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Timescale	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
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Timescale	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
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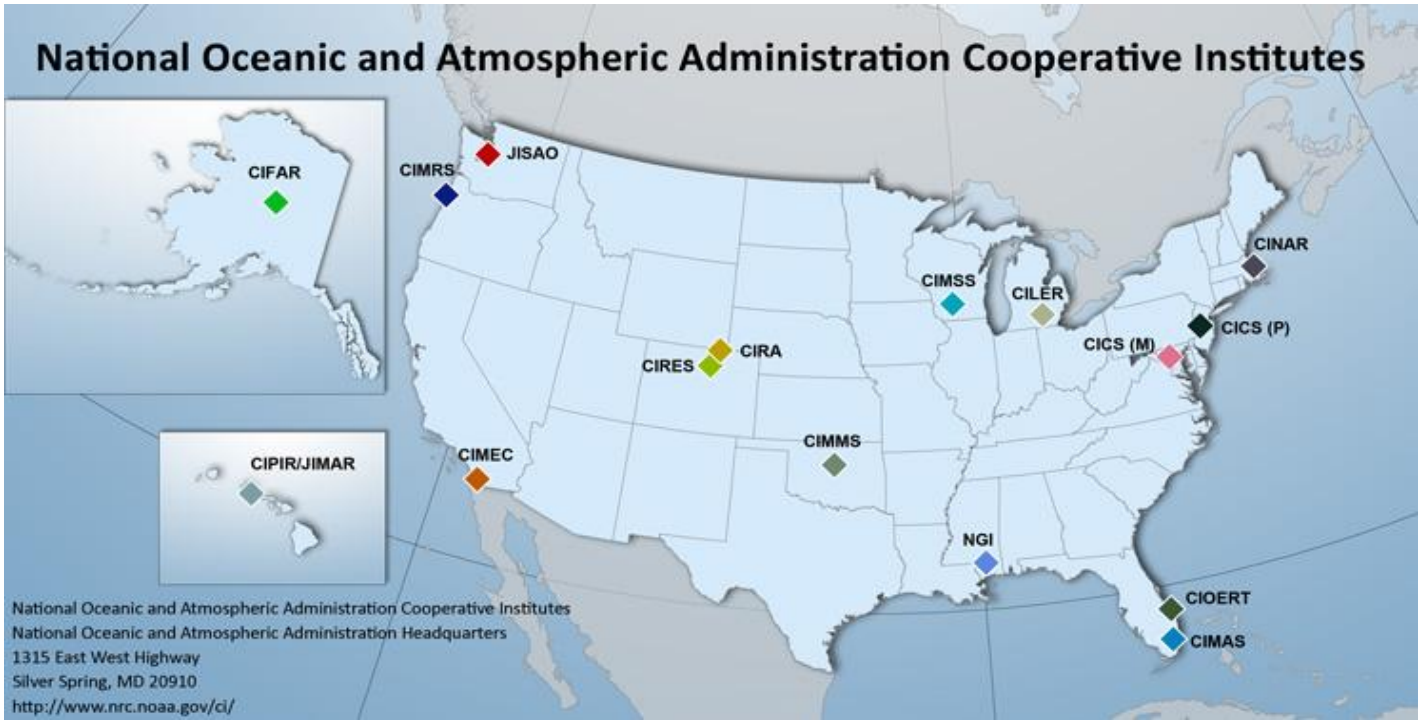
PS 3. Both NOAA and CIs should review statutorily authorized models for PS engagement among the Federal agencies (e.g. STTR, SBIR, CRADA) to establish three-way partnerships with NOAA, CIs, and PS.																				

Timescale	2017				2018				2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PS 4. CIs should develop opportunities for students at their institutions to conduct internships and externships with the PS and for PS employees to conduct research and development activities within the CI academic institutions.																				
Long Term (3-5 Years)																				
WFD 1. NOAA and CI management should establish fair and consistent use of best practices, to help ensure that long-term CI employees can meet various success metrics for their career advancement. Approaches may vary across the CIs, encouraging explicit agreements between NOAA labs and CIs. Examples of such practices may include: establishing progressive responsibilities leading to leadership roles, supporting the pursuit of extramural funding as principal investigators on projects aligned with the mission of NOAA, etc.																				
WFD 4. NOAA and CIs should recruit and train a more diverse and inclusive workforce and should explore mechanisms through CSC and Sea Grant efforts which could be better integrated with the CI employment opportunities.																				
PS 5. NOAA should develop thematic language that promotes social science components in CIs' plans and programs, where appropriate.																				

Appendix II: Cooperative Institutes Background Information

Cooperative Institute Program by the numbers:

- 16 current CIs with total funding of ~$200M per annum
- 13 CIs housed under NOAA's Office of Oceanic and Atmospheric Research (OAR), two CIs housed under the National Environmental Satellite, Data, and Information Service (NESDIS), and one CI under the National Marine Fisheries Service (NMFS)
- Nine CIs are single university programs closely linked to NOAA lab or science centers
- Seven CIs are consortia (NGI, CICS-MD, CIMEC, CIMAS, CINAR, CIOERT, and CILER)
- Three CIs have changed thematic drivers during recompetition
- Three CIs have been sunsetted as research objectives have been met and new CIs can be created to address evolving research needs



Appendix III: CI Directors' Executive Committee Members

- Waleed Abdalati (Chair) - Cooperative Institute for Research in Environmental Sciences (CIRES)
- Don Anderson - Cooperative Institute for the North Atlantic Region (CINAR)
- Fernando Miralles -Wilhelm - Cooperative Institute for Climate and Satellites (CICS-MD)
- Shirley Pomponi - Cooperative Institute Ocean Exploration Research and Technology (CIOERT)
- Christian Kummerow - Cooperative Institute for Research in the Atmosphere (CIRA)
- Michael Banks - Cooperative Institute for Marine Resources Studies (CIMRS)

Appendix IV: List of CI21 Summit Attendees

Participant	Affiliation
Abdalati, Waleed **	CIRES/University of Colorado
Anderson, Don **	CINAR/Woods Hole Oceanographic Institute
Banks, Michael A **	CIMRS/ / Oregon State University
Baringer, Molly	NOAA/OAR/AOML
Bratton, John	LimnoTech
Brennan, Rick	NOAA/ NOS/OCS
Brown, Christopher	NOAA/NESDIS
Brown, Otis	CICS-NC/North Carolina State University
Carl Kraft, Bethany	Ocean Conservancy
Carlis, DaNa	NOAA Office of the Chief Scientist
Chai, Fei	University of Maine
Chen, Debbie	NOAA/AGO/GMD
Chigbu, Paulinus	LMRCSC/ University of Maryland Eastern Shore
Christenson, Todd	NOAA Education
Colohan, Peter	NOAA Office of the Chief Scientist
Colton, Marie	Harris Corp
Cortinas, John	NOAA/OAR/OWAQ
De Guise, Sylvain	Sea Grant Association
De Luca, Mike	Rutgers University
Decker, Cynthia	NOAA/OAR/CIP
Dilling, Lisa	University of Colorado/Western Water Assessment
Fine, Steve	NOAA/OAR
Garber, Nikola	NOAA/OAR/Sea Grant
Gerstman, Ari	UCAR
Graham, Monty	NGI/University of Southern Mississippi
Guch, Ingrid	Noblis
Hayes, Sean	NOAA/NMFS/SWFSC
Hedge, Christopher *	NOAA/NWS
Higgins, Wayne	NOAA/OAR/CPO
Hoffman, Philip L.	NOAA/OAR
Holdren, Richard	Oregon State University
Kalb, Mike	NOAA/NESDIS/STAR
Kaplan, Marlene	NOAA Office of Education
Kelleher, Kevin	NOAA/OAR/ESRL/GSD
Kummerow, Christian **	CIRA/Colorado State University
LaFonta, Jean	CICS-M/University of Maryland
Lechuga, Jen *	NOAA
Lee, Deborah	NOAA/OAR/GLERL
Lindley, Steve	NOAA/NMFS//SWFSC

Lord, Stephen	NOAA/NWS/Retired
Louie, Shannon	NOAA/OAR/CIP
Majumdar, Sharan	CIMAS/University of Miami
Merrick, Richard	NOAA/ NMFS
Montanio, Pat	NOAA
Moorhead, Robert	NGI/Mississippi State University
Napp, Jeffrey	NOAA/NMFS/AFSC
Nierenberg, Claudia	NOAA/OAR /CPO
Ortner, Peter	CIMAS/University of Miami
Pershing, Andrew	Gulf of Maine Research Institute
Pomper, Andrew	CIRES/University of Colorado
Ponwith, Bonnie	NOAA/NMFS/SEFSC
Reinhart, Tracy	CIMMS/ University of Oklahoma
Ross, Mitchell J.	NOAA/ AGO
Sabine, Christopher	NOAA/OAR/PMEL
Schnettler, Erin	Knauss Sea Grant Fellow
Schranz, Sher	CIRA-Colorado State University
Seegers, Bridget	Knauss Sea Grant Fellow
Seki, Michael	NOAA/NMFS/PIFSC
Shambaugh, Jamie	NOAA/OAR/CPO
Sienkiewicz, Joe	NOAA/NWS/OPC
Simpson Porter, Arlene	NOAA/ AGO
Simpson, Caitlin	NOAA/OAR/CPO
Skeehan, Emily	Knauss Sea Grant Fellow
Spinrad, Rick	NOAA Chief Scientist
Stein, John	NOAA/NMFS//NWFSC
Stensrud, David	Penn State University
Thur, Steve	NOAA/NOS/NCCOS
Titley, David	Penn State University
Trueblood, Dwight	NOAA/NOS/OCM
Turner, Beth *	NOAA/NOS
Uhart, Michael	NOAA/OAR
Venable, Demetrius	NCAS/ Howard University
West, Dick	National Sea Grant Advisory Board
Westley, Marian	NOAA Office of the Chief Scientist
Yoskowitz, David	NOAA

* NOAA CI Committee Members

** CI Director Executive Committee Members

Appendix V: Glossary

AFSC	Alaska Fisheries Science Center
AGO	Acquisition and Grants Office
AOML	Atlantic Oceanographic and Meteorological Laboratory
CESU	Cooperative Ecosystem Studies Units
CI	Cooperative Institute
CI21	Cooperative Institutes in the 21st Century
CICS (P)	Cooperative Institute for Climate Science (Princeton University)
CICS (M)	Cooperative Institute for Climate and Satellites (University of Maryland at College Park)
CICS-NC	Cooperative Institute for Climate and Satellites (North Carolina State University)
CIFAR	Cooperative Institute for Alaska Research (University of Alaska)
CILER	Cooperative Institute for Limnology and Ecosystems Research (University of Michigan)
CIMAS	Cooperative Institute for Marine and Atmospheric Studies (University of Miami)
CIMEC	Cooperative Institute for Marine Ecosystems and Climate (Scripps Institution of Oceanography, UC San Diego)
CIMMS	Cooperative Institute for Mesoscale Meteorological Studies (University of Oklahoma)
CIMRS	Cooperative Institute for Marine Resources Studies (Oregon State University)
CIMSS	Cooperative Institute for Meteorological Satellite Studies (University of Wisconsin-Madison)
CINAR	Cooperative Institute for the North Atlantic Region (Woods Hole Oceanographic Institution)
CIOERT	Cooperative Institute for Ocean Exploration, Research, and Technology (Harbor Branch Oceanographic Institute, Florida Atlantic University)
CIP	Cooperative Institute Program Office
CIPIR/JIMAR	Cooperative Institute for the Pacific Island Region / Joint Institute for Marine and Atmospheric Research (University of Hawaii)
CIRA	Cooperative Institute for Research in the Atmosphere (Colorado State University)
CIRES	Cooperative Institute for Research in Environmental Sciences (University of Colorado)
CPO	Climate Program Office
CRADA	Cooperative Research and Development Agreement
CSC	Cooperative Science Center
ESRL	Earth System Research Laboratory
ESSA	Environmental Science Services Administration
F&M	Finance and Management
FFRDC	Federally Funded R&D Center
GLERL	Great Lakes Environmental Research Laboratory
GMD	Global Monitoring Division of ESRL

GS	General Schedule
GSD	Global Systems Division of ESRL
HQ	Headquarters
IPA	Intergovernmental Personnel Act
JISAO	Joint Institute for the Study of the Atmosphere and Ocean
LMRCSC	NOAA Living Marine Resources Cooperative Science Center
LO	Line Office
LT	Long-Term
MAE	Mission Alignment and Enhancement
MT	Medium-Term
NCAS	NOAA Center for Atmospheric Sciences
NCCOS	National Centers for Coastal Ocean Science
NESDIS	National Environmental Satellite, Data, and Information Service
NGI	Northern Gulf Institute
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NWFSC	Northwest Fisheries Science Center
NWS	National Weather Service
O2R	Operations to Research
OAR	Office of Oceanic and Atmospheric Research
OCM	Office for Coastal Management
OCS	Office of Coast Survey
OPC	Ocean Prediction Center
OWAQ	Office of Weather and Air Quality
PMEL	Pacific Marine Environmental Laboratory
PIFSC	Pacific Island Fisheries Science Center
POC	Performer of Choice
PS	Private Sector
R&D	Research and Development
RFI	Request for Information
SBIR	Small Business Innovation Research
SRGM	Strategic Research Guidance Memorandum
ST	Short-Term
STAR	Center for Satellite Applications and Research
STTR	Small Business Technology Transfer
SWFSC	Southwest Fisheries Science Center
TPM	Technical Program Manager
UCAR	University Corporation for Atmospheric Research
WFD	Workforce Development