
# Cooperative Forestry Research Unit

## *Program Prospectus 2020-2025*

1865 THE UNIVERSITY OF MAINE

Center for Research on Sustainable Forests

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## SUMMARY

Maine's large forestland owners have long recognized the need to support a strong research effort as part of their managing Maine's forests. Over forty years ago, a small group of visionary forest industry leaders and representatives of the University of Maine formed the Cooperative Forestry Research Unit (CFRU). Currently composed of 32 private and public forestland management organizations from across the state, CFRU guides and supports research on key issues facing Maine's forest landowners and managers. CFRU is one of the oldest industry/university forest research cooperatives in the United States, and continues to serve as a model of joint leadership and cooperation between Maine's largest industry and the University of Maine. Recently, the CFRU and the University of Maine created a gift fund description (available as an Appendix) for the organization to better clarify roles, responsibilities, and expectations for all involved parties. This should help leverage past successes and ensure a sustainable future for the CFRU going forward.

Typically, the CFRU has surveyed the research priorities of its members every five years and develops a prospectus that guides research and technology transfer activities over the next five-year period. Due to a variety of unforeseen organizational changes surrounding the retirement of CFRU Director Wagner, loss of the program leader in 2019, and ongoing conversations between CFRU and the University, further complicated by the COVID-19 pandemic that began in March 2020, implementation of a new prospectus was delayed several times. In the meantime, the CFRU has been operating under the 2011-2015 prospectus. The following 2020-2025 prospectus, based on a member survey conducted in 2018, will serve as a guide for the operation of the University of Maine's CFRU and the starting point for future refinements. The document is made publically available to help others better understand the organization and its governance as well as current priorities.

## INTRODUCTION

Since before Maine was a state, its forests have been part of a long heritage vital to the economic, social, and environmental well-being of its people. With 17.6 million acres of forests, Maine is the most heavily forested state in the nation (89%) and is unique in that more than 96% of its timberland is privately owned. The Maine forest products industry had a total estimated 2016 statewide economic impact contribution, including multiplier effect, of $8.5 billion in sales output. It is estimated that 33,538 full- or part-time positions rely on the industry representing $1.8 billion in labor income. Thus, Maine forests have been the backbone of the State's industrial economy as well as the tourist and recreational industry.

Due to the overwhelming importance of the state's forest resource, Maine's largest landowners are continually seeking ways to improve the productivity and sustainability of their forests. Improving forestland stewardship requires a constant flow of new information about how to effectively and efficiently manage a wide range of forest resource values in an environmentally sound manner. CFRU members pursue applied research projects that will help them increase forest productivity, improve forest management, protect water quality, and conserve forest biodiversity.

To ensure that CFRU serves its members in an effective and efficient manner, CFRU seeks to develop a program prospectus every five years that defines overall research priorities and directions, as well as how the unit will operate. The CFRU staff and Advisory Committee use the prospectus as a reference and plan for developing, implementing, and evaluating all research projects and technology transfer

activities. Due to organizational changes explained above, the CFRU operated under the 2011-2015 prospectus until 2020. This current prospectus serves as a guide for operation of the University of Maine's CFRU from 2020 through 2025.

## ACCOMPLISHMENTS 2011-20 (BASED ON LAST PROSPECTUS)

As now outlined in the CFRU gift fund description, the CFRU publishes an annual report that provides members with a detailed description of progress made on projects approved by the Advisory Committee. The annual reports document CFRU accomplishments toward the goals and objectives identified from research priorities surveys of CFRU member organizations.

Details of these accomplishments can be found by reviewing the annual reports on the CFRU website (www.umaine.edu/cfru/annual-reports), as well as associated research reports and other publications that were produced from these works. The following provides a brief overview of accomplishments achieved toward each 2011-15 objective, since 2016 (please refer to the annual reports from prior years for additional information):

1. **Improve knowledge about COMMERCIAL THINNING STRATEGIES, including: methods, timing of entry, spacing standards, prioritizing stands, and other decision-making criteria**

    - [2019] Weymouth Point Study: The long-term impacts of whole-tree harvesting has been completed; results may inform development of sustainable forest management standards in northern New England.
    - [2018] Soil samples collected for a study of long-term effects of whole-tree harvesting and residue management at the Weymouth Point Study Area in 2017 were analyzed for nutrient content in 2018. Ecosystem carbon and nutrient budget work is ongoing. Other preliminary results suggest that dead wood debris is three times greater in the unharvested watershed than in the clearcut watershed.
    - [2017] Economic projections of longstanding spruce-fir trials at the Austin Pond Study Area reveal that PCT reduced time to economic maturity by 11 years, increased maximum net present value (NPV) by $1,500/ha, and more than doubled average stem size.
    - [2017] Commercial Thinning Research Network (CTRN) data from unthinned stands indicated that thinning from below returned the highest maximum NPV and double average stem size compared to the control
    - [2017] A new study examining the long-term impacts of whole-tree harvesting was initiated on the Weymouth Point Study Area. Preliminary analysis indicates that aboveground biomass, 35 years after harvesting, did not vary by harvest type or soil rock volume after adjusting for differences in stand density.
    - [2016] A study examining the effects of mechanized harvesting operations on residual stand conditions demonstrated that despite severe rutting and soil disturbance at the time of Whole Tree clearcut harvesting at the Weymouth Point Study, there was no negative impact observed on forest composition, structure, or crop tree growth after 32 years. Soil disturbance had no influence on all tree- and stand-level variables examined, including basal area, density, percent hardwood, volume, DBH, and height

2. **Further understanding about the effects of PARTIAL HARVESTING PRACTICES on regeneration, stand development, productivity, stand management, and future stand values**

    - [2018-2019] The study areas support a diverse range of species including sugar maple, red maple, yellow birch, American beech, spruces, and balsam fir. The forest management practices that will be evaluated for their influence on soils include irregular shelterwood cutting, crop tree release, partial harvesting, and control (no cutting in 2018).

3. **Provide scientific data on current and emerging WILDLIFE HABITAT MANAGEMENT issues such as: deer wintering areas, threatened & endangered species, and others.**

    - [2019] Ground telemetry efforts in 2018 and 2019 yielded 964 American marten locations, contributing to an overall dataset of 7,009 telemetry locations on 153 resident marten. Future work will integrate these data with a time series of habitat data developed from satellite and aerial imagery to investigate marten responses to three decades of habitat change.
    - [2019] Rusty Blackbirds were confirmed nesting in wetlands, naturally regenerating stands, and stands that had undergone pre-commercial thinning. Research continues on nesting and fledgling habitat selection and survival in intensively managed forests in Maine and New Hampshire.
    - [2019] Habitat selection analysis for Bicknell's thrush (harvested v. non-harvested) is currently under way.
    - [2018] A long-term effort (1989–2019) to study the effects of landscape configuration changes on American marten populations indicate that the catch rate in spring 2018 was lower than it has been during the past seven field seasons, and that each of the five martens monitored this season were detected in over 40 locations.
    - [2018] Two deer wintering area habitat models were produced using management guidelines from the Maine Department of Inland Fisheries and Wildlife, one of the models also including basking habitat within 250 m.
    - [2017] A region-wide, geospatial analysis of deer-wintering areas (DWA) was completed in 2017. Economic analyses suggest that financial loss is not universal and is highly dependent on landowner objectives and stand conditions at the start of the simulation.
    - [2017] More than 50% of radio-marked spruce grouse hens nested successfully in intensively-managed forests in Piscataquis County. Models suggest that reproductive success increases when spruce grouse nest sites are located in areas with greater structural complexity.
    - [2016] Spruce Grouse were monitored in the second year of a three year project examining the link between commercial forest management, forest habitat characteristics and Spruce Grouse population performance. Preliminary data indicates that nest site selection by adult females was negatively associated with the basal area of live trees at both local and patch scales and yet there was a positive relationship with lateral cover at the local scale.
    - [2016] A study of Northern Long-Eared Bats (NLEB) in Maine was completed (the NLEB was listed as ESA Threatened in 2015). The study consisted of a literature review focused on bats in northeastern forest ecosystems along with field sampling of bat occupancy to evaluate several detection methods and their efficacy in Maine forests.

- [2016] Opportunity costs of managing Deer Wintering Areas (DWAs) was quantified by modeling common silvicultural scenarios from two representative timberland properties. Results were specific to site and the influence of landowner objectives on past management.
- [2016] The effects of moose density on forest regeneration, composition and damage was investigated over two years in hardwood, mixedwood and conifer stands of varying age and harvest histories. Evidence of damage was higher in hardwood stands and declined with time since harvesting.

**4. Develop and refine GROWTH & YIELD MODELS for Maine forests, and produce inexpensive and efficient tools for forest managers.**

- [2019] LiDAR-based flow-channel, depression and wet-areas mapping initiative were presented at a series of meetings and workshops to inform how geomorphic features such as flow channels, depressions, cartographic depth-to-water and related seasonal variations can be emulated based on digital elevation models.
- [2019] Data from repeat measurements of crop trees on the Penobscot Experimental Forest Rehabilitation Study and the SI Comp experiment are being analyzed. The measurements and findings from both studies will be used to develop tree growth and yield models for early successional hardwood and mixed-wood stands.
- [2019] A comprehensive, flexible and efficient workflow was developed for building, applying and evaluating enhanced forest inventory prediction maps using an area-based approach.
- [2018] Repeat measurements were made on hardwood trees on both the Penobscot Experimental Forest Rehabilitation Study and the Silvicultural Intensity and Species Composition experiment. These data, along with data from forest inventories with repeat measurements of tree attributes in Maine, New Brunswick, and Nova Scotia, will be used to develop growth and mortality response functions for common hardwood species.
- [2018] Data from the 2017–18 spruce budworm second instar larvae (L2) survey suggest that overwintering larvae levels in Maine remain very low, with 32 larvae found in 13 sample locations and no larvae found in 242 of 255 locations.
- [2017] Data from the 2016–17 spruce budworm second instar larvae (L2) survey revealed very low levels of overwintering spruce budworm larvae in northern Maine, but highlighted a few areas with higher L2 densities that will be closely monitored in the future.
- [2017] Data from pheromone traps and spruce budworm L2 density sampling, obtained across over 250 sites on CFRU landowner property in northern Maine, were used to model spruce budworm moth and larval abundance.
- [2017] Landsat imagery and derived vegetation indices (VIs) were used to model current-year spruce budworm defoliation in Quebec and Maine. The most effective model used a combination of VIs to predict defoliation, with accuracy greater than 50% across all defoliation severity classes.
- [2016] A study was initiated in 2016 using Landsat satellite imagery to detect and estimate SBW defoliation severity on the landscape. The goal is a tool that has greater accuracy, near real-time availability, and increased cost effectiveness and non-subjective methodology as compared to traditional methods.

- [2017] Phase two of a three-phase initiative to complete LiDAR acquisition for the entire state of Maine was completed this year leveraging CFRU member funds to attract Federal and State funding.
- [2016] The influence of tree stem form and defects on potential product recovery, diameter increment, probability of survival, and occurrence of decay in northern hardwood species was modeled. Stem taper, crown ratio, and species were found to be influential factors for predicting the occurrence of internal stem decay. Potential product recovery was significantly lower for trees with multiple sweeps or stems, severe lean, significant forks or those considered to be high risk.
- [2016] A 20 meter resolution map of predicted site quality was made for the entire Acadian Forest Region as a function of climate, lithology, soils and topographic features; the products are available on the CFRU website for download: http://www.forusresearch.com/bgi.php

5. **Enhance understanding about how FOREST OPERATIONS such as harvest methods, equipment, roads, stream crossings, and labor influence management efficient and wood costs.**

- [2019] Though few if any direct effects of soils were found on winter harvesting productivity and costs for a white cedar stand at the PEF, tree species composition was an influential factor and is itself related to soils.
- [2019] The evaluation of timber harvesting operations on soil revealed that the cost of BMP implementation was directly influenced by extent and severity of the sensitive zone within the harvest zone, and less impacted by the skidding distance. BMP implementation can be incorporated into a mainstream harvesting operation without much affecting the economic feasibility.
- [2018] An evaluation of the effects of four different prescriptions on soil compaction and the cost of implementing Best Management Practices (BMPs) to reduce soil damage suggest that the cost of BMP implementation (between $10 and $52 PMH-3 ) depends on machine maneuverability and the extent of area covered by the BMP.
- [2019] Data analyses of our fieldwork for quantifying the long-term ecological outcomes and in alternative riparian buffer designs is being finalized, but initial results indicate that ecological communities reflect a legacy of riparian management approaches 17 years after initial harvest occurred.
- [2018] Pre-harvest measurements at the Penobscot Experimental Forest suggest that these forests have high volumes of dead wood, high water tables, and white-cedar that originates from both seed and layers.
- [2018] Two sites in Maine's Adaptive Silviculture Network were harvested in 2017-18. Three more installations were established.
- [2017] Maine Adaptive Silviculture Network (MASN) commenced in 2016-17, with three sites selected. This new network is a statewide series of operational-scale silvicultural treatments where future research on forest productivity and sustainability will be studied.
- [2016] A 10-year-old study of beech control in partially harvested stands using ground-based herbicides indicates a lasting benefit on understory sugar maple abundance

but not height. The lack of a height response to release was most likely due to the effects of browsing and increasing crop tree basal area in the overstory.

- [2016] The ability to identify old-growth northern white-cedar stands through the structural characteristics that are potentially unique to old-growth stand characteristics (he volume of advanced-decay coarse woody material and live tree quadratic mean diameter differentiate old-growth from partially harvested stands) improves successful management of the species.

## MISSION

The mission of the CFRU for 2020-2025 will be "***conduct applied scientific research that contributes to the sustainable management of the Northeast's working forests for desired products, services, and conditions***."

## FIVE-YEAR OBJECTIVES (2020-2025)

Based on results from a 2018 survey of CFRU member organizations about their research priorities (see Appendix I), the objectives of CFRU research will fall within five major themes (themes are listed in order of rankings, and each topic is shown with its mean ranking on a scale from 1 to 5 in parentheses):

1. Silviculture and Applied Research
    - Predicting and influencing ADVANCE REGENERATION dynamics (4.26)
    - Developing and assessing methods of INVASIVE SPECIES MANAGEMENT (4.15)
    - Refining new tools for determining SITE PRODUCTIVITY (4.06)
2. Emerging Technologies and Modeling
    - Using REMOTE SENSING AND OTHER TECHNOLOGY to improve INVENTORY (4.61)
    - Improving GROWTH AND YIELD MODELING (4.42)
    - Improving LANDBASE DESCRIPTIONS and MODELING SITE PRODUCTIVITY (4.05)
3. Forest Ecology and Management
    - Understanding MIXED SPECIES dynamics and response to harvesting (4.55)
    - Assess role of FOREST HEALTH in PRODUCTIVITY (4.17)
4. Economics and Social Science
    - Optimizing harvest efficiency for EARLY ENTRY, SMALL DIAMETER SOFTWOOD stands (4.63)
    - Investigating markets for LOW-GRADE SMALL DIAMETER SOFTWOOD stands (4.62)
    - Explore economic impacts of COMMERCIAL THINNING and MID-ROTATION SILVICULTURE (4.54)
5. Wildlife Habitat and Influence
    - Quantifying BROWSING EFFECTS on growth and regeneration (4.27)
    - Knowledge synthesis to produce BEST PRACTICES FOR WILDLIFE MANAGEMENT (4.07)

- Using LiDAR and remote sensing to MODEL AND MAP WILDLIFE HABITAT (4.01)

## GUIDING PRINCIPLES

CFRU will conduct research to achieve the above objectives that is guided by the following principles:

- Research will be conducted that focuses primarily on developing applied information that can be used by CFRU Cooperators to improve forestland management. However, since increasing fundamental understanding about forest ecosystems can often make the most significant strides toward improved management, basic research efforts that are closely aligned with applied research objectives will be encouraged.
- Experimental design, methods, and procedures used in CFRU research will achieve the highest standards.
- Since field research involves a substantial investment, every effort will be made to encourage projects led by research teams that include interdisciplinary questions and collaboration.
- All research projects will seek to optimize opportunities for leveraging through shared collaborations, in-kind contributions, and funding with other organizations that have similar goals and/or the required expertise.
- Research results from CFRU projects will be rapidly communicated to Cooperators using the most effective means of communication (including: oral presentations at Advisory Committee meetings, workshops and field tours, e-mail campaigns, and webinars). Completed research will be promptly submitted for publication in refereed scientific journals.
- Since success of the CFRU relies heavily on the collaborations between Scientists and Cooperators, vigorous cooperation is expected from each Cooperator, including direct participation and in-kind contributions for Approved Research Projects.

## ORGANIZATIONAL DESIGN

A strong organizational design (Figure 1) will be maintained to accomplish the above mission and research objectives. Objectives for the organizational design include:

- Enhancing cooperation and teamwork among scientists, staff, students, and cooperators;
- Enhancing productivity, creativity, and synergy;
- Increasing efficiency and accountability;
- Attracting the most productive and accomplished researchers;
- Encouraging interdisciplinary research;
- Optimizing flexibility with changing research needs;
- Maximizing operating funds available for research; and
- Encouraging shared funding and integration of research projects with the Maine Agricultural and Forest Experiment Station (MAFES) and other academic departments at the University of Maine, as well as other researchers, organizations, and external funding agencies.

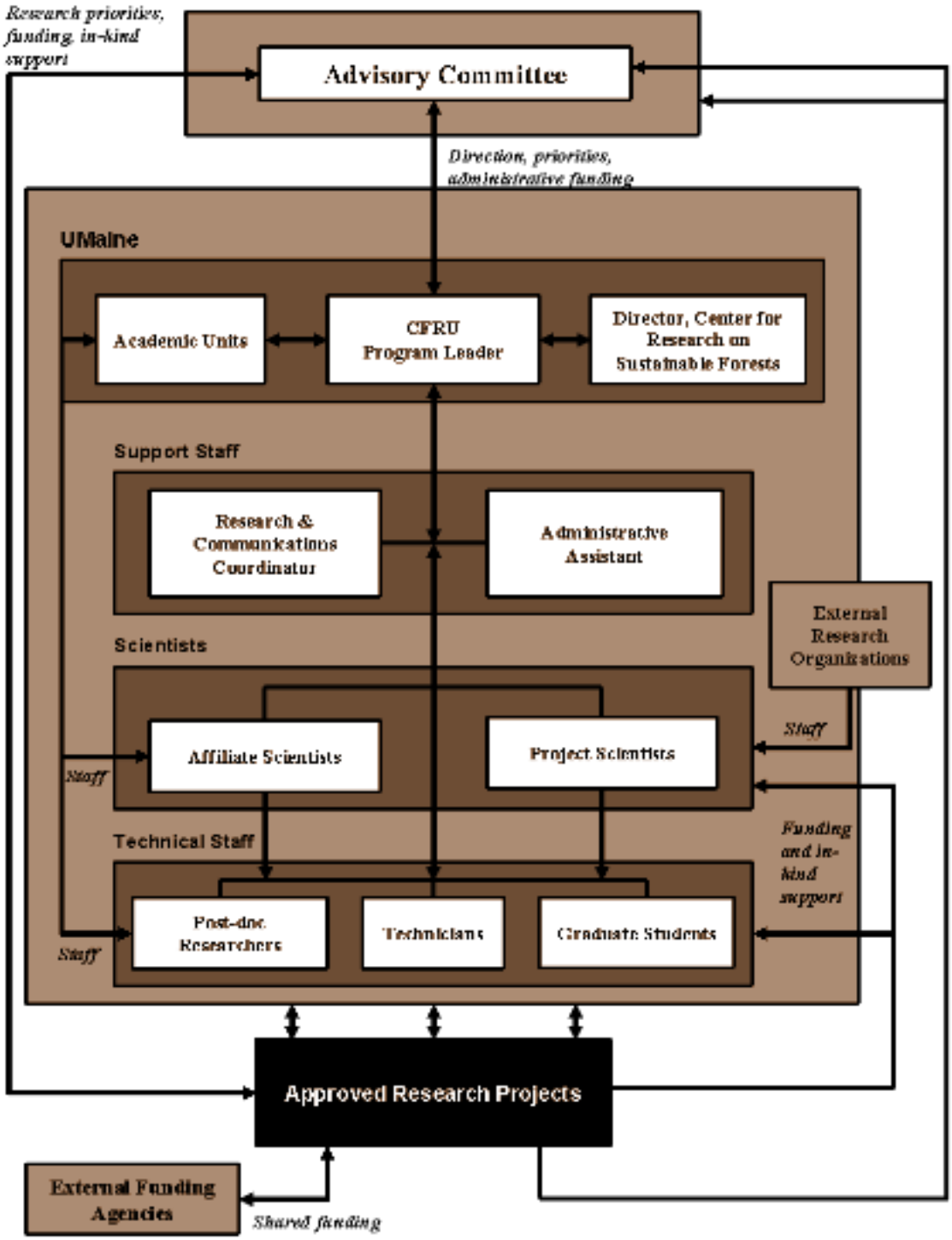


**Figure 1. CFRU Organizational Chart**

### Cooperating Organizations

The CFRU serves the applied research needs of its member organizations which include 1) forest landowners and managers, 2) mill owners and wood processors, 3) corporate businesses or other organizations, and 4) individuals. Cooperating Organizations financially support CFRU and govern its affairs through an Advisory Committee. Four categories of membership are provided for each type of Cooperating Organization wanting to support the advancement of forest management practices in the state of Maine through CFRU research. The cost and services provided for each of the four classes of membership are described in the Bylaws (see Appendix II).

### Advisory Committee

All Cooperating Organizations are represented by an Advisory Committee. Representation on and rules governing the Advisory Committee are described in the Bylaws (see Appendix II) and Policies and Procedures (see Appendix III). The function of the Advisory Committee is to:

- Define the mission, objectives, and guiding principles for CFRU;
- Annually review and approve CFRU Gift Fund Description (Appendix VI)
- Define the research needs and priorities for the expenditure of funds contributed by Cooperating Organizations;
- Approve appointments of Program Leader and Affiliated Scientists;
- Annually assess CFRU Program Leader's performance
- Review research proposals submitted by Scientists and outside organizations for relevance to CFRU objectives and budgets;
- Approve funding for all Approved Research Projects and CFRU administrative budget;
- Provide assistance, as needed, to Affiliated Scientists in implementing Approved Research Projects, identifying and securing opportunities for direct cooperation and in-kind contributions for research on cooperator lands;
- In cooperation with CFRU Program Leader, ensure Approved Research Projects are kept on schedule and results delivered in a timely manner by Affiliated Scientists and outside agencies;
- In cooperation with CFRU Program Leader and Affiliated Scientists, ensure that research results from Approved Research Projects are disseminated to all Cooperating Organizations in a timely and efficient manner;
- Develop and maintain a level of base funding needed to adequately run the CFRU; and
- Recruit new members.

## Research Team

CFRU research and other activities are conducted by a Research Team consisting of Affiliated Scientists, Support Staff, and Technical Staff. The Research Team achieves the mission and objectives of CFRU as set by the Advisory Committee through Approved Research Projects. The Research Team consists of the Program Leader, Research and Outreach Coordinator, Affiliated Scientists, Support Staff, and Technical Staff.

## University of Maine

The CFRU is housed at and administered by the University of Maine (UMaine) within the Center for Research on Sustainable Forests (CRSF). A faculty Program Leader and the Director of the CRSF will provide leadership on active management of the fund and coordination of CFRU activities. UMaine academic units, external research organizations, and additional funding agencies support and/or collaborate in Approved Research Projects.

### CFRU Program Leader

The CFRU is led by a University of Maine faculty Program Leader with the following key responsibilities, listed in order of importance:

1. In consultation with the Director of the Center for Research on Sustainable Forests and the Vice President for Research and Dean for the Graduate School, the CFRU Program Leader shall administer the Cooperative Forestry Research Fund, in accordance with the fund description.
2. In cooperation with the Advisory Committee, maintain, develop, and oversee CFRU finances including detailed budgets with quarterly reports submitted to the Executive Committee on the 1st of October, January, April, and July.
3. Provide direction and supervision of Research & Communications Coordinator, Administrative Specialist, and any seasonal employees to ensure timely and efficient delivery of their functions.
4. Formally report all CFRU related activities, project accomplishments, and fiscal transactions on an annual basis (Annual Report) that is provided to the Advisory Committee within 120 days following the end of the fiscal year – no later than January 10th.
5. In collaboration with the CFRU membership prepare the CFRU Program Prospectus strategic plan document, submitted every 5 years. The CFRU Program Prospectus will document CFRU guiding principles, five-year objectives, organizational design, research project development (the review and funding process), and technology transfer and communications to address and satisfy CFRU member needs. This will be presented at the Fall (October) Advisory Committee Meeting.
6. Work closely with Research & Communications Coordinator, Affiliated Scientists, and other researchers to conceive, develop, and implement Approved Research Projects that advance the mission and objectives of the CFRU.
7. Keep current on emerging and innovative research which may be valuable to the goals of the CFRU membership and shall conduct independent research relevant to the CFRU and periodically publish findings.
8. Responsible for expected CFRU deliverables including;
    a. Organizing and scheduling Advisory Committee Meetings for Fall (October), Winter (January), and Spring (April), with the option of an optional Summer meeting if requested.
    b. Developing agendas for field tours, with a minimum of one field tour in the Fall. Other field tours may be submitted by the Program Leader for consideration and approval by the Executive.
    c. Assessing the need for and organization of workshops to disseminate research results or new technologies to frontline forest managers.

d. Annually reviewing the CFRU website to determine if it is meeting CFRU needs and ensure most recent CFRU publications are available on the website.

e. Maintaining a brochure that provides an overview of the CFRU for prospective members.

f. Maintaining posters the CFRU can use to promote the CFRU and CFRU research at conferences, workshops, professional meetings, and other venues where people are gathered to discuss forest resources or research.

9. Supervise the design, maintenance, and documentation of data for core CFRU research projects (e.g., Commercial Thinning Research Network, Maine Adaptive Silviculture Network, etc.).
10. Ensure Approved Research Projects are scientifically and technically sound by managing a review process for all pre-proposals and full-proposals submitted to the Advisory Committee.
11. Develop contacts, networks, and direct linkages with other researchers, research organizations, and funding agencies nationally and globally to identify and pursue opportunities for shared research funding, and as appropriate, pursue agreements that leverage and compliment CFRU research activities.
12. Develop a strong working relationship with CFRU Cooperating Organizations. This will be facilitated with visitations to offices and operations of the CFRU membership (both Corporate and Individual members). The CFRU Executive Committee will set an annual goal for the frequency of these visits.
13. Strategically recruit new members and key partners.
14. Oversee CFRU operations to include:

    a. Ensuring proper field and lab safety protocols are maintained, communicated, and adhered to.

    b. Ensuring the efficient utilization of university resources and property.

    c. Ensuring the proper storage, organization, and access for all CFRU related materials (e.g., proposals, research notes, bulletin, meeting minutes, etc.).

15. Publicly promote the CFRU and its accomplishments to a broad array of stakeholders including governmental bodies. Serving as a liaison for sound, science-based, and sustainable forest management.
16. In cooperation with the Advisory Committee, identify and select Affiliate Scientists and other researchers that can meet the CFRU mission and objectives when needed.
17. Serve on the University of Maine's graduate faculty and participate on graduate student committees when appropriate.
18. Perform other reasonably related duties as assigned.

The CFRU Program Leader will be:

- Selected from UMaine faculty, based on mutual agreement between the Advisory Committee and university administration (Director of Center for Research on Sustainable Forests and Chair/Director of prospective Program Leader's home academic unit);
- Appointed for a three-year term with renewal based on annual performance review and approval by the Advisory Committee and university administration; and
- Compensated by an annual salary shared equally by the University and CFRU.

## Center for Research on Sustainable Forests (CRSF)

The Center for Research on Sustainable Forests (CRSF) was established in July 2006 and was created in association with re-organization of the UMaine forestry faculty into a School of Forest Resources. As part of this re-organization, CFRU became part of the CRSF, which is administered by a Director who reports to the Vice President for Research. The mission of the CRSF is to *"conduct and promote leading interdisciplinary research on issues affecting the management and sustainability of northern forest ecosystems and Maine's forest-based economy."*

The CRSF is designed to be a center of interdisciplinary collaboration bringing UMaine faculty involved in forest resources related research together under a single "umbrella" organization. In addition to the grants awarded to affiliated CRSF faculty, the CFRU and Northeastern States Research Cooperative (NSRC) form the funding core of the CRSF. The NSRC is a competitive research grants program that supports research on the 26-million acre Northern Forest which occupies the states of Maine, New Hampshire, Vermont, and New York. CRSF supports a number of research initiatives and outreach activities related to forest climate change issues, nature-based tourism, national and regional industry-university research (Center for Advanced Forestry Systems), and the advancement of machine learning related to geospatial information. CRSF provides data tools and resources useful to forest-related stakeholders, such as the Northeast Forest Information Source, Maine Spruce Budworm Task Force Website, and the Maine Forest Ecosystem Status and Trends App. For more information, visit https://crsf.umaine.edu.

## University of Maine Academic Units

Academic Units at UMaine contribute to the CFRU mission and objectives by providing faculty and/or staff that can serve as Program Leader, Affiliated Scientists, or Technical Staff where appropriate.

## Support Staff

Support staff consists of two salaried employees that provide coordination and continuity of CFRU office and field operations. Their responsibilities include:

### *Research & Outreach Coordinator*

Coordinate all field and laboratory research activities for the CFRU, including:

- Manage all field and laboratory activities of technical support staff for approved research projects.
    - Managing long-term CFRU research sites (including Maine's Adaptive Silviculture Network, Commercial Thinning Research Network, and Austin Pond).
    - Serving as safety coordinator in cooperation with UMaine's Department of Safety and Environmental Management to ensure that university safety policies and procedures are followed on CFRU research projects.
    - Fostering development of new research proposals while ensuring a high degree of collaboration, coordination, resource sharing, and communication among research team members.
    - Providing technical guidance and support in experimental design and installation, data management, and field and laboratory methods.

- Conducting statistical analyses of data for approved research projects for research team members.
- Recruiting, hiring, and supervising students and other employees working on CFRU research, and ensuring that all employees are trained and follow university safety policies and procedures.
- Providing technical expertise and advice related to the management of industrial forestlands in Maine.

- Manage the long-term database for all CFRU research projects, including:
  - Developing and maintaining a data bank for the long-term storage and retrieval of data derived from all approved research projects.
  - Ensuring research data from all approved research projects are entered, cleaned, and deposited into a data bank in a timely and efficient manner.
  - Responsible for coordinating real-time cloud based data backup of individual research team members' critical data.
- Coordinate all communications and technology transfer activities for the CFRU, including:
  - Coordinating regular communications with all CFRU cooperators, including:
  - Manage the organization of biennial meetings of the Advisory Committee.
  - Responding to requests for information from Cooperators regarding CFRU research and other matters.
  - Delivering oral presentations at Advisory Committee meetings, conferences, field tours and site visits.
  - Developing a strong relationship with CFRU cooperators, regularly visiting their field operations.
- Coordinating the design and maintenance of the CFRU website by:
  - Working closely with the CFRU Advisory Committee, Program Leader, Cooperating Scientists, graduate students, and others to ensure that the web page is current and meeting the communications needs of the unit
  - Ensuring information about all CFRU and its research projects is up to date
  - Working with technical personnel in the maintenance, troubleshooting, and ongoing development of the web site
- Managing the regular production of CFRU publications by:
  - Designing, producing, writing, and distributing the CFRU Annual Report
  - Designing, producing, writing, and distributing an up-to-date brochure about the CFRU
  - Production of Research Notes and Research Reports (including editing, writing, graphics preparation, desktop publishing, typing, printing) about ongoing CFRU research projects

  - Rapid dissemination of technical publications (including annual reports, research notes, research reports, web pages, posters, and brochures) to CFRU members in a timely manner via MailChimp or similar email marketing services.

- Designing and implementing outreach activities that facilitate regular communications about CFRU research projects to CFRU members, other forestry professionals, policy makers, and public; including:
  - Designing annual CFRU field tour featuring current CFRU research.
  - Developing, designing, and implementing conferences, workshops, field tours, and other meetings that feature CFRU research or other topics of interest to CFRU members.
  - Designing and producing poster displays for scientific and professional meetings.
  - Marketing the CFRU to the public and outside organizations by creating and managing media events (e.g., newspaper, radio, television) and other public communications.

- Other duties
  - Manage CFRU lab and storage facilities (including safety procedures), files, equipment, supplies, and other program materials.
  - Maintaining fleet of CFRU vehicles and coordination of scheduling among CFRU projects.
  - Coordinate all equipment, supplies, and other logistical details for approved research projects in an efficient and timely manner.
  - Reviewing research proposals and approved research projects for appropriate expenditures, and recommending other efficiencies.
  - Other reasonably related duties as assigned.

### *Administrative Specialist*

- Develop, track, and maintain annual budgets, accounts, and financial records in cooperation with Program leader, Research & Communications Coordinator, and Scientists for approval by Advisory Committee; making recommendations about account management as required.
- Prepare and present written and oral financial reports for Executive Officers and Advisory Committee.
- Coordinate all budgeting and accounting matters that arise from cross-departmental, cross-college, and multi-institutional agreements for shared funding of Approved Research Projects.
- Track acreage owned/managed and amount of wood processed by Cooperators, and process annual contribution requests for all members.
- Coordinate all purchasing, hiring, payroll, and personnel actions for the Research Team; providing interpretation of university policy as required.
- Coordinate, develop, and maintain CFRU mailing lists.
- Maintain CFRU central office, including all files, publications, equipment, supplies, and other program materials.

- Organize conferences, workshops, and other meetings as required, including preparing meeting minutes and making presentations as required.
- Assist with development and maintenance of CFRU website.

## Scientists

Two types of scientists are associated with CFRU:

- Affiliated Scientists will be selected at the discretion of the Program Leader and Executive Committee, based on their specific expertise and will be responsible for providing leadership and guidance in helping achieve the CFRU's Five-Year Objectives. Affiliated Scientists will work closely with the Program Leader, Research & Communications Coordinator, Cooperating Organizations, and Support Staff to meet the overall mission and objectives of CFRU, as well as delivering Approved Research Projects in their area of expertise. Affiliated Scientists will be appointed to CFRU for up to a three-year term, with renewal based on a performance and approval by the Program Leader, CFRU Executive Committee, and Director of the Center for Research on Sustainable Forests.
- Project Scientists will be responsible only for delivering Approved Research Projects, will receive no compensation beyond that specified in project budgets, and will be affiliated with CFRU for the period during which their Approved Research Projects are funded.

Specific responsibilities and selection for both types of CFRU Scientists are as follows:

### *Affiliated Scientists*

- Responsibilities:
    - In cooperation with the Program Leader, Research & Communications Coordinator, and other Affiliated Scientists, ensure that the mission and objectives of the CFRU related to their specific field of expertise are accomplished in a timely, fiscally-efficient, and high-quality manner.
    - Develop a problem analysis and related research proposals that will achieve Five-Year Objectives in their field of expertise.
    - Submit regular research proposals addressing the Five-Year Objectives for funding consideration by the Advisory Committee.
    - Implement Approved Research Projects, analyze data, and contribute to Annual Report
    - Promptly report research results using regular oral presentations, field tours, web pages, articles, research notes and reports, posters, journal publications, and other appropriate forms of communication.
    - Communicate research needs and emerging issues that are relevant to the Cooperators and CFRU mission.
    - Attend and take an active role in CFRU Advisory Committee meetings and field tours.
    - Maintain a high degree of collaboration, coordination, resource sharing, and communication with other members of the Research Team.

- Develop contacts, networks, and direct linkages with other researchers, research organizations, and funding agencies to identify and pursue opportunities for shared research funding in their field of expertise, working with the Program Leader and Research & Communications Coordinator to develop agreements that leverage and compliment CFRU research activities.
- Develop strong relationships with CFRU member organizations, visiting their operations as needed.
- In cooperation with the Program Leader, Research & Communications Coordinator, and other Scientists, select highly qualified graduate students and technicians needed to deliver Approved Research Projects.
- Work closely with the Research & Communications Coordinator to coordinate field activities, technicians, vehicles, equipment, and supplies in cooperation with other Scientists.
- Supervise and coordinate graduate students and technicians to deliver approved CFRU research projects in an efficient and high-quality manner.

- Selection, Term, and Compensation:
  - Selected from existing UMaine faculty or staff (or other organizations as required) based on expertise required to achieve specific CFRU research objectives, and by mutual agreement with CFRU Program Leader, Advisory Committee, and university administration (chair of prospective scientist's home department).
  - Number of Affiliated Scientists on the Research Team will be determined based on research needs outlined by the Five-Year Objectives.
  - May be selected by competitive process based on qualifications and past productivity in relevant scientific disciplines.
  - Appointment will be a three-year term; with renewal based on performance review and approval by the CFRU Program Leader, Advisory Committee, and appropriate university administration.
  - May have access to CFRU vehicles, equipment, and services from Support Staff for delivery of Approved Research Projects.
  - Additional funds for graduate students, technicians, travel, equipment, and supplies may be provided through budgets of Approved Research Projects that are led by Affiliated Scientists.

### *Project Scientists*

- Responsibilities:
  - Submit research proposals addressing Five-Year Objectives for funding consideration by Advisory Committee.
  - Implement Approved Research Projects, analyze data, and prepare an annual report on associated research activities.
  - Provide project updates at Advisory Meetings and during field seasons as requested.

  - Promptly report research results using regular oral presentations, field tours, web pages, articles, research notes and reports, posters, journal publications, and other appropriate forms of communication.
  - In cooperation with CFRU Program Leader and other Scientists, select highly qualified graduate students and technicians to deliver Approved Research Projects.
  - Work closely with Research & Communications Coordinator to coordinate field activities, technicians, vehicles, equipment, and supplies in cooperation with other Scientists.
  - Supervise and coordinate graduate students, undergraduate students, and technicians to deliver Approved Research Projects in an efficient and high quality manner.
- Selection, Term, and Compensation:
  - Selection based on having submitted and received funding from the CFRU Advisory Committee to deliver an Approved Research Project.
  - Member of the Research Team for the length of time that their Approved Research Project is funded by the CFRU.
  - May have access to CFRU vehicles, equipment, and services from Support Staff for delivery of Approved Research Projects.

### *Technical Staff*

- Includes graduate students, post-doctoral fellows, technicians, or other professionals who are funded and/or work on Approved Research Projects, and are employed by the University of Maine or a collaborating organization.
- Graduate students may be funded through research assistantships; post-doctoral fellows may be fixed-term employees; technicians and other filled positions may be either fixed-term employees, temporary classified pool personnel, or student employees.
- Supervised by the Scientist leading the Approved Research Project, but are managed as part of the Research Team to ensure maximum cooperation, coordination, and resource sharing among Approved Research Projects.
- Shared funding among Approved Research Projects for Technical Support is strongly encouraged.

## Approved Research Projects

The CFRU mission and objectives will be accomplished primarily through Approved Research Projects:

- All funding (except the administrative budget) occurs through Approved Research Projects.
- Funding for Approved Research Projects is only available through research proposals that have been approved by the Advisory Committee.
- This is a three-step process with project ideas first submitted for ranking by the Advisory Committee as short pre-proposals via an online process. Results are shared with the project scientists who have the option to advance their pre-proposal or withdraw it from consideration. Pre-proposals follow the format using the template in Appendix IV.

- If a pre-proposal is approved, it can be submitted as a full proposal (format in Appendix V) for funding consideration by the Advisory Committee.
- Research pre-proposals and full proposals may be submitted by Affiliated Scientists, Project Scientists, other UMaine faculty, or researchers from External Research Organizations.
- Proposals demonstrating shared funding or leveraging with External Funding Agencies or External Research Organizations are strongly encouraged.
- Funding for projects can be approved for single or multiple years, and renewed annually by the Advisory Committee for multiple-year projects based on satisfactory performance.
- Project funds not expended in the year(s) proposed may be carried over to future years with approval from the CFRU Program Leader.

### External Research Organizations and Funding Agencies

Every effort will be made by the CFRU Program Leader, Research & Communications Coordinator, and Affiliated Scientists to develop contacts, networks, and direct linkages with other researchers, research organizations, and funding agencies to identify and pursue opportunities for shared funding of research projects that are consistent with the CFRU mission and objectives. Preference for funding will be given to proposals that demonstrate collaboration, shared funding, and in-kind contributions with External Research Organizations and Funding Agencies.

## RESEARCH PROJECT DEVELOPMENT, REVIEW & FUNDING PROCESS

To achieve the Five-Year Objectives established by the Advisory Committee, Scientists will submit research proposals and present updated findings on an annual basis. Figure 2 outlines the general process that will be used for the development, review, and funding of research proposals submitted to CFRU. Research proposals also may be submitted at other times of year depending on need and funding availability. However, the following process will be followed to facilitate a consistent funding and approval process:

- The Advisory Committee defines the Five-Year Objectives and research priorities for CFRU.
- Scientists and other researchers develop pre-proposals (3-pages maximum using the Pre-Proposal format in Appendix IV) that address CFRU research priorities.
- Pre-Proposals are generally submitted to the CFRU Program Leader prior to the fiscal year for which funding is being requested (CFRU fiscal year is October 1 to September 30). Pre-proposals will generally be presented at the winter Advisory Committee meeting in January. The Program Leader and Research & Communications Coordinator will work with Scientists to help refine objectives, methods, collaborations, and shared funding opportunities for proposed projects. Ranking of pre-proposals is done by the Advisory Committee before the Winter Advisory meeting allowing sufficient time for Scientists to consider feedback and make a decision to advance or withdraw their pre-proposal from consideration.
- A decision to recommend development of a Pre-Proposal to become a Full Project Proposal is made by the Advisory Committee, generally at the winter (January) quarterly meetings. Pre-Proposals that

are not recommended for development into Full Project Proposals are returned to Scientists with feedback about reasons for rejection. Revised Pre-Proposals may be re-submitted at a later time.

- Full Proposals (10-pages maximum using the Full Proposal format in Appendix V) are developed by Scientists and are generally presented at the spring (April) Advisory Committee meetings.
- The Program Leader or Advisory Committee may request that Full Project proposals be sent out for external scientific review when needed.
- Decisions about funding for all Approved Research Projects during the upcoming fiscal year will generally be made at the April Advisory Committee meeting. Approved Research Projects will begin on October 1 of the following fiscal year unless otherwise designated and approved by the Advisory Committee.
- Scientists will submit written annual reports for each Approved Research Project to the Program Leader by October 30 of each year for inclusion in the CFRU Annual Report. Written reports will describe details of work accomplished during the previous year and summarize any important results and management implications. Oral presentations of results also will be made as appropriate by Scientists during CFRU Advisory Committee meetings, field tours, and workshops.
- Annual reports will be used as a basis for decisions about continued funding of multi-year projects.
- Final project reports (both oral and written) will be prepared for all Approved Research Projects within six months of the final funding year. Written reports can be in the form of Research Reports or graduate student theses. Publication of results in refereed scientific journals is strongly encouraged. Oral presentation of final project reports will be presented at quarterly Advisory Committee meetings.

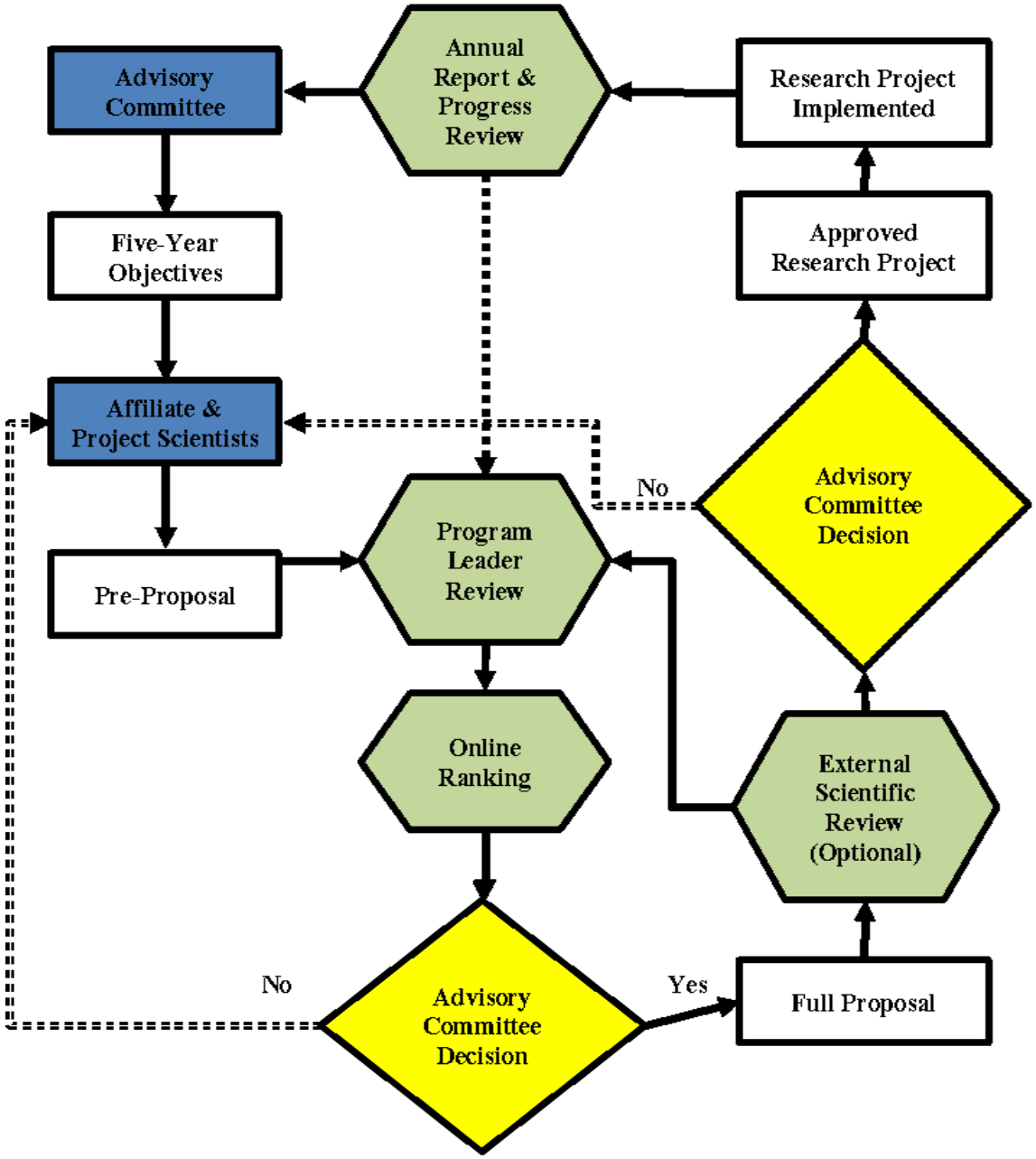


Figure 2. General process that will be used for the development, review, and funding of research proposals submitted to CFRU.

# TECHNOLOGY TRANSFER & COMMUNICATIONS

## 1. Communication Outlets

Results from CFRU research have appeared in a wide range of publications over the years to ensure prompt and early reporting of important information to Cooperators. Over 500 research articles have been produced by the CFRU research since 1976.

The CFRU webpage was developed in 2000 to provide CFRU members with password-protected access to all CFRU publications and other important information. The Website was redesigned in 2014 for ease of navigation and to come into compliance with updated University and Federal policies and regulations regarding ADA. Shortly after its inception, the CFRU website became the primary vehicle of communication with Cooperators. A seperate, CFRU publicly accessible website has been updated to enhance communication with the general public about CFRU's mission and research efforts through access to the annual reports.

In addition, quarterly Advisory meetings, workshops, and conferences have been sponsored by CFRU to rapidly disseminate research results to its members. Technical advice and recommendations to cooperators about forest management continues to be a benefit of membership and has been a hallmark of CFRU since its earliest days.

## 2. Communications Plan 2020-2025

As a cooperative effort among Cooperators, UMaine, and research scientists, the success of CFRU research relies on strong communications and technology transfer. The value of CFRU research can only be realized with a prompt and clear dissemination of practical information to member organizations, policy makers, and other scientists across Maine, the Northeast, and nationally. In addition, informing members of the Maine public about the work of CFRU is important to its member organizations and UMaine. To achieve these communications objectives, CFRU communication efforts during 2020-2025 will focus on the following components:

### Meetings, Conferences, and Workshops

*1. Advisory Committee Meetings*

Quarterly Advisory Committee Meetings will continue to be the most important form of communication between the CFRU Advisory Committee, Scientists, and the Staff. The Staff strive to make these meetings as informative, productive, and comfortable as possible. Meetings are generally held in fall (October), winter (January), and spring (April), with the option of holding a summer meeting when necessary for business.

All business may be conducted at Advisory Meetings, including reviewing Pre-Proposals and Full Proposals, project updates, final project reports, financial matters, Scientist appointments, communications, membership, etc. These meetings are organized by the Research & Outreach Coordinator in cooperation with the Program Leader and Chair of the Advisory Committee. Meetings are generally held in Orono at the University of Maine, although alternate venues may be used as appropriate; especially when held in conjunction with field tours or conferences.

*2. Field Tours*

Annual field tours have been a CFRU tradition and continue to be among the most effective and preferred means of communicating research results, research ideas, and other information among CFRU Advisory Committee members, scientists, and staff. As the CFRU is an applied forest research organization, field tours emphasize application of CFRU research to solving forest management problems. Field tours are organized by scientists, staff, and invited speakers and generally include visiting current CFRU research sites, member lands, and other locations.

*3. Workshops and Webinars*

CFRU workshops are held periodically to disseminate research results to frontline forest managers in Cooperating Organizations. These workshops are held approximately every two years when a sufficient amount of new research information has been developed. More timely, narrow research topics, may be disseminated through webinars featuring project scientists, graduate students, and Cooperators.

*4. Conferences*

Regional and national conferences held by organizations such as the Society of American Foresters (SAF) and Eastern CANUSA Forest Science Conference (ECANUSA) conferences also are important venues for CFRU Scientists to communicate the latest research results from CFRU projects. Participation in these meetings by CFRU Scientists and member organizations is an important way to stay abreast of the latest research.

## Website

The CFRU public website (http://www.umaine.edu/cfru) is the primary means of communication between Scientists and Staff, the Advisory Committee, Cooperating Organizations, and the public. The public website provides general information about the mission, objectives, access to annual reports, and a general overview of CFRU research. The password-protected *Members Only* website provides Cooperating Organizations with access to preliminary research results, research proposals, research data and maps of experimental sites, presentations, posters, meeting materials, and other materials vital to the operation of CFRU.

## Publications

All CFRU publications are published electronically on the CFRU website (see below) and are available in print form upon request. All CFRU publications since its inception in 1975 have been digitized and are available through a search engine that is part of the publications database on the website. Preliminary research results published in Research Reports and Notes are available through password access on the CFRU website before they are available to the general public, and is one advantage of CFRU membership. The CFRU Annual Report and Prospectus are made available to the general public. Other publications may be made available to the general public depending on the wishes of the author(s) and Advisory Committee.

*1. Prospectus*

Every five years, the CFRU publishes a Prospectus (this document) that details the mission, objectives, accomplishments, and organizational details that guide all CFRU operations. The CFRU Prospectus is a public document and is posted on the public website.

*2. Annual Reports*

An Annual Report describing the accomplishments and activities of the CFRU during the previous year continues to be the principal publication of the unit. The Annual Report is a public document and is available on the public website. All CFRU Annual Reports since 1975 are available on that website. Annual Reports are generally published in the first quarter of the calendar year describing accomplishments and activities from the previous fiscal year (October 1 to September 30).

*3. Research Reports*

Research Reports describe detailed interim or final results from Approved Research Projects. Generally five or more pages in length, Research Reports can take the form of special CFRU publications, graduate theses, or Maine Agriculture and Forest Experiment Station reports. They can be made available on either the public or members-only website depending on the topic and degree of completion, as well as approval by the author(s) and Advisory Committee.

*4. Research Notes*

In an effort to rapidly communicate the key messages from CFRU research to frontline foresters in Cooperating Organizations, the Results publication series was developed in the 2000s. Results articles concisely describe the practical applications and/or management implications from CFRU research using a one-page, plain-language format. Results articles are sent out via email to the frontline staff of all Cooperating Organizations and are made available only on the password-protected portion of the CFRU website. Supporting Research Reports and other CFRU publications with more detailed results from the same research projects are cross-referenced for those who would like to pursue additional information.

*5. Refereed Journal Articles*

To ensure that CFRU research meets the highest scientific standards, Scientists and Technical Staff are strongly encouraged to publish the results of CFRU-sponsored research into leading scientific journals that are refereed by scientific peers. Results from CFRU research that is published in journal articles are generally made available in CFRU Research Reports, Results articles, Annual Reports, and presentations one to several years before publication in refereed journal articles, but are distributed to members and made available on the CFRU website immediately after publication.

*6. Brochures*

Brochures providing an overview of CFRU are developed for prospective members, conference participants, interested organizations, and the public.

*7. Poster Displays*

Poster displays are used to promote CFRU and CFRU research at conferences, workshops, professional meetings, and other venues where people gather to discuss forest resources or research.

## Webinars

Webinars of approximately one hour, are an effective means to communicate research results in an interactive format to CFRU members and the public. CFRU plans 4 to 6 per year on topics of general interest to CFRU members and the public, showcasing CFRU research conducted by scientists and graduate students whenever possible.

## PROGRAM REVIEW

In order to make continual improvements and adapt to the changing needs of CFRU Cooperating Organizations, it is recognized that the CFRU organization will need to change and adapt. Thus, this Prospectus is expected to be a living document and will be revised every five years. At the end of each five-year period or at other times, the Advisory Committee may elect to conduct a formal review or audit of the accomplishments, finances, and organizational design of the CFRU. The type of review will be jointly decided by the CFRU Advisory Committee and the Director of the Center for Research on Sustainable Forests. Review teams may consist of representatives from Cooperating Organizations, members of the UMaine administration, and qualified reviewers from outside organizations. Recommendations by such review teams will be used as the basis for making modifications to the CFRU organization through revisions to the Prospectus.

# APPENDICES

Appendix I – 2018 Survey Results for Research Priorities

Appendix II – Advisory Committee Bylaws

Appendix III – Policies & Procedures

Appendix IV – Format for Pre-Proposals

Appendix V – Format for Full Project Proposals

Appendix VI – Gift Fund Description

## Appendix I – 2018 Survey Results for Research Priorities

**CFRU Research Interests Survey Results – November 2018**

Thirty cooperators representing at least 12 CFRU cooperating organizations took the CFRU Research Interests survey in Fall 2018. To analyze these results, we calculated the mean ranking among responses for each organization, and then ranked the mean of these organization-level means. The two responses for which respondents did not list an organization were treated as a single organization, and so these values were averaged together. The following criteria, themes, and topics are listed from greatest to least interest:

**Maine State Sustainability Criteria Ranking**

1. Water Quality and Riparian Zones
2. Forest Health
3. Biological Diversity
4. Soil Productivity
5. Economic Considerations
6. Timber Supply and Quality
7. Social Considerations
8. Public Accountability
9. Aesthetic Impacts of Timber Harvesting

**Ranking of Research Themes**

1. Silviculture and Applied Research
2. Emerging Technologies and Modeling
3. Forest Ecology and Management
4. Economics and Social Sciences
5. Wildlife Habitat and Management

**Ranking of Research Topics within Themes (listed as ranked above, top 5 choices in bold and italicized)**

*Theme 1: Silviculture and Applied Research (Score out of 5)*

1. Predicting and influencing ADVANCE REGENERATION dynamics (4.26)
2. Developing and assessing methods of INVASIVE SPECIES MANAGEMENT (4.15)
3. Refining new tools for determining SITE PRODUCTIVITY (4.06)
4. Quantifying the influence of harvesting on WOOD QUALITY (3.91)
5. Developing cost-effective tools for ENVIRONMENTAL MONITORING/CERTIFICATION requirements (3.85)
6. Evaluating the benefits and efficacy of HERBICIDE TOOLS (3.54)

Other Topics:

- Climate--silvicultural techniques to make our forests more resilient and to maximize their climate mitigation role
- non-intensive regeneration techniques in hardwood/mixedwood stands

*Theme 2: Emerging Technologies and Modeling (Score out of 5)*

1. ***Using REMOTE SENSING AND OTHER TECHNOLOGY to improve INVENTORY (4.61)***
2. Improving GROWTH AND YIELD MODELING (4.42)
3. Improving LANDBASE DESCRIPTIONS and MODELING SITE PRODUCTIVITY (4.05)
4. Developing and assessing methods of FOREST CHANGE DETECTION (3.94)
5. Leveraging TECHNOLOGY to cost-effectively meet SUSTAINABILITY/CERTIFICATION GOALS (3.72)
6. Developing and evaluating RISK MAPS and DECISION SUPPORT SYSTEMS (3.4)
7. Improving modeling tools for QUANTIFYING CARBON STOCKS (3.17)

Other Topics:

- What can we realistically expect from growth and yield modelling?
- Assume much of this captures use of LIDAR, drones etc.

*Theme 3: Forest Ecology and Management (Score out of 5)*

1. ***Understanding MIXED SPECIES dynamics and response to harvesting (4.55)***
2. Assess role of FOREST HEALTH in PRODUCTIVITY (4.17)
3. Quantify short- and long-term consequences of SOIL DISTURBANCE and evaluate methods of mitigation (3.9)
4. Evaluate methods of adaptation and resilience to CLIMATE CHANGE (3.79)
5. Improve understanding of FOREST HYDROLOGY, e.g., as it relates to vernal pools, riparian environments, etc. (3.57)
6. Better quantify FOREST NUTRITION and associated issues as it relates to disturbance (3.18)
7. Evaluate the costs and benefits of FOREST FERTILIZATION (2.65)

Other Topics:

- Soils/mycorhizal relationships - more than just compaction

*Theme 4: Economics and Social Sciences (Score out of 5)*

1. ***Optimizing harvest efficiency for EARLY ENTRY, SMALL DIAMETER SOFTWOOD stands (4.63)***
2. ***Investigating markets for LOW-GRADE SMALL DIAMETER SOFTWOOD stands (4.62)***
3. ***Explore economic impacts of COMMERCIAL THINNING and MID-ROTATION SILVICULTURE (4.54)***
4. Better understanding the DISCONNECT between SCIENCE and REGULATION (3.92)
5. Quantifying productivity and costs of TRANSPORTATION and LOGGING SYSTEMS (3.91)
6. Improving HARVEST AESTHETICS and SOCIAL LICENSE (3.63)
7. Better understanding MARKETS and SUPPLY CHAIN LOGISTICS (3.37)
8. Determining the VALUE OF CERTIFICATION (economic, social, etc.) (3.31)

Other Topics:

- Economic considerations of sugaring
- Economics of silvicultural alternatives in white pine management
- Forest-dependent rural communities
- Values of Non-timber forest products (syrup, mushrooms)

*Theme 5: Wildlife Habitat and Influence (Score out of 5)*

1. Quantifying BROWSING EFFECTS on growth and regeneration (4.27)
2. Knowledge synthesis to produce BEST PRACTICES FOR WILDLIFE MANAGEMENT (4.07)
3. Using LiDAR and remote sensing to MODEL AND MAP WILDLIFE HABITAT (4.01)
4. Investigate and quantify WILDLIFE POPULATION DYNAMICS AND STATUS (e.g., deer, lynx, birds, umbrella species) (3.82)

Other Topics:

- Incorporate invertebrates (particularly forest associated pollinators)

**Other Topics and Comments:**

- Market demand drives forestry and makes it a feasible ambition. New, better, and in high demand markets need to be nurtured and created in order to make any forestry practices a economically viable action.
- More research topics dealing with mixed wood and hardwood stands

## Appendix II – Advisory Committee Bylaws

**ARTICLE I** – Name

The name shall be the Cooperative Forestry Research Unit (CFRU) Advisory Committee

**ARTICLE II** – Purpose

The CFRU Advisory Committee provides overall direction for CFRU and advise the University of Maine on all administrative matters pertaining to operation of CFRU.

**ARTICLE III** – Responsibilities

Responsibilities of the Advisory Committee are to:

- Define the mission, objectives, and guiding principles of CFRU.
- Maintain and periodically update the bylaws governing the Advisory Committee.
- Maintain and periodically update the CFRU Prospectus that governs administration of CFRU.
- Define the research needs and priorities for the expenditure of funds contributed by CFRU Cooperators.
- Approve appointments of CFRU Program Leader and Affiliate Scientists.
- Develop and maintain base funding for CFRU, including recruitment of new members.
- Review all pre-proposals for research projects and recommend development of full proposals
- Review full proposals submitted to CFRU and render a decision about funding and/or in-kind support for proposed projects.
- Review and approve annual research and administration budgets presented by CFRU Program Leader and Staff.
- Advise and assist the CFRU Program Leader and Director of Center for Research on Sustainable Forests on all matters relating to the administration of CFRU.
- Provide assistance, as necessary, to Project Scientists in implementing Approved Research Projects, identifying and securing opportunities for direct cooperation and in-kind contributions for research on cooperator lands.
- Periodically review progress of Approved Research Projects and in cooperation with CFRU Program Leader, ensure that results from Approved Research Projects are delivered in a timely manner.
- In cooperation with CFRU Program Leader and Cooperating Scientists, ensure research results from Approved Research Projects are disseminated to all CFRU Cooperators in a timely and efficient manner.
- Provide CFRU Staff with contact information of forestry personnel in their organization for the purpose of disseminating CFRU research results to their forest management staff.

**ARTICLE IV** – Membership

The CFRU Advisory Committee will consist of:

- One representative from each member organization that contributes $1,000 or more annually;
- One representative from the USDA Forest Service, Northern Research Station. The USFS representative will be a voting member and the USFS will not be required to make an annual financial contribution to CFRU.

Each member organization shall have a vote on all matters voted on by the Advisory Committee. A member who is unable to attend a meeting may appoint an alternate representative for that meeting. The alternate may vote for the replaced member. The Chairperson will be informed, prior to the meeting, of who the alternate will be.

**ARTICLE V** – Officers

1) The officers of the CFRU Advisory Committee shall be elected by the Advisory Committee and shall include: Chairperson, Vice Chairperson, Member-at-Large, and Financial Officer.
2) The terms of officers shall be two years in even years beginning on January 1 after the election.
3) The Vice Chairperson will serve as Chairperson after one term.
4) The past Chairperson will serve as Financial Officer for one term.
5) The Member-at-Large may be re-elected for one additional term.
6) The CFRU Administrative Assistant will record and publish minutes of the meeting and assist the Chairperson with correspondence as required.
7) Duties of the officers are as follows:

   Chairperson:

   1) Set the date, time, and place of meetings, and work with CFRU Program Leader and Staff to prepare and send agenda of meetings to CFRU Staff, Cooperating and Project Scientists, and Advisory Committee members in advance of meeting.
   2) Preside over all CFRU meetings.
   3) Coordinate Committee activities with CFRU Program Leader.
   4) Direct activities of subcommittees.

   Vice Chairperson:

   1) Serve in absence of Chairperson.
   2) In coordination with CFRU Staff, promote accomplishments of CFRU to all Cooperators.
   3) Promote and publicize CFRU accomplishments to legislators, policy makers, and general public.

   Member-at-Large:

   1) Serve as Chairperson of the Membership Subcommittee.

Financial Officer:

1) Work with the CFRU Program Leader, Scientists, and Staff to develop annual budgets.
2) Report on financial conditions of CFRU at Advisory Committee meetings.

**ARTICLE VI** – Committees

The Chairperson will appoint the following committees each year:

Executive Committee:

1) Shall be composed of officers from the Advisory Committee, including Chairperson, Vice Chairperson, Financial Officer, Member-at-Large, and Director of the Center for Research on Sustainable Forests.
2) A CFRU Staff member may attend as a recorder, if so desired by Chairperson.
3) Shall meet at the call of the Chairperson.
4) In cooperation with Director of the Center for Research on Sustainable Forests and through approval of Advisory Committee, select the Program Leader, review his/her performance, and renew appointments as required.
5) In cooperation with the CFRU Program Leader and through approval of Advisory Committee, select Affiliate Scientists, review his/her performance, and renew appointments as required.
6) In cooperation with the Director of the Center for Research on Sustainable Forests, Advisory Committee, CFRU Program Leader, advise, assist, and approve all administrative and policy matters affecting the functioning of CFRU.
7) Shall present a new slate of officers (Chairperson and Member-at-Large) to the Advisory Committee for vote at the final meeting (generally the fall meeting) of a two-year term for current officers.

Membership Subcommittee:

1) Shall consist of three members, including the Member-at-large, who shall act as Chairperson of the Subcommittee.
2) Shall work with the Program Leader and CFRU Staff in recruiting and maintaining organizations as members of CFRU.

**ARTICLE VII** – Meetings

The Advisory Committee will meet once a quarter during the fall, winter, and spring. The Chairperson may call a summer meeting or additional meetings as needed. A quorum of the Advisory Committee will be 51% of voting member organizations.

**ARTICLE XIII – Parliamentary Procedures**

The latest edition of Rules of Order Revisited shall govern the Committee in deliberations.

**ARTICLE IX** – Governance

All policies, procedures, rules, guidelines, and other matters that govern the administration of CFRU shall be described in a published CFRU Prospectus that will be revised periodically by the Advisory Committee through a majority vote. The current version of the CFRU Prospectus will be made available on the public portion of the CFRU web page.

**ARTICLE X** – Amendments

Proposed amendments to these bylaws must be offered in writing to the Chairperson. The Chairperson must provide the proposed amendment to the full Advisory Committee membership at least two weeks before the next scheduled meeting. The Chairperson will then read the amendment for action at that meeting. Ratification of amendments shall require acceptance by two-thirds of all voting members of the Advisory Committee.

**ARTICLE XI –** Additional Financial Contributions

Any Cooperator may elect to make additional financial contributions (through direct financial or in-kind contributions) to CFRU for support of individual research projects that have been approved by the Advisory Committee. These additional contributions can be used to support additional investigations or particular aspects of an Approved Research Project desired by one or more Cooperators. Additional contributions also may be sought from Cooperators when the financial requirements for proposed projects exceed the capability of CFRU to provide support from general operating funds. These solicitations will be made as part of the normal funding approval process at Advisory Committee Meetings. Any additional direct financial or in-kind contributions made by Cooperators will be considered above and beyond the Cooperator's annual contributions. The same rules and regulations that govern acceptance of annual contributions will apply to any additional financial contributions.

## Appendix III – Policies & Procedures

### MEMBERSHIP CATEGORIES

The CFRU offers four categories of membership for organizations and individuals wishing to support the CFRU mission and objectives. Each membership category offers different services and opportunities:

| Category | Description | Services received | Annual contribution † |
|---|---|---|---|
| **Forest Landowner / Manager** | Owner or manager of commercial forestlands in the states of Maine, New York, New Hampshire, and/or Vermont | ▪ Voting representation on CFRU Advisory Committee that directs all CFRU research and activities (for landowners / managers contributing $1,000 or more).<br>▪ Immediate notification to all frontline forest managers in your organization as new CFRU research notes, reports, and other materials are released.<br>▪ Internet password access to all CFRU publications (including research notes, full research reports, and annual reports).<br>▪ Quick access to CFRU scientists for technical advice and support.<br>▪ Participation in quarterly Advisory Committee meetings and annual field tour.<br>▪ Listing of your company name as a CFRU cooperator on all publications, poster displays, and web page.<br>▪ Opportunity to have CFRU research projects conducted on your lands.<br>▪ Access to CFRU databank. | Three-tiered structure based on amount forestland owned and/or managed:<br>▪ $0.0584 / A on first 1 to 500,000 A;<br>▪ $0.0533 / A on next 500,001 to 1,000,000 A; and<br>▪ $ 0.0508 / A for each acre >1,000,000 A.<br>(Acre calculation includes all lands and waters less acreage of water bodies ≥10 acres in size)<br>($1,000 minimum) |

| Category | Description | Services received | Annual contribution † |
|---|---|---|---|
| **Mill owner / Wood Processor** | Owner of pulp and paper mill or sawmill Maine, New York, New Hampshire, and/or Vermont, that does not own or manage commercial forestland | ▪ Voting representation on CFRU Advisory Committee that directs all CFRU research and activities (for mills contributing $1,000 or more).<br>▪ Immediate notification when new CFRU research notes, reports, and other materials are released.<br>▪ Internet password access to all CFRU publications (including research notes, full research reports, and annual reports).<br>▪ Participation in quarterly Advisory Committee meetings and annual field tour.<br>▪ Listing of your company name as a CFRU cooperator on publications, poster displays, and web page.<br>▪ Access to CFRU databank. | $0.0127 per ton of pulp, paper, and other wood products processed per year.<br><br>($1,000 minimum) |

| Category | Description | Services received | Annual contribution † |
|---|---|---|---|
| **Corporate** | Corporation, business, or other organization that does not meet either the Forest Landowner / Manager or Mill owner / Wood Processor categories above | ▪ Voting representation on CFRU Advisory Committee that directs all CFRU research and activities (for members contributing $1,000 or more).<br>▪ Immediate notification as new CFRU research notes, reports, and other materials are released.<br>▪ Internet password access to all CFRU publications (including research notes, full research reports, and annual reports).<br>▪ Participation in quarterly Advisory Committee meetings and annual field tour.<br>▪ Listing of your company name as a CFRU cooperator on publications, poster displays, and web page.<br>▪ Access to CFRU databank. | **Small:** $1,000 per year if gross revenue ≤$100,000.<br><br>**Medium:** $3,000 per year if gross revenue is $100,001 to $1,000,000.<br><br>**Large:** $5,000 per year if gross revenue is >$1,000,000. |

| Category | Description | Services received | Annual contribution † |
|---|---|---|---|
| **Individual** | Individual person who does not meet any of the above categories | ▪ Immediate notification as new CFRU research notes, reports, and other materials are released.<br>▪ Internet password access to all CFRU publications (including research notes, full research reports, and annual reports).<br>▪ Participation in quarterly Advisory Committee meetings and annual field tour.<br>▪ Listing of your name as a CFRU sponsor on all CFRU publications, poster displays, and web page. | $500 per year. |

Barring unforeseen circumstances, all contributions are to be paid one year in advance of the fiscal year in which the funds are used. Current acres owned/managed and tons of wood products processed for landowner/managers and wood processor members, respectively, will be requested in December of each year. Contribution requests will be based on the above rates and sent to members each January. Contributions must be received no later than August 30 of each year to be counted as received for that fiscal year.

**MAINTENANCE OF CFRU FUNDING BASE**

Every three years (beginning in 2011) the CFRU Advisory Committee will review member contribution rates and consider adjusting them to maintain the purchasing power of CFRU. The members agree to maintain an annual base funding level for CFRU of between $500,000 and $600,000 (adjusted to 2011 dollars). During each three-year review of member contributions, the Advisory Committee will evaluate the status of membership and contribution rates to set an appropriate increase in contribution rate for the next three-year period. Changes in the contribution rate will be voted on at the fall Advisory Committee meeting prior to the beginning of each three-year period. [*Approved (17-0) at October 26, 2011 Advisory Committee Meeting*].

## ACCOUNTING PRACTICES FOR COOPERATOR FUNDS

CFRU Cooperator dues are considered gifts to the university under a standing agreement and are maintained in a special gift account by the Office of University Development. Under this long-standing agreement, a 10% overhead is assessed on accounts that support Approved Research Projects that are conducted at the University of Maine. No overhead is assessed on funds allocated for the administration of the CFRU. All salaries and stipends of the Program Leader, Research & Communications Coordinator, and Support Staff will be part of the administrative budget. All CFRU gift funds are held in an interest-bearing reserve account until the Advisory Committee allocates the funds through the annual approval process.

A revised Gift Fund Agreement with the University was negotiated in 2020 (Appendix VI). This agreement is a living document to be reviewed annually and approved every three years.

The budget proposed to the Advisory Committee for each fiscal year will be based upon the contributions received in the previous fiscal year, plus any uncommitted funds from the prior fiscal year. The CFRU fiscal year begins October 1 and ends September 30. Funds remaining in project accounts at the end of the fiscal year are generally restored to the reserve account. However, scientists may request that these funds be carried over to the next fiscal year provided the following conditions are met:

a. Project is not currently in its final year

b. Scientist presents a formal request to the CFRU Program Leader by August 31 , providing a valid reason for wishing to carryover funds with a discussion of any impact with respect to deliverables in the approved project.

c. Program Leader may approve such a request if the conditions above are met.

## UNIVERSITY RESPONSIBILITIES

### Program Management and Control of Operations

The CFRU is a recognized program of the University of Maine System by action of the Board of Trustees. Administration of the CFRU at the University of Maine is the responsibility of the CFRU Program Leader, Director of the Center for Research on Sustainable Forests, and Vice President for Research. UMaine Department Chairs/School Directors of CFRU Affiliated Scientists' academic homes may provide guidance and support to their faculty based on their departmental mission and role of faculty members in CFRU research.

The CFRU Program Leader will supervise all funds expended by CFRU and approved by the CFRU Advisory Committee. Personnel working on CFRU projects are not required to be employees of the college, university, or unit. CFRU personnel employed by UMaine will conform to all Administrative and Workers' Compensation policies of the University.

### Lab and Office Space

The Center for Research on Sustainable Forests in cooperation with the College of Natural Sciences, Forestry, and Agriculture and School of Forest Resources will provide office and laboratory space without charge for the CFRU Program Leader, Research & Communications Coordinator and Support Staff, as well as all post-doctoral researchers, professional employees, and graduate students associated

with CFRU. The College of Natural Sciences, Forestry, and Agriculture is also responsible for maintenance of the CFRU building on University Forests properties (Orono).

**CFRU Vehicles**

Use of CFRU vehicles will be permitted by UMaine employees for delivery of Approved Research Projects, or related research as approved by the Program Leader or CRSF Director. Vehicle expenses for Approved Research Projects will be included in the budget section of an approved Full Research Proposal.

**COOPERATOR RESPONSIBILITIES**

**Capital Equipment**

Purchases of capital equipment exceeding $5,000 and all vehicles will require approval of the CFRU Executive Committee.

**Cooperator Mailing List**

To maintain an updated contact list for all CFRU communications, a representative from each member organization will annually review the mailing lists for personnel in their organization. Current names, mailing addresses, email addresses, phone numbers, and fax numbers are to be provided to the CFRU Research & Outreach Coordinator at Advisory Committee Meetings.

## Appendix IV – Format for Pre-Proposals

**COOPERATIVE FORESTRY RESEARCH UNIT**

**PRE-PROPOSAL**

*(Maximum of 3 pages)*

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**PROJECT TITLE:** *Brief and descriptive title.*

**PRINCIPAL INVESTIGATOR:**

*Person responsible for leading and delivering project.*

Name: Organization: Phone: Email:

**CO-PRINCIPAL INVESTIGATORS:**

Name: Organization: Phone: Email:

**POTENTIAL COOPERATING CFRU MEMBERS OR OTHER RESEARCH ORGANIZATIONS:** *(if any)*

Name: Organization:

**PROJECT OBJECTIVES:**

*Briefly describe, in bullet form, objectives to be accomplished.*

**BACKGROUND:**

*Briefly describe problem and its importance, previous work completed, and why this project is important.*

**APPROACH:**

*Briefly describe the experimental approach that would be taken. Do not include a lot of detail, just the general approach that would be used.*

**ANTICIPATED BENEFITS TO CFRU MEMBERS:**

*Briefly describe how the above project objectives meet the stated mission and objectives of CFRU.*

**APPROXIMATE LENGTH OF STUDY:** *years*

**ESTIMATED AMOUNT REQUESTED FROM CFRU:**

*Estimate total amount likely to be requested and over how many years.*

**MATCHING FUNDS:**

*List sources and approximate amounts of other funding sources supporting or likely to support this project.*

**DELIVERABLES:**

*Briefly list products/outputs expected from project.*

## Appendix V – Format for Full Proposals

**COOPERATIVE FORESTRY RESEARCH UNIT**

**FULL RESEARCH PROPOSAL**

*(Maximum of 10 pages plus CV and appendices)*

**PROJECT TITLE:** *include brief and descriptive title.*

**ABSTRACT:** *Briefly describe the objectives of the project, the benefit to CFRU members, and the products that will be delivered (limit to 200 words).*

**PRINCIPAL INVESTIGATOR:** *Person responsible for leading and delivering project.*

Name: Organization: Phone: Email:

**CO-PRINCIPAL INVESTIGATORS:**

Name: Organization: Phone: Email:

**COOPERATING CFRU MEMBERS OR OTHER RESEARCH ORGANIZATIONS:**

Name: Organization:

**OTHER RESEARCHERS, STUDENTS, & PROFESSIONALS:** *(if any)*

Name: Organization:

**NAME & ADDRESS OF PRINCIPAL RESEARCH ESTABLISHMENT (***For Non-UMaine organizations only)*

Contract Representative: Organization: Phone: Email:

**PLANNED START DATE:** *month and year*

**PLANNED END DATE:** *month and year*

**AMOUNT APPLIED FOR FROM CFRU:** *Include total amount requested over how many years.*

**STATEMENT OF AUTHORIZATION SIGNED AND DATED BY AN AUTHORIZED REPRESENTATIVE OF THE RESEARCH ESTABLISHMENT:**

*Include names, titles, and signatures of administrators responsible for approving research proposals (required only for organizations external to UMaine).*

**BACKGROUND:**

*Briefly describe problem and previous research in the field (including key literature citations) that has addressed the problem.*

**PROJECT OBJECTIVES:**

*Describe, in bullet form, specifically what objectives are to be accomplished by the proposed research project.*

**EXPERIMENTAL DESIGN:**

*Include brief description of the site requirements (if any), experimental design (including experimental and sampling units), treatments, sampling methodology, and variables to be measured. If phases or stages are required, describe the sequence of events and relation of each.*

**ANALYTICAL APPROACH:**

*Briefly describe the statistical methods and analytical procedures that will be used to test hypotheses, as well as how they will achieve stated objectives.*

**ANTICIPATED BENEFITS TO THE CFRU:**

*Briefly describe how the above project objectives meet the stated mission and objectives of the CFRU, including the probable magnitude of impact if project is successful and if not undertaken.*

**SCHEDULE OF DELIVERABLES:**

*Include list of measurable outputs to be delivered to the CFRU from this work, including likely publications, presentations, products, etc. with the date of delivery for each item.*

| Deliverables | Date |
|---|---|

**COMMUNICATIONS PLAN:**

*Briefly describe how research results will be communicated to CFRU and scientific community. The following must be included:*

- *Written annual reports are required by November 1 of each year, a summary of which will be published in the CFRU Annual Report.*
- *Oral progress reports will be presented at CFRU Advisory Committee meetings, scientific conferences, and other appropriate meetings, written progress reports will be due by August 1 prior to funding renewal for multi-year projects.*
- *Interim results via CFRU 1-2 page Research Notes are strongly encouraged.*
- *A final report is required within 6 months of project termination. This report may be in the form of a research report, thesis/dissertation, or published journal article.*
- *All data produced from the project, if CFRU is the principal funding source, will be deposited into the CFRU databank according to required specifications.*
- *It is the responsibility of the researcher(s) to publish final results in the peer-reviewed scientific literature.*
- *List potential publications (titles, authors, and outlets).*

**BUDGET**

- *Show budget for each fiscal year (October 1 to September 30).*
- *Multi-year projects are acceptable, but funding is approved annually by CFRU Advisory Committee depending on funding availability and evaluation of previous year's performance.*
- *Projects should generally be less than 3 years, and must not exceed 5 years in length.*
- *Show budget for entire project even if funding is shared by other sources.*
- *Show financial and in-kind contributions from all funding sources.*
- *The following format should be used:*

| **Item** | **Year 1** | **Year 2** | **Year 3** | **TOTAL** |
|---|---|---|---|---|
| Professional & technical staff: | | | | |
| Salary | | | | |
| Fringe benefits | | | | |
| Graduate students: | | | | |
| Stipends | | | | |
| Insurance | | | | |
| Tuition | | | | |
| Travel | | | | |
| Equipment | | | | |
| Supplies | | | | |
| **SUBTOTAL** | | | | |
| **Overhead** (*10% overhead required if work is conducted at UMaine. No more than 10% overhead will be paid to organizations external to UMaine*) | | | | |
| **TOTAL COST** | | | | |
| **Leveraged Funds:** | | | | |

| | | | | |
|---|---|---|---|---|
| Organization 1 | | | | |
| Organization 2, etc. | | | | |
| **TOTAL LEVERAGED FUNDS** | | | | |
| **Amount requested from CFRU** | | | | |
| **% of total project cost requested from CFRU** | | | | |

**LITERATURE CITED:**

*Include any literature citations used above.*

**RESUME OF PRINCIPAL AND CO-PRINCIPAL INVESTIGATORS:**

*Maximum of 5 pages for each PI and Co-PI showing relevant work from past 5 years.*

**APPENDICES:**

Up to 10 pages of additional documentation in support

## Appendix VI – Gift Fund Description

### THE COOPERATIVE FORESTRY RESEARCH UNIT
### COOPERATIVE FORESTRY RESEARCH UNIT FUND

The Cooperative Forestry Research Unit Fund was established at the University of Maine in 1979 as a quasi-endowment wherein revenue from contributing landowner[1] fees paid to the Cooperative Unit shall be invested and the interest shall accrue to the Fund.
(*In 2020, at the request of the donors and university administration, the fund description was amended to provide clarification relative to the relationship between the landowners and companies that provide donations for the Cooperative Forestry Research Unit [CFRU] and the University of Maine.*)

The principal shall be invested in the general endowment pool and both principal and income shall be used to provide financial assistance for (1) the conduct of research projects focused on improving forest management in Maine (minimum 60% of annual expenditures), including but not restricted to research faculty and non-faculty salary and benefits, research students, travel, equipment, field work, and other needs related to research activities, and facilities and university overhead ("F&A", "indirect", or "overhead"; F&A not to exceed 10% of annual expenditures); (2) program leadership and administrative support (up to 40% of annual expenditures), including but not restricted to 50% of the Program Leader salary and benefits up to $75,000.00, administrative staff salaries and benefits, supplies, travel, CFRU website, Program Leader-directed research and communications, and Member meetings and field trips. Research projects shall be approved by the Director of the Center for Research on Sustainable Forests (or successor position) and the Program Leader of the CFRU (or successor position) in consultation with the Advisory Committee of the CFRU (or successor entity). Strategic goals and objectives of the CFRU shall be outlined annually before the start of each academic year with an annual report of work accomplished submitted to the Vice President for Research and the CFRU Advisory Committee by the close of the University of Maine fiscal year (June 30), recognizing the CFRU has an operating fiscal year from October 1 to September 30. In the event that funds

[1] The Members now include organizations other than forest landowners.

1

are used for student support, the Director of the Center for Research on Sustainable Forests (or successor position) shall provide the Office of Student Financial Aid with the recipient(s)'s names, student support provided, and student expenses covered by the fund.

Should it ever become impossible or impractical to carry out the purposes of this fund as described above, an alternative purpose that best fits the donors' intent and wishes shall be designated by the President of the University of Maine in his/her sole discretion after consulting with the Members of the CFRU, if possible.

The Program Leader of the Cooperative Forestry Research Unit (or successor position), in consultation with the Director of the Center for Research on Sustainable Forests (or successor position) and the Vice President for Research and Dean for the Graduate School (or successor position), shall administer the fund and shall be responsible for submission of an annual report on Fund activity to the President and to the Treasurer of the University. When funds are used for student support, the Director of the Center for Research on Sustainable Forests (or successor position) shall administer the fund in consultation with the Office of Student Financial Aid.

Signed: Ian Prior — Date: July 20/2020

CFRU Executive Chair

Signed: Dr. Joan Ferrini-Mundy — Date: 07.17.20

President

University of Maine

# COOPERATIVE FORESTRY RESEARCH UNIT FUND (CFRU)

## FUND IMPLEMENTATION

**The CFRU FUND Description,** amended as of April 1, 2020, between UNIVERSITY OF MAINE SYSTEM, acting through the University of Maine, hereinafter referred to as UNIVERSITY, Donors/Members to the CFRU FUND, hereinafter referred to as MEMBERS, defines the major elements of support and cooperation expected from the UNIVERSITY and MEMBERS for the CFRU research program. The detailed scope, program operations, and strategic priorities of this program have been outlined in the current CFRU Prospectus, which is attached and made a part hereof.

### ARTICLE I. RESPONSIBILITIES OF UNIVERSITY

A. The principal shall be invested in the general endowment pool and both principal and income shall be used to provide financial assistance for the conduct of CFRU research projects focused on improving forest management in Maine.

B. Provide overall leadership, thru a faculty CFRU Program Leader and the Center for Research on Sustainable Forests, on the active management of the FUND and coordination of CFRU activities. Such functions will include:

1. Maintain a flexible and relevant administrative structure primarily provided by the Center for Research on Sustainable Forests (CRSF), including office/laboratory space for CFRU staff, and general administrative support (e.g., IT, telecommunications).
    a. Providing leadership through CRSF for the MEMBERS including an Executive Committee and an Advisory Board.
    b. Scheduling and moderating periodic meetings of the MEMBERS.
    c. Administering the financial, professional, and material resources available to the CFRU program in a cost-effective manner.
    d. Tracking and reporting quarterly expenditures of the FUND that are summarized by administration and sponsored research projects. Reports will include funds that are cost shared by the UNIVERSITY and other external grant/contract funds which were leveraged to support the CFRU and projects.

2. Provide an organized approach for identifying research needs and for planning and mobilizing efforts needed to resolve them in an efficient and effective manner.
    a. Providing a strategic and prioritized prospectus that outlines potential research

needs and issues which can guide future research projects.

b. Serving as a liaison to various organizations and individuals with expertise in applied, scientific-based sustainable forest management.
c. Organizing project teams with the scientific and technical expertise to design and implement study plans and to interpret and report on results.

B. Provide a forum for information exchange.

1. Publish and distribute the results of CFRU-sponsored scientific experiments, data analyses, and information syntheses in collaboration with interested participants in an appropriate manner.
2. Prepare an annual report summarizing the accomplishments of the CFRU program.
3. Maintain both a public and MEMBER-only website and online database of relevant data, past reports, and publications.

C. Provide scientific expertise in support of CFRU objectives.

1. Identify robust as well as sound statistical and experimental methods for CFRU projects.
2. Ensure a high degree of quality control and uniformity in assembling databases and applying statistical methods in CFRU projects.
3. Synthesize technical input from project teams at each stage of project development and implementation, including design, execution, analysis/inference, and interpretation.
4. Manage and maintain data sets collected and/or assembled for CFRU projects in a manner consistent with the Data Sharing Plan specific to each project and in a manner that protects any proprietary information.
5. Provide technical guidance for translating research findings into practice.
6. Provide expert testimony and documentation to improve public understanding of issues involving applied, scientific-based sustainable forest management.

D. Build necessary synergies and partnerships with external organizations that help to support and further the CFRU's overall mission.

**ARTICLE II. RESPONSIBILITIES OF MEMBERS**

A. Serve in volunteer voting advisory capacities on CFRU advisory and executive committees for items such as program direction and emphasis, level of support, compatibility with other

research programs, and other general issues.

B. Provide input on CFRU strategic direction, management, and approval of research proposals and budget.

C. Provide technical suggestions for pursuing CFRU objectives.

D. Provide financial support through individual MEMBER gifted contributions to the FUND. The UNIVERSITY and donors to the FUND shall suggest level for gifted contributions to accomplish the annual CFRU goals at the annual meeting of the CFRU MEMBERS. Individual MEMBERS may contribute additional gifted funds to the CFRU at their discretion for specific research. This includes non-faculty administrative and technical support staff on an as needed basis according to the Prospectus and as funding allows.

E. Under this gift fund, a 10% indirect rate is assessed on accounts that support CFRU Approved Research Projects that are conducted at the UNIVERSITY. No indirect charge is assessed on funds allocated for the administration of the CFRU. This rate is subject to change at future renewals.

F. The gifted donations to the FUND shall have the following uses:

1. CFRU Research Project Support (minimum 60% of annual expenditures dependent on Program Leadership/Support level). Research Project support would include faculty and non-faculty wages, travel, equipment, and other needs related to research activities. The Fund shall cover University Indirect Costs on individual research projects at a rate of 10% as calculated on the total direct costs of individual and approved research that are conducted at the UNIVERSITY. This rate shall be in effect for FY2021–FY2023 and may be reviewed at the end of this term.

2. CFRU Program Leadership and Support (up to 40% of annual expenditures)
   a. Program Management—The University shall appoint or hire a full-time faculty CFRU Program Leader. Up to 50% of the CFRU Program Leader salary plus fringe benefits shall be paid from the CFRU fund, but the Fund shall not pay more than $75,000.00 per year for FY21-23. Ongoing disbursements for Program Salary line shall be disclosed to donors for fund years after the initial three-year period.
   b. Program Administration—additional salaries plus benefits to support University of Maine faculty, staff, and students working on CFRU projects. Funds for equipment, meetings, field tours, and travel. Additional support not covered by University as provided under Article 1, A.1.

G. Provide logistical support (such as study sites, labor, equipment, materials, data, and statistical advice) for CFRU projects. Such assistance will be negotiated on a project-by-project basis so that a firm commitment by all parties involved is assured. If necessary, supplemental agreements or contracts will be prepared which specify the type and amount of assistance offered.

H. Maintain the integrity of datasets and CFRU field installations until the projects have been completed. All current and planned CFRU field installations will be annually reviewed on the start of the CFRU Fiscal Year (Oct 1) to determine if still relevant and needed.

I. Subject to the permission and sole discretion of CFRU, permit the use of study sites for visits and tours directed and arranged by UNIVERSITY.

J. Provide MEMBER suggested Contributions to support CFRU activities and fund. These gifted contributions will be made annually by CFRU MEMBER. UNIVERSITY will issue an annual statement of expected gifts from MEMBERS for the coming CFRU Fiscal Year on January 1 each year. Gifts should be mailed to:

University of Maine Foundation
Buchanan Alumni House
Two Alumni Place
Orono, ME 04469-5792

**ARTICLE III. MUTUAL RESPONSIBILITIES OF MEMBERS AND UNIVERSITY**

Together the MEMBERS and the UNIVERSITY shall collaborate on the following:

A. Provide technical guidance and support to meet CFRU objectives.
1. Identify and set priorities among critical research needs.
2. Plan and design projects that meet the practical needs of CFRU, yet conform to the standards of scientific experimentation, data analysis, and statistical inference.
3. Implement CFRU approved and sponsored projects, which would primarily involve the collection, management, protection, and storage of relevant data.
4. Analyze, interpret, and report the results of CFRU projects.

C. Provide and exchange information where necessary to meet requirements for experimentation, data analysis, modeling, software development, and documentation.

D. Ensure that all CFRU activities comply with legal, regulatory, and administrative requirements, and that they are conducted in a safe manner.

E. Foster a spirit of cooperation toward achieving the objectives of the CFRU program.

F. UNIVERSITY and the FUND will cost-share the amount needed to fund the full-time compensation for the CFRU Program Leader. Use of the Fund for annual compensation for Program Leader position would be flexible and depend on the nature of the position. The compensation may be in the form of direct salary & fringe, stipend, additional compensation, and/or summer salary.

G. The CFRU Program Leader shall be a faculty member of the UNIVERSITY formally selected within the UNIVERSITY human resources policies and procedures and with full consultation of CFRU members. This position would require an applied forest science PhD and prior experience or interest in working directly with the forest industry. Initial appointment shall be for three years.

H. The UNIVERSITY Program Leader, as a faculty member, shall:

1. Be subject to an annual evaluation and reappointment, which would be conducted with input from CFRU Advisory Board. CFRU Advisory Board will provide an annual letter of performance and goals for the coming year for the Program Leader to consider.

2. CFRU Program Leader would be a fixed, three-year term appointment and CFRU will be consulted in determining position reappointment.

3. Develop, deliver, and communicate an applied forest science research program that addresses stated MEMBER needs identified in the CFRU Research Prospectus.

4. Have a formal faculty appointment that aligns with their expected duties and provided funding. This would include time for the administrative and technical oversight of CFRU (50%), research duties (50%), and service (0%) as part of their University assigned duties.

**ARTICLE IV. PROTECTION OF RIGHTS AND PRIVILEGES**

A. MEMBERS' participation in all CFRU activities and projects will be on a voluntary basis. Special supplemental agreements or contracts will be prepared when necessary to clarify goals,

MEMBER will be given an equal opportunity to review and participate in such agreements or contracts prior to their initiation.

B. Requests by MEMBER for anonymity with respect to certain types of information to be collected will be accomplished through supplemental agreements or contracts negotiated with UNIVERSITY prior to the collection of such information.

C. Any MEMBER may inspect the data or procedures of any CFRU project, subject to the confidentiality requirements of cooperating parties.

D. Access to study sites involved in the CFRU program will be only with the permission and at the discretion of MEMBER involved, said permission not to be unreasonably withheld. This would include the annual review and sign off on a general land use agreement as outlined in the CFRU Operating Prospectus.

E. Publications

1. The UNIVERSITY shall have the full and exclusive right to edit and report as it sees fit any and all facts established, or findings made, by CFRU projects which in its judgment should be reported to the public. Information collected through the CFRU program will be consolidated, analyzed, and reported through UNIVERSITY. As a general rule, information will not be released until it has undergone thorough analysis, interpretation, and editing by UNIVERSITY; at that point, information will be available upon request to all MEMBERS. Publication of results in scientific literature will be the primary mode of documentation. Any assistance and information provided by CFRU/MEMBER will be properly acknowledged in publications and theses by UNIVERSITY personnel.

2. Activities and policies of CFRU are public information and may be freely publicized by MEMBER and by UNIVERSITY. However, when publicizing CFRU information, UNIVERSITY will make no reference to specific CFRU/MEMBER actions, interests, and policies without prior written consent from CFRU/MEMBER. UNIVERSITY may, however, cite the CFRU membership at any time when publicizing the CFRU structure, goals, and accomplishments.

3. Also, under no circumstances or conditions shall the name of the Cooperative Forestry Research Unit, or University of Maine, be used directly or indirectly in an advertising or promotion related in any way to the CFRU program without the written consent of UNIVERSITY.

F. Intellectual Property

1. Materials and information produced by CFRU shall not be restricted or limited to the sole use of the CFRU or any individual MEMBER, although availability of information from special projects supported by only a specific set of members is controlled by those supporting members for a period up to three years.

2. MEMBERS and UNIVERSITY mutually recognize that each may create Intellectual Property independent of the activities supported by FUND. Participation in this FUND does not provide a preference to any UNIVERSITY generated Intellectual Property nor prevent any MEMBER from obtaining a License from the UNIVERSITY. Intellectual Property Protection of and disposition of Intellectual Property shall be in accordance with the University of Maine System Policy on Patents and Copyrights.

3. Final decision to seek patent protection of Intellectual Property arising out of CFRU projects rests solely with UNIVERSITY. Even if protection is obtained by UNIVERSITY for a process or a material, it may be subject to other proprietary rights; these will be negotiated directly among the CFRU, interested MEMBERS and relevant property holders.

4. CFRU and MEMBERS will consider intellectual property interests in a timely manner. The CFRU may delay publication for up to 60 days following written notice of intent to publish, to allow MEMBERS to consider their intellectual property options. MEMBERS will consider intellectual property interests in a timely manner. Such written intent to publish may take the form of a draft manuscript, an abstract, or a poster for a scientific meeting and shall be communicated to MEMBER. If an individual MEMBER elects to support UNIVERSITY in seeking patent protection, then all other MEMBERS shall have up to two months to decline to participate from the time they are notified of the proposed action.

G. Confidentiality

1. Information or materials subject to confidentiality requirements must be clearly marked as "confidential" at the time the information is provided and may be subject to additional confidentiality agreements to be made in writing within no more than 30 days from the time information is provided. If UNIVERSITY/MEMBER agrees to accept confidential information, UNIVERSITY/MEMBER agrees to maintain confidentiality using at least the same degree of care used to protect party's own confidential information, and in conformance with the terms outlined in any blanket confidentiality agreements

agreed to and signed by the UNIVERSITY or specific MEMBERS.

2. This obligation shall not apply to information that was in the public domain at time of disclosure or comes into the public domain without breach of UNIVERSITY's or MEMBER's obligation of confidentiality; was known to UNIVERSITY or MEMBER at time of disclosure; was independently developed by a UNIVERSITY or MEMBER; or becomes known to UNIVERSITY or MEMBER from a third party not subject to these obligations. If MEMBER provides its confidential information to UNIVERSITY, it also must initially be in writing or, if they are first communicated orally, must be confirmed in writing within 30 days thereof. Each such writing must be clearly marked as "confidential" at the time the information is provided.

3. UNIVERSITY will make this information available only to those who need to know it for conduct of research, and explicitly inform all those to whom it is communicated of procedures for its use and any restrictions on distribution.

**ARTICLE V. RENEWAL AND AMENDMENT**

MEMBER and UNIVERSITY shall meet to review and discuss this Agreement to determine any necessary amendments on October 1 of each calendar year that this Agreement remains in effect. If October 1 falls on a weekend, the parties shall meet on the next business day thereafter. Any amendments or modifications to the terms of this Agreement shall be reduced to a writing agreed to by PARTIES. Unless written termination notice as specified below is given, or unless superseded by a new fund description, this document shall be automatically renewed following each annual review.

**ARTICLE VI. TERMINATION**

A. A MEMBER may, without penalty or prejudice, cease or restrict participation in the CFRU program covered by this Agreement including, without limitation, the right to stop transmittal of funds and to halt further use of study sites and other logistical support, provided notice is given in writing to the UNIVERSITY at least thirty (30) days prior to such action.

B. UNIVERSITY may cease or restrict MEMBER's participation in the CFRU program covered by this Agreement if adequate financial support from MEMBER is not forthcoming or for any reason in the best interest of UNIVERSITY. MEMBER will be notified in writing by UNIVERSITY at least thirty (30) days prior to such action.

c. Should operations of CFRU cease for any reason, all reserve in the FUND and assets of CFRU shall be used to fund any ongoing research project in-progress pursuant to this Agreement for the lesser of one year or the completion of said research project. The CFRU Program Leader may, in its sole discretion, liquidate any CFRU assets to provide said funding.