



REQUEST FOR WRAC REGIONAL RESEARCH AND OUTREACH PROJECT PRE-PROPOSALS

FY 2011

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Problem Statements and Request for Project Pre-Proposals

The Western Regional Aquaculture Center's (WRAC's) Industry Advisory Council and Technical Committee recently reviewed the status of priority needs of the aquaculture industry throughout the western region and developed problem statements for projects in the 2011 fiscal funding cycle. The Board of Directors approved the enclosed nine statements for solicitation of pre-proposals.

WRAC policy requires that each project include participation by **two or more states located within the western region** (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming). Research partnerships may be formed among all elements of federal, state, and local government, public institutions, and the private sector. A regional research and outreach effort may be shared by a number of institutions (at least two institutions are required) and activities within participating states, depending on the nature of the problem and the most effective use of resources.

WRAC is seeking pre-proposals for the following nine research areas (Problem Statements attached):

1. Alternative Species
2. Addressing Current Concerns with Farmed Sturgeon Caviar Quality
3. Nutritional Approaches to Improving Larval Marine Finfish Production
4. Coastal Water Quality - Shellfish
5. Bird Predation at Aquaculture Facilities
6. Eelgrass
7. Aquatic Nuisance Species #1 – Effective Decontamination Following Aquatic Nuisance Species Detection
8. Aquatic Nuisance Species #2 – Risk Assessment Framework
9. Water Quality - Effluent

Criteria for WRAC Regional Research and Outreach Proposals (extract from WRAC's Manual of Operations. While the Manual of Operations is currently under revision, the relevant updated sections are included in this RFP.)

A strong domestic aquaculture industry is needed to increase production of fish and shellfish, resulting in lower cost, high quality food for domestic consumers and greater capacity to compete in global markets. This can be achieved with a partnership among elements of the federal government, state and local public institutions, and the private sector with expertise in aquaculture development. The following criteria shall be used to prioritize cooperative regional research and outreach projects to receive WRAC funding:

- The problem involves participation by two or more states within the western region.
- Research on the problem requires more scientific labor, equipment, and facilities than are generally available at individual research stations (i.e., the resources of two or more research stations are required).
- The research approach is adaptable and particularly suitable for inter-institutional

- cooperation, resulting in better use of limited resources and saving of research funds.
- Initiation of the project will complement and enhance ongoing research by participating research stations.
- The proposal is likely to attract additional support for research and/or outreach on the problem, which is not likely to occur through other programs and mechanisms.
- The project can be made sufficiently specific to promise significant accomplishment within four (4) years or less.
- The results can provide the solution to a problem of fundamental importance or fill an information gap in knowledge from the standpoint of present and future aquaculture of the region.
- The project can be effectively organized and conducted on a regional level, assuring coordinated and complementary contributions by all participants.

Importance of the Outreach Component in Assessing WRAC Pre-Proposals and Full Proposals

A well-considered and appropriate outreach component is an essential part of any WRAC project. Increasing attention to the quality of outreach has been emphasized by USDA-NIFA, and has received considerable recent attention from WRAC's Board of Directors. This has resulted in efforts by the Board to ensure that adequate outreach is included in all project proposals. Below is an excerpt from the Manual of Operations concerning **Extension Outreach Criteria for WRAC Project Objectives**. These points are of particular relevance during pre-proposal preparation.

Extension Outreach Criteria for WRAC Project Objectives

One of the principal goals of the Regional Aquaculture Center program is the application of project results for the benefit of industry, yet without adequate and early attention to the outreach component of WRAC projects, research results and outcomes may be of limited value, or completely unknown to producers. The WRAC Board of Directors has recognized that a more detailed account of outreach plans at the proposal stage would help to identify project audiences, outcomes, and evaluation methods. This essential information will ensure that results meet industry needs, and that producers receive pertinent information from projects that might be applied in their operations. Each proposal must contain a comprehensive outreach plan containing the following information provided for listed objectives:

Objective 1: [list first project objective]

1. Target Audience - Who will receive project information for this objective?

2. Intended Learning Outcomes - What will be learned from this objective of the project?

3. Intended Management and/or Behavioral Outcomes - What will be the management or behavioral outcomes of this project objective?

4. Procedures to Achieve Intended Outcomes

Inputs

- Who will do what and at what cost?
- How will target audience be contacted?

Outputs (Outcomes?)

- What products will be developed and at what cost?

- What publications, workshops, demonstrations, etc will be developed?

5. Evaluation Plan - What methods will be used to measure what learning or behavioral changes have occurred?

Outreach Publications

- The required outreach publication(s) portion of WRAC grants is to be funded through WRAC core funds and maintain a WRAC identification, or primary acknowledgment.
- The core funding for the WRAC outreach publication(s) may be supplemented by other funding sources, but WRAC identification should be acknowledged.
- Ancillary funding may be applied to the support of additional outreach activities.
- A minimum of one outreach publication shall be produced for any multi-year grant award, and the publication shall address the associated research component of the awarded grant.
- The primary outreach publication should not be in the form of a flyer or fact sheet, but cover the subject in a depth that gives substance to the subject matter that benefits the targeted audience.

Other Information

1. Guidelines for development of pre-proposals and the pre-proposal format are enclosed for your information. These have recently been modified and supersede the Guidelines contained within the Manual of Operations, available on the WRAC website (<http://www.fish.washington.edu/wrac>).
2. Please note that while each of the priority statements indicate that funding requests should not exceed the stated maximum amount, the WRAC pre-proposal and full proposal reviews are highly competitive, and the proposed budget is an important criterion used in assessment of pre-proposals and full proposals.

Pre-proposals Submission and Deadline – See Guidelines section (pp 16-24) for specific instructions.

Send the Pre-proposal as follows:

1. **Mail** one (1) printed copy to:

Western Regional Aquaculture Center
School of Aquatic and Fishery Sciences
Box 355020
University of Washington
Seattle, WA 98195-5020

2. **Email** as an attachment (both PDF and WORD) to dgranger@u.washington.edu.

The deadline for submission of pre-proposals is March 2, 2010.

NOTE: WRAC encourages early submission of pre-proposals. If a pre-proposal is received at least two weeks prior to the final deadline, this will allow time for the Administrative Office to review the pre-proposal using the checklist and inform the authors what requirements are not met, thereby providing the authors time to adjust and re-submit before the final deadline.

WRAC also strongly encourages investigators who are submitting a pre-proposal for the first time to WRAC to consult with the relevant contact person listed for each problem statement. The Executive Director (Dr. Graham Young, grahamy@u.washington.edu) and the Program Manager (Debbie Granger, dgranger@u.washington.edu) are also available for questions on pre-proposal submission.



Western Regional Aquaculture Center

Problem Statements for Pre-proposals to WRAC for Funding in FY2011

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1. Alternate Species

PROBLEM

Opportunities exist to produce alternative marine and freshwater species of fish, shellfish, and aquatic plants. Commercial operations need to diversify production of species to meet market pressures from imports. Aquaculture opportunities also exist for producing new species for environmental restoration and supplementing recreational fisheries, but lack of biological knowledge and/or technological applications constrains aquaculture operations from participating. Existing aquaculture operations must respond to the changing economic circumstances and environmental regulations that require improved production efficiency – alternative species used in isolation or combination with other species may provide economic opportunity and increase efficiencies.

SOLUTION

This priority area seeks proposals that address any needs related to development of alternative species aquaculture which have market potential. Research should be specific and targeted to one or two specific objectives but can address any bottleneck, disease concerns, nutritional needs, or under-represented industry to culture an emerging species. Pre-proposals should propose new species for existing aquaculture industries or systems and/or new or underutilized resources. Priority alternative species would be those that can provide an economic as well as an ecological advantage and encourage development in states with minimal aquaculture. An example would be mitigating an adverse environmental impact from another species in cultivation.

Examples for consideration may include but are not limited to:

- Use of filter feeders to improve water quality
- Production of a species of potential commercial value that is currently not being produced in the western states. Examples are:
 - o Tropical fish
 - o Shellfish
 - o Rockfish
 - o Crab
 - o Macroalgae
 - o Endemic species for stocking or restoration
- Polyculture of multiple species of commercial value
 - o Includes polyculture of multitrophic species
- Development of marine or freshwater hatchery, larval, nursery rearing technology for new species.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from the inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. Outreach products should target the states and/or industries that the project addresses. Expected products of the research would include outreach publications, workshops for interested industry and regulatory members, presentations at scientific meetings and any other products that would provide information on project results. Applicants are strongly encouraged to develop proposals that would involve cooperating with extension personnel and/or aquaculture coordinators.

FUNDING LEVEL

Anticipated project duration is two years; three and four year projects will be considered if justified. Requests from WRAC should not exceed \$120,000 per year. In-kind and leveraged funds from industry, academia and other entities are strongly encouraged.

CONTACT: Jeff Hetrick (jjh@seward.net) can be contacted for further information on this problem statement.

2. Addressing Current Concerns with Farmed Sturgeon Caviar Quality

PROBLEM

Many factors affect egg quality of farmed sturgeon (*Acipenser transmontanus*) but these effects are not well understood and are widespread across the industry. These problems include softening, egg size, and fatty infiltration of the ovaries, flavor, shelf life and/or oxidation. Quality texture loss due to softening is well substantiated and may be due to processing factors, diet and husbandry. Flavor and color uniformity and mottled eggs can affect marketability that may be related to genetic characteristics. Nutrition and feeding are important criteria.

Farmed sturgeon ovaries often contain significant interstitial fat. The presence of ovarian fat significantly degrades the quality of caviar, since it is extremely difficult to remove fat particles from caviar during processing, resulting in grade reduction and a lower price, while also adversely affecting farmed caviars' reputation in the market. Potential causes of this obesity could include ontogeny, energy budget, genetics, or an interaction of these (or other) factors.

SOLUTION

An analysis of causes and suggested solution (s) on the factors affecting egg quality would greatly assist sturgeon farmers. Researchers would work with producers/cooperators across the Western region on issues potentially incorporating genetics, nutrition and food quality. The research site would cross between production facilities and institutional research laboratories and would incorporate a study of environmental conditions, fish husbandry, nutrition and feeding practices, and processing parameters.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from the inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. Outreach products should target the states and/or industries that the project addresses. Expected products of the research would include outreach publications, workshops for interested industry and regulatory members, presentations at scientific meetings and any other products that would provide information on project results. Applicants are strongly encouraged to develop proposals that would involve cooperating with extension personnel and/or aquaculture coordinators.

An initial information gathering session would be conducted between cooperators, scientists and extension personnel to obtain key data regarding husbandry, farm management practices, processing and other factors and to determine information that would be used to coordinate research design.

DURATION & FUNDING LEVEL

Anticipated project duration is two years; three and four year projects will be considered if justified. Requests from WRAC should not exceed \$120,000 per year. In-kind and leveraged funds from industry, academia and other entities are strongly encouraged.

CONTACT: Ken Beer (beerfishery@yahoo.com) can be contacted for further information on this problem statement.

3. Nutritional Approaches to Improving Larval Marine Finfish Production

PROBLEM

Early life stages of many marine fish have unique nutritional needs and require very small feed particles. Current practices typically require live feed organisms and enrichment protocols for the marine larvae. Even with these current approaches survival and growth are often limited, and levels of deformities can be high. The ability to switch from live foods to formulated feeds as soon as possible will decrease production costs dramatically. Weaning to dry foods is made difficult by several factors including visual stimulation from live prey; olfactory and gustatory stimulation; and concurrent development of the larval digestive system and associated enzymes. Commercially available starter feeds are closed formulations, which limit customization for new species and are not effective for initial feeding for many species.

SOLUTION

WRAC requests proposals to develop practical nutritional approaches to improving larval production of marine finfish species. This may include innovation in live feed production and enrichment, formulation and development of enrichment sources, and development of formulations and/or manufacturing methods for micro-particulate diets.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from the inception of the project. A minimum of one outreach publication (not peer-reviewed journal paper) is required for all WRAC - funded projects.

Expected outreach products of this research include;

1. Workshops for interested industry and agency members discussing and demonstrating improved methods and approaches.
2. Outreach publications targeting new aquaculturists interested in the technology, and existing aquaculturists in the area.
3. Dissemination of results at scientific meetings.

DURATION AND FUNDING LEVEL

Anticipated project duration is up to 3 years of funding with a maximum request to WRAC of \$65,000/year. In-kind and leveraged funds from industry, academia, and other entities are strongly encouraged.

CONTACT: Jim Parsons (parsons@troutlodge.com) can be contacted for further information on this problem statement.

4. Coastal Water Quality - Shellfish

PROBLEM

Shellfish hatcheries on the west coast are having a serious problem with mortality of larval shellfish. This threatens the supply of shellfish “seed”, which is needed to establish commercial shellfish operations and may endanger resident populations. Recent work indicates that the problem is correlated with water quality. In particular, the present upwellings of water containing excess CO₂ are shifting the carbonate equilibrium towards lower pH and decreasing the aragonite supersaturation need for shell formation. The upwelling of anaerobic water from the present dead zones along the coast seems to be adding to the problem.

SOLUTION

A water treatment system is required to test solutions for this problem and implement a pilot project that can be used at hatchery scale. The water treatment system must produce supersaturated water with respect to CaCO₃ that will be provided to tanks containing the larvae. Particular emphasis will be placed on optimizing the manner in which carbonate chemistry is adjusted, as biological pathways may be important, rather than simple chemical manipulation.

In recent years, fundamental shifts in the chemical and microbial composition of our coastal oceans have taken place. One manifestation of these changes is a radical shift in the carbonate chemistry of upwelled seawater, which has been shown to have direct effects on shell formation of oyster larvae in the hatchery environment.

However, simply adjusting the carbonate chemistry of incoming seawater will not correct the entire suite of complex chemical and biological processes that have been impacted. Therefore, once carbonate chemistry has been corrected, the treatment system must be further optimized to restore the balanced chemical makeup and bacterial fauna necessary to support the growth of shellfish larvae.

A better understanding of the impact of water conditions (pH, dissolved oxygen, trace elements, bacterial composition) is required with the objective of fully understanding the kinetics of the treatment system. The improved understanding would feed back into criteria for the suitability of treated water and impact the engineering design criteria.

The solution should be tested on water from an area with a known problem and tested at a scale that is large enough to eliminate potential design scaling problems, reflecting commercial size production systems.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from inception of the project. A minimum of one outreach publication is required for all WRAC - funded project. Expected products will be presentations to the industry through conferences and workshops. An open-to-the-public demonstration project involving industry participation will be viewed most favorably. Published and electronic products might include peer reviewed journal publications, trade publications, fact sheets, industry newsletters, email lists, website posting.

DURATION & FUNDING LEVEL

The project is up to 2 years. Requests from WRAC should not exceed \$120,000 per year. In-kind and matching funds from industry will be required for the construction cost of the prototype treatment system on an impacted facility. In-kind and leveraged funds from academia and other entities are strongly encouraged.

CONTACT: Sue Cudd (whiskeycreek1@mac.com) can be contacted for further information on this problem statement.

5. Bird Predation at Aquaculture Facilities

PROBLEM

Bird predation is a significant source of loss in aquaculture facilities. Birds also serve as vectors for disease, and can compete with fish for the artificial feed. Lethal control through acquisition of federal depredation permits is granted on a limited basis for limited species, with probable decreases in allotted numbers in the future. Novel methods of bird control, utilizing motion detectors, water cannons, pyrotechnics, flashing lights, and even guard dogs and birds (falcons) have been attempted. An analysis of bird depredation (bird species, affected fish species, analysis of depredation, seasonality, etc), with suggested improved methods of control is needed.

SOLUTION

An objective of the problem statement is to expand on research conducted by the Southern RAC to assess the economic impact of birds – specifically predation, vectoring of disease and loss through consumption of fish feed.

We request proposals in one or both of the following areas:

1. To study the vectoring of disease and loss through consumption of fish feed. WRAC asks for proposals examining methods related to increasing understanding of bird population dynamics and their predation levels and/or to develop methods specifically designed to discourage or significantly alter injurious bird behavior.
2. Determine the economic damage from birds in conjunction with aquaculture. A major aspect of this research objective is to estimate the cost associated with methods specifically designed to discourage or significantly alter injurious bird behavior and to determine the economic impact of bird predation. These could include already-studied methods modified for application on aquaculture facilities in the West.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from the inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. Outreach products should target the states and/or industries that the project addresses. Expected products of the research would include outreach publications, workshops for interested industry and regulatory members, presentations at scientific meetings and any other products that would provide information on project results. Applicants are strongly encouraged to develop proposals that would involve cooperating with extension personnel and/or aquaculture coordinators.

DURATION & FUNDING LEVEL

Anticipated project duration is two years with a funding level of up to \$120,000/year. In-kind and leveraged funds from industry, academia and other entities are strongly encouraged.

CONTACT

Ken Beer (beerfishery@yahoo.com) can be contacted for further information on this problem statement.

6. Eelgrass

PROBLEM

For the past century or more, west coast shellfish aquaculture has been carried out on extensive tidal flats, in some places overlapping native eelgrass (*Zostera marina*). The potential trade-off between economic value of shellfish and ecological habitat value has recently caught the attention of regulators charged with managing marine waters, coastal habitats, and threatened species (e.g. Army Corps of Engineers Nationwide Permit 48 in March 2007, with ensuing Biological Opinions by NOAA Fisheries and USFWS). By virtue of their roles as ecosystem engineers, seagrasses receive “no net loss” protections at U.S. state and federal levels. Such protections are well motivated by worldwide losses of seagrasses, recently estimated to approach 7% annually. Yet most information on the status and ecological function of seagrasses comes from US east and gulf coasts, Europe, and Australia, with only a handful of studies available in the eastern Pacific. Regionally, the bivalve shellfish aquaculture industry faces new and existing regulations that restrict expansion into eelgrass or curtail existing operations.

Research on this topic to date has focused on characteristics of eelgrass populations in only a few locations but has documented remarkable distinctions in terms of biomass, productivity, and temporal trends relative to global compilations. Nevertheless, the few populations studied have also shown substantial variation in morphology, life history, and potential resilience to disturbance. Maintaining resilience should be a key piece of information in determining the long-term coexistence of bivalve shellfish aquaculture and native eelgrass. At the same time, essentially nothing is known about the functional consequences on eelgrass populations in configurations influenced by on-bottom or near-bottom aquaculture on the west coast, particularly edge vs. interior habitat and eelgrass at different densities.

SOLUTION

WRAC requests proposals that address the following two areas:

1. Proposals should address and determine key life history parameters underlying resilience of *Z. marina* across existing as well as potential shellfish-growing areas throughout the western region. This component of the project could potentially be completed in one year.
2. Proposals should also investigate functional consequences of eelgrass configurations characteristic of shellfish beds in at least one area. These functional consequences would be most critical to evaluate with respect to commercially- or ecologically-important species at higher trophic levels and could include aspects of their performance such as survival, growth, and feeding rate. This is likely a multiyear project.

Better understanding of life history parameters of *Z. marina* as well as the functional consequences of shellfish culture on eelgrass beds would allow for better assessment of culture effects and more informed regulatory decisions. Proposals must include a multi-state field component.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from the inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. Expected outreach products of this research include presentations to industry and agency personnel through conferences and workshops. The project team is expected to coordinate with shellfish growers farming in eelgrass to measure resilience of eelgrass on and near their farms.

DURATION & FUNDING LEVEL

Anticipated project duration: it is expected that Part I would be accomplished in Years 1 & 2, and Part II would be accomplished in Years 3 & 4. Requests from WRAC should not exceed \$120,000 per year.

In-kind and leveraged funds from industry, academia and other entities are strongly encouraged.

CONTACT: Jim Gibbons (jlgibbons@seattleshellfish.com) for more information on this problem statement.

7. Aquatic Nuisance Species #1 -- Returning Aquaculture Facilities to Production: Effective Decontamination Following Aquatic Nuisance Species Detection

PROBLEM

Aquatic nuisance species (ANS), ranging from pathogens to vertebrates, combined with the increased regulatory awareness of ANS, pose a growing threat to the aquaculture industry. Protection of the individual facilities requires a combination of facility biosecurity and careful management practices. In the case where a facility becomes contaminated by an ANS, the burden is placed on the grower to demonstrate that the facility has been decontaminated prior to being allowed to resume production.

SOLUTION

Research that can quantify the efficacy and feasibility of different decontamination approaches (e.g., heated power-washing, chemical, drying) for aquatic nuisance species for example: pathogens like viral hemorrhagic septicemia and *Vibrio tubiashii*, New Zealand mud snails, zebra mussels, and quagga mussels is desired.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. The expected product or products, such as a manual and DVD, would describe guidelines for the effective decontamination of facilities that have been contaminated by a broad spectrum of aquatic nuisance species.

DURATION & FUNDING LEVEL

Duration can be up to two years. Requests from WRAC should not exceed \$120,000 per year. In-kind and leveraged funds from industry, academia, and other entities are strongly encouraged.

CONTACT: Ken Beer (Beerfishery@yahoo.com) for more information on this problem statement.

8. Aquatic Nuisance Species #2 – Risk Assessment Framework for Western Aquaculture Facilities

PROBLEM

Aquatic nuisance species (ANS), ranging from pathogens to vertebrates, combined with the increased regulatory awareness of ANS, pose a growing threat to the aquaculture industry. Protection of the individual facilities requires a combination of facility biosecurity and careful management practices. Individual growers need to be able to assess the risk factors specific to their facilities, but there is no central source for information that would allow them to do so.

SOLUTION

The goal of this project is to review the available information on aquatic nuisance species relating to aquaculture in the western region. The project would have two components. The first would be a geographic evaluation of current and potential aquatic nuisance species threats, perhaps by integrating information from the U.S. Fish and Wildlife Service's National Wild Fish Health Survey, the US Geological Survey Nonindigenous Aquatic Species database, and the Western Regional Panel on Aquatic Nuisance Species (<http://www.fws.gov/answest/>). The second component will be related to facility biosecurity and management practices. This should take the form of a risk assessment framework that can be applied at the facility level. We anticipate that this document would consider the species being cultured, supply chain, potential threats, culture techniques, and facility location as key parameters in the risk assessment.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. The expected product is a risk assessment tool that allows individual growers to identify and plan for coping with realistic ANS threats to their facility.

DURATION AND FUNDING LEVEL

Duration is estimated at one year. Requests from WRAC should not exceed \$75,000 per year. In-kind and leveraged funds from industry, academia, and other entities are strongly encouraged.

CONTACT: Ken Beer (Beerfishery@yahoo.com) for more information on this problem statement.

9. Water Quality – Effluent

PROBLEM

Growing awareness of environmental issues, and the desire to be good environmental stewards, coupled with increasing regulatory restrictions has prompted the aquaculture industry to find new and innovative ways to decrease effluent quantity and increase effluent quality. Furthermore, the aquaculture industry is continually trying to maximize production and produce more income from their allotted water resources. To accomplish that, they must maintain or improve water quality of their effluent to meet regulatory standards.

Potential issues related to poor effluent quality:

- Decreased quality of receiving surface waters
 - Settleable solids
 - Oxygen depletion
 - High levels of phosphorus, ammonia
- Anoxic conditions
- Massive algal blooms (die-off depletes oxygen, creates off-odors/stench)
- Increased aquatic macrophytes (which can deplete oxygen level during die-offs and can plug-up irrigation canals)

RATIONALE

This research is needed so aquacultural growers can maximize the utilization of their water resource while maintaining quality of the effluent. If they can find ways to control their effluent quality, they can increase their production and still comply with regulatory effluent standards.

SOLUTION

Research is needed to evaluate different methods to enhance the water quality of aquaculture effluent. It should be noted that proposed solutions for one operation (e.g., recirculating) may not work for another (e.g., flow through). Multiple technology solutions will need to be developed.

WRAC encourages innovative solutions that may currently not be economically feasible for all sectors of the industry or regions. However, over time these innovative technologies will be refined to work in larger segments of the industry or become scaleable. These solutions could include strategies addressing nutrient and other inputs to the system. Examples include:

- Different fish-rearing management practices
- Modified fish diets and/or fish-feeding regimens: reduced nutrition inputs; nocturnal vs. diurnal feeding

Alternative solutions could encompass strategies mitigating outputs from the system. Examples include:

- Biological organisms (e.g., plants, animals, and microbes) that can utilize, metabolize, or reduce effluent nutrients. This could include:
 - Filter-feeders such as mollusks
 - Other fish species
 - Specialty crops or other plants (e.g., chives, mint)
- Chemical processes (precipitation reactions, sequestering agents, zeolites, etc.)
- Physical strategies (filtration, settlement, etc.)

Proposed solutions can be either sequential processes or simultaneous/multi-system/parallel processes such as polyculture.

WRAC encourages cooperative research at existing aquaculture operations for pilot studies. Multi- and inter-

disciplinary collaborative approaches are strongly encouraged.

Feasibility A well thought-out and designed economic component (cost-benefit analysis) is encouraged.

OUTREACH

A funded participant responsible for outreach must be included as part of the project Work Group from inception of the project. A minimum of one outreach publication is required for all WRAC-funded projects. Published and electronic products might include peer-reviewed journal publications, trade publications, fact sheets, industry newsletters, web-site postings, etc.

Any new development in the research that is published in a peer-reviewed scientific journal is expected to be described in a companion publication in a trade journal for public/industry implementation.

DURATION & FUNDING LEVEL

Duration can be up to four years (1-2 years for technology development; 2 years for demonstration pilot project at on-site application and implementation). Requests from WRAC should not exceed \$120,000 per year. In-kind and leveraged funds from industry, academia and other entities are strongly encouraged.

CONTACT

Rossana Sallenave (rsallena@nmsu.edu) and Kelli Belden (soiletest@uwyo.edu) for more information on this problem statement.

Guidelines for WRAC Regional Research and Outreach Pre-proposals

(Note: these guidelines supersede the guidelines contained within WRAC's Manual of Operations)

Instructions: WRAC Policy requires that each project include participation by two or more states located within the western region (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming). Research partnerships may be formed among all elements of federal, state, and local government, public institutions, and private sectors. A regional research and outreach effort may be shared by a number of institutions (at least two institutions are required) and activities within participating states, depending on the nature of the problem and the most effective use of resources.

Components: The pre-proposal must contain each of the elements in the Format/Content section below in order to show and conform to the detailed requirements for each element.

Pre-Proposal Checklist: A Checklist of required elements for the Pre-proposal is included (see Attachment F).

- The lead PI must initial each box to confirm inclusion of each element.
- The Pre-proposal Checklist must be submitted with the pre-proposal.

Sample Pre-proposal: A sample pre-proposal will be available on the new WRAC website by Jan. 31, 2010. For those wishing to see a sample pre-proposal before then, please contact the WRAC Administrative Office.

Requirements for submission of a complete pre-proposal: A pre-proposal must meet the following requirements or it will not be accepted.

The Pre-Proposal must:

- Be received by the announced deadline. Electronic submission by the due date qualifies as meeting the deadline – the printed copy must be received within a day of the deadline.
- Address each element in the pre-proposal in the order presented on the checklist.
- Include the initialed checklist.
- Be signed by the P.I. (on the Cover Page) submitting the pre-proposal.

Length: The body of the text should be a maximum of five (5) pages – this does not include the references, budgets, or biographies. Use 12-pt. Times New Roman, or similar, font, single-spaced with 1” margins.

Send: the completed pre-proposal as follows:

1. Mail one (1) printed copy to:

Western Regional Aquaculture Center
School of Aquatic and Fishery Sciences
Box 355020
University of Washington
Seattle, WA 98195-5020

2. Email as an attachment (both PDF & WORD) to dgranger@u.washington.edu.

Questions: please contact the WRAC office at (206) 685-2479.

Format/Content:

A. Cover Page: Show the title of the project, participating institutions, and the principal investigators, which include outreach representative (Pre-proposal Attachment A, p. 19)

B. Table of Contents: Follow the format indicated (Pre-proposal Attachment B, p. 20).

C. Project Narrative:

Justification: Include a brief statement of the benefits to be gained by applying the results anticipated as a result of the project.

Related, Current and Previous Work: Assess the current state of knowledge concerning the problem or opportunity to be assessed, and include a brief summary of previous applicable research.

Objectives: List the objectives to be achieved including those of research and outreach.

Procedures: Provide a detailed description of the approach(es) to address the problem or solution, striking a balance between information and brevity in the description. If a multi-year project is proposed, indicate the activity that would take place in each year.

Note: Please review sections addressing outreach expectations for all pre-proposals and full proposals (Pre-proposal Attachment E, p. 23)

Outreach and Evaluation Plan: (Pre-proposal Attachment E, p. 23)

Resource and Facility Commitment from each Institution: List the institutions involved in the project and the resources that are to be utilized from each.

Note: Pre-proposals should show industry participation in the form of contributions of funds, matching funds and leveraged services.

References: Include the references that are included in the pre-proposal text.

Budgets: Include preliminary budgets for each year proposed, according to the format indicated (Pre-proposal Attachment C, page 21). Per Section 1473 of Public Law 95-113, indirect costs and tuition remission cost are NOT allowable on any portion of the sub-awards of the WRAC grant from USDA.

Note: Include specific breakdown of any **salary funds** required (i.e., who will receive the salary: Principal Investigators, Graduate Student/Research Assistant, etc.). Payment of percentages of faculty salaries from WRAC funds is strongly discouraged by the Board of Directors, although it is recognized that in some cases it is essential for the success of the project.

Note: Pre-proposals must contain itemized budget breakdowns for each budget item for each PI. Use the format presented on Attachment C, p. 21.

Note: Industry and Academic Salary Support

- Industry Salary Support: No industry PI salary is allowed. Industry technician funding is allowed with adequate justification. However, this may affect the competitiveness of proposal.

- Academic Salary Support: Up to one month's academic salary under certain circumstances with strong justification can be requested, but this may affect competitiveness of the proposal.

Biographies: Provide a one-page biography for each investigator and outreach personnel, according to the format indicated (Pre-proposal Attachment D, 22).

Pre-proposal Checklist: See Pre-Proposal Attachment F, p. 23

PROJECT TITLE:

TABLE OF CONTENTS

Page #

Project Narrative

Justification

Related Current and Previous Work

Objectives (Research and Outreach)

Procedures

Outreach and Evaluation Plan

Resource and Facility Commitments from Each Institution

References

Budgets:

Individual Budgets for Participating Institutions:

Institution name (PI name)

Institution name (PI name)

Institution name (PI name)

Budget Summary for All Participating Institutions:

Year 1

Year 2

Year 3

Year 4

Biographies

**PROPOSED SUMMARY BUDGET for YEAR _____
for All Participating Institutions
(additional budget pages should be prepared
for each year of proposed project)**

Project Title:

	Institution (PI Name)	Institution (PI Name)	Institution (PI Name)	Institution (PI Name)	PROJECT TOTAL
Salaries					
Benefits					
Supplies					
Equipment					
Other					
TOTAL					

Note: Include specific breakdown of any **salary funds** required (i.e., who will receive the salary: Principal Investigators, Graduate Student/Research Assistant, etc.). Payment of percentages of faculty salaries from WRAC funds is strongly discouraged by the Board of Directors, although it is recognized that in some cases it is essential for the success of the project.

Note: Pre-proposals **must contain** itemized budget breakdowns for each budget item for each PI. The above example is the general format of the spreadsheet to be used for the budget section.

**Pre-proposal Attachment D
Biography
(One page per person)**

NAME:

TITLE:

DEPARTMENT:

INSTITUTION:

ADDRESS:

TELEPHONE/FAX/EMAIL:

EDUCATION: (degree, name of institution, year; list latest first)

POSITIONS HELD: (title, name of institution, employment dates; list latest first)

PROFESSIONAL MEMBERSHIPS:

SELECTED PUBLICATIONS: (list most recent first)

Extension Outreach Criteria for WRAC Project Objectives

One of the principal goals of the Regional Aquaculture Center program is the application of project results for the benefit of industry, yet without adequate and early attention to the outreach component of WRAC projects, research results and outcomes may be of limited value, or completely unknown to producers. The WRAC Board of Directors has recognized that a more detailed account of outreach plans at the proposal stage would help to identify project audiences, outcomes, and evaluation methods. This essential information will ensure that results meet industry needs, and that producers receive pertinent information from projects that might be applied in their operations. Each proposal must contain a comprehensive outreach plan containing the following information provided for listed objectives:

Objective 1: [list first project objective]

- 1. Target Audience** - Who will receive project information for this objective?
- 2. Intended Learning Outcomes** - What will be learned from this objective of the project?
- 3. Intended Management and/or Behavioral Outcomes** - What will be the management or behavioral outcomes of this project objective?
- 4. Procedures to Achieve Intended Outcomes**

Inputs

- Who will do what and at what cost?
- How will target audience be contacted?

Outputs (Outcomes?)

- What products will be developed and at what cost?
- What publications, workshops, demonstrations, etc will be developed?

- 5. Evaluation Plan** - What methods will be used to measure what learning or behavioral changes have occurred?

Outreach Publications

- The required outreach publication(s) portion of WRAC grants is to be funded through WRAC core funds and maintain a WRAC identification, or primary acknowledgment.
1. The core funding for the WRAC outreach publication(s) may be supplemented by other funding sources, but WRAC identification should be acknowledged.
 2. Ancillary funding may be applied to the support of additional outreach activities.
 3. A minimum of one outreach publication shall be produced for any multi-year grant award, and the publication shall address the associated research component of the awarded grant.
 4. The primary outreach publication should not be in the form of a flyer or fact sheet, but cover the subject in a depth that gives substance to the subject matter that benefits the targeted audience.

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**Pre-proposal Attachment F
Pre-Proposal Checklist**

See the Pre-Proposal Guidelines and Sample for more information.

NOTE: The PI must initial each box below to confirm inclusion of each element.

Page # <i>If applicable</i>	Does the Pre-Proposal include/identify the following?
	<p>Required Elements as explained in the RFP and in the Manual of Operations pp. _____</p> <ul style="list-style-type: none"> ○ Cover Page – to include the following: <ul style="list-style-type: none"> • Title • Statement matching Pre-Proposal to identified Problem Statement • Principal investigators & institutions • Suggested Technical Advisor • Duration of Project ○ Table of Contents ○ Project Narrative – to include the following: <ul style="list-style-type: none"> • Justification • Objectives • Outreach and Evaluation Plan (see Outreach Components for details) • Resource/Facility Commitments ○ References ○ Budgets (see Budget Section below) ○ Biographies
	○ Multi-state/institution requirement
	○ Page limits adhered to (5 pages for the Project Narrative portion. The page limit does NOT include the cover page, table of contents, references, budgets, nor biographies). 12 pt, Times New Roman font or similar, with 1 “ margins.

Outreach Components (Follow the guidelines in Pre-Proposal Attachment E)

Page # <i>If applicable</i>	Are the following Outreach elements included and clearly identified?
	○ Outreach Coordinator within WRAC identified and consulted in the preparation of the pre-proposal? (see list of WRAC Extension Sub-committee members on website)
	<p>For each Objective are the following identified:</p> <ul style="list-style-type: none"> ○ Target Audiences - who will benefit from receiving project information ○ Intended Learning Outcomes – what will be learned from this objective ○ Intended Management and/or Behavioral Outcomes ○ Procedures to Achieve Intended Outcomes: <ul style="list-style-type: none"> • Inputs - who will do what and at what cost? • Outputs – what products will be developed and at what cost? • What publications, workshops, demonstrations, etc., will be developed? ○ Evaluation Plan

Budget

Page # <i>If applicable</i>	Does the Budget Section:
	○ Follow the format for the Summary Budget (Pre-proposal Attachment C) available on p. _____ of the Manual of Operations
	○ For each year of the proposed project, specify the breakdown of any salary funds by who will receive the salary (e.g., principal investigator, graduate student/research assistant, etc.)

***If the WRAC Administrative Office cannot verify inclusion of any element,
the pre-proposal will not be reviewed.***