

# WHITE PAPERS<sup>14</sup>

Progress Report for the Period  
September 1, 1998 to December 31, 1999

**NCRAC FUNDING LEVEL:** \$22,500 (July 1, 1998 to December 31, 1999)

## **PARTICIPANTS:**

Jeffrey L. Gunderson	University of Minnesota-Duluth	Minnesota
Roy C. Heidinger	Southern Illinois University-Carbondale	Illinois
Ronald E. Kinnunen	Michigan State University	Michigan
Christopher C. Kohler	Southern Illinois University-Carbondale	Illinois
Jeffrey A. Malison	University of Wisconsin-Madison	Wisconsin
Joseph E. Morris	Iowa State University	Iowa
Robert C. Summerfelt	Iowa State University	Iowa
Harry Westers	Aquaculture Bioengineering Corporation, Rives Junction	Michigan

## **PROJECT OBJECTIVE**

Develop white papers on a limited number of species and systems.

## **ANTICIPATED BENEFITS**

The North Central Regional Aquaculture Center (NCRAC) Board of Directors approved the final draft of a Strategic Plan for the Center on June 16, 1999 (see [Appendix B](#)). The first goal of the NCRAC Strategic Plan is to research, develop, and extend profitable aquaculture technology, marketing, and economics for a limited number of species and systems. The first objective for achieving that goal is to develop a long-term needs assessment which establishes industry priorities in the North Central Region (NCR). One of the major steps for obtaining that objective is the development of white papers on a limited number of species and systems. These white papers will synthesize the literature for the purposes of identifying the most critical gaps of knowledge required for the economical and sustainable production in the NCR. NCRAC's Board decided that white papers on baitfish, effluents, hybrid striped bass, largemouth bass, salmonids, sunfish, tilapia, walleye, and yellow perch should be developed which, in turn, will be used by each state in the NCR to develop their industry priorities. The white papers are not to be an exhaustive literature review, but rather working documents that clearly define the current state of technology for the respective species and/or systems, the critical factors limiting economical and sustainable commercial production, and recommendations as to the research/extension agenda that should be considered. Industry participation and peer review are critical components of the white paper process.

## PROGRESS AND PRINCIPAL ACCOMPLISHMENTS

Kohler and Malison have completed white papers on tilapia and yellow perch, respectively, which were posted on NCRAC's Web site (<http://ag.ansc.purdue.edu/aquanic/ncrac/wpapers/wpapers.htm>) in February 1999. They have served as models for the seven new white papers that the Board requested in June 1999.

## WORK PLANNED

White papers on baitfish (Gunderson), effluents (Westers), hybrid striped bass (Kohler), largemouth bass (Heidinger), salmonids (Kinnunen), sunfish (Morris), and walleye (Summerfelt) will be completed by early 2000.

## IMPACTS

The nine white papers will be used by each state in the NCR to develop their aquaculture industry priorities. These will be instrumental in guiding NCRAC resource allocations in the next three to five years so that the limited resources have the greatest impact on the industry in the NCR.

## PUBLICATIONS, MANUSCRIPTS, OR PAPERS PRESENTED

See [Appendix A](#) for a cumulative output for all NCRAC-funded White Paper activities.

## SUPPORT

YEARS	NCRAC- USDA FUNDING	OTHER SUPPORT					TOTAL SUPPORT
		UNIVERSITY	INDUSTRY	OTHER FEDERAL	OTHER	TOTAL	
1998-99	\$22,500						\$22,500
<b>TOTAL</b>	\$22,500						\$22,500

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## Footnotes

1. NCRAC has funded six Extension projects. The first three were chaired by Donald L. Garling, the fourth project was chaired by Fred P. Binkowski, and the fifth and sixth projects are chaired by Joseph E. Morris. A Project Component Termination Report for one of the objectives of the fifth Extension project is contained in the 1997-98 Annual Progress Report. The sixth project is a 2-year project that began September 1, 1997.
2. NCRAC has funded seven Yellow Perch projects. Termination reports for the first three projects are contained in the 1989-1996 Compendium Report; a termination report for the fourth and fifth projects is contained in the 1997-98 Annual Progress Report. This progress report is for the sixth Yellow Perch project, which is chaired by Jeffrey A. Malison. It is a 2-year study that began September 1, 1997. Originally Fred Binkowski of the University of Wisconsin-

Milwaukee was to have participated in Objective 3 but because the brood stock that were to have been used for the project were destroyed he withdrew from the project and did not expend any funds. A progress report for the seventh Yellow Perch project is contained elsewhere in this Annual Progress Report.

3. NCRAC has funded six Yellow Perch projects. Termination reports for the first three projects are contained in the 1989-1996 Compendium Report; a termination report for the fourth and fifth projects is contained in the 1997-98 Annual Progress Report. A progress report for the sixth project, chaired by Jeffrey A. Malison, is contained elsewhere in this Annual Progress Report. This progress report is for the seventh Yellow Perch project, which is chaired by Donald L. Garling. It is a 2-year study that began September 1, 1998.
4. Paragon Aquaculture has withdrawn from the project for year two as noted in the body of the report.
5. NCRAC has funded six Hybrid Striped Bass projects. Termination reports for the first four projects are contained in the 1989-1996 Compendium Report; a project component termination report for the two research objectives of the fifth project is contained in the 1997-98 Annual Progress Report. The first five projects were all chaired by Christopher C. Kohler. This progress report is for Extension-related activities and outputs (the third and final objective of the fifth project which began September 1, 1995 as well as the objectives of the sixth project). The 1-year sixth project began June 1, 1999 and is under the direction of Joseph E. Morris.
6. NCRAC has funded four Sunfish projects. This termination report is for the third and fourth projects. Termination reports for the first two Sunfish projects, or components thereof, are contained in the 1989-1996 Compendium Report. The third and fourth projects continued and built upon the first two projects. The third project was a 2-year study that began September 1, 1994 and was chaired by Donald L. Garling. The fourth project was also a 2-year study that began September 1, 1996 and was chaired by Robert J. Sheehan. Charlie Stevens was appointed to serve as the Center's Industry Advisory Council Liaison for the fourth project.
7. NCRAC has funded four Salmonids projects. Project component termination reports for objectives of the first two projects are contained in the 1989-1996 Compendium Report; termination reports for the remainder of the first two projects and all of the third are contained in the 1996-97 Annual Progress Report. This progress report is for the fourth project, which is chaired by Paul B. Brown. The fourth project built upon the first three projects. It is a 2-year study that began September 1, 1997.

8. NCRAC has provided funding for two North Central Regional Aquaculture Conferences. The termination report for the first funded conference is contained in the 1989-1996 Compendium Report.
9. NCRAC has funded two Wastes/Effluents Projects. The termination report for the first project is contained in the 1989-1996 Compendium Report. This project component termination report is for one of the two objectives of the second project, which is chaired by Fred P. Binkowski. It was originally a 2-year study that began September 1, 1996. A progress report for the other objective of the second project is contained elsewhere in this Annual Progress Report.
10. NCRAC has funded two Wastes/Effluents projects. The termination report for the first project is contained in the 1989-1996 Compendium Report. A termination report for one of the two objectives of the second project is contained elsewhere in this Annual Progress Report. This progress report is for other objective of the second project, which is chaired by Fred P. Binkowski. It was originally a 2-year study that began September 1, 1996.
11. Ted R. Batterson serves as the facilitator for this multi-year project interacting with a steering committee in overseeing the Coordinator's activities.
12. NCRAC has funded two Tilapia projects. A progress report for the second project is contained elsewhere in this Annual Progress Report. This termination report is for the first Tilapia project, which was chaired by Donald L. Garling. It was originally a 2-year study that began September 1, 1996.
13. NCRAC has funded two Tilapia projects. A termination report for the first project is contained elsewhere in this Annual Progress Report. This progress report is for the second project, which is chaired by Paul B. Brown. It is a 2-year study that began September 1, 1998.
14. NCRAC has funded the development of nine white papers.

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# APPENDIX A

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## EXTENSION

### ***NCRAC Extension Fact Sheet Series***

Garling, D.L. 1992. Making plans for commercial aquaculture in the North Central Region. NCRAC Fact Sheet Series #101, NCRAC Publications Office, Iowa State University, Ames.

- Harding, L.M., C.P. Clouse, R.C. Summerfelt, and J.E. Morris. 1992. Pond culture of walleye fingerlings. NCRAC Fact Sheet Series #102, NCRAC Publications Office, Iowa State University, Ames.
- Kohler, S.T., and D.A. Selock. 1992. Choosing an organizational structure for your aquaculture business. NCRAC Fact Sheet Series #103, NCRAC Publications Office, Iowa State University, Ames.
- Swann, L. 1992. Transportation of fish in bags. NCRAC Fact Sheet Series #104, NCRAC Publications Office, Iowa State University, Ames.
- Swann, L. 1992. Use and application of salt in aquaculture. NCRAC Fact Sheet Series #105, NCRAC Publications Office, Iowa State University, Ames.
- Morris, J.E. 1993. Pond culture of channel catfish in the North Central Region. NCRAC Fact Sheet Series #106, NCRAC Publications Office, Iowa State University, Ames.
- Morris, J.E., C.C. Kohler, and C.C. Mischke. 1999. Pond culture of hybrid striped bass in the North Central Region. NCRAC Fact Sheet Series #107, NCRAC Publications Office, Iowa State University, Ames.
- Cain, K., and D.Garling. 1993. Trout culture in the North Central Region. NCRAC Fact Sheet Series #108, NCRAC Publications Office, Iowa State University, Ames.
- Riepe, J.R. 1999. Marketing seafood to restaurants in the North Central Region. NCRAC Fact Sheet Series #110, NCRAC Publications Office, Iowa State University, Ames.
- Riepe, J.R. 1997. Costs for pond production of yellow perch in the North Central Region, 1994-95. NCRAC Fact Sheet Series #111, NCRAC Publications Office, Iowa State University, Ames.
- Riepe, J.R. 1999. Supermarkets and seafood in the North Central Region. NCRAC Fact Sheet Series #112, NCRAC Publications Office, Iowa State University, Ames.
- Morris, J.E. In review. Plankton management for fish culture ponds. NCRAC Fact Sheet Series #114, NCRAC Publications Office, Iowa State University, Ames.

***NCRAC Technical Bulletin Series***

- Thomas, S.K., R.M. Sullivan, R.L. Vertrees, and D.W. Floyd. 1992. Aquaculture law in the north central states: a digest of state statutes pertaining to the production and marketing of aquacultural products. NCRAC Technical Bulletin Series #101, NCRAC Publications Office, Iowa State University, Ames.

Swann, L. 1992. A basic overview of aquaculture: history, water quality, types of aquaculture, production methods. NCRAC Technical Bulletin Series #102, NCRAC Publications Office, Iowa State University, Ames.

Kinnunen, R.E. 1992. North Central Region 1990 salmonid egg and fingerling purchases, production, and sales. NCRAC Technical Bulletin Series #103, NCRAC Publications Office, Iowa State University, Ames.

Hushak, L.J., C.F. Cole, and D.P. Gleckler. 1993. Survey of wholesale and retail buyers in the six southern states of the North Central Region. NCRAC Technical Bulletin Series #104, NCRAC Publications Office, Iowa State University, Ames.

Meronek, T., F. Copes, and D. Coble. 1998. The bait industry in Illinois, Michigan, Minnesota, Ohio, South Dakota, and Wisconsin. NCRAC Technical Bulletin Series #105, NCRAC Publications Office, Iowa State University, Ames.

Lichtkoppler, F.P. 1993. Factors to consider in establishing a successful aquaculture business in the North Central Region. NCRAC Technical Bulletin Series #106, NCRAC Publications Office, Iowa State University, Ames.

Swann, L., and J. R. Riepe. 1994. Niche marketing your aquaculture products. NCRAC Technical Bulletin Series #107, NCRAC Publications Office, Iowa State University, Ames.

Swann, L., J. Morris, and D. Selock. 1995. Cage culture of fish in the North Central Region. NCRAC Technical Bulletin Series #110, NCRAC Publications Office, Iowa State University, Ames.

Riepe, J.R. 1997. Enterprise budgets for yellow perch production in cages and ponds in the North Central Region, 1994/95. NCRAC Technical Bulletin Series #111, NCRAC Publications Office, Iowa State University, Ames.

Brown, P., and J. Gunderson, editors. 1997. Culture potential of selected crayfishes in the North Central Region. NCRAC Technical Bulletin Series #112, NCRAC Publications Office, Iowa State University, Ames.

Riepe, J.R. 1998. Walleye markets in the North Central Region: results of a 1996/97 survey. NCRAC Technical Bulletin Series #113, NCRAC Publications Office, Iowa State University, Ames.

Morris, J.E., and C.C. Mischke. In press. Plankton management for fish culture ponds. NCRAC Technical Bulletin Series #114 NCRAC Publications Office, Iowa State University, Ames.

### ***NCRAC Video Series***

Swann, L. 1992. Something fishy: hybrid striped bass in cages. VHS format, 12 min. NCRAC Video Series #101, NCRAC Publications Office, Iowa State University, Ames.

Pierce, R., R. Henderson, and K. Neils. Aquacultural marketing: a practical guide for fish producers. 1995. VHS format, 19 min. NCRAC Video Series #102, NCRAC Publications Office, Iowa State University, Ames.

Swann, L., editor. 1993. Investing in freshwater aquaculture. VHS format, 120 min. NCRAC Video Series #103, NCRAC Publications Office, Iowa State University, Ames.

Morris, J.E., and C.C. Mischke. 1998. Sunfish culture. NCRAC Video Series #104, NCRAC Publications Office, Iowa State University, Ames.

Kayes, T.B. In production. Spawning and propagating yellow perch. VHS format, 45 min. NCRAC Video Series, NCRAC Publications Office, Iowa State University, Ames.

### ***NCRAC Culture Series***

Summerfelt, R., editor. 1996. Walleye culture manual. NCRAC Culture Series #101, NCRAC Publications Office, Iowa State University, Ames.

Mischke, C.C., and J.E. Morris, editors. In press. Sunfish culture guide. NCRAC Culture Series #102, NCRAC Publications Office, Iowa State University, Ames.

### ***Other Videos***

Kayes, T.B., and K. Mathiesen, editors. 1994. Investing in freshwater aquaculture: a reprise (part I). VHS format, 38 min. Cooperative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln.

Kayes, T.B., and K. Mathiesen, editors. 1994. Investing in freshwater aquaculture: a reprise (part II). VHS format, 41 min. Cooperative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln.

### ***CD-ROMs***

Swann, L. 1998. Getting started in freshwater aquaculture. NCRAC CD-ROM Series #101, NCRAC Publications Office, Iowa State University, Ames.

### ***Situation and Outlook Report***

Hushak, L.J. 1993. North Central Regional aquaculture industry situation and outlook report, volume 1 (revised October 1993). NCRAC Publications Office, Iowa State University, Ames.

***Workshops and Conferences***

Salmonid Culture, East Lansing, Michigan, March 23-24, 1990. (Donald L. Garling)

Midwest Regional Cage Fish Culture Workshop, Jasper, Indiana, August 24-25, 1990. (LaDon Swann)

Aquaculture Leader Training for Great Lakes Sea Grant Extension Agents, Manitowoc, Wisconsin, October 23, 1990. (David J. Landkamer and LaDon Swann)

Regional Workshop of Commercial Fish Culture Using Water Reuse Systems, Normal, Illinois, November 2-3, 1990. (LaDon Swann)

First North Central Regional Aquaculture Conference, Kalamazoo, Michigan, March 18-21, 1991. (Donald L. Garling, Lead; David J. Landkamer, Joseph E. Morris and Ronald Kinnunen, Steering Committee)

Crayfish Symposium, Carbondale, Illinois, March 23-24, 1991. (Daniel A. Selock and Christopher C. Kohler)

Fish Transportation Workshops, Marion, Illinois, April 6, 1991 and West Lafayette, Indiana, April 20, 1991. (LaDon Swann and Daniel A. Selock)

Regional Workshop on Commercial Fish Culture Using Water Recirculating Systems, Normal, Illinois, November 15-16, 1991. (LaDon Swann)

National Aquaculture Extension Workshop, Ferndale, Arkansas, March 3-7, 1992. (Joseph E. Morris, Steering Committee)

Regional Workshop on Commercial Fish Culture Using Water Recirculating Systems, Normal, Illinois, November 19-20, 1992. (LaDon Swann)

In-Service Training for CES and Sea Grant Personnel, Gretna, Nebraska, February 9, 1993. (Terrence B. Kayes and Joseph E. Morris)

Aquaculture Leader Training, Alexandria, Minnesota, March 6, 1993. (Jeffrey L. Gunderson and Joseph E. Morris)

Investing in Freshwater Aquaculture, Satellite Videoconference, Purdue University, April 10, 1993. (LaDon Swann)



National Extension Wildlife and Fisheries Workshop, Kansas City, Missouri, April 29-May 2, 1993. (Joseph E. Morris)

Commercial Aquaculture Recirculation Systems, Piketon, Ohio, July 10, 1993. (James E. Ebeling)

Yellow Perch and Hybrid Striped Bass Aquaculture Workshop, Piketon, Ohio, July 9, 1994. (James E. Ebeling and Christopher C. Kohler)

Workshop on Getting Started in Commercial Aquaculture Raising Crayfish and Yellow Perch, Jasper, Indiana, October 14-15, 1994. (LaDon Swann)

Aquaculture in the Age of the Information Highway. Special session, World Aquaculture Society, San Diego, California, February 7, 1995. (LaDon Swann)

Second North Central Regional Aquaculture Conference, Minneapolis, Minnesota, February 17-18, 1995. (Jeffrey L. Gunderson, Lead; Fred P. Binkowski, Donald L. Garling, Terrence B. Kayes, Ronald E. Kinnunen, Joseph E. Morris, and LaDon Swann, Steering Committee)

Walleye Culture Workshop, Minneapolis, Minnesota, February 17-18, 1995. (Jeffrey L. Gunderson)

Aquaculture in the Age of the Information Highway. Multimedia session, 18 month meeting of the Sea Grant Great Lakes Network, Niagara Falls, Ontario, May 6, 1995. (LaDon Swann)

AquaNIC. Annual Meeting of the Aquaculture Association of Canada, Nanaimo, British Columbia, June 5, 1995. (LaDon Swann)

Yellow Perch Aquaculture Workshop, Spring Lake, Michigan, June 15-16, 1995. (Donald L. Garling)

Rainbow Trout Production: Indoors/Outdoors, Piketon, Ohio, July 8, 1995. (James E. Ebeling)

North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, Champaign, Illinois, November 2-4, 1995. (Christopher C. Kohler, LaDon Swann, and Joseph E. Morris)

Third North Central Regional Aquaculture Conference, Indianapolis, Indiana, February 6-7, 1997. (LaDon Swann)

Overview of Sunfish Culture. Missouri Joint Aquaculture Conference, Springfield, Missouri, March 4-6, 1998. (Joseph E. Morris)

Seafood and Food Safety Issues Related to Aquaculture, North Central Regional Aquaculture Conference, Columbia, Missouri, February 24-26, 1999. (Ronald E. Kinnunen)

Overview of Sunfish Culture. North Central Aquaculture Conference, Columbia, Missouri, February 24-26, 1999. (Joseph E. Morris and Charles C. Mischke)

Angel Fish Production, North Central Regional Aquaculture Conference, Columbia, Missouri, February 24-26, 1999. (LaDon Swann)

Potential of Recirculating Systems in the North Central Region, North Central Regional Aquaculture Conference, Columbia, Missouri, February 24-26, 1999. (LaDon Swann)

Overview of Freshwater Shrimp Culture, North Central Regional Aquaculture Conference, Columbia, Missouri, February 24-26, 1999. (Laura Tiu)

Fertilization Regimes for Fish Culture Ponds, Wisconsin Aquaculture Conference, Green Bay, Wisconsin, March 12-13, 1999. (Joseph E. Morris)

Extension Programming in the North Central Region, SERA-IEG-9, Frankfort, Kentucky, March 14-16, 1999. (Joseph E. Morris)

Description of the aquaculture and bait fish industries: threat evaluation and identification of critical control points, International Joint Commission Workshop on Exotic Policy, Milwaukee, Wisconsin, September 22-26, 1999. (Jeffrey L. Gunderson)

### ***Proceedings***

Proceedings of the North Central Regional Aquaculture Conference. 1991. First North Central Regional Aquaculture Conference, Kalamazoo, Michigan, March 18-21, 1991.

Gunderson, J., editor. 1995. Proceedings of the Combined North Central and Ninth Annual Minnesota Aquaculture Conference and Tradeshow. Second North Central Regional Aquaculture Conference, Minneapolis, Minnesota, February 17-18, 1995.

Swann, L., editor. 1997. Proceedings of the 1997 North Central Regional Aquaculture Conference. Third North Central Regional Aquaculture Conference, Indianapolis, Indiana, February 6-7, 1997. Illinois-Indiana Sea Grant Program, Publication CES-305. (Also available electronically at: <http://ag.ansc.purdue.edu/aquanic/publicat/state/il-in/ces-305.htm>)

Morris, J.E., editor. 1999. Aquaculture at the crossroads: linking the past to the future. Compilation of abstracts, papers, and supporting articles for the Fourth North Central Regional Aquaculture Conference, Columbia, Missouri, February 24-26, 1999.