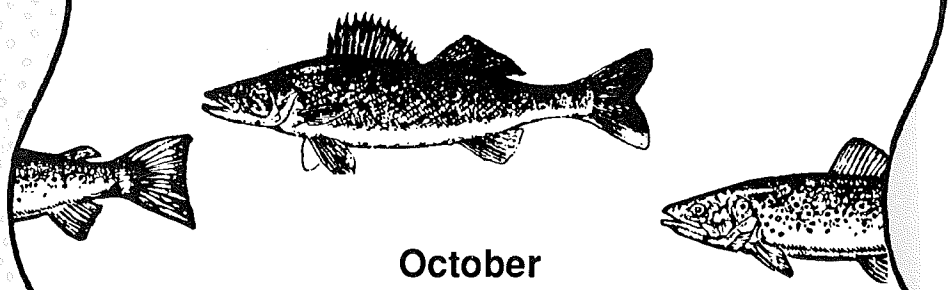
# MINNESOTA AQUACULTURE REPORT



October
1993



**Minnesota Department of Agriculture**
**With support from the Agricultural Utilization Research Institute**

# Minnesota Department of Agriculture

October 5, 1993

Dear Friends of Aquaculture:

Thank you for your interest in aquaculture. Though the fish farming industry in Minnesota remains relatively small, I am excited to say that it has shown impressive growth since our last report. It has been a trying year for many farmers across the Midwest, so it's especially refreshing to be able to relate some good news about a growing agricultural enterprise.

The incentive to develop aquaculture stems from our present dependence on imported fish and the potential for the industry to spur employment and economic development opportunities across rural Minnesota. In 1990, we produced only .3% of the fish and seafood eaten here. Since 1990, production of fish for food has tripled to more than one million pounds. We now grow an estimated 1.6% of what we consume. Employment in the Minnesota aquaculture industry has also increased more than 53% in the past two years.

As the lead agency in charge of coordinating aquaculture, the Minnesota Department of Agriculture is committed to supporting the expansion of this industry. We have worked to bring together all interested parties with the goal of encouraging environmentally sound aquaculture development. In following with the goals of the Minnesota Aquaculture Commission, we have focused recent efforts on a significant hurdle that confronts the industry: technology development.

Initiatives have been established in the form of a research grant program and another project designed to compare and demonstrate indoor water recirculation systems. Funded by the State Legislature as recommended by the Legislative Commission on Minnesota Resources, we are hopeful that these projects will encourage new ideas and innovation in the industry. Given sufficient initial support, I am convinced that aquaculture will continue to grow and become an integral component of Minnesota agriculture; creating jobs and stimulating statewide economic growth.

This report is respectfully submitted to the Governor, the Minnesota State Legislature, and the aquaculture industry. Information for the document was compiled by the Minnesota Agricultural Statistics Service from more than 140 cooperating producers. Assistance was also provided by the Agricultural Utilization Research Institute. Thank you for your continued support.

Sincerely,

Elton R. Redalen

Elton R. Redalen
Commissioner

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# Executive Summary

Fish is a very healthy food. Low in cholesterol and high in protein, fish products are often recommended by health professionals as a wholesome addition to a well-balanced diet. The presence of "Omega-3 fatty acids" in fish has led to the discovery that people who eat fish two times a week run lower risks for heart disease. Other potential advantages of eating fish may include lower blood pressure and benefits to those with digestive disorders.

U.S. per capita fish consumption increased 40 percent between 1968 and 1989, and total consumption of fish increased 73 percent during that same period due to our growing population. Per capita fish consumption, reported at 14.8 pounds in 1992, may have slowed recently as a result of negative press regarding safety issues. However, the National Academy of Sciences found that fish and shellfish constitute only 3.6 percent of all food-borne illnesses. Considered separately, the number of illnesses from eating fish and shellfish is lower than for any other animal meat category.

Worldwide consumption of fish and shellfish has shown consistent growth to the present level of nearly 30 pounds per capita. Experts are saying that wild-catch harvest rates are higher than natural replenishment rates in most areas and that commercial fishing will not be able to meet the increasing global demand. In 1989, the world's fishermen landed nearly 100 million metric tons (mmt) of wild product. Global landings fell 3% in 1990 to 97.2 mmt. In the U.S. alone, we could be consuming an additional 1.5 - 2.0 billion pounds of fish by 1995, and at the current rate, wild-catch fisheries will only be able to supply 25 - 30% of that additional demand.

Importation's of fish have contributed to our large national trade deficit. Currently exceeding $2 billion annually, the deficit in fish trade has eclipsed $3 billion in the recent past. Good data on fish consumption in Minnesota is not available. However, if one multiplies Minnesota's 4.4 million people by the U.S. per capita fish and shellfish consumption level (14.8 lbs.), we can estimate that Minnesotans consume roughly 65 million pounds of those products annually. That means Minnesota currently must import approximately 64 million pounds of fish and shellfish each year. Multiplying $1.90 per pound (1992 MN producer sales value figure) by the 64 million pounds of imported product, results in an estimated state trade deficit of $122 million annually.

Aquaculture has the potential to reduce state and national reliance on fish imports. Aquaculture is of growing importance in many areas of the world, particularly where protein is needed or where fish is a major portion of the traditional diet. Aquaculture comprised about 16% of the total fish harvest in 1991. That is up from only 12% in 1984. In the U.S., aquaculture has grown from only 78,000 tons of production in 1975 to the present level which exceeds 400,000 tons.

In Minnesota, aquaculture is a small, but fast-growing industry. Production of fish for food has risen from only 230,000 pounds in 1990, to a 1992 mark exceeding one million pounds. During that period, sales value to the producer of food fish rose from $464,000 to over $2 million. Farmed bait fish sales also grew to more than $2 million in 1992, an increase of more than 46% from 1990. Sales of fish raised for stocking to enhance a recreational fishery eclipsed $600,000 in 1992.

The aquaculture industry directly employed more than 465 people in Minnesota at least part time in 1992. Full time equivalency converts to approximately 234 jobs. That represents 82 new jobs since 1990; a 53% increase. At the present rate of increase, the industry has the potential to employ more than 550 Minnesotans by 1996. If value of food fish production also continues at the same rate of growth, sales will exceed $37 million by that same date.

The growth of aquaculture has caused a response from several state and federal agencies. Those agencies perform a variety of support services and regulatory functions that will directly and indirectly affect the development of the industry. Agency policies have begun to reflect a recognition of the potential that aquaculture holds. But, because aquaculture takes place in what is often considered a "common property resource" (e.g. water), fish producers are often confronted with what they perceive as an alarming and expensive array of permits and licenses.

The Minnesota Department of Agriculture (MDA) has been designated the "lead agency" for promotion and coordination of aquaculture. MDA staff have worked with an inter-agency/industry advisory group called the Minnesota Aquaculture Commission to encourage environmentally sound industry growth. Staff are currently focusing on an important impediment to aquaculture: production technology development. Other topics that will require on-going attention if Minnesota is to become a major aquaculture player in the future include: financing, processing, marketing, and resource access.

# TABLE OF CONTENTS

CHAPTER — PAGE NUMBER

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# CHAPTER 1:
# WHY DO WE NEED AQUACULTURE?

As a protein source, fish is becoming increasingly important to the world's burgeoning population. In most cultures, harvest of wild stocks through fishing has been the primary method used to access that protein source. Experts agree that the world's lakes, rivers, and oceans have a limited supply of fish. The current consensus is that all of the major world fisheries are already exploited at or beyond their sustainable yield.

Mankind has reduced wild fish populations through over-harvest, habitat destruction and water pollution. Some commercially important fish and shellfish populations have become scarce and others are unfit for consumption. All indications point to decreasing production from commercial fishing in the future. The answer to many of these problems is aquaculture.

## NUTRITIONAL VALUE OF FISH

Fish is a healthy food. Fish are high in polyunsaturated fatty acids, which doctors recommend over saturated and contain relatively low quantities of cholesterol when compared with beef or poultry (generally less than 40 mg per 100 grams). Shellfish, such as lobsters, contain slightly more. Fish and shellfish are highly digestible (90% to 100%). Compared with mammals, fishery products have a much greater ratio of muscle protein to connective tissue protein which is believed to ease digestion. For that reason, fish is often recommended for people with digestive disorders, such as ulcers.

***Figure #1** - Source: Seafood Leader*

**The Best Food Is Fish**

| Feature | Beef | Plants | Pork | Poultry | Fish |
|---|---|---|---|---|---|
| Completeness of protein | X | | X | X | X |
| Source of vitamins & minerals | X | X* | X | X | X |
| Relatively low in calories | | | | X* | X** |
| Relatively low in fats | | X* | | X* | X* |
| Relatively low in cholesterol | | X | | X** | X |
| High in polyunsaturated fats | | X | | | X |
| Relatively high in calcium | | X | | | X* |
| Recommended for diets of cardiovascular disease patients | | | | X* | X** |
| Possible therapeutic value to cardiovascular disease patients | | | | | X** |

Plants and seafood comprise a wide variety of species that may contain a wide range of nutients. The plants include grains, nuts, and beans and products made from them.

**Applies to only some species or only for specific cuts or parts.*

*** Applies to many species.*

Fish compare very favorably with other animal products as a source of protein. Generally, they contain about the same protein content as beef and chicken but more than pork, milk, or eggs. Fish contain fewer calories - 195 for 100 grams of rainbow trout - than beef, 266 calories, or pork, 513 calories.

Studies from Scandinavia show that people who eat fish twice a week (240 grams or 8 ounces of total weekly intake) have lower risks of heart disease than people who rarely eat fish. This may be partially explained by the "omega-3 fatty acids" present in some fish. "Omega-3's" decrease the stickiness of blood cells that are responsible for clotting. Excessively sticky cells are believed to play a major role in blocking arteries, and this sudden arterial blockage causes strokes and heart attacks. In addition, fish and fish oils may lower blood cholesterol levels. Other potential beneficial effects may include lower blood pressure and decreased blood viscosity.

## FISH SAFETY

Many consumers are undoubtedly confused by media stories of safety issues with fish, often followed by glowing reports from health professionals of the benefits of eating more fish. Because fish flesh deteriorates very rapidly, fish requires special attention in handling and holding. Most fish have a shelf life of 7 - 12 days when kept at 30 - 32 degrees F. (Consumer Reports, 1992). Fish industry experts often agree that improper fish handling is the most common cause of poor product.

A widely publicized 1992 Consumer Union investigation revealed a relatively high incidence of poor quality fish at selected retail outlets. The study was very limited in scope; however, it did point to a need for industry quality control improvements. Most of the "bad" product cited in the C.U. report was the result of poor handling along the product trail, which resulted in high bacterial counts- not an unsafe or toxic product. Nonetheless, the report and subsequent publicity created negative impressions in the minds of consumers.

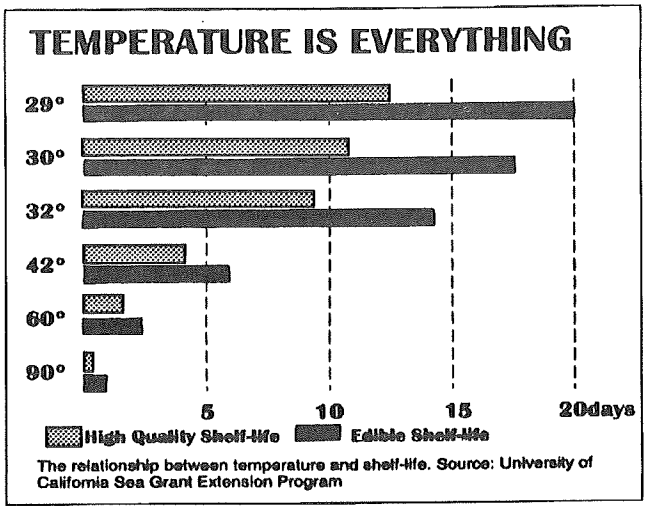



*Figure #2 - Source: Seafood Leader*

## SEAFOOD SAFETY

### ILLNESSES PER SERVING

| | |
|---|---|
| Raw mollusks | 1/ 1,000 –1/2,000 |
| Chicken | 1/25,000 |
| Seafood, including raw mollusks | 1/250,000 |
| Seafood, excluding raw mollusks | 1/1,000,000 |
| Cooked finfish | 1/5,000,000 |

*Figure #3 - Source: USA Today, Seafood Leader*

Despite a lack of mandatory product inspection, fish products are among the safest meats available today. That is exceptional when you consider the astonishing variety of species and product forms sold from a multitude of fisheries around the world. A 1991 report on seafood safety from the National Academy of Sciences found that fish and shellfish constitute only 3.6 percent of all cases of food-borne illnesses when all foods are considered. The report goes on to say that if shellfish and fish are considered separately, the number of cases from each is lower than for any other animal meat category, lower than beef, pork, or chicken.

Aquaculture products have the advantage of scheduled harvest that allows on-site processing and rapid shipping. This edge may allow producers to get a fresher product to the consumer. That product also has the benefit of a controlled environment and diet, which allows the farmer to protect it from some environmental pollutants that may affect the quality of some wild caught products. Problems with that logic include: 1) many consumers do not differentiate between wild and farm-raised product, and 2) the farmer does not have control over their product after sale to the grocer, distributor, etc. The advent of mandatory inspection of fish should improve the latter; however, to improve the former, the aquaculture industry will need to increase consumer awareness of the advantages of eating "farm-raised" fish.

Purveyors of farmed and wild fish products often seem to consider the two as different products, although many consumers are likely not aware, and often not apparently concerned, of a product's origin. A comparison that often surfaces is that of farmed and wild salmon. There are several commercially important salmon species from wild catch and aquaculture and a diversity of product forms including fillets, steaks, whole fish, and a host of other value-added products.

Both wild-caught and farmed salmon can be excellent table-fare. Many salmon fishermen and suppliers declare their product to have superior flavor and texture. Commercial aquaculture proponents note the farmed products' consistent size and quality as reasons their fish are better. Indeed, many prominent chef's seem to have embraced farmed salmon for those reasons. Both products are excellent, but questionable safety of some wild fish is bound to become a more important factor in consumer's minds in the future.

## FISH CONSUMPTION PATTERNS

During the 1980's, recognizing the health benefits of eating fish, people in the United States responded by increasing consumption of fish and shellfish from 12.5 pounds per capita in 1980, to a high of 16.2 pounds per capita in 1987. Proponents of aquaculture lauded these numbers as further evidence of the need for promoting the fledgling aquaculture industry. The National Fisheries Institute, the seafood industry's trade association, established a goal of "20 by 2000," meaning 20 pounds per capita consumption by the turn of the century. During the mid '80's such a goal did not appear unreasonable.

Since 1987, however, U.S. fish and shellfish per capita consumption has declined to the 1992 level of 14.8 pounds (USDA 1993). Analysts cite many potential reasons for the decline in domestic per capita consump-

tion, ranging from the high cost of some fish products, (especially as compared to competing protein sources during tighter economic times), to poor restaurant sales, to lack of a coordinated generic promotion campaign, to lingering food-safety issues in the media. It is most likely a combination of all these factors. Despite flagging per capita consumption in the U.S., worldwide consumption appears to be continuing on an upward trend. Global per capita seafood consumption rose nearly 19 percent from 24.9 pounds to 29.5 pounds between 1980 and 1989 (Aquaculture Magazine, 1993).

Dietary concerns were the most obvious reason why people consumed more fish in the United States during the 1980's; however, it appears the trend toward healthy diets may be slowing. According to a 1993 article in Seafood Leader, "Consumption of less healthy products has flattened out after declining for more than a decade." The article went on to say that, "Bacon makers are in fat city.... More of their product was bought by consumers last year than ever before (Seafood Leader, 1993)."

While changing eating habits explained much of the increased demand for fish in the 1980's, U.S. population growth is now the main reason why fish are being eaten in record volumes. USDA figures indicate that U.S. per capita seafood consumption increased 40 percent between 1968 and 1989, but that total seafood consumption increased 73 percent during that same period (USDA, 1990). Despite the 1992 one-tenth of a pound drop in domestic per capita consumption, *overall* consumption of fish and shellfish actually increased in the past year. Because there were three million more Americans, total fish and shellfish consumption in the U.S. actually rose to 3.7 billion pounds in 1992, up 19.4 million pounds over 1991 (USDA 1993).

Experts cite changing demographics, an improving economy, and increased inspection efforts as reasons to be optimistic that the trend in fish consumption patterns will turn around. Others caution that unless producers of different species can lower production costs to a level where their product can compete with other protein sources, domestic demand for aquaculture products may flatten out. In 1992, the price of fish rose while that of other protein sources was static or declined. On a domestic, per-capita basis, turkey is poised to overtake fish and shellfish. Experts predict that turkey will surpass seafood within the next two years (Northern Aquaculture, 1993).

The consumer price index is a tool used to compare the real cost of consumer items. The Bureau of Labor Statistics, U.S. Department of Labor, pegged the 1992 consumer price index of all fish and seafood at 151.7. Comparatively, for that same period, pork, beef, and veal were all below 133.

Given the support of a rising U.S. and world population, and further indications of troubled commercial fisheries, aquaculture producers and supporters remain optimistic about the growth of the industry despite waning per capita consumption. Aquaculture products are becoming a larger component of the fish products consumed in the U.S. The USDA tells us that shrimp imports, for example, were valued at over $2 billion in 1992. Over half were farm raised. Almost all of the trout and catfish eaten domestically today comes from a farm.

*Figure #4 - Source Aquaculture Magazine*

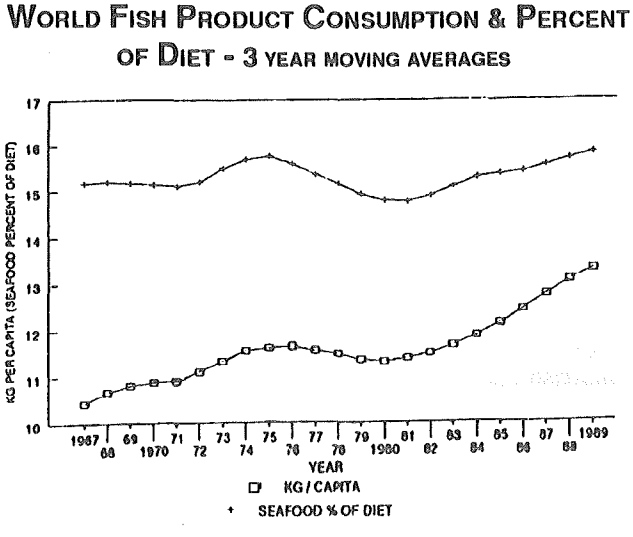
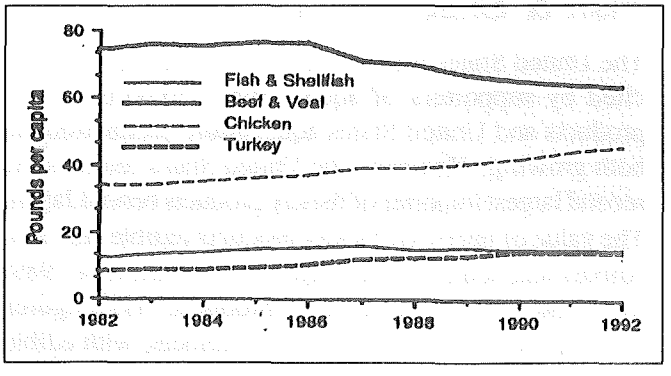



*Figure #5 - Source: USDA/ERS, USDA/NMFS*



## World and United States Fisheries Production

In 1989, the world's fishermen landed nearly 100 million metric tons (mmt) of wild product. Annual world commercial fisheries landings of all species had been slowly increasing through the 1980's in an effort to meet a rising demand; however many fisheries are now showing signs of depletion. In fact, global landings fell 3% in 1990 to 97.2 mmt. The USDA says that "It is too early to know if this drop is simply a 1-year downturn or a signal that wild-catch fishing has reached its maximum level." According to the Food and Agriculture Organization (FAO), between 1950 and 1990 the total annual catch worldwide increased nearly 400%. Experts are saying that harvest rates are higher than natural replenishment rates in most areas (USDA, 1993).

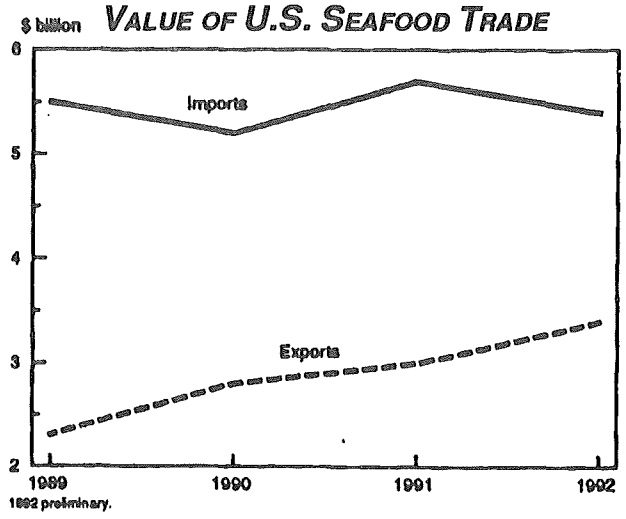
United States fishermen caught 7.3 billion pounds of edible seafood in 1990, nearly 40% of which was from the last great U.S. fishery of pollock from the Bering Sea and Gulf of Alaska. Supplies of fish are diminishing off the coast of New England, in the South Atlantic, and the Gulf of Mexico (U.S. News and World Report, 1990). Many more wild fish populations are apparently being harvested at, or near maximum yield. Christopher Weld, President of the National Coalition for Marine Conservation says, "The majority of our marine and coastal fisheries are either in decline or approaching collapse."

The USDA estimated that we could be consuming an additional 1.5 - 2.0 billion pounds of seafood by 1995, and at the current rate, wild catch fisheries will only be able to supply 25 - 30% of that additional demand. Aquaculture has the potential to supplement wild fisheries, protect species from over-harvest, and provide more stability for the seafood industry as a result.

## Fish & Shellfish Trade

The United States trade deficit in fish products is often cited by supporters of aquaculture. Exports of fish products and United States aquaculture production are both growing. However, the United States remains the second largest importer of fishery products behind Japan. The value of imported fishery products (edible and non-edible) reached a record high of $9.6 billion in 1989, including $5.5 billion of edible products. 1992 figures indicated slightly smaller import numbers, with edible imports at $5.4 billion (USDA 1993).

*Figure #6 - Source (USDA ERS)*



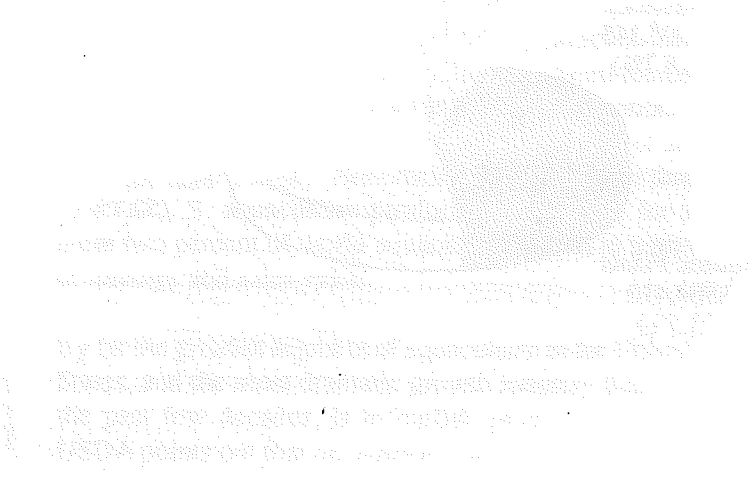

The value of fish and shellfish exports set a record in 1992 for the seventh consecutive year. Edible fish exports topped $3.4 billion in 1992, an 11 percent increase from 1991. According to the USDA Economic Research Service, most of the increase in seafood exports comes from higher commercial fishery landings that are in turn due to tighter control on foreign fishing vessels in the U.S. Exclusive Economic Zones (USDA, 1993). Although exports continue to trend upward, and imports have not increased significantly, a $2 billion trade deficit in fish products remains nationally.

It is easy to make a case for supporting an industry with the potential to directly reduce such a large negative fiscal impact on the country. And, if the national trade deficit in fish is that large, then how big is Minnesota's deficit?

No data exist which identify how much fish Minnesotans eat. If one multiplies the 1990 census population figure for Minnesota (4.4 million) by the U.S. per capita fish and shellfish consumption level (14.8 lbs.), we can estimate that Minnesota consumes roughly 64.8 million pounds of those products annually. As summarized in chapter 3, Minnesota food fish growers sold 1,051,459 pounds of fish in 1992. Nearly all of that product was sold in Minnesota. That means Minnesota currently imports approximately 63.7 million pounds of fish and shellfish each year into the state.

Multiplying the conservative sales value figure of $1.90 per pound (1992 MN producer average sales value) by the 63.7 million pounds of imported product, results in a state trade deficit in the neighborhood of $123 million.

Many imported species of fish and shellfish may never be cultured here due to our climate and resource characteristics; however, with the advent of indoor culture technologies, the impact of those limitations has been somewhat reduced. The $123 million per year Minnesota consumers spend on imported fish products is a strong incentive for the state to investigate all opportunities for environmentally sound aquaculture development.



## CHAPTER 2:

# WORLD AND UNITED STATES AQUACULTURE

## WORLD AQUACULTURE

Almost 100 different species are presently cultured worldwide for food including shrimp, crawfish, oysters, clams, mussels, and salmon. Aquaculture practices vary widely, depending on the species, geographic area and economic and political considerations. In all cases, however, the definition of aquaculture that separates it from fisheries is some degree of control over the life cycle of the cultivated organism in order to increase production or reduce costs. The Food and Agriculture Organization (FAO) of the United Nations defines aquaculture as, "the farming of aquatic organisms, including fish, mollusks, crustaceans, and aquatic plants." Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. (Conrad, 1991).

Aquaculture is an ancient practice. Carp were grown in ponds by the Chinese over 3,000 years ago. Even before that, a 4,000 year old Egyptian hieroglyph is thought to depict fish farming in the day's of the pharaohs. In times past, aquaculture was probably more art than science. Today's aquatic farmer enjoys many advantages provided by modern technology, and relies more on business, marketing, and scientific expertise to raise an aquatic product.

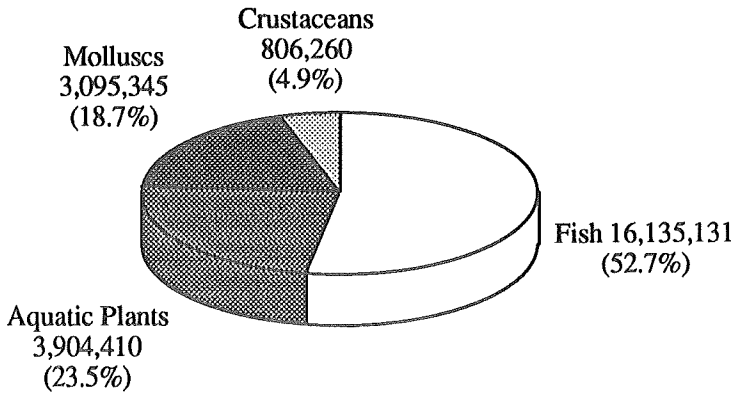
Aquaculture is of growing importance in many areas of the world, particularly where protein is needed or where seafood's are a major portion of the traditional diet. The total world aquatic harvest including aquaculture reached about 96 million metric tons (mmt) in 1991. Aquaculture comprised about 16 percent of that harvest. That is up from only 12 percent in 1984 (Aquaculture Magazine, 1993).

The FAO states that 1991 worldwide aquaculture production was 16.5 mmt. That figure represents a 2 percent increase from the previous year, and an 8 percent increase from 1989. When compared to the reported 1975 level, the 1990 worldwide output is more than double (Aquaculture Magazine, 1993). Value of world production has increased correspondingly, from an estimated US$11.9 billion in 1984, to US$26.5 billion by 1990 (FAO).

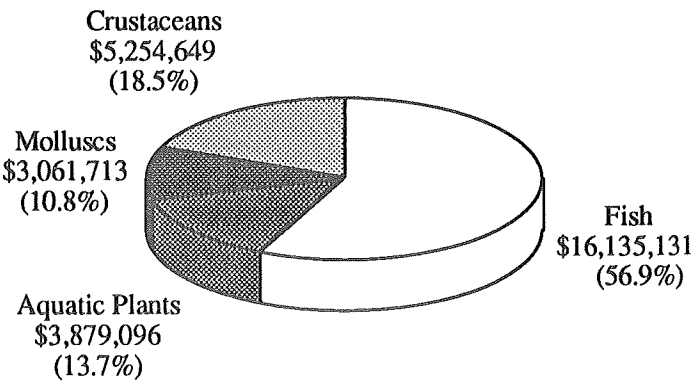
*Figure #7*
*Source: FAO*

### 1991 WORLD AQUACULTURE OUTPUT
IN QUANTITY AND VALUE AS A PERCENTAGE OF THE TOTAL

**Quantity in Metric Tons**

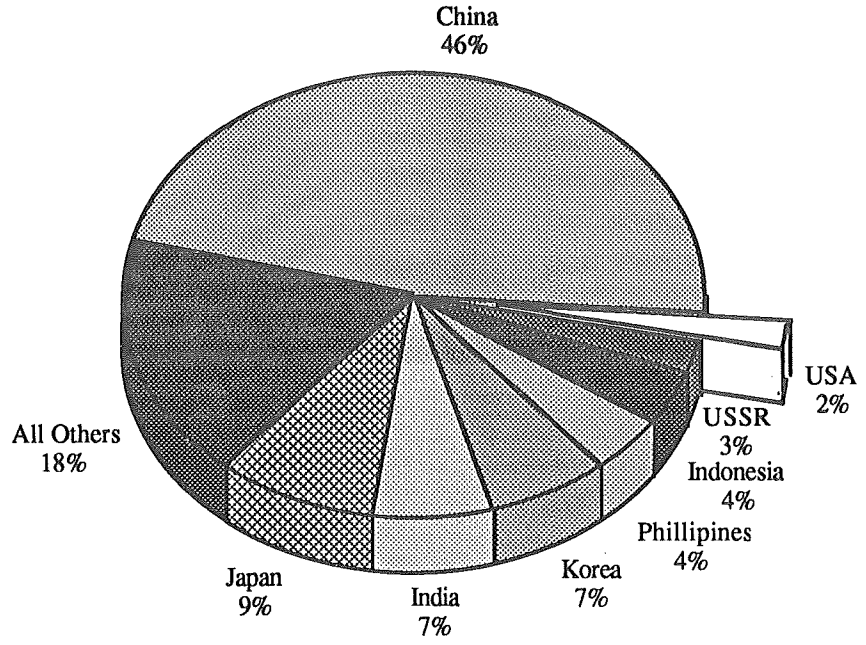



**Value in Thousands of U.S. Dollars**



## Top Eight Aquaculutre Producing Countries Based on 1990 Production

*Figure #8 - Source: FAO*




Some nations already rely on aquaculture for over 40% of their total fisheries supply. China (PRC) is the top aquaculture producing country in the world. In 1990, China reportedly produced 47 percent of the world's aquaculture output. Japan, India, Korea, and the Philippines round out the top five producing nations, with the United States placing eighth in terms of tonnage (USDA 1991).

FAO statistics indicate that carps, barbels, and cyprinids are the category of largest worldwide production, totaling almost one third of annual production by metric ton. China harvests 3.8 million metric tons of fish in that category. In comparison, annual harvest in the category of salmon, trout, and smelt was estimated at around 460,000 metric tons (Conrad, 1991). In total, finfish comprise about 55 percent of the world's aquaculture production by tonnage. Aquatic plants, mollusks, crustaceans, and miscellaneous species follow finfish at about 21, 19, 5, and 3 percent respectively. In the category of value of production, the crustacean species jump to second place. The expansion of high value marine shrimp production in Asia and Latin America generally account for this discrepancy (Aquaculture Magazine, 1993).

## United States Aquaculture

Fish culture techniques were primarily imported to the United States by European immigrants. Aquaculture has been practiced in the U.S. for well over 100 years, beginning with salmon and trout release programs designed to augment natural stocks. In comparison with the rest of the world, however, aquaculture in this country is relatively new and underdeveloped.

In the last two decades, however, aquaculture in the U.S. has experienced considerable growth. In 1975, U.S. production was only 78,000 tons. By 1980, this figure had reached 101,500 tons. 1987 production exceeded 375,000 tons, and by 1990, aquaculture production had exceeded 400,000 tons. Aquaculture has been touted as the fastest growing sector of the agricultural economy in the United States, increasing at an annual rate of 20 percent (USDA, 1988). Nonetheless, the FAO notes that in 1990 U.S. aquaculture production accounted for a mere two percent of world aquaculture output in terms of tonnage and sales value.

By far the greatest segment of aquaculture in the United States, and the most dramatic growth industry through the past few decades, is in catfish production. The USDA points out that on average, each American buys

nearly a pound of processed catfish products a year. In 1992, catfish processors reported buying over 457 million pounds of catfish, accounting for almost half our domestic aquaculture production. Total value of grower sales rose to $316 million in 1992, up 11 percent from the previous year, but below 1990 sales (USDA, 1993). Catfish production, which saw double digit increases throughout the 1980's, has slowed somewhat in the face of declining prices, an indication of over supply. Experts say that market expansion is continuing, but not fast enough to keep pace with present production.

Other significant species cultured in the United States include salmon, trout, tilapia, and hybrid striped bass. Sales of food-size trout fell 9 percent in 1992 to $53 million, the lowest value in the last five years (USDA, 1993). Experts cite a weak average price per pound, the continued drought in Idaho, and the recession for the decline. (With a very large share of U.S. trout production coming from Idaho, events in that state can affect the entire industry).

Salmon production in the U.S. has been estimated at around 19 million pounds (live weight). The USDA says that production may be valued at $55 - 60 million. At that value, salmon sales would eclipse those of food-size trout despite a large inverse disparity in pounds produced. Maine is the leading growth state in net-pen salmon production, with production of approximately 13 million pounds (USDA, 1993).

The American Tilapia Association estimates that 1992 production of that species was approximately 9 million pounds. That organization expects another increase in 1993 production, showing market growth far beyond the product's original ethnic niche (USDA, 1993). Imports of tilapia come primarily from Taiwan, with an increasing share originating from Central and South American countries. The USDA reports that the U.S. imported over 7.5 million pounds of tilapia over the second half of 1992. At that rate, the annual import value (around $12 million) of tilapia would about equal imports of smoked salmon, and would exceed that of trout (USDA, 1993).

Production of hybrid striped bass has been increasing rapidly following the decline in wild striped bass populations and the development of growout technology for the species. Estimated at 1.7 million pounds, hybrid bass production was predicted to approach 3.7 - 4.8 million pounds in 1992 (Seafood Leader, 1992). No hard figures are available, however.

In addition to the above mentioned finfish, domestic aquaculture production includes numerous other species of finfish, shellfish and aquatic plants. Production takes place in tanks, ponds, raceways, cages or through ocean ranching. Growth will be stimulated by an increasing focus of resources on improving the techniques of growers and on investigating the many basic research needs of this new industry. Research in areas such as disease prevention, breed improvement, nutrition and feeding practices, predator control, and grading and harvesting techniques, will add to information needed to increase production efficiency. The resulting cost competitiveness of many types of aquaculture operations will in turn cause more funds to be invested in production operations, support services, and more research. All indications point to the fact that aquaculture production in the U.S. will continue to increase.

*Figure #9*
*Source:Water Farming Journal*

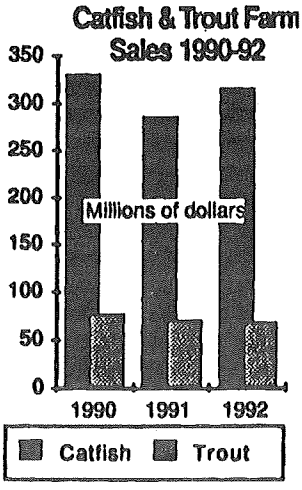
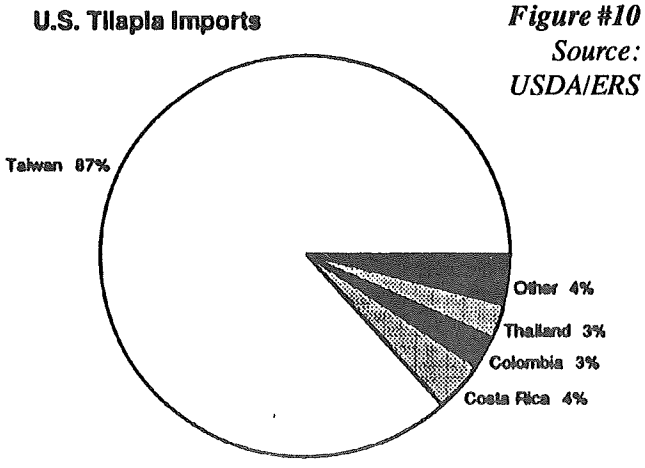



*Figure #10*
*Source: USDA/ERS*



## CHAPTER 3:

# PRIVATE AND PUBLIC AQUACULTURE IN MINNESOTA

Aquaculture has been described by such promising terms as: "The Wave of the Future" and the "Blue Revolution." Reasons for the national increase in aquaculture production were summarized in Chapter One; they include greater fish and seafood consumption, an increase in recreational and commercial fishing demand, and the inability of nature to supply the subsequent rising harvests. These same reasons have also stimulated great interest in Minnesota aquaculture development.

## HISTORY OF PRIVATE AQUACULTURE IN MINNESOTA

Trout and salmon were highly prized game and food fish during the late 1800's as they are today. They were the first fish propagated in our state. Trout have been raised in private Minnesota hatcheries for over 120 years. Private aquaculture began in Peterson, Minnesota (Fillmore County) as an effort to supplement and expand the wild fishery. The Peterson hatchery, established in 1871 by a Norwegian immigrant, first sold fish to the state for stocking in 1874.[1] The State also contracted with private hatcheries in Stillwater and Red Wing (DNR, 1957).

The first Minnesota food fish sales were made by the Peterson hatchery in 1875 soon after the railroad was routed through that small southern Minnesota town. Rainbow trout and brook trout were sold to the railroad for consumption on the dining cars and for transport to markets in Chicago and Milwaukee. Trout were sold for the handsome price of $1.05 per pound in 1875. In comparison, good land in that area was selling for around $8.00 per acre at the time.[1]

Many early fish enterprises in Minnesota focused on salmonids; however, warm/cool water fish such as buffalo and carp have also been marketed to certain ethnic groups since the early 1900's. Live rail shipments of those fish for 15 -18 cents per pound supported a small industry which was begun by the Lapinski family in the southwestern Minnesota community of Currie.[1] Considered a fishery by most definitions, the "rough-fish" industry still exists in western Minnesota today.

Culture of cool water species also has a long history in Minnesota. Walleye and other cool water sport fish have been cultured for stocking since the 1920's in state hatcheries. Private hatcheries became involved with cool-water game fish culture on a large scale more recently; a group called "Operation Walleye" focused further attention on such efforts. Operation Walleye began in 1984 and was organized by people interested in improving walleye angling in west-central Minnesota lakes. They cooperated with the state in raising fry to the fingerling stage to encourage more successful stocking of those fish. Private facilities were subsequently initiated partly due to the pioneering work done by Operation Walleye.

Increased angling pressure and success in the resort industry in Minnesota opened up markets for bait fish. Bait culture, and the technology to transport the product has developed since the 1920's. The first bait fish transported for sale were trucked from southern Minnesota to resorts up north in cream cans on the back of a Model-T truck with a person called a splasher dipping water alternately from one barrel to another in an effort to "stimulate" the minnows (Hennagir, 1980).

As knowledge of aeration developed, and the highway system grew, bait transportation methods improved greatly. The bait industry has since grown to become a significant component of aquaculture in Minnesota. Minnesota's wild-harvest bait fishery has been estimated at between $30-50 million in annual sales. Bait products from the state, primarily minnows and leeches, are now transported to markets across the nation.

## 1992 MINNESOTA PRIVATE AQUACULTURE INDUSTRY STATUS

In 1991, the Minnesota Aquaculture Commission (MAC) recognized growing interest and investment in aquaculture in the state. The commission subsequently recommended the Minnesota Department of Agriculture (MDA) do a thorough study of aquaculture production in order to provide a benchmark from which to measure future industry growth. By establishing a record of expected production expansion, increased employment, and sound resource utilization, the MAC hoped to convince policy makers, educators, researchers and others that aquaculture was worthy of increased investment. The survey lead to the first industry status report. This report is a follow-up of that first effort.

Agricultural Utilization Research Institute (AURI) support was instrumental in the development of this status report. Their help allowed the MDA to contract

[1] James Cady, Personal Communication, Minnesota Aquafarms, Inc., 1992.

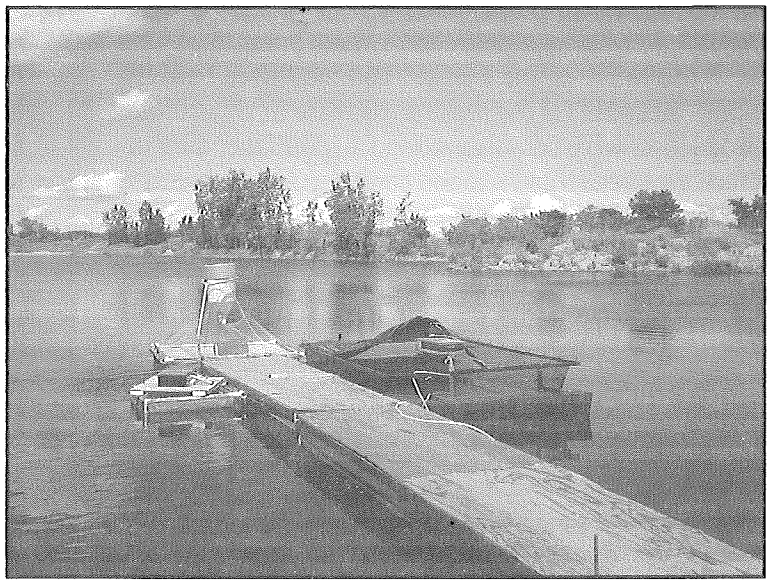
with the Minnesota Agricultural Statistics Service (MASS) to conduct the survey of Minnesota aquaculture producers. MASS has extensive experience in surveying traditional agricultural industries.

Mail surveys were sent to all aquatic farms and hatcheries licensed by the Minnesota Department of Natural Resources (DNR). They were followed by a subsequent mailing if no reply resulted from the first. MASS field staff were also able to conduct phone and personal interviews with a number of non-respondents.

Very similar to the first survey issued following the 1990 production year, the goal of the 1993 project was to collect employment, revenue, resource utilization, and other data about Minnesota's aquaculture industry. Department staff use such data in responding to daily requests for information, developing program documents such as the *Aquaculture News*, and in prioritizing other projects that support and promote aquaculture.

It is important to note this survey did not include aquatic plant production such as cranberries, hydroponically grown fruits and vegetables, or wild rice. The survey also excluded wild capture of fish, including wild bait fish. Wild harvest of bait fish and food fish are considered fisheries. They do not fit the definition of aquaculture, which generally implies some level of intervention in a species life cycle. The wild harvest bait industry has been estimated by the Minnesota Department of Natural Resources (DNR) at between $30 - 50 million in annual retail sales; other wild harvest fisheries, including Lake Superior, have been estimated between $1 - 2 million annually.[1]

Out of the 193 licensed fish farms and hatcheries surveyed, 79 sold product in 1992 and are hereafter classified as "commercial" producers. Of the remaining 114 licensed facilities, 63 could be classified as "recreational" or start-up operations. Many recreational operations are simply pond owners who have stocked a few fish for recreational fishing, or they may be experimenting with raising fish indoors in tanks. The remaining 51 licensees surveyed were either inaccessible, refused to respond, or were out of business. Staff were able to estimate production of growers who



***Food Fish Cage Culture in a Minnesota Gravel Pit***

refused to respond based on past survey information and first-hand knowledge of individual operations.

Unless stated otherwise, the following summarizes commercial fin-fish producers' data only. Although there has been some wild harvest of turtles, frogs, crayfish and freshwater clams, we are aware of no reptiles, amphibians, crustaceans or shellfish *cultured* commercially in Minnesota today.

There are three commonly grouped categories of commercial fin-fish production in Minnesota. They include food fish, bait fish, and sport fish. **Food fish** are fish that are sold directly for consumption (i.e. restaurant, grocery store, food-service). **Sport fish** are fish that are raised for the purpose of release to the wild to enhance or expand the range of a public or private recreational fishery. **Bait fish** are fish that are raised for sale as bait for anglers.

Many producers overlap categories. For example, many walleye fingerling sport fish producers also produce baitfish. A few growers also produce trout for food and for stocking purposes. Additionally, there are some niche markets such as sales of fish for research, and sales of native game fish for the aquarium industry. For the purposes of the survey, we grouped those niche marketed fish into the stocking category. No attempt was made to accurately survey ornamental (tropical) fish growers and breeders.



[1] Ken Kursawski, Personal Communication, Minnesota Department of Natural Resources, 1992.

### *Where is aquaculture practiced in Minnesota?*

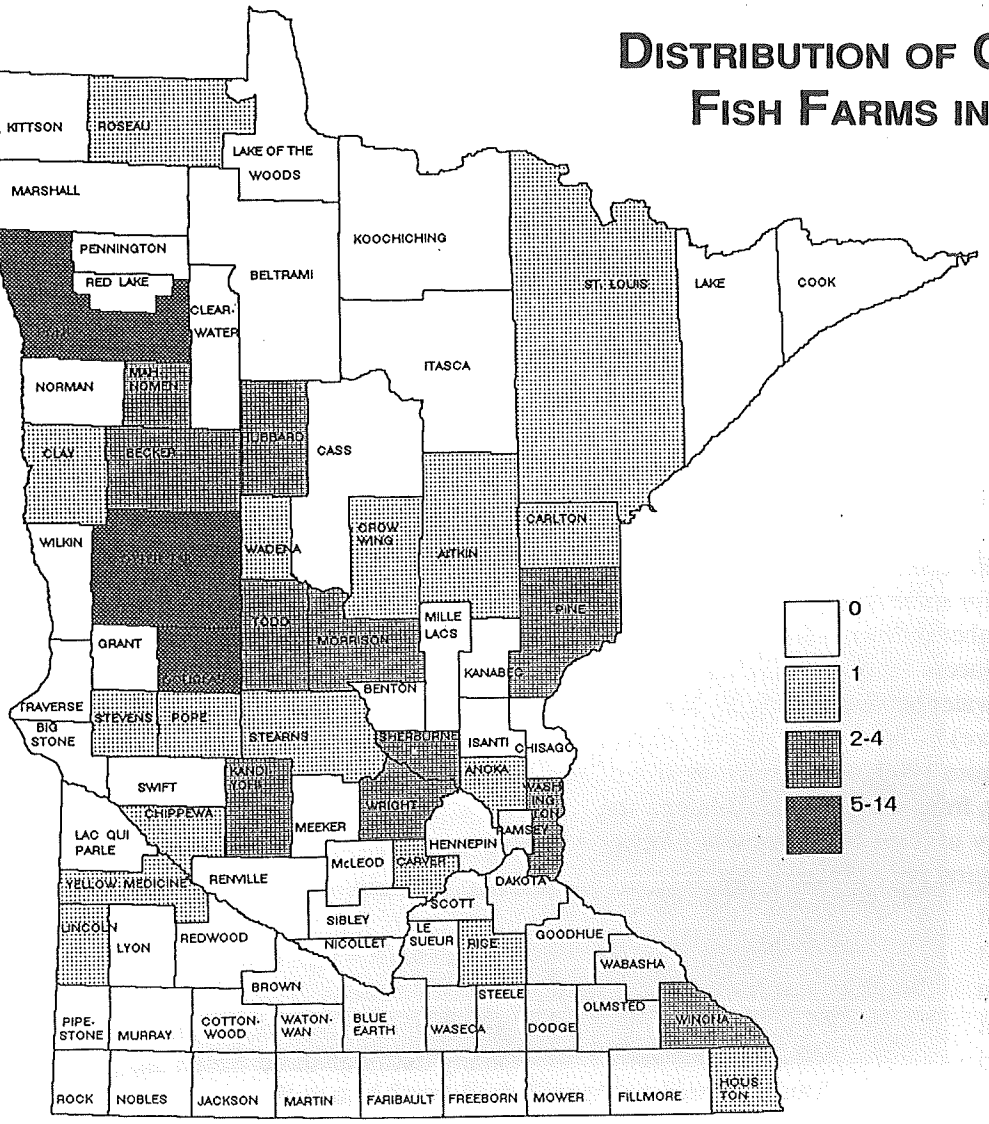
Aquaculture is practiced across Minnesota in a variety of systems; however, there are a few generalizations that can be made about where production of fish occurs in the state. Walleye and other sport fish fingerlings, along with bait fish, are raised primarily in west-central Minnesota due to the abundance of natural ponds and lakes in that region. Salmon are grown-out on the Iron Range in the northeastern part of the state. Rainbow trout facilities are more common in eastern Minnesota.

It is difficult to describe the regionality of aquaculture activity in the state beyond the above generalizations because many Minnesota farmers utilize natural ponds which may be miles apart, in some cases in several different counties. In addition, the advent of several indoor water re-use systems is decreasing the geographical influence of isolated or unique water resources.

In an attempt to discover some data on the distribution of aquaculture operations in the state, we asked licensed growers in what county most of their 1992 production occurred. As in 1990, Ottertail County was the most common answer. Fourteen of 79 (18%) of the commercial operators reported most of their 1992 production in that west-central Minnesota county. The next highest frequency of operations by county was neighboring Douglas, with 8 reporting operators. Those two counties stood out because of their abundant natural water resources; however, thirty-one different counties were reported by at least one commercial operation. The wide-spread distribution of operations demonstrates the potential for statewide economic impact from this growing industry.

*Figure #11*

## DISTRIBUTION OF COMMERCIAL FISH FARMS IN MINNESOTA



### *How is Aquaculture Practiced in Minnesota?*

With all the different types of aquaculture systems being employed by the industry today, it is important that Minnesota producers identify the most efficient and profitable farming methods to best utilize available resources. Water quantity and quality, land availability, and financial resources are a few of the most important considerations for potential producers to review when selecting a production location and system.

While many aquaculture systems are used in Minnesota, a few principle production methods are in greatest use. Those culture systems include: 1) **natural pond/lake**, 2) **cage or net-pen**, 3) **raceway**, 4) **dug pond**, and 5) **recirculating (recirc) or water re-use systems.** All of these culture methods will work in certain circumstances, and all are employed by Minnesota aquatic farmers. Some are used in conjunction on the same farm. Cage, raceway, re-circ systems, and dug ponds are the most common culture systems used to produce fish for food markets. Natural ponds and lakes are more commonly used to produce bait fish and sport fish for stocking to enhance recreational fishing.

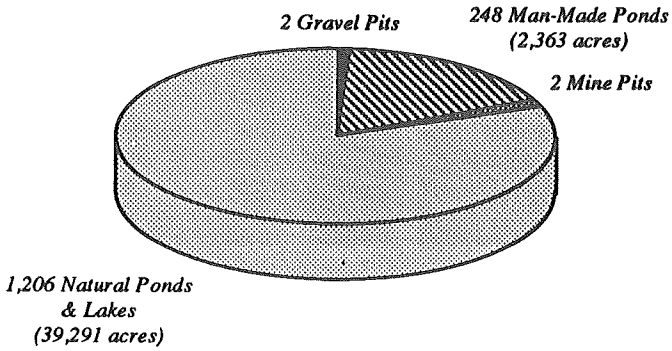
### *Natural Pond/Lake Culture: Commercial Sport Fish and Bait Fish Production*

Because of Minnesota's great wealth of wetlands, a potential aquatic farmer may initially surmise that utilizing an existing Minnesota pond or lake would be the easiest and cheapest method to raise fish here. Many producers do utilize this abundant Minnesota resource for aquaculture production.

Fifty-three of 79 (69%) commercial producers utilized natural water bodies for some component of their 1992 production. That number is down from more than 91% in 1990. Those producers reported utilizing approximately 1,206 natural water bodies, totaling 39,291 acres (32.6 acre average size). The number of ponds/lakes utilized was up 412 from 1990, but the average size of pond used was down from 42.4 acres. Although the resource is commonly utilized by Minnesota producers, fish culture in natural ponds/lakes is not as simple as it may sound.

*Figure #12*

**Water Bodies Used by Commercial Aquaculture Producers in Minnesota**




Many ponds and lakes in our state have been declared off-limits for aquatic production by the Minnesota Department of Natural Resources (DNR) due to the presence of a public fisheries and/or other potentially competing uses such as recreation. Fishing, hunting, canoeing, water skiing, and other water related recreation is a big industry in the state. As it is commonly practiced today, aquaculture may not be seen as compatible with those pursuits in publicly accessible waters. Therefore, aquatic production in Minnesota is mostly limited to water bodies with no public access.

Common practice involves leasing access rights to a pond/lake from a farmer (or farmers) with riparian lands. Roughly defined, riparian lands are those with which a tenant has ownership abutting the waterway, creating control over access to the water through trespass law. Producers of bait fish and sport fish are reportedly competing for lease of natural ponds/lakes. A result has been some destructive dissension between the groups, and most likely a higher cost of doing business.

Wildlife conservation organizations have also alleged a potential conflict in natural pond/lake utilization for production of sport fish and bait fish fingerlings. They hypothesize that fry stocking practices create unnatural conditions in the resource, resulting in low invertebrate populations which could be detrimental to waterfowl.

Users of the resource say that their ponds produce as many ducks as those which are not being utilized for

aquaculture production. They further reason that if shown a significant profit from their ponds, it is possible traditional farmers could be convinced to plug existing drain tile, resulting in wetland creation from presently dry marginal crop lands. They also cite the aquaculture practice of wetland creation in digging production ponds and artificial wetlands for waste treatment as positive benefits to waterfowl populations.

Research presently underway has the potential to shed some further light on the subject of aquaculture in wetlands (natural ponds). However, wetlands represent a complex eco-system. The diverse nature of Minnesota ponds coupled with wide-ranging production practices used may make it difficult to apply research results universally.

Natural pond users are also forced to contend with many other problems such as lack of an easy method to harvest the product, difficulties in feeding, bird predation, and the seasonal variations in temperature that may be lethal to some fish. Many pond culturists overcome these obstacles by employing extensive (low-input) and seasonal methods of production.

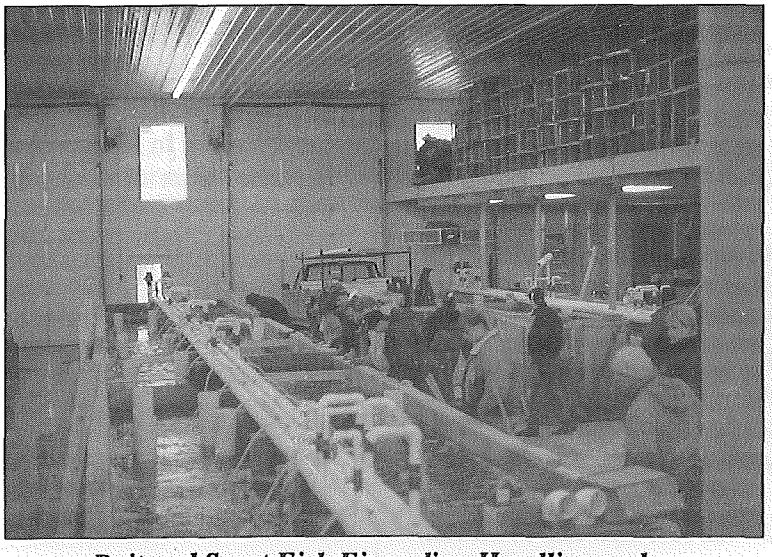
It is very likely that Minnesota produces the most cool-water sport fish fingerlings (walleye, bass, northern pike, etc...) in the nation. As mentioned previously, the category of sport fish includes all fish raised for stocking into a private or public water body to enhance a recreational or commercial fishery. Added to that category is a relatively small number of fish sold for research and to the aquarist. Most sport fish are cultured in ponds seasonally, for a period of four to seven months. Most are sold as fingerlings, commonly between three to ten inches in length.

Sport fish fingerling producers generally utilize natural ponds that are shallow enough to "winter kill" so fish do not carry over to the next season and cannibalize newly planted fry. Sport fish production comprised 13% of Minnesota's total aquaculture sales value in that year. Number of producers declined from 26 to 19, while value of production decreased from $802,000 to $614,000.

It would be easy to speculate that the drop in sport fish value of production reflects a market limitation for the product. On the other hand, it is always questionable to draw such conclusions from just two years of production data, especially since the industry is so new, and is sensitive to natural events such as drought and flood. The reduction in number of producers does likely reflect an observed shake-out of sorts in the industry, as a handful of producers apparently established dominance in sport fish production in the past few years. In fact, the five largest sport fish producers accounted for nearly 82% of the total 1992 sport fish sales value.

Walleye, largemouth bass, crappie, bluegill sunfish, muskellunge, rainbow and brook trout, yellow perch, and northern pike were the nine sport fish species cultured and sold for stocking by private aquatic farmers in 1992. There were more than 600,000 walleye fingerlings and 6.5 million walleye fry sold. Walleye, trout, and muskellunge sales represent more than 89% of sport fish sold. Walleye fry and fingerlings accounted for 65% of Minnesota's sport fish sales value in 1992.

Many sport fish fingerlings sold by private growers were taken as eggs from wild fish. They may have been hatched in a DNR facility for sale to the private sector at "fair market value," or they may have been bought from a private producer with walleye broodstock. In the case of walleyes, private fry sales represented nearly 39% of total sales to growers. The state sold 16,778,000 walleye fry taken "in excess of state needs" to 18 private growers in 1992. Private growers sold 6,500,000 fry in 1992, 90% of which were sold intrastate.



***Bait and Sport Fish Fingerling Handling and Distribution Facility***

Producers mostly stock fry into natural ponds for grow-out to marketable sizes. The fish are commonly fed by natural food in the

## 1992 Sport Fish Production by Species and Value of Sales

| Species (common name) | Number of Fish Sold | Value of sales | Average Value Per Fish * |
|---|---|---|---|
| Walleye (fingerlings) | 606,081 | $327,972 | $0.54 each |
| Walleye (fry) | 6,500,500 | $68,075 | $0.01 |
| Rainbow Trout | 102,601 | $75,628 | $0.74 |
| Muskellunge | 10,725 | $75,163 | $7.01 |
| Yellow Perch | 266,500 | $46,313 | $0.17 |
| Crappie | 450 | $14,060 | $31.24 |
| Brook Trout | 6600 | $4,250 | $0.64 |
| Northern Pike | 1,900 | $4,000 | $2.10 |
| Largemouth Bass | 8,500 | $3,100 | $0.36 |
| Bluegill Sunfish | 2,100 | $1,408 | $0.67 |
| **TOTAL** | **7,505,957** | **$619,969** | **$0.08** |
| | (1,005,457 W/O fry) | | ($0.62 W/O fry) |

* The survey did not differentiate between different sizes of sport fish sold. Although most sport fish sales are fingerlings, some are adult fish. There is a big disparity in the value of a two pound trout as compared to two inch trout, for example.

pond, sometimes supplemented with stockings of fathead minnows and/or zooplankton growth encouraged by fertilization. The rough industry standard for *expected* harvest efficiency (fingerlings harvested divided by fry stocked) is between 5 - 15%.[1]

If one assumed that all 22,628,000 (private + DNR) walleye fry purchased were stocked into growout ponds, that would mean that the *actual* overall industry harvest efficiency in 1992 was much lower than the expected; slightly less than 2.7%. In the case of walleye, this number is probably skewed somewhat due to several assumptions which include: 100 percent survey reporting, all walleye fry bought are stocked for growout, no fish are lost in holding after harvest, and all 1992 stocked fish harvested were sold in 1992.

The initial financial input (capital costs) from many of these operations is not great when compared to other culture techniques. These operations are, however, subject to the whims of nature. Problems common to traditional agriculture such as extreme heat or cold, extended drought, and predation by unwanted birds, fish and mammals can cut very deeply into profits. In addition, many sport fish fingerling producers employing these techniques harvest their fish in the fall with traps, and the fish can be elusive.

Some commercial producers raise sport fish *and* bait fish because of the similar culture technology and type of water resource used. Bait fish growers and those who harvest wild stocks are both required to have a baitfish dealers license in order to sell what they have harvested. Some industry observers have postulated that the bait industry may move away from natural pond/lake wild-harvest in the future and become more reliant on intensive dug-pond aquaculture production as practiced in Arkansas. There is some evidence from this survey to support that theory.

As mentioned in the introduction, the wild harvest component of the bait fish industry could be considered a large *fishery* in Minnesota. Much of the bait sold is harvested from the same sought after leased ponds/lakes that sport fish culturists use, so there is some potential for conflicts between the two enterprises.

Most consumers only buy live bait fish. As a consequence, the marketing process must be efficient and fairly direct. Harvested bait fish follow several different marketing channels. Live bait fish hauled out of state typically are distributed through wholesalers and/or retailers in the destination state. Live bait fish distributed within the state typically go to bait fish



[1] Richard Walker, Personal Communication, Prairie Lakes Aquaculture, 1993.

retailers operating near fishing areas. Some dealers also market live bait fish directly to anglers and to sport fish growers who use the product as feed (Hanson, 1989).

There were 53 commercial aquaculture producers who reported bait fish production in 1992. The sales value of baitfish which are *cultured* totaled over $2 million. That was a 46% increase from 1990. Bait farming accounted for 43% of the aquaculture industry's total sales value last year.

Total production of bait fish approached 271,000 gallons. That represented a 171% increase from 1990, when there were less than 100,000 gallons reportedly produced.

The white sucker, or *sucker minnows*, used primarily in sport fishing for northern pike, catfish and walleye, accounted for almost 62% of 1992 cultured bait fish sales value. In 1990 it was 84%. There is no clear explanation for that change.

Sucker eggs are generally stripped from wild fish in the spring by permit, and under supervision of the DNR. During the 1992 spring sucker egg-take, the DNR issued permits and 7,392 quarts of eggs were taken. In 1993, private producers took sucker eggs from wild spawning runs under DNR permits totaling 7,160 quarts. The DNR issues those permits on a quota system based upon acres of production water available.

As with walleye sport fish fingerlings, sucker eggs are most commonly taken from wild fish, fertilized, hatched, then stocked in extensively managed natural ponds for harvest later in the summer and fall. John Ringle of Leech Lake Reservation Fisheries said their operation also sold approximately 230 quarts of fry, or approximately 1,150 quarts of eggs, to private growers.[1] Estimating 45,000 eggs per quart would put the total Minnesota sucker egg take at 373.9 million. A 60% hatch would result in 224.4 million fry available for stocking grow-out ponds.

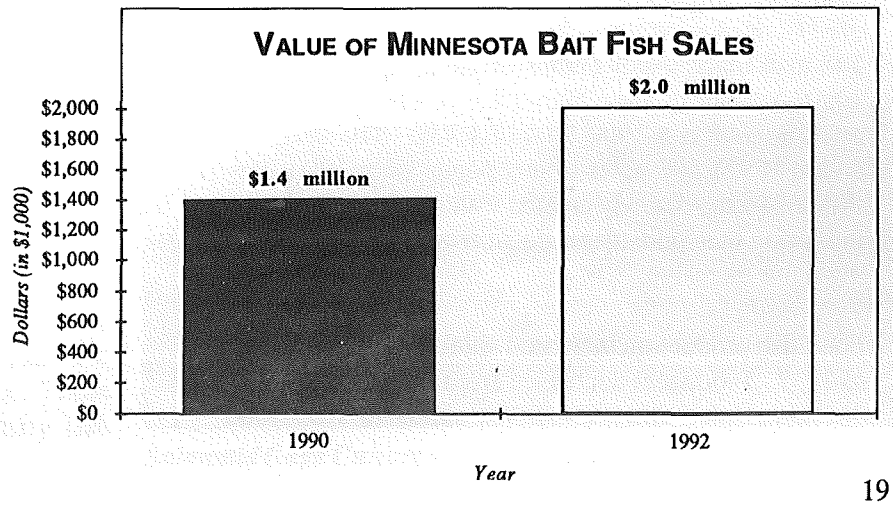
A rough industry standard for *expected* harvest efficiency (fish harvested divided by fry stocked) has been established around 20%.[2] In attempting to establish a rough *actual* industry harvest efficiency number, we divided the 224.4 million fry stocked by number of fish sold. To arrive at the number of fish sold, we had to convert the 124,000 gallons reported by producers as sold, to number of fish. Four to five inch suckers represent the largest market size; they average about 300 per gallon.[3] That means that there were approximately 37.2 million sucker minnows reported as sold by producers in 1992. That would put the *actual* harvest efficiency of sucker growers in 1992 at just under 17%.

The many assumptions used in calculating the actual industry harvest efficiency number included: 100 percent survey reporting, all sucker fry bought are stocked for growout, no fish are lost in holding after harvest, and all 1992 stocked fish harvested were sold in 1992.

In 1992, commercial sucker growers reported over 56,000 gallons were sold out of state. That was over 45% of sucker minnow sales volume last year. Overall, the bait fish growers exported nearly 62% of the gallons of product cultured here.

White sucker culture is very similar to sport fish fingerling production. It is interesting to note that only 7 of 53 reporting bait producers (13%) also raised sport fish in 1992. That number is down considerably from 65% in 1990. This may be a result of a sport fish fingerling enterprise "shake-out" mentioned previously. A few large producers invested heavily in pond lease and facility upgrade between 1990 and 1992. Perhaps the top

***Figure #13***




[1] John Ringle, Personal Communication, Leech Lake Res. Fisheries, 1993.

[2] Richard Walker, Personal Communication, Prairie Lakes Aquaculture, 1993.

[3] Phillip Koep, Personal Communication, Urbank Live Bait Co. Inc., 1993.

## 1992 Cultured Bait Fish Production

| Species (common name) | Gallons Prod. | Value of Sales | Avg Value Per Gal | % sold in MN |
|---|---|---|---|---|
| Sucker Minnows | 124,392 | $1,230,460 | $9.89 | 45% |
| Fathead Minnows | 144,074 | $710,653 | $4.93 | 77% |
| Golden Shiners | 2,315 | $59,250 | $25.60 | 9.6% |
| Rainbow Chubs | 15 | $200 | $13.33 | 0% |
| TOTAL | 270,796 | $2,000,563 | | |

sport fish producers established some market share dominance which forced some bait fish producers to abandon sport fish culture efforts. Competition for culture water and market conditions may have also exerted some influence on these numbers.

Done properly, and with the cooperation of mother nature, extensive pond culture can be an effective method of production in Minnesota. More "intensive" or high input pond production has not been utilized here to any great extent. It is, however, very popular in more temperate climates such as in the south, where Mississippi catfish growers feed their fish and intensely manage water quality. Many of those ponds are man-made and constructed so that they may be easily drained for harvest. Some Minnesota producers do utilize dug ponds and elongated impoundments that have a constant flow of water, often referred to as raceways.

### *Raceway, Dug Pond, and Cage Culture: Commercial Food Fish Production*

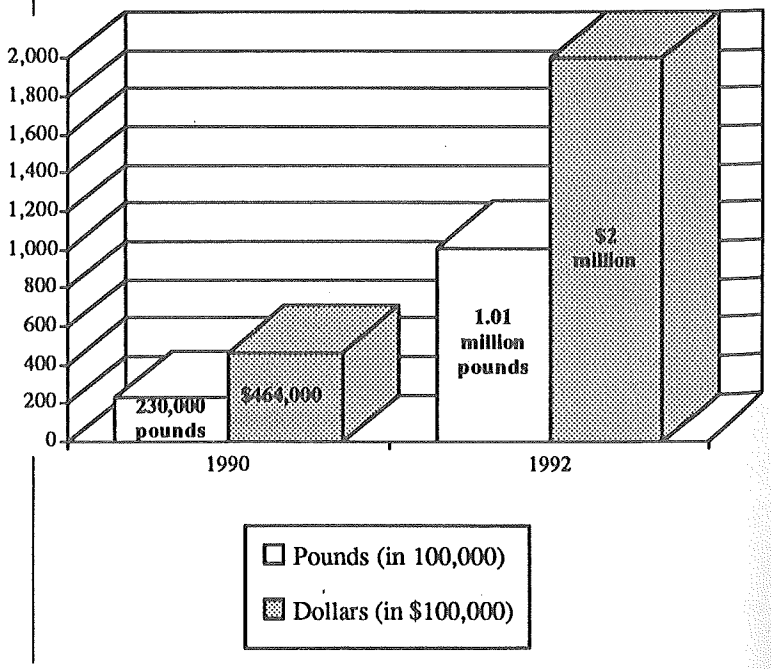
In 1992, seven Minnesota commercial aquatic farmers utilized raceways in fish production, twenty-eight used man-made ponds, two used flooded gravel pits, and one used flooded mine pits. Commercial producers utilized 248 man-made water bodies in 1992, up from 152 in 1990. Acreage of those man-made ponds totaled 2,363, as compared to a 1990 total of 1,452. The sharp increase of 911 new acres of dug ponds since 1990, contributed from 96 newly created water bodies, may be an indication that industry production methods are becoming more intensive.

Food fish production increased significantly from 1990 to 1992. Producers decreased from 14 to 10, but production tripled from 230,000 pounds to 1,051,000 pounds, and value of production increased from $464,000 to over $2 million. The top three food fish producers accounted for almost 99% of that sales value.

As in 1990, food fish sales in the past year consisted primarily of chinook salmon and rainbow trout. In fact, those two species again accounted for over 99% of total food fish sales value. Food fish producers also reported over 99% of their product was sold in Minnesota. Average sales value per pound was $1.90, declining from a 1990 level of $2.02. This may have been due to periodically weak market conditions for salmon and trout products in the past two years.

*Figure #14*

### Sales of Food Fish 1990 &1992



### *Raceway Culture*

In its most common form, a raceway is a shallow elongated containment structure. Fresh, well oxygenated water comes in one end, and flows out the other. This culture method allows the fish to be easily observed, fed, and harvested when the right time comes. Some aquatic farmers enclose their raceways in netting to exclude any unwanted predators. Some have automated feeders, and some feed by hand. The species most commonly raised in a raceway environment are salmonids. The key to this type of a system is the water source.

Salmonids require high quality, cold water. A common resource for such a facility is ground water. Ground water pumping was reported by 36 of 79 commercial operators (very similar to 1990 numbers). The average flow for commercial operators who pumped ground water was approximately 116 gallons per minute at an average of 257 days per year. Cool-water producers generally only need water in their hatcheries, or when holding fish for a short period of time. Cold-water producers are more likely to utilize a higher flow, and constant volume of ground water.

Either pumped or free flowing from springs, ground water is usually high quality and close to the correct temperature that will allow salmonids to grow. Locations with high volume, free flowing spring water are excellent sites for raceways because there are low pumping costs. Unfortunately, this resource is not very common in most of our state. Where springs are not available, pumping costs add to cost of production.

### *Cage Culture*

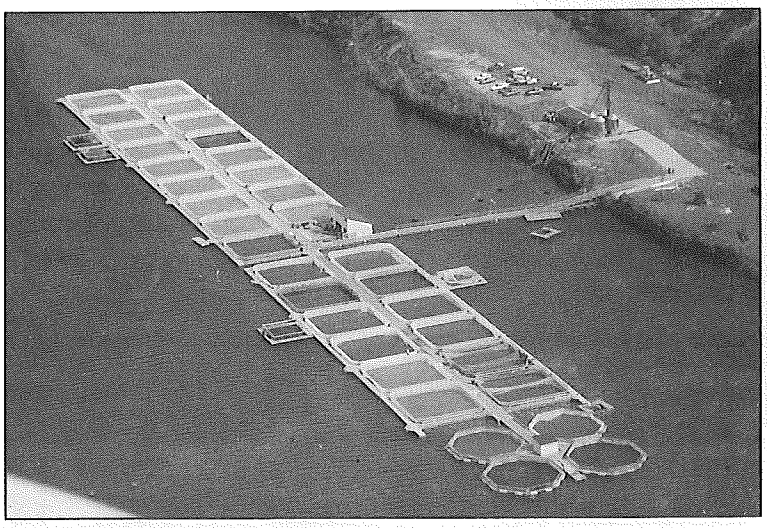
Cage culture can be pursued in a variety of waters, and can vary from back-yard hobby to high technology. Beginning fish farmers, or those who only wish to raise enough fish for themselves, often find cage culture to be an excellent method to grow fish. Fish in a small cage suspended in a pond, lake, or stream are also fairly simple to raise. The fish are easy to feed, monitor, and harvest, thus offering the perfect learning environment.

Cage culture is not only utilized by the hobbyist. Some of the worlds largest fish farms utilize net-pens, cage-like enclosures that are floated in the water and supported by a buoyant frame at the surface. These large enclosures are home to high density fish populations which are managed to provide maximum growth and efficiency. Net-pen systems are very common in northern European countries, Chile, and in Canada's British Columbia and Maritime Provinces. As mentioned in chapter two, approximately 19 million pounds of salmon are raised every year in the United States; most were grown in net-pen systems. The preferred salmon species of many marine net-pen producers seems to be the Atlantic salmon, but Minnesota production has been primarily chinook or "King" salmon.

### *Water Recirculation or "Closed-Loop" Systems*

"Re-circ," "water re-use," and "closed-loop", are all names used to describe an aquaculture grow-out system. Water recirculation is a technique which has the potential to facilitate food fish aquaculture production in areas that lack a consistent temperature, high volume water resource. The production technology is being tested world-wide. If proven to be economically viable for Minnesota, this technology will be unique because it will allow operators to develop aquaculture facilities in areas that were previously not considered.

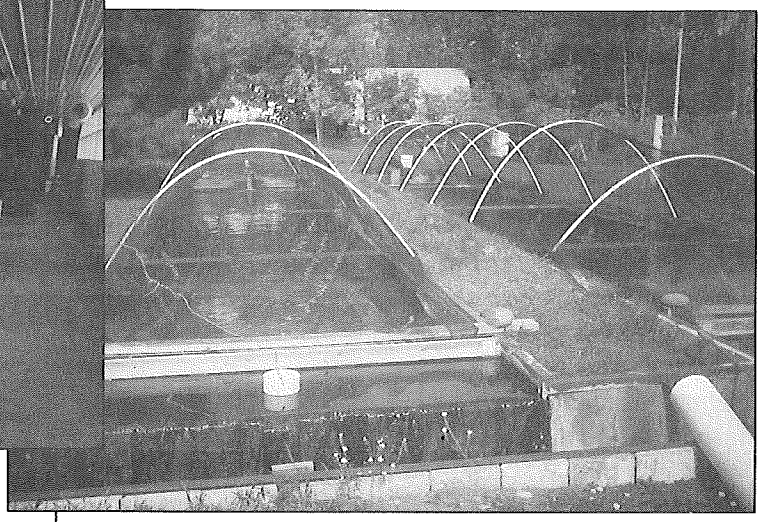
Recirculation systems are essentially high density growing units where the water is maintained chemically, thermally, and biologically to provide maximum production. These systems vary widely in rate of water replacement and design, and are correspondingly diverse in construction cost and production limits. Technology varies from system to system, but the common goal is to achieve high production in little water and space by



***Salmonid Cage Culture in a Minnesota Mine Pit Lake***

***Indoor Water Recirculation Tank Culture***

***Raceway Trout Production***



maintaining sufficient water quality through biological filtration and other chemical and thermal manipulation.

Large scale commercial recirculation facilities require special engineering, intensive management, and extensive monitoring systems. The high cost of these facilities may be offset by economies of scale in purchasing feed and other supplies, and marketing advantages provided by the greater volume of production. However, larger facilities require more water, a scarce resource in some Minnesota regions. If an aquaculture venture has access to high volumes of low cost water, there may be no reason to recirculate. A flow-through raceway operation would probably be more economical in that instance.

Several companies throughout the United States are marketing "turn-key" recirculation culture systems and/or components. Many of the systems are currently targeted to the hobbyist. Interest in recirculation systems has been intense in Minnesota. Although several systems are currently producing fish, they are so new that their production did not show up in the 1992 survey.

Many feel recirculation technology represents the future of Minnesota aquaculture because of the characteristics of our water resources; however, because recirculation technology is so new to commercial aquaculture here, none of these systems has a track record of economic viability. If found to be economically feasible, such a system has the potential to diversify existing farm operations and subsequently encourage rural economic development.

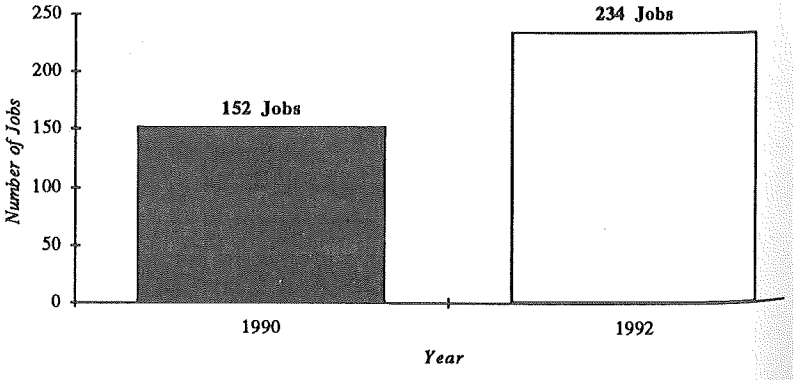
### *How Many People Does the Aquaculture Industry Employ?*

Many fish farm operations are labor intensive. Tasks such as trapping, treating, sorting, processing, seining, and transporting, all require many hours of manual labor. That is reflected in the high number of people employed in the industry today. The 1992 industry survey revealed that aquaculture production directly employs more than 465 people in Minnesota at least part-time. Of that total, 363 were paid employees. Of the paid employees, 167 were reported as permanent full-time, 31 as permanent part-time, 40 as seasonal full-time, and 125 as seasonal part-time.

Considering permanent part-time and seasonal full-time jobs as one half of a job, and part-time seasonal as one quarter of a job, the full-time equivalency (FTE) in the

***Figure #15***

**DIRECT EMPLOYMENT IN MINNESOTA'S AQUACULTURE INDUSTRY**



aquaculture industry for 1992 adds up to approximately 234. That is 82 more jobs than in 1990. The average number of full-time jobs per commercial operation would be approximately three. In following with the overall increase in aquaculture sales value of 75% from 1990 to 1992, the number of full-time jobs has increased an impressive 53% in the past two years.

Aquaculture in Minnesota is sometimes used as a diversification strategy by traditional farmers and others. Approximately 47% of the fish farm/fish hatchery operators surveyed indicated they derive less than half of their personal income from aquaculture. More than 44% surveyed said they derive more than 75% of their personal income from their aquaculture enterprise. Only 8% said they receive between 51 - 75% of their personal income from aquaculture.

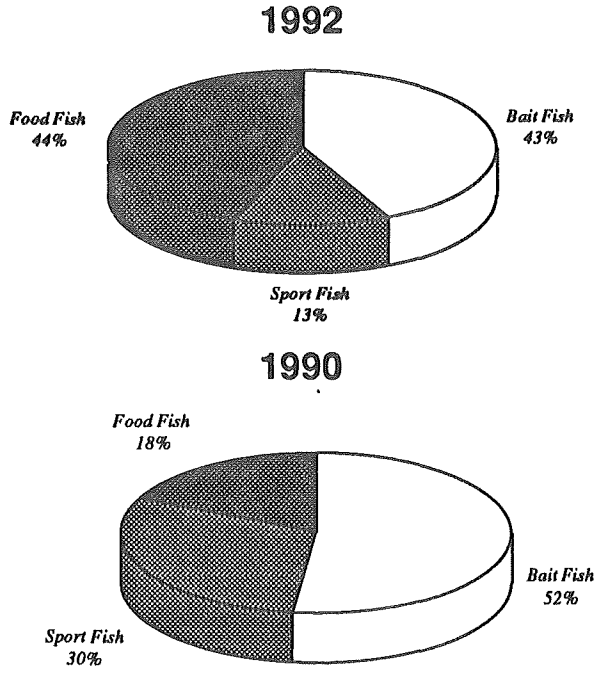
As aquaculture moves further from an art to become more scientifically driven, there will be a greater need for trained specialists. In view of the increasing production figures for Minnesota's aquaculture industry, there is little question of the need for more trained professionals and technicians to guide the industry into the next century. Biologists, engineers, economists, pathologists, nutritionists, and a diversity of other scientific and economic disciplines will become more important to the industry in the future.

### *What Do Producers Perceive is Constraining Aquaculture Production in Minnesota?*

A survey question aimed at soliciting grower perceptions of constraints to production asked, "Is your operation producing at full capacity?" If they answered no, growers were given seven options from which to select the reason(s) for their below capacity production including labor shortage, no market, no capital, no processing capacity, lack of technical information/ assistance, over-regulation, and other. The most common reason given for below capacity production was lack of capital (48 responses). The next highest reason cited was no market (30). There were 29 respondents who said that over-regulation was a reason for below capacity production, 11 listed lack of technical information/assistance, 7 cited a shortage of labor, and only 2 mentioned a lack of processing capacity. Other reasons written in include: bird predation and lack of desire/time.

*Figure #16*

**VALUE OF SALES IN MINNESOTA BY GROUPS**




### *Where is aquaculture going in Minnesota?*

Environmentally sound economic development and agricultural diversification can be the result of a strong aquaculture industry. A 1989 study completed for the state entitled, *"Strategies for Aquaculture Development in Minnesota,"* predicted that aquaculture has the potential to generate as much as $34 million/year in direct revenues and 151 new jobs in seven years. The consultant team *Fish Factory* went on to explain, "While difficult to assess, the long-term potential for aquaculture in Minnesota may be a factor of 3 - 4 times higher..." They also pointed out that much of the employment would be generated in rural areas which are experiencing high unemployment rates and slowing economies. As outlined in Chapter Three, there are some positive signs that Minnesota aquaculture has begun to realize the potential for growth outlined by the *Strategies* report.

The department's first aquaculture survey documented 1990 statistics. Although it is less than statistically adequate to base a projection on just two known points, we thought it may be interesting to project what the industry may look like if the same growth pattern established between 1990 and 1992 were applied through to 1996. If the rate of growth observed from 1990 to 1992 continues, the projected number of full time jobs in 1996 would be 548.

The 1992 sales value in excess of $2 million in the category of food fish represents a 331% increase from 1990. If food fish sales value continues to expand at that same rate, it will exceed $37 million by 1996. The Fish Factory consultant team predicted a potential of $34 million in overall aquaculture sales by that same date. If production of food fish is projected in a similar manner, it could exceed 21 million pounds.

The impressive industry growth exhibited between 1990 & 1992 is reason for industry supporters to be optimistic about the future of Minnesota aquaculture. However, the industry is still in its infancy, and remains subject to the volatility of other agri-businesses. The relatively small number of commercial food fish producers will need to increase if the industry is to gain more stability.

There are some indications that substantial recent investment in recirculation systems will contribute to continued food fish production increases. Such facilities will have to demonstrate profitability in Minnesota before any predictions can be made about their long-term contribution to aquaculture production. Subsequent surveys will provide more solid evidence to project the industry's future.

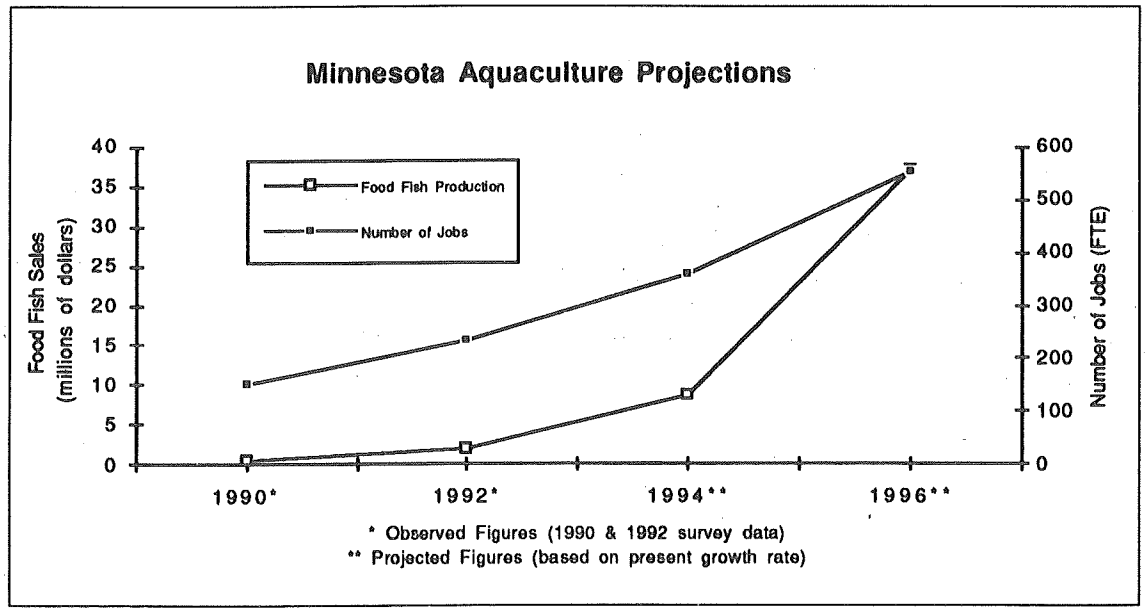
## Public Aquaculture in Minnesota

Although most people think of aquaculture as a private enterprise, the state of Minnesota has been raising fish for stocking lakes and streams almost as long as the private sector. In fact, Minnesota first became involved with managing fisheries in the 1870's when the State Legislature appropriated $500 to establish the State Fish Commission. The first publicly funded fish hatchery in Minnesota was built in 1878 in St. Paul. That hatchery is still in use today.

Fisheries biology and management were not well understood during the early years, and stocking of popular game fish, primarily trout and salmon, was determined by what waters could be reached by railway and horse-drawn wagon. Rainbow trout were the first species stocked, and were followed by other species such as brown trout in 1888, Arctic grayling in 1955, and splake in 1957 (DNR, 1957).

The goal of improving and expanding angling opportunities has remained since the early days of public aquaculture, although some culture methods have changed significantly. Today, the DNR's Section of Fisheries and Wildlife manages Minnesota fisheries using a wide variety of tools. Some of those tools include limiting harvest, managing selective harvest, improving and/or maintaining habitat and water quality, removal or exclusion of undesirable species, and maintenance stocking or stocking to expand the range of a desirable species.

***Figure #17***



The DNR prefers to manage lakes individually by assessing fish populations, limnological characteristics, user groups, and more. They use that information to determine fishery management plans for lakes. A particular management plan may call for anything from annual stocking of several million fry to every other year fingerling stocking. A plan may also call for no stocking at all.

Much of the following information on the present production of the state's public aquaculture operations is taken from the *"1992 Fish Stocking Report"* compiled by the Minnesota Department of Natural Resources (DNR), Division of Fish and Wildlife, Section of Fisheries. According to that report, fourteen cool and warm-water species and seven cold-water species were cultured for stocking by the DNR in 1992. Cool/warm-water species included black crappie, bluegill, channel catfish, white crappie, lake sturgeon, largemouth bass, muskellunge, northern pike, pumpkinseed sunfish, smallmouth bass, tiger muskellunge, walleye, yellow bullhead, and yellow perch.

Walleye were the cool/warm-water species stocked in the greatest quantity. Fifteen DNR walleye egg-taking sites produced 560,354,000 eggs (4,558 quarts) from wild fish. Eggs hatched in thirteen state hatcheries produced 351,947,000 fry. A total of 259,552,000 of those fry were stocked into 221 lakes and streams, and 92,384,000 were stocked into rearing ponds. A total of 3,304,000 fish (primarily fingerlings) weighing 116,000 pounds were removed from 285 rearing ponds and stocked into 312 lakes.

Muskellunge stocking, including muskellunge x northern pike hybrids (tiger muskie), totaled 90,000 fish. Those fish weighed a total of 11,400 pounds. Seven different species and 14 strains were utilized. The DNR also takes eggs from wild white sucker runs to be hatched and used as forage for their musky rearing program. In 1992, they took 2,449 quarts of sucker eggs (103.7 million). Most are reared to a size of 1.5 - 2 inches before release into musky growout ponds.

The DNR cultured a total of 3,382,000 trout and salmon in 1992. Those fish weighed 271,000 pounds when stocked into lakes and streams throughout Minnesota. The seven different cold-water species cultured by the DNR in 1992 included Atlantic salmon, brook trout, brown trout, chinook salmon, lake trout, rainbow trout, and splake. Fourteen different strains of those species were utilized.

CHAPTER 4:

# FEDERAL ORGANIZATIONS INVOLVED WITH AQUACULTURE

As indicated in chapter two, the United States aquaculture industry has grown fast in the past few decades. Federal agencies and organizations have responded to this growth in many different ways. Regulatory issues continue to get headlines at aquaculture gatherings and publications as the industry pushes for more streamlined processes and less government involvement in their agri-business. Meanwhile, support programs in the areas of financing, technical assistance, and others become more available to growers. The following is a short summary of the functions performed by the predominant agencies involved with the industry in this country. For specific references to the organizations listed, call the Minnesota Department of Agriculture at (612) 296-5081.

## FOOD & DRUG ADMINISTRATION (FDA)

The FDA Center For Food Safety and Applied Nutrition is the primary Federal office with responsibility for the assurance of seafood safety. The Center houses a wide range of programs devoted to the research and management of seafood, including aquaculture products. FDA is responsible to ensure that seafood shipped or received in interstate commerce is "safe, wholesome, and not misbranded or deceptively packaged."

## NATIONAL AQUACULTURE ASSOCIATION (NAA)

The National Aquaculture Association (NAA) is a non-profit organization whose purpose is to unite all segments of the U.S. aquaculture community into one major nationwide organization. The intention of NAA is to serve as a united "umbrella association" for the purpose of nationwide representation of mutual interests for aquaculture. NAA is dedicated to the establishment of policies that further the common interest of its membership, both as individual producers and as members of an industry. NAA objectives include: providing a collective voice for the aquaculture industry in relations with the general public and with Government, advocate policies and legislation that enhance the goals of the aquaculture industry and to inform and educate the public and government regarding the needs and benefits of the aquaculture industry.

## THE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

The Agricultural Research Act of 1977 gave the USDA authority to coordinate, identify, and fund agricultural research and extension needs (South Carolina Plan, 1989). Aquaculture was specifically mentioned in that Act; however, until the National Aquaculture Act of 1980 was passed, there was not a lot of activity in aquaculture research from the USDA (Newton, 1978). The 1980 Act established a body called the Joint Subcommittee on Aquaculture to develop a national aquaculture development plan.

The Joint Subcommittee on Aquaculture (JSA) is a statutory committee that operates under the Federal Coordinating Council on Science, Engineering, and Technology, in the Office of
the Science Advisor to the President. The mission of the JSA is to serve as a coordinating group to increase the overall effectiveness of Federal programs in aquaculture. The Secretary of Agriculture was designated as the chairman, with USDA serving as the lead Federal agency for the coordination and dissemination of aquaculture information. At present, 23 Federal Departments and their agencies are represented in the JSA.

The Act was re-authorized in 1985 as the National Aquaculture Improvement Act. That new language further refined the USDA's lead role as industry coordinator's. The Act also created and outlined the functions of a National Aquaculture Information Center, which was subsequently established as part of the National Agricultural Library (NAL) in Beltsville, Maryland. The NAL has established an Aquaculture Information Center, which was mandated to serve as a repository for national aquaculture information. The materials acquired in the field of aquaculture include: books and journals, microfiche collections, audiovisuals, and computer software. Staff of the Aquaculture Information Center are members of JSA. They publish bibliographies of interest to potential and practicing aquaculturists, conduct on-line and CD-ROM computerized searches of aquaculture-related databases, provide general information, bibliographies and referrals to aquaculture extension specialists or other contact sources.

The U.S. Congress amended the National Agricultural Research, Extension, and Teaching Policy Act of 1977 to provide for regional aquaculture research development, and demonstration centers. The North Central Regional Aquaculture Center (NCRAC) was formed as a result of the changes to the Act. NCRAC was formed in February 1988. It is one of five regional aquaculture centers administered by the USDA. The purpose of these centers is to work together within the broader, integrated aquaculture program of USDA to promote a well developed and sustainable aquaculture industry in the U.S. Programs of NCRAC are jointly administered by Michigan State University and Iowa State University.

## United States Environmental Protection Agency (EPA)

The EPA has several programs involving aquaculture. Water Quality programs set standards for assuring the protection of the Nation's waterways and water supplies. The EPA issues National Pollutant Discharge Elimination System (NPDES) permits for the discharge of waste water to surface waters. Permits are also available from this program to use therapeutants and other chemicals in public waters for aquaculture purposes. Chemicals and other materials to be used in aquaculture are subject to Pesticide Registration by EPA prior to marketing to the user. Research and Development activities which impact aquaculture systems are also undertaken by the EPA.

## United States Fish and Wildlife Service

The U.S. Fish and Wildlife Service (FWS) has responsibilities for restoring depleted fish population, preserving endangered species, mitigating the impacts of Federal water developments on fish populations, managing fish resources on Federal lands, and providing scientific leadership in fishery resource management. A nationwide system of fish hatcheries, fisheries assistance offices, fish health centers, fish technology centers, fisheries, research centers, and a training facility are operated to carry out these responsibilities. The Service has established an aquaculture mission consisting of two broad functions: 1) encourage the development of private aquaculture in a manner that is compatible with responsible natural resource stewardship, and 2) make Service expertise, knowledge and technical/scientific capabilities in fish culture and related disciplines available to the private aquaculture community.

# CHAPTER 5:
# STATE ORGANIZATIONS INVOLVED WITH AQUACULTURE

State agencies and other entities' policies have begun to reflect a recognition of the potential that aquaculture holds for Minnesota. Those agencies perform a variety of services and regulatory functions that will directly affect the development of the industry. The following is a listing of state agencies and other organizations involved with aquaculture, along with a short description of their present role. Most of the following text on individual organizations was supplied by them individually. Please refer to appendix A for specific address and phone references to the organizations listed.

## MINNESOTA DEPARTMENT OF AGRICULTURE

The Aquaculture Program of the Minnesota Department of Agriculture has the following mission: *Foster the development of a profitable and environmentally sound aquaculture industry in Minnesota.* Staff pursue that mission through coordination with federal, state, and local entities, promotion of aquaculture production and consumption, development of programs which encourage technology development and provision of technical assistance and marketing information.

MDA Aquaculture Program staff work closely with the Minnesota Aquaculture Commission. Promotional and support functions performed by staff often begin as MAC recommendations. Current and on-going department activities include:

- Coordination of the Aquaculture Regulatory Framework. To encourage aquaculture development in response to MAC recommendations, staff coordinate and participate in meetings, research proposed rule or law changes, and advise legislators and other policy makers on aquaculture related issues.

- Aquaculture Status Report. This report is essential for documentation of industry trends and publication of widely used statistics. The report also serves as a guide for prospective producers learning how to start an aquaculture business. It may also be used to evaluate program effectiveness.

- Aquaculture Newsletter. The publication, *Aquaculture News*, has a current circulation of over 800 producers, policy makers, educators and others interested in the aquaculture industry. The newsletter functions as a communication tool in coordinating and promoting the industry.

- State Fair Aquaculture Promotion and Education Booth. This annual event has served as an effective tool in educating consumers about aquaculture and the availability of Minnesota Grown aquatic products.

- Annual Aquaculture Conference and Tradeshow. Aquaculture staff participate in planning, act as moderators for conference technical sessions, address participants on the status of Minnesota's industry, produce graphics such as the conference announcement and agenda, and provide an educational booth for conference participants.

- Staffing the Minnesota Aquaculture Commission. Responding to MAC initiatives, program staff have worked cooperatively with Commission members to develop the infrastructure necessary to support a significant aquaculture industry here. The first priority of the MAC was to address the industry's regulatory framework which presently involves several state and federal agencies. That work culminated in the Aquaculture Development Act; the product of extensive inter-agency coordination by program staff. Policy, and more specifically, regulatory issues will continue to be a focus of the MAC; however, as the regulations become less of an impediment to industry development, promotional and technology advancing activities are becoming more important.

- Technical assistance to fish farmers. In conjunction with the University of Minnesota's Extension Service, staff often work with individual producers to develop technically strong aquatic farming operations. Referrals are made to other support and regulatory agencies, and others, when information is not available through the department. Requests for information from prospective producers are continually increasing.

- Technology Development Initiatives. Staff have started two new programs designed to investigate and inspire new production technology. The Minnesota Aquaculture Development Program (MADP) is a grant program aimed at funding research projects with the goal of developing environmentally sound technologies for Minnesota producers. The first round of MADP funding is scheduled to be completed in November of 1993. The second project is called "Alternative Aquaculture Methods." That program is set up to compare and demonstrate different indoor, water recirculation production systems. Three systems will be set up with replications to compare the relative performance of each. Promising systems will then be demonstrated to interested producers. These new projects were funded by the Legislature upon recommendation of the Legislative Commission on Minnesota Resources.

## Minnesota Aquaculture Commission

The State Legislature designated the Minnesota Department of Agriculture (MDA) the "lead-agency" for aquaculture promotion and coordination. In order to effectively carry out its mandate to "direct the development of the industry," the Department assembled an inter-agency/industry advisory group called the Minnesota Aquaculture Commission (MAC). The MAC is mandated to advise the Commissioner in developing a program to promote and coordinate aquaculture development in Minnesota. Since its first meeting as the MAC in December of 1989, this collaboration has evolved to provide inter-agency communication, an industry voice to the MDA, and regulatory policy review.

The MAC originated in 1987 as a Governor's Task Force investigating diversification opportunities for rural Minnesota. Once housed in the State Planning Agency and called the Minnesota Aquaculture Advisory Committee, the organization has undergone several changes since its inception.

The 1989 legislation that designated the MDA as "lead-agency" also outlined committee membership and further refined MDA's role. The MDA subsequently assumed administration of the MAC and took the opportunity to increase industry representation on the committee. The resulting body was re-named the Minnesota Aquaculture Commission. Since that date, the MAC has been meeting to advise the Commissioner on aquaculture policies and programs, and to encourage cooperation between private industry and local, state and federal regulatory agencies. The goal of the MAC is to develop and support an economically and environmentally sustainable aquaculture industry in Minnesota.

The following are a few of the projects the MAC has completed. The MAC: initiated the 1991 "Aquaculture Development Act," requested and supported the enclosed "Minnesota Aquaculture Industry Production Survey," initiated development of new rules for regulatory agencies, and has participated in several promotional activities such as the state fair booth in cooperation with MDA staff. MAC initiatives have also resulted in establishment of an "Aquaculture Development and Aid Program" to support research, demonstration, and other support services for the industry, and a proposal for developing a program to establish recognition and quality assurance of *Minnesota Grown* aquatic products.

Looking to the future, the MAC recognized a great diversity of opportunities to improve the environment for aquaculture in Minnesota. In an effort to more effectively cover all aspects of the industry, the Commission formed four sub-committees. Sub-committees include: Legislative/Regulatory, Marketing, Finance/Feasibility & Technology, and Education/ Publication.

The MAC includes members from:
Agricultural Utilization Research Institute
Department of Agriculture
Department of Natural Resources
Department of Trade & Economic Development
Fish & Seafood Processing/Marketing Industry
Iron Range Resources and Rehabilitation Board
Leech Lake Reservation Fisheries
Minnesota Aquaculture Association
Natural Resources Research Institute
Pollution Control Agency
Several Private Aquatic Farms
State House Environment & Natural Resources Committee
State Senate Environment & Natural Resources Committee
U of M Extension Service/Sea Grant
U of M Fisheries & Wildlife Department

## Agricultural Utilization Research Institute (AURI)

The Agricultural Utilization Research Institute (AURI) is a non-profit institute created in 1987 by the Minnesota Legislature to promote the utilization of agricultural commodities through the development of new processing technologies. AURI's mission is to foster economic growth by creating new products and by developing markets for food and industrial products made from Minnesota-grown agricultural commodities. AURI has offices located in the central, northern, southeastern and southwestern areas of Minnesota.

AURI serves on several committees involved with aquaculture including: the Minnesota Aquaculture Commission, the Finance, Feasibility and Technology Transfer Committee (a subcommittee of the Minnesota Aquaculture Commission), the Alexandria Technical College Aquaculture Advisory Committee, and the Aquaculture Conference Planning Committee.

AURI also funds aquaculture projects conducted by various entities including:

- **Aquaculture Pellets for Walleye:** Feed formulations nutritionally adequate for aquaculture of walleye in grow-out phase will be pelleted by various means and tested for acceptance by the species. Some production cost/market potential assessments will be made.

- **Aquaculture Resource Utilization:** Co-sponsors are MN Dept. of Agriculture. The Aquaculture Resource Utilization Report is designed to provide a base of information which can be used by present and prospective aquatic farmers when making marketing decisions. An inventory of present production characteristics will also be a part of the report.

- **Assessment of Minnesota Fisheries:** A uniquely designed Minnesota Aquaculture operation which plans to raise crappies for the consumer food market. Plans include water conservation and natural environmental water treatment methods.

- **Feasibility of Yellow Perch - Aquaculture:** The project will evaluate the technical and economic feasibility of raising yellow perch in a recirculating tank closed system using power plant waste heat to provide year-round growth conditions.

- **Utilization of Carp as Forage:** The project will study the possible use of carp fry and fingerlings as a forage base to maximize walleye growth.

- **Wheat Flour and Gluten for Enhanced Fish Feed:** The project will evaluate wheat flour and wheat gluten for water stability enhancement in extruded crustacean and fish rations.

New aquaculture projects that have been approved within the last year include:

- **Adapting technology to Minnesota Crayfish:** Project will adapt the newest technology for the baiting, trapping, harvesting, and transporting Minnesota crayfish to market.

- **Aquaculture Production Survey and Report:** An aquaculture production survey will be conducted to measure industry growth in the past two years. The Report will be updated to include new production status, aquaculture development efforts and laws and regulations pertaining to aquaculture.

- **Crayfish/Baitfish Culture in Wild Rice Paddies:** The focus of this project is to develop technology to culture baitfish and crayfish in Minnesota wild rice paddies. Crayfish are currently not marketed to any degree in Minnesota but development of local sources of high quality product could change that.

- **Evaluation of Membrane Based Bubbleless Oxygenator for Applications in Aquaculture:** Study will evaluate the technical feasibility of a novel bubbleless membrane oxygenator that transfers oxygen into the water without the formation of bubbles.

- **Aquaculture Pond Weed Harvester:** This project will assist in the development of a small, inexpensive, highly maneuverable pond weed harvester to improve yields from farm grown fish and to return lake nutrients back to crop fields for another cycle of production.

- **Fish Processing Plant Assessment:** Project assesses fish processing plant technology for West Central Minnesota. The research will assess various sizes of plants, mobile-Vs-fixed location plants, the economic aspects of alternative technology and all existing and expected federal standards.

- **Bubbleless Oxygenator for Aquaculture:** Project will include scale-up of manufacturing processes for bubbleless oxygenators that offer substantially reduced operating costs for aquaculture facilities.

## Alexandria Technical College

The Aquaculture Program at Alexandria Technical College, Alexandria, Minnesota, started in 1989 and is the first program in the Midwest to focus specifically on aquaculture as a profession. The program offers a two-year Associate in Applied Science degree and an optional diploma track in addition to outreach classes throughout the state for those individuals who cannot make the time commitment to a two year program.

Students develop skills specific to fish culture, pond and water management, and hatchery maintenance with an emphasis on practical skills. This strong hands-on approach makes these students valuable employees in either public or private industry. Students could function as an aquaculture technician, field supervisor, or as an entrepreneur.

The Alexandria Aquaculture Outreach Program offers short courses and seminars to interested individuals throughout the state. Courses this year include transportation and handling of fish, quality control of aquaculture products, fish health management, financing and business start-up, water quality in intensive systems, and water chemistry. Courses are taught by aquaculture program instructors and experts in the industry. The Outreach Program reaches a broad group of individuals; some have been in the industry since its early days, while others are just starting out.

The Advisory Board for the Alexandria Aquaculture Program consists of individuals representing all aspects of the industry—private industry, the Minnesota Departments of Agriculture and Natural Resources, the Minnesota Fish Farmers Association, and Tribal Fisheries. This board advises the college about program content and emphasis. The Alexandria program had its first students graduate in February 1992. Enrollment in the program totals 60 first and second year students.

## Iron Range Resources and Rehabilitation Board (IRRRB)

The Iron Range Resources and Rehabilitation Board (IRRRB) is a regionally-based state agency whose primary concern and responsibility is the development of the remaining resources in Northeastern Minnesota. IRRRB's programs address different facets of one primary goal: to diversity and strengthen the economy of northeastern Minnesota. Specifically related to aquaculture, IRRRB feels that this industry could play a significant role in their diversification efforts. Seventy mine pit lakes in the area may have potential for some type of aquaculture. IRRRB has commissioned the Natural Resources Research Institute to conduct a limnological study to see what effects intensive aquaculture might have on these mine pit lakes.

## Minnesota Department Of Natural Resources (DNR)

The Minnesota Department of Natural Resources has been and continues to be a major aquaculture producer for stocking fish in waters of the state. It is also the lead agency in the culture of game fish species, management of aquatic plants, lake aeration for extensive aquaculture, use and appropriation of surface and ground water, fish health services and dissemination of aquaculture information. The Department of Natural Resources recognizes the need for an aquaculture research and development program to improve the efficiency of fish production in northern climates. The role of the Minnesota Department of Natural Resources in the Minnesota Aquaculture agreement is to:

1. Exercise regulatory control over species to be farmed and over facility operations.
2. Provide leadership and support for aquaculture research and development related to game fish species.
3. Provide technical assistance on aquatic plant management for aquaculture and exercise regulatory control over aquatic plants growing in protected waters.

4. Provide technical assistance on aeration for extensive aquaculture and exercise regulatory control over aeration of protected waters.
5. Exercise regulatory control over use and appropriation of surface and ground waters.
6. Provide diagnostic services and assistance in the management of fish health based on available staff.
7. Provide information in cooperation with the University of Minnesota Aquaculture Extension Program to owners of private aquaculture facilities.
8. Assist as appropriate and feasible in the development and delivery of information on permitting of regulated activities through seminars, workshops and short courses.
9. Make available surplus eggs or fish of unique species or characteristics to commercial producers for purchase at fair market value.

The primary goal of fishery management in Minnesota is to protect, maintain, or enhance the fishery resource and the aquatic community for long term recreational, aesthetic and economic benefits to the state.

## Minnesota Aquaculture Association (MAA)

The Minnesota Aquaculture Association (MAA) began as a Wright County grant designed to look into the feasibility of raising fish in ponds. Farmer cooperators working with the project in the late 1970's subsequently drafted a list of bylaws and organized the Central Minnesota Fish Farmer's Association. Two term past president, Ron Rademacher, said the organization has been interested in the development and promotion of aquaculture since its inception.

The MAA has undergone many changes since its formation. In the spring of 1993, the organization changed its name from Minnesota Fish Farmers Association to the Minnesota Aquaculture Association to better encompass all facets of the industry in Minnesota. The organization's structure includes six directors: Lori York, Jesse Preiner, Ron Rademacher, Dennis Collins, Bruce Howick, and Gene Hanson. The president is Richard Walker, the vice president is Ron Johnson, and the secretary/treasurer is Gloria Olson.

Members include culturists of fish for food, stocking, bait and fee fishing; in addition to members from support industries and educators. Membership in the MAA includes bi-annual meetings, workshops and tours, the quarterly publication "The Catch," and networking opportunities within the industry. The annual membership fee is presently $15.00, due January 1st of each year.

## Minnesota Pollution Control Agency (MPCA)

The Minnesota Pollution Control Agency (MPCA), Water Quality Division, has responsibility under state and federal law to prevent pollution of waters of the state of Minnesota. Under the provisions of the 1974 Delegation Agreement with the U.S. Environmental Protection Agency (EPA), the MPCA administers the federal National Pollutant Discharge Elimination System (NPDES) permit program in Minnesota. This includes regulation of aquaculture activities which exceed production thresholds outlined in EPA regulations. Currently, the MPCA regulates five aquaculture facilities in Minnesota. As a result of a directive from the 1991 Legislature, the MPCA has developed rules which are specific to the regulation of aquaculture facilities in Minnesota (see appendix B).

## Natural Resources Research Institute (NRRI)

The Natural Resources Research Institute (NRRI) is part of the University of Minnesota -Duluth and maintains a strong interest in aquaculture and aquaculture research within the State of Minnesota. Active work on aquaculture projects is currently underway in two centers within NRRI; the Center for Water and the Environment (CWE), and the Center for Economic Development (CED). Through NRRI's relationship with Minnesota Technology, Inc. (MTI), they have established a research program in aquaculture and advise MTI in this area. The program is administered through CWE and at present consists of a series of research projects conducted by NRRI scientists, and outside University, governmental, and private interests. These projects were funded after review by an advisory committee and several out-of-state peer reviewers. The aquaculture program funded through MTI invites proposals from private and institutional organizations on an annual cycle that meet MTI guidelines. Minnesota Technology Inc.

requires considerable matching moneys from private and public source and sound business potential in addition to positive peer review. Three projects are currently funded through this program. These projects are focused on large-scale water resources in northern Minnesota. Project titles are 1) Crayfish and Baitfish Production in Minnesota Rice Paddies: Economic, Resource, and Technologic Aspects, 2) Commercial Aquaculture on the Iron Range: Implications for Water Quality in Mine Pit Lakes, 3) System Development for Collection and Reclamation of Aquacultural Wastes. In addition, individuals within the Center for Economic Development have been participating in a project funded through the Legislative Commission on Minnesota Resources in cooperation with the University of Minnesota-Department of Fisheries and Wildlife in St. Paul. This effort concerns the economic evaluation of research/demonstration projects investigating pond culture of walleye, baitfish, and native crayfish.

## Sea Grant College Program

There are 31 Sea Grant programs at land-grant universities in every coastal and Great Lakes state. Minnesota Sea Grant is a statewide program that funds research, education, and extension on issues related to Lake Superior and Minnesota's water resources. Sea Grant works on economic development, environmental protection, aquaculture, biotechnology, policy and law, and fisheries management. Minnesota Sea Grant's offices are located at the Duluth and St. Paul campuses of the University of Minnesota. Funding is provided by the state legislature and the National Oceanic and Atmospheric Administration (NOAA).

Minnesota Sea Grant involvement in aquaculture includes research, extension and publications. Faculty research is done on: fish genetics, enhancing fish growth, sustainable fisheries, fish reproduction, lamprey control, and biology of the river ruffe. Extension agents provide advice on aquaculture, organize workshops and conferences and do aquaculture demonstration projects on raising baitfish, crayfish, and other species. Publications from the six Great Lakes Sea Grant programs are available on subjects such as building ponds, raising tilapia, financing aquaculture ventures and information on specific species.

## University Of Minnesota-Department Of Fisheries & Wildlife

The faculty and staff of the Department of Fisheries and Wildlife are active in advancing the three-fold mission of the University of Minnesota, teaching, research, and outreach/public service with regard to aquaculture. Currently, three faculty members devote at least part of their work efforts directly to aquaculture. Four other faculty conduct general work on fisheries that is sometimes pertinent to aquaculture and their expertise may be called on for specific problems. One upper division aquaculture course is taught along with a number of courses on fish biology, water quality and fisheries management that provide some background relevant to aquaculture. Numerous aquaculture research projects have been undertaken, ranging from the utilization of power plant waste heat, to broodstock development, to genetics and physiology of cultured fishes, to development of culture methods for different species in Minnesota. Extension efforts have included assisting fish farmers in solving problems, publication of numerous bulletins and fact sheets, and working with state and federal agencies and organizations on the development of aquaculture. A new facility for conducting aquaculture research and demonstration projects will be completed by January 1994.

CHAPTER 6:

# AQUACULTURE DEVELOPMENT IN MINNESOTA

## DISCUSSION OF OPPORTUNITIES & IMPEDIMENTS

The land of 10,000 lakes. Minnesotans speak proudly of abundant water resources and the numerous benefits they provide the state. The average citizen may take water for granted; but when considering aquaculture production, it is important to look very closely at where the water in Minnesota comes from, its characteristics, and how it is presently used. Aquaculture operations may require the use of large quantities of water. Surface and ground water characteristics, and access rights to those sources, vary widely across Minnesota, which means that a potential aquaculture venture must pay close attention to location.

With the exception of northwestern Minnesota which is drained by the Red River of the North, and northeastern Minnesota which is drained into Lake Superior, most of Minnesota is drained by the Mississippi River. Minnesota receives an annual average precipitation of about 26 inches (Gibson and Seymour, 1987), equivalent to 104,000 million gallons per day (Mgal/d). In 1985, about 2,840 Mgal/d of fresh water was withdrawn from Minnesota's rivers, streams, and aquifers; of that amount, 768,768 Mgal/d was consumed, and 2,070 Mgal/d was returned to a natural water source (USGS, 1987). The northeastern part of the state, which is dominated by forestry, tourism, paper production, and mining, relies primarily on surface water because ground water resources are limited. The southwestern part of the state, primarily dominated by agriculture, depends more on ground water.

At first blush, it would seem natural for Minnesota to lead the nation in aquaculture production in view of our extensive and varied water resources. Under closer scrutiny, it becomes clear that our aquaculture production has been limited for a variety of reasons. In the 1989 document, *"Strategies for Aquaculture Development in Minnesota,"* the Fish Factory study team compiled a list of major obstacles to aquaculture development.

Collectively, the list appeared daunting. But since that document was compiled in 1989, progress has been made in addressing several of the issues. Some obstacles to aquaculture development are natural or environmental and cannot be effectively altered. Other obstacles are the product of regulatory influence or lack of governmental and institutional support. Both of the latter categories must be thoroughly addressed if Minnesota is to become a significant player in United States aquaculture production in the future.

The following is a listing and discussion of the obstacles identified in *"Strategies," followed* by recommendations concerning how the state could further address each obstacle listed in order to encourage more rapid industry development. Recommendations are not intended to place blame with any organization or entity. They are merely a list of issues that must be addressed if Minnesota is to enjoy the many benefits a large environmentally sound aquaculture industry could provide.

## RESOURCE CHARACTERISTICS

*Fish Factory: "The constraint of broad temperature ranges typical of Minnesota (surface) water resources presents a challenging problem..." "Aquaculture production is best served by stable and homogeneous water supplies that provide for the full utilization of facilities through the year and continuity of market supply."*

### *Surface Water Resources*

The Department of Natural Resources *"Protected Waters and Wetlands Inventory"* states that Minnesota has 11,842 lake basins and 10,029 wetlands, comprising slightly over 3.5 million acres. These are impressive numbers when compared to other states. Although Minnesota is blessed with many acres of lakes and wetlands, present water acreage pales in comparison to what we once had. According to DNR figures, Minnesota has lost 72% of our surface waters since the mid-1800's, representing more than 9.8 million acres of lost surface water. Profit and progress were the motivation for draining the water, causing problems for wildlife, water quality, and erosion of productive soils. Although conservationists are presently slowing the loss, it is very possible that profit and progress are the only reason the water will return. Aquaculture may be part of the answer.

Though abundant, water *temperature* in most of our surface waters may swing more than 50 degrees F. over a period of a year; limiting that resource's potential for aquaculture development. Unfortunately, most food fish production that employs feeding requires water close to the culture species maximum growth temperature throughout much of the year to be economically viable. Feed and operational costs generally prohibit the prolonged culture cycles that result from water that is too cold for extended periods to produce growth. Water that gets too warm in the summer may also cause mortality or disease problems depending upon the tolerance levels of the cultured species in question.

There would appear to be little Minnesota can do to improve this situation. We cannot feasibly change the climate to improve our surface water resource for intensive food fish production. However, we do have some available water resources that are apparently suitable for food fish production. The abandoned mine pit lakes of the Iron Range region are a Minnesota surface water resource with great aquaculture development potential. The depth and volume of water in most pit lakes allows for a pumping regimen which may confine the aquatic stock in "growth temperature" water for much of the year; therefore, it is possible these water bodies may be economically utilized in production of cold water species. One corporation is currently pioneering aquatic production in mine pit lakes utilizing net-pen technology used extensively in marine environments.

Idle abandoned mine-pit waters, used in an environmentally sound manner, may arguably be our best opportunity to position Minnesota as a major producer of food-fish in the Midwest region. The IRRRB estimated there are around 70 abandoned mine pit lakes which may be suitable for aquaculture operations at the present time. These sites were mentioned because of their size, depth, proximity to power sources, and access to major transportation routes. Pit lakes on the Mesabi Range appear to have the most potential for aquaculture, with a few exceptions on the Cuyuna and Vermilion ranges.

Aquatic farmers in other states have primarily utilized man-made ponds for warm water fish production, or raceways that use spring water to raise cold-water fish. Due to our climate and available natural resources, pond production here has been a seasonal venture. In fact, seasonal production of bait and fingerlings in surface water bodies is the most common Minnesota culture technique. Production of baitfish and fingerling sport fish in natural ponds and lakes represented nearly 57% of total industry sales value in 1992.

As described in Chapter Three, competition for privately owned lakes and ponds between private aquaculturists, state fisheries interests, and wild harvest minnow producers appears to be rising. This competition has the potential to provide a strong incentive for land owners to plug some of the drain tile and ditches to create restored wetlands for wildlife and aquaculture production alike.

Ponds and small lakes that are too shallow for game fish populations appear to be the preferred culture system for fingerling and baitfish producers. The most common culture method involves acquiring white sucker or game fish eggs/fry from wild sources with the cooperation of the DNR, stocking the fry in the pond, then harvesting the fingerlings in the fall when they reach marketable sizes. These water bodies are generally too shallow to sustain necessary oxygen levels in the winter; therefore, few fish carry over to the next spring to gobble up the newly planted fry. Many of these water bodies are surrounded by private land which allows for less complicated access and more secure production.

Utilization of surface water as a source for land-based tank or raceway production may be commercially viable if an operator can develop a technique for economically regulating water temperature and quality. Some developers have shown interest in utilizing mine pit waters for flow-through system production, which would take advantage of the high volume, consistent water temperature of that resource, and allow for effluent control. Such production could take place either on land in tanks, or in floating barge type raceways. The advantage of effluent treatment provided by this type of facility may allow more control over water quality for application in a setting such as a mine-pit lake; however, this technology has not been demonstrated to be economically feasible in Minnesota to date.

### *Ground Water Resources*

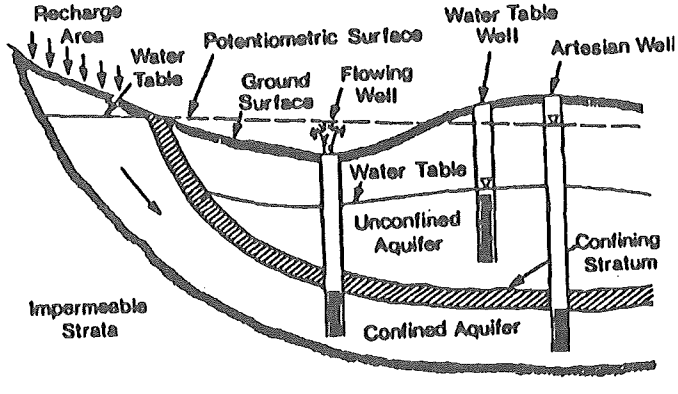
It is important to re-emphasize that resource characteristics are listed as a constraint not because of a water deficit in Minnesota, rather because constant temperature water sources that do not require extensive

pumping are limited in quantity. Ground water occurs in unconsolidated deposits (sand and gravel of glacial origin), and in consolidated deposits. The supply potential in these two broad categories varies widely.

Bedrock (consolidated) aquifers can be divided into crystalline rocks which form the bedrock in most of the state, and stratified sedimentary sandstone and limestone underlying the southeastern part of Minnesota; the primary water source for that area (including the Twin Cities). The crystalline rocks underlying the remainder of the state provide water only locally where they are fractured. Much of the state is covered by unconsolidated glacial deposits (drift) more than 100 feet thick. Large quantities of water are available from sand and gravel deposits occurring in this drift, particularly in the central part of the state In the Red River Valley, more fine grained clay drift marks the location of glacial lake Aggasiz; its low permeability reduces its ability to serve as a water source (DNR, 1984).

*Figure #18 - Source: DNR Reports #105*

**UNCONFINED AND CONFINED AQUIFERS**




Fish farm profits can be quickly reduced by an extensive power bill resulting from pumping a high volume of deep ground water. As a result, shallow water tables, artesian conditions, or free flowing springs may offer the most promise for immediate development of flow-through, cold-water food fish production.

John Daily, Aquaculture Specialist with the Minnesota Department of Natural Resources said, "There appears to be approximately 8 - 12 potential sites left undeveloped with spring flow sufficient to sustain a small, cold-water, food fish operation." Daily characterized such a facility as one with more than 500 gallons per minute water flow. He said these locations are located primarily in Southeastern Minnesota. There may be more locations available that could produce the necessary volume of water by incorporating ground/surface water pumping with spring or artesian water.

The DNR estimates that 75 percent of all Minnesotans derive their domestic water supplies from ground water, and 88% of the water used for agricultural irrigation is supplied by ground water. The quality of water in most aquifers in Minnesota is suitable for most uses with the exception of naturally occurring saline water along the western border and on the North Shore, and because of nitrate contamination in some of the karst area of southeastern Minnesota (Woodward, 1985).

### *Waste Heat Water Resources*

Waste heat provided by electric generating plants, and other industrial processes such as ethanol production facilities has been used in aquaculture production. But, as pointed out in the "Strategies" document, an inherent problem with such a facility is that most of these plants occasionally must cease operations for a period of time, which may be disastrous to an associated aquaculture facility. Additionally, poor water quality of the heated water may require another water source, necessitating heat exchange technology to warm the culture water.

There presently are several plants producing waste heat that could potentially be used for aquaculture, including several recently constructed or planned ethanol plants. However, access to the waste heat may be complicated and lease arrangements may be difficult.

The technology does exist to utilize waste heat in an exchange system to reduce the cost of production and/or enable production of species that require water warmer than ambient conditions provide. Such systems would be limited to the number of plants willing to work with aquaculture entrepreneurs.

### *Resource Characteristics Recommendations:*

1. Identify funding and conduct research to characterize and catalogue high quality Minnesota water resources that retain a fairly stable annual temperature regime. Presently, most food-fish production facilities in our state are located on a such a site, and these appear to have immediate potential for further intensive production industry development. Examples may include:
    - free flowing, high volume springs or artesian ground water conditions, or
    - high-volume, deep, not publicly accessible water bodies such as abandoned mine-pit lakes.

2. Identify funding and conduct research on environmentally sound utilization of suitable surface waters. This may include:
    - extensive grow-out of high-value species,
    - environmentally sound intensive management of surface waters for more consistent seasonal fingerling and baitfish production, or
    - systems that would combine surface water with ground water to provide the correct temperature regime for marketable species.

3. Identify funding and conduct research on highly intensive production systems such as recirculation and dug pond systems, to determine biological and economic feasibility of those systems for Minnesota production.

## Resource Access

*Fish Factory: "Minnesota's definitions of public waters and waters of the state define areas of regulatory control that are substantial and compare to the most confining in the United States; additionally, this regulatory control...involves the state in nearly all cases of acquisition and distribution of aquaculture products."*

### *Water Resource Access*

Aquaculture development in Minnesota has been generally confined to bodies of water with privately owned lands surrounding the facility and no public access. Other states and nations have allowed private aquatic production in publicly accessible bodies of water, including net-pen salmonid culture in Washington State, and bed-lease arrangements for shellfish culture on the East Coast. The decision whether or not to allow fish culture in "public waters" is a policy question to ultimately be decided by the State Legislature. There has been little interest from the private sector in utilizing publicly accessible water bodies for aquaculture production in Minnesota to this point, and it is unlikely to occur due to the popularity of recreational water use here.

The Minnesota Pollution Control Agency, in conjunction with the United States Environmental Protection Agency, has exercised authority to require a permit for discharges to waters of the state from aquaculture facilities that produce specified quantities of fish, regardless of public access to the water. The MPCA presently regulates five aquaculture facilities in Minnesota.

Under the assumption that net-pen culture in the mine pit lakes may adversely impact off-site ground water drinking resources, and to protect the abandoned mine pit lakes for a potential future use, the MPCA has issued a National Pollutant Discharge Elimination System Permit (NPDES) to the one aquaculture facility presently raising food fish in abandoned mine pit lakes. The NPDES permit requires that corporation to monitor, within the culture waters, a wide variety of water quality parameters at great annual cost. Rules finalized in 1992 have added costly collection and treatment requirements. Aquatic farmers and the MPCA disagree on the merits of water quality regulation of the culture waters in the mine-pit lakes partly because there is a lack of knowledge of area hydrogeology.

Most fish farm facilities, and other industries for that matter, have a distinct discharge where the MPCA can measure water quality before it is combined with publicly accessible waters. That allows them to monitor "end-of-pipe" water quality. This is not the case with a mine pit lake. Currently, the MPCA regulates the water quality in the mine pit lake used as a fish farm, by exercising their authority to regulate all "waters of the state," as defined in Minnesota Statute, Section 115.01.

It is currently unknown to what extent, if any, waters from a mine pit lake aquaculture operation may migrate off-site through the ground water, constituting a tangible discharge from the production site. Further, it has not been determined whether nutrients such as phosphorus would be transported with that water, or to what extent this potential mixing may cause taste or odor problems to off-site drinking water resources (the MPCA's primary concern with the operation). The private aquatic farm involved uses aeration and mixing methods in their normal operations to enable continued fish production. Other industries are not regulated inside a facility, as long as the water quality meets the discharge standards at the point of contact with publicly accessible waters.

Access to water resources in Minnesota has been limited by several factors including water quality regulations and perceived user conflicts. Some feel the regulations limiting water resource access are overly burdensome and unnecessary. Others may feel they do not go far enough. Despite the regulatory influences, the industry seems to be finding the necessary water to allow significant industry growth. Although as an industry, aquaculture is generally very compatible with the environment, the struggle among other water users, environmental groups, and the aquaculture industry will likely continue.

### *Access to Fish Stocks*

In the past, the DNR has helped fish farmers by providing game fish eggs, fry, and limited quantities of broodstock from wild stocks contingent upon fulfillment of state stocking needs. A group called "Operation Walleye" has also assisted the DNR in rearing walleye fry to the fingerling stage to encourage more successful stocking in area lakes. Minnesota Statute (see appendix B) establishes a priority for "disposal of state hatchery eggs or fry."

The interest in state game fish eggs/fry comes primarily from fingerling producers who intend to sell their product for stocking purposes. Genetically speaking, fingerling producers should strive to retain the fishes "wild" characteristics so the fish do well when returned to a lake or stream. In the late 1980's the State Legislature, in an attempt to give private hatcheries a chance to establish their own broodstock, established a "sunset clause" of July 1, 1990, during which time the DNR was to have made "at least two percent of the game fish eggs collected available to private hatcheries."

Only a few private sector hatcheries (primarily walleye fingerling producers) have established their own broodstock to date. The DNR has continued to supply private hatcheries with fish after meeting state stocking needs, in following with the priorities established in the aforementioned statute. The state is providing a service to the aquaculture industry by selling game fish eggs and fry to them. This transaction is becoming more complicated as private producers begin to sell fry/eggs, creating potential competition between the state and private business. The Legislature is attempting to maintain an equitable system by requiring the DNR to only sell at an established "fair market value."

With the exception of new culture species, producers who wish to raise food fish are generally not interested in state fish stocks because those fish are wild and have not been selectively bred for characteristics which would promote fast growth in the confinement of a fish farm. Trout and salmon producers have been restricted in importing eggs from west of the continental divide, and from areas with no established record of disease free operation. Prior to 1992, the DNR had, as a policy decision, chosen to follow the Great Lakes Fisheries Commission recommendations regarding such importation's. The purpose of such limitations was to keep certain "emergency disease" organisms, not already manifest in wild Minnesota stocks of fish, from being introduced to the public fishery. That policy had restricted access to some high performance strains of salmonids that could potentially improve the profitability of a few cold-water production facilities in Minnesota.

Access to different stocks of fish may have been eased somewhat by quarantine rules promulgated by the DNR as mandated. Ostensibly, a quarantine facility would permit importation's not previously allowed by DNR policy. The fish would be required to be held for a certain length of time, under certain stringent protocol, before being distributed to a fish farm with a potential to impact a wild fishery. The question remains whether any private or public facility can be built or modified to meet quarantine protocol in view of the small pool of potential clientele.

Access to fish stocks has been a problem reported by a few Minnesota food fish producers. If the DNR and fish farmers continue cooperating in this area, it could become an insignificant obstacle to industry development in the near future.

### *Access to Other Resources: Feed, Equipment, Etc.*

Fish feed accessibility, along with that of other equipment and industry services, will improve as the industry grows large enough to support more local production. Presently, the cost of raising fish here is inflated by the fact that much of the necessary technology and equipment has to be shipped in from great distances. Of all the resources that will need to be developed locally as industry production expands, feed formulation may be the most important.

Approximately 600,000 tons of domestic grain products are used annually in the United States to produce fish diets (USDA, 1990). If aquaculture continues its current expansion, by the year 2000, the industry will use 2 million tons of soybean meal and 2.1 million tons of other domestic grain products (Dicks and Hervey, 1990). If Minnesota aquaculture continues to expand at the present rate, the industry could be consuming nearly 33 million pounds of formulated feed by 1996. A locally produced feed ingredient with potential use in fish diets is distillers dried grains with solubles (DGS). An example of DGS are the by-products from ethanol production.

Ingredients used in commercial fish diets can be classified as protein (amino acid) sources, energy sources, essential lipid sources, and vitamin and mineral sources. Fish meal is the highest quality protein source commonly added to fish diets. Because of its high cost, fish meal is used sparingly in commercial fish diets, but has not been eliminated entirely. Soybean meal has the highest protein among plant feedstuffs and has been used as a major source of protein for fish diets.

### *Resource Access Recommendations:*

1. The DNR should continue to work with farmers to equitably distribute fish in excess of state needs. Wherever possible, the private sector should attempt to develop their own brood stock. The issue of the state competing with the private sector for fry and brood stock sales will continue to cause friction. In the event that private industry demonstrates the ability to supply the market, the two groups should discuss the possibility of ending the arrangement. Start-up farmers should continue to be given opportunities to acquire broodstock from the wild in the absence of imported stock that is acceptable to the DNR.

2. Feed research should be encouraged for:
   - development of feeds specifically tailored to the needs of new species which will increase the productivity of those species,
   - new feeding strategies which will promote betterbv growth or reduce the amount of fat in the product,
   - experimental trials to develop feed formulations that use lower ingredient cost, perhaps by utilizing more locally produced ingredients including by-products from other industries, and
   - investigate feed ingredients that contain higher digestibility of nutrients.

## LEADERSHIP

*Fish Factory: "Leadership is cited not because it does not exist" "...the existing leadership must be increasingly transferred to the private sector where it will find expression as political action leading to resolution of the regulatory and economic issues."*

### *Leadership Discussion*

Since leadership was mentioned as an impediment to industry development, progress has been made in this area. Direction has been provided by the Legislature, which gave "lead-agency" designation to the Department of Agriculture for industry promotion and coordination. The Department has taken this opportunity to get industry's advice in developing an aquaculture program through the Minnesota Aquaculture Commission (MAC)

The MAC's first priority was to review the entire aquaculture regulatory environment in Minnesota. A result of work in that area was the successful passage of the Aquaculture Development Act. Mike Mulford (Miltona Fisheries) held the elected chair position in 1990, the year in which legislative language was first crafted by the MAC. Lona Minne (Minnesota Aquafarms, Inc.) followed Mulford, and led the MAC to completion of several initiatives, including the Development Act. Cal Courneya (Pure Water Aquaculture Corporation) was elected to the post for 1992, and re-elected for 1993. It appears that the 1991 Development Act was merely a starting point, as rules and legislative items are continuing to dominate MAC meeting agendas.

### *Leadership Recommendations:*

1. The state should identify "hard" funding for the Minnesota Aquaculture Development Program and any other worthy aquaculture research/technology initiatives, in order to encourage industry oriented "basic" and "applied" research. Funding for research should be the responsibility of all entities involved with the industry and should be influenced by industry participation. Although "basic" research sometimes sounds distant from the goals of industry, it is necessary for the future well-being of aquaculture.

2. Minnesota should develop a generic marketing strategy to position "Minnesota Grown" aquaculture products as high-quality. Although not well developed yet, the food fish industry could initiate work to establish Minnesota cultured products as superior to other competing products. Emphasis of the benefits of eating "farm-raised" products to consumers could be a large part of the effort. Creating a consumer perception of high-value could spur aquaculture development by "pulling" the industry into prominence through greater demand.

## COMMUNICATION

*Fish Factory: "Poor communication between regulatory agencies, development agencies, and the aquaculture industry is a serious problem." "The development of both formal and informal communication channels between all groups would greatly aid understanding and should be encouraged",*

### *Communication Discussion*

Just as the MDA, MAC, and the MAA are supposed to provide leadership for the industry, these entities should also encourage better *communication.* Development of a new industry requires an extensive infrastructure of communication closely linking researchers, extension, regulators, and other state support and regulatory personnel to the industry.

The *"Aquaculture News,"* a quarterly publication of the MDA, is one example of an effort to improve in this area. The *News* is used primarily as a tool by which the department keeps people aware of staff and MAC activities. The publication is sent to over 800 present and prospective producers, state agency staff, legislators, and others interested in the industry. Other examples of good communication that help to link the world of Minnesota aquaculture include *The Catch,* a quarterly publication of the MAA, and *Seiche,* a publication of Minnesota Sea Grant, University of Minnesota.

The above mentioned written communication tools serve their purpose very well, but the interactive communication provided at the Annual Minnesota Aquaculture Conference is without a doubt the most effective method to share aquaculture information in Minnesota. This annual event was established in 1987 by the University of Minnesota through the Sea Grant and Minnesota Extension Service programs. Past conferences have been held in different locations throughout the state in an effort to give interested persons across Minnesota a better opportunity to participate.

The first conference was held in St. Cloud, MN, and was attended by 140 persons who came to hear eight speakers. In 1993, the conference had grown to include sponsorship by several state and quasi-government agencies and the Minnesota Aquaculture Association. Attendance has grown to over 300 participants, with more than 30 speakers. The conference provides industry members with up-to-date information and an opportunity to network with a variety of industry interests.

### *Communication Recommendations:*

1. Extension efforts should be supported and funding sought for positions. The University of Minnesota has housed aquaculture extension staff, but present funding from Sea Grant and the Minnesota Extension Service is apparently inadequate to support a full-time extension position. Other agencies participate in extension activities, but they do not have access to the information resources and research data bases that are available at a major land-grant university. If the research recommendations made in this document are met, information generated will require support by an effective extension program to make sure that it reaches the industry. University aquaculture extension positions should be expanded and supported as appropriate to the needs of the industry. These positions should be funded in part by the industry itself.

   A concerted effort should be made to educate county agriculture extension agents and specialists on aquaculture basics. Such agents will never replace

someone specially trained in aquaculture, but could help tremendously if they were armed with basic knowledge of the industry and information resources where a perspective producer may go for more detailed assistance.

2. Improve interagency communication and cooperation by more clearly defining organizational roles. Potential projects include:
   - Update the 1988 document, "Interagency Responsibilities for Aquaculture Development in Minnesota." That publication could potentially serve as a guide-book for assistance with Minnesota aquaculture,
   - Initiation of Memorandums of Agreement or Understanding, or
   - Publish easy to read rule and regulation guidelines for industry.

3. The print communication tools presently employed (*Catch, Aquaculture News, Seiche*) should be made accessible to all interested parties, and these publications should continue to include information that helps to link the industry with support entities.

4. The Annual Aquaculture Conference should continue to be supported. Additional workshops and presentations should be sponsored so that industry members with like interests can be kept abreast of advancing technology.

5. Minnesota should identify funding and continue to support an annual or bi-annual survey of industry statistics in order to improve communication of accurate and timely industry information.

## Financial Barriers

*Fish Factory: "Investment in aquaculture ventures is the fuel that drives the engine of aquatic animal production." "Investment is attracted in an environment in which the profit incentive outweighs potential risks and is comparative with alternative investments." "The factors that come into play when assessing risk are as follows: technical feasibility, management capability, market certainty, and regulatory certainty.*

### *Financial Discussion*

One of the most misunderstood notions that potential fish farmers have when seeking assistance, is that the state or federal government is making extensive financial investment in aquatic farming businesses. Curtis Stutzman, Director of the Midwest Aquaculture Learning Center, says, "While it is true that the federal government has made aquaculture development one of its priorities, it is also true that entrepreneurs wanting to enter this business cannot expect numerous state or federal grants." Stutzman goes on to explain that with the current budget situation on the state and federal level, direct involvement in financing businesses is not expected to become a priority. Stutzman does list the Small Business Administration, Farmers Home Administration, and USDA's Small Business and Innovation Research Group as a potential source of federal funds or guarantees on bank loans (Financing Aquaculture Ventures, 1991).

At the state level, the AURI has been involved with funding some aquaculture projects related to processing technology or utilization of Minnesota resources. The IRRRB has also been involved on a regional basis with economic development projects related to aquaculture. The Department of Agriculture has programs such as the Aggie Bond and Beginning Farmer, which are primarily designed to help new farmers in land purchase. Although there are some financing options for the prospective producer, the primary source of funding for most new operations in Minnesota has been more traditional venture capital and commercial banks.

An improved financial *environment* can be most effectively fostered by addressing all the previous obstacles discussed in this chapter. By improving the environment for the industry in general and documenting several "success stories," venture capitalists and banks will become more willing to invest their dollars in Minnesota aquaculture ventures. George Purcell, First South Production Credit Association talking about lending money to potential catfish producers says, "...when I know that a person would make a good customer, and that he's in a position to make good use of some money, I'm often the one who goes soliciting him." (Aquaculture Magazine, 1990). That quote illustrates the effectiveness of documenting successes and getting that information to potential lenders.

Before we have recorded long-term successes, it may be useful for the prospective producer to draw information from those involved with the more established catfish industry. Purcell emphasizes the need

for his customers to complete a 12 month cash flow projection. He says, "We absolutely have to know how you're going to make your money, and how you're going to pay us back." That is really the crux of the matter when borrowing money. Writing a professional business plan has the potential to alleviate many concerns a prospective borrower may have (Aquaculture Magazine, 1990).

Stutzman provides the following list of pointers for potential borrowers to consider when seeking traditional financing for an aquatic farm business:

1. Thoroughly research your proposal and have accurate data and information. Document sources.
2. Have examples from someone who is already engaged in the enterprise that can help you document your budgets and act as a mentor.
3. Have reliable information on markets and how to access them.
4. Have a professional business plan.
5. Suggest a third party who can provide an unbiased opinion about the business proposal. Take your banker to an operating farm, if possible.
6. Be creative in finding ways to finance up to 50% of the total costs yourself.
7. Find ways to spread or minimize the risk so that the lender does not carry the full financial weight of the proposal.
8. Do not present only a best case scenario. Also present a worst case scenario and an alternative payback plan.
9. Document that you may not be drawing a salary until 6 - 12 months after start-up.
10. Know that your past performance on loans may affect your credit worthiness.
11. Provide the lender with evidence that you have the production, management, and marketing skills to make it work.
12. Do not attempt to start on too large of scale. Earn your lenders confidence by starting small and expanding as you meet predetermined benchmarks (Financing Aquaculture Ventures, 1991).

### *Financial Recommendations:*

1. Lenders, venture capitalists, state supported funding programs, and other financial entities should be informed about the industry, and industry successes documented for them.

2. Extension type bulletins should be developed that clearly explain all the options for the potential borrower. Similarly, state agencies/extension should work with fish farmers to develop business spread-sheets and professional business plans.

# List of References


**Conrad, J.** 1990. A Banker Looks at Fish Farming: PCA's George Purcell Talks in Simple Terms. Aquaculture Magazine. November/December Issue.

**Conrad, J.** 1991. FAO's Birds-Eye View of Aquaculture. Aquaculture Magazine. March/April Issue.

**Consumer Reports.** 1992. Is Our Fish Safe to Eat? February Issue.

**Dentzer, S.** 1990. The Fish Story of the Decade. U.S. News & World Report. November Issue.

**Dicks, M.R. and D. J. Hervey.** 1990. Aquaculture Situation and Outlook Report. United States Department of Agriculture.

**DNR.** 1957. Coldwater Culture Study. Minnesota Department of Natural Resources.

**DNR Reports.** Ground Water. Title #105. Minnesota Department of Natural Resources.

**Drillers Guide to the Geology of Minnesota.** Minnesota Department of Natural Resources Bulletin.

**Operation Walleye.** Economics of Rearing Walleye Fingerling 1984 - 1987. Alexandria, Minnesota.

**ERS.** 1991. Aquaculture Situation and Outlook Report. United States Department of Agriculture. Economic Research Service. Various issues.

**ERS.** 1993. Aquaculture Situation and Outlook Report. United States Department of Agriculture. Economic Research Service. March Issue.

**Colt, J.** 1989. Strategies for Aquaculture Development in Minnesota. Fish Factory Report No.89/6-001.

**Fitzgerald, R.** 1991. The Real Truth About Seafood. Seafood Leader. May/June Issue.

**Hanson, J.** 1989. A Primer on Marketing Aquaculture Products in Minnesota. Report for the Minnesota Aquaculture Advisory Committee.

**Horowitz, J.** 1990. The Fish Tank on the Farm. Time. December 3 Issue.

**Lee, W.** 1992. Risky Business. Seafood Leader. January/February Issue.

**Mearns, G.** 1993. Improving Economy Will Increase Demand for Aquaculture Products-USDA. Water Farming Journal. May Issue.

**Minnesota Department of Natural Resources.** 1992. 1992 Fish Stocking Report. Division of Fish and Wildlife, Section of Fisheries Report.

**National Agriculture Library.** 1991. Aquaculture: A Guide to Federal Government Programs. U.S. Dept. of Agriculture.

**Newton, G.** 1978. Aquaculture: Emerging Issues of Law and Policy. New York Sea Grant Law and Policy Journal, II.

**One Industry One Voice.** 1991. National Aquaculture Association Brochure.

**Peterson D. L. and F.A. Hennagir.** 1980. Minnesota Live Bait Industry Assessment Study, Minnesota Department of Natural Resources, Investigational Report No. 367, St. Paul, MN.

**Redmayne, P.** 1993. Just Do It! Seafood Leader. May/June Issue.

**Rhodes, R.** World Situation and Outlook, 1993: An Overview. 1993. Aquaculture Magazine. Vol. 19, No. 3.

**Seafood Leader.** 1992. Hybrid Striped Bass. 1992 Buyer's Guide. Vol 12, No. 2.

**Seafood Leader.** 1993. Whole Seafood Catalog. Vol. 12, No. 5.

**State Aquaculture Plan for Louisiana.** 1985. School of Forestry, Wildlife, and Fisheries, Louisiana State University.

**Strategic Plan for Aquaculture Development in South Carolina.** 1989. Volume II: Status of the Industry.

**Stutzman, C.** Financing Aquaculture Ventures. A Cooperative Project Between Kirkwood Community College & Iowa Department of Agriculture.

**Talley, K.** 1993. Seafood Consumption Founders While Turkey Takes Flight. Northern Aquaculture. Vol. 9, No.4.

**Trotta, L.C.** Minnesota Water Supply and Use. U.S. Geological Survey Water-Supply Paper 2350.

**U.S.D.A., E.R.S.** 1990. Food Consumption, Prices and Expenditures, 1968 - 1989.

**Webster, C. D., James H. Tidwell, and Daniel H. Yancey.** Use of Distillers Grains with Solubles in Aquaculture Diets. Aquaculture Research Center, Kentucky State University.

**Woodward, D. G.** Minnesota Ground-Water Resources. U.S. Geological Survey Water Supply Paper 2275.

## *Appendix A:*

# Minnesota Aquaculture Contacts

**Minnesota Department of Agriculture**
Ying Ji, Aquaculture Coordinator, or
Brian Erickson, Marketing Specialist
Market Development and Promotion Division
90 West Plato Boulevard
St. Paul, MN 55107-2094
ph: 612-296-5081, or 296-4939

**Minnesota Aquaculture Commission**
Cal Courneya, Chair
Pure Water Aquaculture Corporation
West Highway 82, Box 176
Garfield, MN 56332
ph: 612-834-2211

**Agricultural Utilization Research Institute**
Duaine Flanders, Technical Services Manager
Central Minnesota Office
P.O. Box 188
Morris, MN 56267
ph: 612-589-4532

**Alexandria Technical College**
Instructors Larry Belusz or Greg Raisanen
1601 Jefferson Street
Alexandria, MN 56308
ph: 612-762-4566

**Iron Range Resources and Rehabilitation Board**
Phil Bakken, Director
Economic Development Division
Box 441, Highway 53 South
Eveleth, MN 55734
ph: 218-744-2993

**Minnesota Department of Natural Resources**
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Fisheries Section
500 Lafayette Road, Box 12
St. Paul, MN 55155-4012
ph: 612-296-0790

**Minnesota Aquaculture Association**
Richard Walker, President
Prairie Lakes Aquaculture
Route 1
Hancock, MN 56244
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**Minnesota Pollution Control Agency**
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St. Paul, MN 55155
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**Natural Resources Research Institute**
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**Sea Grant College Program**
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## APPENDIX B:

# STATE STATUTES AND RULES REGULATING MINNESOTA AQUACULTURE PRODUCTION

The following list includes Minnesota statutory and rule language relating directly to aquaculture. It is not meant to be used by producers as a regulatory checklist, rather as a general reference to state laws and rules regulating aquaculture production. There are federal statutes and rules which also directly impact fish production which are not enclosed. Ancillary activities associated with fish production such as piscicide applications, winter water aeration, processing, fish packing and vending, and others may also have specific state and federal statutory and rule language not included. If you have a question about aquaculture regulations, please call the Minnesota Department of Agriculture at (612) 296-5081 or 296-4939, or consult Appendix A for an appropriate agency contact. Some subdivisions and subparts have been removed for brevity if they are not directly related to aquaculture production. Requested data was supplied by the State of Minnesota Revisor of Statutes.

**17.46 SHORT TITLE.**

Laws 1991, chapter 309, sections 4 to 16, may be cited as the aquaculture development act.

**17.47 DEFINITIONS.**

Subdivision 1. **Scope.** The definitions in this section apply to Laws 1991, chapter 309, sections 2 to 16.

Subd. 2. **Aquaculture.** "Aquaculture" means the culture of private aquatic life for consumption or sale.

Subd. 3. **Aquatic farm.** "Aquatic farm" means a facility used for the purpose of culturing private aquatic lifein waters, including but not limited to artificial ponds, vats, tanks, raceways, other indoor or outdoor facilities that an aquatic farmer owns or where an aquatic farmer has exclusive control of, fish farms licensed under section 97C.209, or private fish hatcheries licensed under section 97C.211 for the sole purpose of processing or cultivating aquatic life.

Subd. 4. **Aquatic farmer.** "Aquatic farmer" means an individual who practices aquaculture.

Subd. 5. **Commissioner.** "Commissioner" means the commissioner of agriculture.

Subd. 6. **Department.** "Department" means the department of agriculture.

Subd. 7. **Private aquatic life.** "Private aquatic life" means fish, shellfish, mollusks, crustaceans, and any other aquatic animals cultured within an aquatic farm. Private aquatic life is the property of the aquatic farmer.

**17.49 AQUACULTURE PROGRAM AND PROMOTION.**

Subdivision 1. **Program established.** The commissioner shall establish and promote a program of aquaculture in consultation with an advisory committee consisting of the University of Minnesota, the commissioner of natural resources, the commissioner of agriculture, representatives of the private aquaculture industry, and the chairs of the environment and natural resources committees of the house of representatives and senate.

Subd. 2. **Coordination.** Aquaculture programs in the state must be coordinated through the commissioner of agriculture. The commissioner of agriculture shall direct the development of aquaculture in the state. Aquaculture research, projects, and demonstrations must be reported to the commissioner before state appropriations for the research, projects, and demonstrations are encumbered. The commissioner shall maintain a data base of aquaculture research, demonstrations, and other related information pertaining to aquaculture in the state.

Subd. 2a. **Development program.** The commissioner may establish a Minnesota aquaculture development and aid program that may support applied research, demonstration, financing, marketing, promotion, broodstock development, and other services.

Subd. 3. **Report.** The commissioner shall prepare an annual report on the amount of fish and aquaculture products produced in the state, where the products were produced, the opportunities in the state for aquaculture development, and impediments to Minnesota development of aquaculture.

**17.491 AQUACULTURE IS AGRICULTURAL PURSUIT.**

Aquaculture is an agricultural pursuit.

**17.494 AQUACULTURE PERMITS; RULES.**

The commissioner shall act as permit or license coordinator for aquatic farmers and shall assist aquatic farmers to obtain licenses or permits.

By July 1, 1992, a state agency issuing multiple permits or licenses for aquaculture shall consolidate the permits or licenses required for every aquatic farm location. The department of natural resources transportation permits are exempt from this requirement. State agencies shall adopt rules or issue commissioner's orders that establish permit and license requirements, approval timelines, and compliance standards.

Nothing in this section modifies any state agency's regulatory authority over aquaculture production.

**17.495 APPEAL PROCEDURES.**

A state agency that denies a license or permit to an aquatic farmer shall provide the aquatic farmer with a written notice specifying the reasons for refusal.

An aquatic farmer may appeal a state agency's denial of the license or permit in a contested case proceeding under chapter 14.

**17.496 QUARANTINE FACILITY; RULES.**

By July 1, 1992, the commissioner of natural resources shall adopt rules, in consultation with the commissioner of agriculture and the aquaculture advisory committee, for the construction and operation of a quarantine facility for fish eggs presently requiring quarantine and disposition of fish from the facility. Fish in a quarantine station that are determined to be disease-free under the procedures developed by the commissioner of natural resources may be bought, sold, or transported.

**17.497 EXOTIC SPECIES IMPORTATION; RULES.**

The commissioner of natural resources shall establish rules, in consultation with the commissioner of agriculture and the aquaculture advisory committee, for approving or rejecting importation of "exotic" or genetically altered aquatic species to protect the integrity of the natural ecosystem and provide aquatic farmers with information that may affect business decisions.

**17.498 RULES; FINANCIAL ASSURANCE.**

(a) The commissioner of the pollution control agency, after consultation and cooperation with the commissioners of agriculture and natural resources, shall present proposed rules to the pollution control agency board prescribing water quality permit requirements for aquaculture facilities by May 1, 1992. The rules must consider:

(1) best available proven technology, best management practices, and water treatment practices that prevent and minimize degradation of waters of the state considering economic factors, availability, technical feasibility, effectiveness, and environmental impacts;

(2) classes, types, sizes, and categories of aquaculture facilities;

(3) temporary reversible impacts versus long-term impacts on water quality;

(4) effects on drinking water supplies that cause adverse human health concerns; and

(5) aquaculture therapeutics, which shall be regulated by the pollution control agency.

(b) Net pen aquaculture and other aquaculture facilities with similar effects must submit an annual report to the commissioner of the pollution control agency analyzing changes in water quality trends from previous years, documentation of best management practices, documentation of costs to restore the waters used for aquaculture to the trophic state existing before aquatic farming was initiated, and documentation of financial assurance in an amount adequate to pay for restoration costs. The trophic state, which is the productivity of the waters measured by total phosphorus, dissolved oxygen, algae abundance as chlorophyll-a, and secchi disk depth of light penetration, and the condition of the waters measured by raw drinking water parameters, shall be determined to the extent possible before aquatic farming is initiated. The financial assurance may be a trust fund, letter of credit, escrow account, surety bond, or other financial assurance payable to the commissioner for restoration of the waters if the permittee cannot or will not restore the waters after termination of aquatic farming operations or revocation of the permit.

(c) The commissioner of the pollution control agency shall submit a draft of the proposed rules to the legislative water commission by September 1, 1991. By January 15, 1992, the commissioner of the pollution control agency shall submit a report to the legislative water commission about aquaculture facilities permitted by the pollution control agency. The report must include concerns of permittees as well as concerns of the agency about permitted aquaculture facilities and how those concerns will be addressed in the proposed rules.

(d) Information received as part of a permit application or as otherwise requested must be classified according to chapter 13. Information about processes, aquatic farming procedures, feed and therapeutic formulas and rates, and tests on aquatic farming products that have economic value is nonpublic data under chapter 13, if requested by the applicant or permittee.

**17.4981 GENERAL CONDITIONS FOR REGULATION OF AQUATIC FARMS.**

Aquatic farms are licensed to culture private aquatic life. Cultured aquatic life is not wildlife. Aquatic farms must be licensed and given classifications to prevent or minimize impacts on natural resources. The purpose of sections 17.4981 to 17.4997 is to:

(1) prevent public aquatic life from entering an aquatic farm;

(2) prevent release of nonindigenous or exotic species into public waters without approval of the commissioner;

(3) protect against release of disease pathogens to public waters;

(4) protect existing natural aquatic habitats and the wildlife dependent on them; and

(5) protect private aquatic life from unauthorized taking or harvest. Private aquatic life that is legally acquired and possessed is an article of interstate commerce and may be restricted only as necessary to protect state fish and water resources.

**17.4982 DEFINITIONS.**

Subdivision 1. **Scope.** The definitions in this section apply to sections 17.4981 to 17.4998.

Subd. 2. **Approved laboratory methods.** "Approved laboratory methods" means methods described in the latest edition of the "Procedures for the Detection and Identification of Certain Fish Pathogens" published by the American Fisheries Society Fish Health Section known as the Fish Health Blue Book.

Subd. 2a. **Aquaculture therapeutics.** "Aquaculture therapeutics" means drugs, medications, and disease control chemicals that are approved for aquaculture use by the United States Food and Drug Administration or the United States Environmental Protection Agency.

Subd. 3. **Aquarium facilities.** "Aquarium facilities" means facilities that rear or hold private aquatic life for sale for aquarium or display purposes.

Subd. 4. **Aquatic farm.** "Aquatic farm" means a licensed facility used for hatching, raising, rearing, and culturing private aquatic life in waters and preparing aquatic life for sale, including, but not limited to, ponds, vats, tanks, raceways, and other indoor or outdoor facilities that an aquatic farmer owns or waters of which an aquatic farmer has the use.

Subd. 5. **Aquatic life.** "Aquatic life" has the meaning given to "private aquatic life" in section 17.47, subdivision 7, and for purposes of commercial transactions, aquatic life is livestock.

Subd. 6. **Certifiable diseases.** "Certifiable diseases" include channel catfish virus, bacterial kidney disease, bacterial furunculosis, enteric redmouth disease, enteric septicemia of catfish, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, whirling disease, proliferative kidney disease, viral hemorrhagic septicemia virus, epizootic epitheliotropic virus, ceratomyxosis, and any emergency disease.

Subd. 7. **Commissioner.** "Commissioner" means the commissioner of natural resources.

Subd. 8. **Containment facility.** "Containment facility" means a licensed facility for salmonids or catfish that complies with clauses (1), (3), and (4), or clauses (2), (3), and (4):

(1) disinfects its effluent to the standards in section 17.4991 before the effluent is discharged to public waters;

(2) does not discharge to public waters or to waters of the state directly connected to public waters;

(3) raises aquatic life for food consumption only;

(4) contains aquatic life requiring a fish health inspection prior to transportation.

Subd. 9. **Emergency fish disease.** "Emergency fish disease" means designated fish diseases not already present in this state that could impact populations of aquatic life if inadvertently released by infected aquatic life, including channel catfish virus, viral hemorrhagic septicemia virus, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, whirling disease, ceratomyxosis, proliferative kidney disease, and epizootic epitheliotropic virus disease.

Subd. 10. **Enzootic.** "Enzootic" means a disease that is known to occur within well-defined geographic boundaries.

Subd. 11. **Fish Health Blue Book.** "Fish Health Blue Book" means the standardized set of procedures and guidelines established and

published by the American Fisheries Society Fish Health Section for the detection and isolation of fish pathogens.

Subd. 12. **Fish health inspection.** "Fish health inspection" means an on-site, statistically based sampling in accordance with processes in the Fish Health Blue Book for all lots of fish in a facility. The inspection must include at least viral testing of ovarian fluids at the 95 percent confidence level of detecting two percent incidence of disease (ovarian fluids must be sampled for certification of viral hemorrhagic septicemia and infectious hematopoietic necrosis). Bacterial diseases must be sampled at the 95 percent confidence level with a five percent incidence of disease. The inspection must be performed by a fish health inspector in cooperation with the producer with subsequent examination of the collected tissues and fluids for the detection of certifiable diseases.

Subd. 13. **Fish health inspector.** "Fish health inspector" means an individual certified as a fish health inspector by the American Fisheries Society or state, federal, or provincial resource management agency, except that a certification may not be made by an inspector who has a conflict of interest in connection with the outcome of the certification.

Subd. 14. **Game fish.** "Game fish" has the meaning given in section 97A.015, subdivision 25, except that green or orange spotted sunfish are not game fish for purposes of determining fish of significant public value.

Subd. 15. **Intensive culture.** "Intensive culture" means the rearing of fish at densities greater than can be supported in the natural environment.

Subd. 16. **Licensed facility.** "Licensed facility" means a licensed aquatic farm, including all licensed waters.

Subd. 17. **Lot.** "Lot" means a group of fish of the same species and age that originated from the same discrete spawning population and that always have shared a common water supply. Various age groups of adult brood stock of the same species may comprise the same lot if they have shared the same containers for one brood cycle.

Subd. 18. **Minnows.** "Minnows" has the meaning given in section 97A.015, subdivision 29, except the 12-inch restriction on sucker minnows does not apply.

Subd. 19. **Public waters.** "Public waters" has the meaning given in section 103G.005, subdivision 15.

Subd. 20. **Quarantine facility.** "Quarantine facility" means a culture system that is enclosed in a building and is separated from other fish culture facilities where fish can be isolated and maintained while preventing their introduction and pathogen introduction into the environment.

Subd. 21. **Standard facility.** "Standard facility" means a licensed facility with a continual or intermittent discharge of effluent to public waters.

Subd. 22. **Waters of the state.** "Waters of the state" has the meaning given in section 103G.005, subdivision 17.

### 17.4983 AQUATIC FARM OPERATIONS.

Subdivision 1. **Acquisition and sale of private aquatic life.** Aquatic life legally possessed may be bought, acquired, and sold by licensed facilities as provided in sections 17.4981 to 17.4997.

Subd. 2. **Acquisition from state.** (a) The commissioner may sell aquatic life to licensed facilities at fair wholesale market value. Fair wholesale market value must be determined by the average market price charged in this state and contiguous states and provinces for similar quantities.

(b) The commissioner shall establish procedures to make aquatic life available to licensed facilities if state aquatic life would otherwise die or go to waste, such as in cases of winterkill lakes, waters where piscicides will be applied, and waters subject to extreme draw-down. The public must be given angling opportunities if public access is available.

(c) The commissioner shall attempt to provide opportunities to make brood stock available to licensed facilities to reduce reliance on out-of-state sources without causing adverse impacts to game fish populations.

(d) If the commissioner denies approval to obtain aquatic life outside the state, a written notice must be submitted to the applicant stating the reasons for denial, and the commissioner shall:

(1) designate approved sources if available to obtain the desired aquatic life; or

(2) sell the aquatic life from state hatcheries at fair wholesale market value if there is a surplus from state operations.

Subd. 3. **Methods to harvest aquatic life.** Licensed facilities may use all reasonable methods to operate and harvest aquatic life from licensed facilities, including available nets.

Subd. 4. **Discharge may require permit.** The discharge from an aquatic farm must comply with discharge permits required by the Minnesota pollution control agency.

Subd. 5. **Ownership of aquatic life.** (a) Notwithstanding other provisions of law, aquatic life lawfully acquired and possessed by a licensed facility is private aquatic life and property of the owner of the licensed facility.

(b) The state may not seize or otherwise confiscate private aquatic life without due process of law, except that private aquatic life in public waters may become property of the state if the waters are not part of a licensed facility. The commissioner shall notify the licensee that the aquatic life in a facility that is no longer licensed will become property of the state if the aquatic life is not removed. If the licensee does not respond in writing within 30 days after receiving the notice and make alternative arrangements, or does not remove the aquatic life by 60 ice-free days after receiving the notice, the private aquatic life becomes property of the state.

(c) Private aquatic life that is transferred to the state or released into public waters that are not part of a licensed facility is owned by the state and may be considered wildlife.

Subd. 6. **Control of licensed waters.** (a) If the public cannot legally access waters of the state that are part of a licensed aquatic farm except by permission of the licensee, the use of the waters by the public is subject to restriction by the licensee.

(b) Waters of the state may not be licensed for aquaculture use to more than one licensee.

Subd. 7. **Angling in licensed waters.** A person may not take fish by angling from waters subject to subdivision 6 unless the person has written permission from the licensee and:

(1) has an invoice when in possession of fish; or

(2) takes fish under an angling license, subject to the limits and conditions in the game and fish laws.

### 17.4984 AQUATIC FARM LICENSE.

Subdivision 1. **License required.** (a) A person or entity may not operate an aquatic farm without first obtaining an aquatic farm license from the commissioner.

(b) Applications for an aquatic farm license must be made on forms provided by the commissioner.

(c) Licenses are valid for five years and are transferable upon notification to the commissioner.

(d) The commissioner shall issue an aquatic farm license on payment of the required license fee under section 17.4988.

(e) A license issued by the commissioner is not a determination of private property rights, but is only based on a determination that the

licensee does not have a significant detrimental impact on the public resource.

Subd. 2. **Listed waters.** (a) An aquatic farm license must list:

(1) the specific waters of the state that may be used in connection with the licensed aquatic farm and the species approved for each licensed water; and

(2) whether aeration requiring a permit is approved. Additional waters may not be used until they are approved by the commissioner.

(b) The right to use waters licensed for private fish hatchery or aquatic farm purposes may be transferred between licensees with prior approval by the commissioner if requirements for species to be raised are met. Waters that are continually connected by a permanent watercourse to other waters must not be approved for aquatic farm use, except that connected waters that are isolated from other waters may be licensed as a single water body. Waters that are intermittently connected or may become connected with other waters may be denied, or screening or other measures may be required to prevent passage of aquatic life. Listed waters may be changed on approval by the area fisheries supervisor or the commissioner.

(c) The commissioner shall conduct an inspection of waters to be licensed prior to approving or denying initial licensing of the waters.

(d) Waters containing game fish of significant public value may be denied licensing unless the applicant can demonstrate exclusive riparian control.

(e) Waters containing game fish of significant public value may be denied licensing unless the game fish of significant public value are sold to the licensee, removed for other state use by the department of natural resources, or disposed of as provided in writing by the commissioner.

(f) Waters licensed under an aquatic farm license may be aerated during open water periods without a separate aeration permit.

Subd. 3. **Listed species.** (a) An aquatic farm license must list the species of aquatic life appropriate for the classification of the waters. Listed species of aquatic life may be changed on written request to and approval by the area fisheries supervisor. Species of aquatic life regulated under chapter 97A, 97B, or 97C may not be cultured unless listed on the license.

(b) All waters licensed before July 1, 1992, under a private fish farm or fish hatchery license must be approved for species listed under current licenses if other conditions for licensing are met.

(c) If licensed waters are located within a 25-year floodplain and are not enclosed within a building, species of aquatic life may be licensed at the discretion of the commissioner.

(d) Licensed waters located outside of a 25-year floodplain or enclosed within a building may be licensed for any species, except that the commissioner may deny licensing for species not present in the state.

Subd. 4. **Single license for aquatic farming operation.** The commissioner shall issue a single license for aquatic farming, with the following information and endorsements:

(1) waters covered by the license;

(2) classification of each of the licensed waters;

(3) aeration endorsement for each licensed water where the licensee has exclusive control of riparian access or where the conditions for an aeration permit have been met; and

(4) endorsements requested by the licensee.

Subd. 5. **State list of waters.** If the state uses waters of the state for aquatic farming, the state shall acquire legal access to the waters and make documentation of the access available to the public.

Subd. 6. **Inspections and enforcement.** (a) The premises, property, vehicles, private aquatic life, and equipment where private aquatic farm operations are being conducted are subject to an annual operations inspection and other reasonable and necessary inspections at reasonable times by conservation officers. The reason for the inspection must be provided in writing upon request. The owner, operator, or designee may be present when inspections are conducted.

(b) Conservation officers may enforce sections 17.4981 to 17.4997 under section 97A.205.

Subd. 7. **Nonpublic records.** (a) Licensees must keep complete, up-to-date, nonpublic records of the operation of the aquatic farm. The records must be kept for at least three years.

(b) The records must be in English and include the following information:

(1) for each species acquired, the number and pounds of fish or eggs acquired, names and addresses of the sources from which acquired, and the dates of receipt;

(2) for each species sold or disposed of, the number and pounds of fish sold or disposed of, the names and addresses of the purchasers or persons to whom the conveyances are made, and the dates of sale; and

(3) for fish sperm or viable eggs, the amount acquired or sold, the names and addresses of the sources from which acquired, the purchasers to whom conveyed, and the dates of purchase or sale.

(c) On or before March 1 of each year, the licensee shall submit a complete annual report on a form furnished by the commissioner, covering the quantity of all species sold or purchased in the preceding licensed year.

(d) An aquatic farmer shall maintain records for reasonable inspection by the commissioner. Information on aquatic life production, harvest, and sales is nonpublic information.

### 17.4985 TRANSPORTATION OF AQUATIC LIFE.

Subdivision 1. **Requirements for importation, transportation within the state, or stocking of fish.** Except as provided in subdivision 3, a licensee may not import aquatic life into the state, transport aquatic life within the state, or stock waters of the state with aquatic life without first obtaining a bill of lading or transportation permit from the commissioner, with disease certification, if applicable.

Subd. 2. **Bill of lading.** (a) A person may transport aquatic life except salmonids or catfish with a completed bill of lading for:

(1) intrastate transportation of aquatic life between licensed private fish hatcheries, aquatic farms, or aquarium facilities licensed for the same species and of the proper classification for the aquatic life if the aquatic life is being transported into a watershed where it is not currently present or if the original source of the aquatic life is outside Minnesota and contiguous states; and

(2) stocking of waters other than public waters.

(b) When aquatic life is transported under paragraph (a), a copy of the bill of lading must be submitted to the regional fisheries manager at least 72 hours before the transportation.

(c) For transportation and stocking of waters that are not public waters:

(1) a bill of lading must be submitted to the regional fisheries manager 72 hours before transporting fish for stocking;

(2) a bill of lading must be submitted to the regional fisheries manager within five days after stocking if the waters to be stocked are confirmed by telecopy or telephone prior to stocking by the regional fisheries office not to be public waters; or

(3) a completed bill of lading may be submitted to the regional fisheries office by telecopy prior to transporting fish for stocking. Confirmation that the waters to be stocked are not public waters

may be made by returning the bill of lading by telecopy or in writing, in which cases additional copies need not be submitted to the department of natural resources.
(d) Bill of lading forms may only be issued by the department of natural resources in St. Paul, and new bill of lading forms may not be issued until all previously issued forms have been returned.
Subd. 3. **Exemptions for transportation permits and bills of lading.** (a) A bill of lading or transportation permit is not required by an aquatic farm licensee for importation, transportation, or export for the following:
(1) minnows taken under an aquatic farm license in this state and transported intrastate;
(2) aquarium or ornamental fish including goldfish and tropical, subtropical, and saltwater species that cannot survive in the waters of the state, which may be imported or transported if accompanied by shipping documents;
(3) fish or fish eggs that have been processed for use as food, bait, or other purposes unrelated to fish propagation;
(4) live fish from a licensed aquatic farm, which may be transported directly to an outlet for processing or for other food purposes if accompanied by shipping documents;
(5) fish being exported if accompanied by shipping documents;
(6) sucker eggs, sucker fry, or fathead minnows transported intrastate for bait propagation or feeding of cultural aquatic life;
(7) species of fish that are found within the state used in connection with public shows, exhibits, demonstrations, or fishing pools for periods not exceeding 14 days; or
(8) intrastate transportation of aquatic life between licensed private fish hatcheries, aquatic farms, or aquarium facilities licensed for the same species and of the proper facility classification for the aquatic life, except where required in subdivision 2 and except that salmonids and catfish may only be transferred or transported intrastate without a transportation permit if they had no record of bacterial kidney disease at the time they were imported into the state and if the most recent fish health inspection since importation has shown no certifiable diseases to be present.
Aquatic life being transferred between licensed private fish hatcheries, aquatic farms, or aquarium facilities must be accompanied by shipping documents and salmonids and catfish being transferred or transported intrastate without a transportation permit must be accompanied by a copy of their most recent fish health inspection.
(b) Shipping documents required under paragraph (a) must show the place of origin, owner or consignee, destination, number, and species.
Subd. 4. **Transportation permit requirements.** A transportation permit is required for all importation, transportation, or stocking of private aquatic life not covered by subdivision 2 or exempted in subdivision 3. A transportation permit may be used for multiple shipments within the 30-day term for the permit if the source and the destination remains the same. Transportation permits, which may authorize importation or stocking of public waters, may be issued through department of natural resources regional offices or the St. Paul office, and must be obtained prior to shipment.
Subd. 5. **Permit application.** An application for a transportation permit must be made on forms provided by the commissioner. An incomplete application must be rejected. An application for a transportation permit for salmonids and catfish, their eggs, or sperm must be accompanied by certification that the source of the eggs or sperm are free of certifiable diseases, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported, transported, or stocked following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported, transported, or stocked into areas where the disease has been previously introduced. A copy of the transportation permit showing the date of certification inspection must accompany the shipment of fish while in transit and must be available for inspection by the commissioner. By 14 days after a completed application is received, the commissioner must approve or deny the importation permits as provided in this section.
Subd. 6. **Vehicle identification.** (a) A vehicle used by a licensee for transporting aquatic life must be identified with the licensee's name and town of residence as it appears on the license and the license number.
(b) A vehicle used by a licensee must have identification displayed so that it is readily visible from either side of the vehicle in letters and numbers not less than 2-1/2 inches high and with a three-eighths inch wide stroke. Identification may be permanently affixed to vehicles or displayed on removable plates or placards placed on opposite doors of the vehicle or on the tanks carried on the vehicle.
(c) An application to license a vehicle for minnow transport or export or for use as a fish vendor that is received by the commissioner is a temporary license until it is approved or denied.

### 17.4986 IMPORTATION OF AQUATIC LIFE.

Subdivision 1. **Importation and stocking restrictions.** A person may not import fish into or stock fish in the state without first obtaining a transportation permit with a disease certification when required or a bill of lading from the commissioner, unless the person is exempted.
Subd. 2. **Licensed facilities.** (a) The commissioner shall issue transportation permits to import:
(1) indigenous and naturalized species except trout, salmon, and catfish from any source to a standard facility;
(2) trout, salmon, and catfish from a nonemergency disease area to a containment facility if the fish are certified within the previous year to be free of certifiable diseases, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced; and
(3) trout, salmon, and catfish from a facility in a nonemergency disease area with a disease-free history of three years or more to a standard facility, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced.
(b) If a source facility in a nonemergency disease area cannot demonstrate a history free from disease, aquatic life may only be imported into a quarantine facility.
Subd. 3. **Enzootic disease area.** (a) Except as otherwise provided and except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced, fish may be imported from emergency disease enzootic areas only as fertilized eggs under the following conditions:
(1) to be imported into a standard facility, fertilized eggs must have a disease-free history for at least five years;
(2) to be imported into a containment facility, fertilized eggs must have a disease-free history for at least three years; or
(3) to be imported into a quarantine facility, fertilized eggs may have a disease-free history of less than three years.
(b) A hatchery inspection must occur at least once a year and fish

must have been tested for all certifiable diseases. Fish health inspections under this subdivision must comply with section 17.4982, subdivision 12.

Subd. 4. **Disease-free history.** When disease-free histories of more than one year are required for importing salmonids or catfish, the disease history must be of consecutive years that include the year previous to, or the year of, the transportation request.

### 17.4987 STOCKING PRIVATE AQUATIC LIFE.

(a) A person may not release private aquatic life into public waters that are not licensed as part of an aquatic farm without first obtaining a transportation permit from the commissioner. The commissioner may deny issuance of a permit if releasing the private aquatic life is not consistent with the management plan for the public waters. The commissioner shall make management plans available to the public.

(b) If a permit is denied, the commissioner must provide reasons for the denial in writing.

### 17.4988 LICENSE AND INSPECTION FEES.

Subdivision 1. **Requirements for issuance.** A permit or license must be issued by the commissioner if the requirements of law are met and the license and permit fees specified in this section are paid.

Subd. 2. **Aquatic farming license.** (a) The annual fee for an aquatic farming license is $275.

(b) The aquatic farming license must contain endorsements for the rights and privileges of the following licenses under the game and fish laws. The endorsement must be made upon payment of the license fee prescribed in section 97A.475 for the following licenses:

(1) minnow dealer license;

(2) minnow retailer license for sale of minnows as bait;

(3) minnow exporting license;

(4) minnow dealer helper license;

(5) aquatic farm vehicle endorsement, which includes a minnow dealer vehicle license, a minnow retailer vehicle license, an exporting minnow hauler vehicle license, and a fish vendor vehicle license;

(6) sucker egg taking license; and

(7) game fish packers license.

Subd. 3. **Inspection fees.** The fees for the following inspections are:

(1) initial inspection of each water to be licensed, $50;

(2) fish health inspection and certification, $20 plus $80 per lot thereafter; and

(3) initial inspection for containment and quarantine facility inspections, $50.

Subd. 4. **Aquarium facility.** (a) A person may not operate an aquarium facility without an aquarium facility license issued by the commissioner. The fee for an aquarium facility license is $15.

(b) Game fish transferred by an aquarium facility must be accompanied by a receipt containing the information required on a shipping document by section 17.4985, subdivision 3, paragraph (b).

### 17.4991 DISEASE TRANSMISSION.

Subdivision 1. **Facility designation.** (a) The licensee may apply to the commissioner for designation of all or a portion of a facility as a standard, containment, or quarantine facility on forms prescribed by the commissioner as part of the license application or separately.

(b) By 15 business days after an application is submitted, the commissioner must notify the applicant if there are any deficiencies in the application. By 30 business days after a complete application is submitted, the commissioner shall approve or deny the designation requested. A denial must include an assessment of the actual risk to wildlife populations at the particular site. A containment designation must be approved if the facility meets the disinfection requirements of subdivision 2 and complies with section 17.4982, subdivision 8.

Subd. 2. **Disinfection.** (a) Containment facilities must disinfect effluent prior to discharge to public waters. The effluent required to be disinfected includes water used by a containment facility in the production of the aquatic life of concern, waste or mortalities from the aquatic life of concern, and live forage or commercial feed discarded from the containment facility. Runoff from precipitation and excess water from natural springs, wells, or other sources that is not used in the production of aquatic life is not effluent to be disinfected.

(b) The disinfection must minimize the potential release of disease pathogens to wildlife susceptible to the pathogens based on a reasonable risk assessment. Disinfection treatment processes may include chlorination or other processes. If chlorine disinfection is utilized, a measurable residual level of 1.0 parts per million of active chlorine in the effluent must be maintained for one hour of retention time. The effluent must be sufficiently dechlorinated to prevent toxic adverse impacts to wildlife after discharge to public waters.

(c) A disinfection treatment process must ensure uninterrupted effluent treatment in the event of electrical power failure, a primary system failure, or other similar events that would cause treatment interruptions.

(d) The effluent disinfection process must be sited, designed, and operated in a manner that allows inspection by the commissioner at all times to determine whether adequate effluent disinfection is maintained.

(e) The commissioner may prescribe reasonable documentation of daily monitoring of treatment system performance to be included in the licensee's annual report. The records must be available for daily inspection by the commissioner during normal business hours and maintained for three years.

Subd. 3. **Fish health inspection.** (a) An aquatic farm propagating trout, salmon, or catfish and having an effluent discharge from the aquatic farm into public waters must have an annual fish health inspection conducted by a certified fish health inspector. Testing must be conducted according to approved laboratory methods.

(b) A health inspection fee must be charged based on each lot of fish sampled. The fee by check or money order payable to the department of natural resources must be prepaid or paid at the time a bill or notice is received from the commissioner that the inspection and processing of samples is completed.

(c) Upon receipt of payment and completion of inspection, the commissioner shall notify the operator and issue a fish health certificate. The certification must be made according to the Fish Health Blue Book by a person certified as a fish health inspector.

(d) All aquatic life in transit or held at transfer stations within the state may be inspected by the commissioner. This inspection may include the collection of stock for purposes of pathological analysis. Sample size necessary for analysis will follow guidelines listed in the Fish Health Blue Book.

(e) Salmonids and catfish must have a fish health inspection before being transported from a containment facility, unless the fish are being transported directly to an outlet for processing or other food purposes or unless the commissioner determines that an inspection is not needed. A fish health inspection conducted for this purpose need only be done on the lot or lots of fish that will be transported.

The commissioner must conduct a fish health inspection requested for this purpose within five working days of receiving written notice. Salmonids and catfish may be immediately transported from a containment facility to another containment facility once a sample has been obtained for a health inspection or once the five-day notice period has expired.

Subd. 4. **Emergency disease determination.** If emergency diseases exist, the commissioner may order the aquatic life in the facility to be impounded, confiscated, sold, or destroyed and the facility disinfected. The commissioner shall make every effort to allow disposed aquatic life to be sold for market if there is no imminent danger of a significant adverse impact on natural fish populations or of escape of the pathogen to public waters.

Subd. 5. **Aquaculture therapeutics registration.** (a) Aquaculture therapeutics must be registered and labeled in accordance with rules adopted by the commissioner of agriculture relating to drugs and feed additives.

(b) The department of agriculture may not require registration of those aquaculture therapeutics designated as low regulatory priority by the United States Food and Drug Administration.

**17.4992 GAME FISH.**

Subdivision 1. **Acquisition and purchase.** Game fish sperm, viable game fish eggs, or live game fish may not be taken from public waters for aquaculture purposes, but may be purchased from the state or acquired from aquatic farms.

Subd. 2. **Restriction on the sale of game fish.** Species of the family salmonidae or ictaluridae, except bullheads, must be free of certifiable diseases if sold for stocking or transfer to another aquatic farm, except that eggs with enteric redmouth, whirling disease, or furunculosis may be transferred or stocked following treatment approved by the commissioner, and fish with bacterial kidney disease may be transferred or stocked to areas where the disease has been previously introduced.

Subd. 3. **Acquisition of fish for brood stock.** Game fish brood stock may be sold to private fish hatcheries or aquatic farms by the state at fair wholesale market value. As a one-time purchase for brood stock development, up to 20 pair of adults may be provided, if available, by the state through normal operations.

Subd. 4. **Sale of eggs by the state.** The commissioner may offer for sale as eggs or fry up to two percent of the department's annual game fish egg harvest. Additional eggs or fry may be sold if they are surplus to this state's program needs.

Subd. 5. **Purchase of eggs dependent upon facility.** Licensees may purchase game fish eggs or fry from the state at a rate based on the capacity of their facility to hatch and rear fish. Licensees may purchase walleye at a rate of no more than one-half quart of eggs or 5,000 fry for each acre or fraction of licensed surface water. This limitation may be waived if an aquatic farm is an intensive culture facility. The allowable purchase of trout or salmon eggs must be based on the capacity of rearing tanks and flow of water through the aquatic farm facility.

Subd. 6. **Stocking walleyes north of marked state highway No. 210.** Walleyes from outside of the area of the state north of marked state highway No. 210 may not be stocked in waters of the state north of marked state highway No. 210 without approval by the commissioner.

**17.4993 MINNOWS.**

Subdivision 1. **Taking from public waters.** A licensee may take minnow sperm, minnow eggs, and live minnows from public waters for aquatic farm purposes under an aquatic farm license.

Subd. 2. **Importation of live minnows.** Minnows from outside the state may not be imported live by a licensee for purposes other than processing or feeding aquatic farm fish.

**17.4994 SUCKER EGGS.**

Sucker eggs may be taken from public waters with a sucker egg license endorsement, which authorizes sucker eggs to be taken at a rate of one quart of eggs for each 1-1/2 acres of licensed surface waters except that for intensive culture systems, sucker eggs may be taken at a rate of two quarts per 1,000 muskellunge fry being reared. The taking of sucker eggs from public waters is subject to chapter 97C and may be supervised by the commissioner.

**17.4995 RECEIPTS TO THE GAME AND FISH FUND.**

Money received by the state under sections 17.4981 to 17.4997 must be deposited in the state treasury and credited to the game and fish fund.

**17.4996 WHITE EARTH INDIAN RESERVATION.**

Until the commissioner reaches an agreement with the White Earth Indian Reservation regarding the acquisition and sale of aquatic life from public waters, an aquatic farm licensee may acquire and transport rough fish, as defined in section 97A.015, subdivision 43, and yellow perch lawfully acquired and possessed by a tribal member for sale under tribal laws and regulations on the White Earth Reservation. Transportation of yellow perch off the reservation must be accompanied by documentation showing the source and number of the yellow perch.

**17.4997 RULES.**

The commissioner may adopt rules that are consistent with sections 17.4981 to 17.4996. The commissioner must notify the Minnesota aquaculture commission and the commissioner of agriculture prior to publication of the proposed rules.

**17.4998 VIOLATIONS; PENALTY.**

Unless a different penalty is prescribed, a violation of a provision of sections 17.4981 to 17.4997 or a rule of the commissioner governing the operation of an aquatic farm, private fish hatchery, or quarantine facility is a misdemeanor.

**97A.475 LICENSE FEES.**

Subdivision 1. **Requirements for issuance.** A license shall be issued when the requirements of the law are met and the license fee specified in this section is paid.

Subd. 26. **Minnow dealers.** The fees for the following licenses are:

(1) minnow dealer, $77;

(2) minnow dealer's helper, $5.50;

(3) minnow dealer's vehicle, $11;

(4) exporting minnow dealer, $275; and

(5) exporting minnow dealer's vehicle, $11.

Subd. 27. **Minnow retailers.** The fees for the following licenses, to be issued to residents and nonresidents, are:

(1) minnow retailer, $11; and

(2) minnow retailer's vehicle, $11.

Subd. 28. **Nonresident minnow haulers.** The fees for the following licenses, to be issued to nonresidents, are:

(1) exporting minnow hauler, $525; and

(2) exporting minnow hauler's vehicle, $11.

Subd. 29. **Private fish hatcheries.** The fees for the following licenses to be issued to residents and nonresidents are:

(1) for a private fish hatchery, with annual sales under $200, $27.50;
(2) for a private fish hatchery, with annual sales of $200 or more, $55; and
(3) To take sucker eggs from public waters for a private fish hatchery, $165, plus $3 for each quart in excess of 100 quarts.
Subd. 29a. **Fish farms.** The fees for the following licenses to be issued to residents and nonresidents are:
(1) for a fish farm, $275; and
(2) to take sucker eggs from public waters for a fish farm, $165, plus $3 for each quart in excess of 100 quarts.
Subd. 39. **Fish packer.** The fee for a license to prepare dressed game fish for transportation or shipment is $14.50.
Subd. 40. **Fish vendors.** The fee for a license to use a motor vehicle to sell fish is $27.50.

**97C.203 DISPOSAL OF STATE HATCHERY EGGS OR FRY.**

The commissioner shall dispose of game fish eggs and fry according to the following order of priorities:
(1) distribution of fish eggs and fry to state hatcheries to hatch fry or raise fingerlings for stocking waters of the state for recreational fishing; and
(2) sale of fish eggs and fry to private fish hatcheries or licensed aquatic farms at a price not less than the fair wholesale market value, established as the average price charged at the state's private hatcheries and contiguous states per volume rates.

**97C.205 RULES FOR TRANSPORTING AND STOCKING FISH.**

(a) The commissioner may adopt rules to regulate:
(1) the transportation of fish and fish eggs from one body of water to another; and
(2) the stocking of waters with fish or fish eggs.
(b) The commissioner shall prescribe rules designed to encourage local sporting organizations to propagate game fish by using rearing ponds. The rules must:
(1) prescribe methods to acquire brood stock for the ponds by seining public waters;
(2) allow the sporting organizations to own and use seines and other necessary equipment; and
(3) prescribe methods for stocking the fish in public waters that give priority to the needs of the community where the fish are reared and the desires of the organization operating the rearing pond.

**97C.211 PRIVATE FISH HATCHERIES.**

Subdivision 1. **License required.** A person may not operate a private fish hatchery without a private fish hatchery license. A private fish hatchery is a facility for raising fish, including minnows, for sale, stocking waters, angling, or processing.
Subd. 2. **Rules for operation.** The commissioner shall prescribe rules that allow a person to maintain and operate a private fish hatchery to raise and dispose of fish. The commissioner shall establish and assess a fee to cover the cost of inspection and disease certification of private hatcheries.
Subd. 2a. **Acquisition of fish.** (a) A private fish hatchery may not obtain fish outside of the state unless the fish or the source of the fish are approved by the commissioner. The commissioner may apply more stringent requirements to fish or a source of fish from outside the state than are applied to fish and sources of fish from within the state. The commissioner must either approve or deny the acquisition within 30 days after receiving a written request for approval. Minnows acquired must be processed and not released into public waters, except as provided in section 97C.515, subdivision 4. A request may be for annual acquisition.
(b) If the commissioner denies approval, a written notice must be submitted to the applicant stating the reasons for the denial and the commissioner must:
(1) designate approved sources to obtain the desired fish or fish eggs; or
(2) sell the fish or fish eggs from state fish hatcheries at fair market value.
Subd. 3. **Fishing license not required for persons to take fish.** A person may take fish by angling without a fishing license at a licensed private fish hatchery or an artificial pool containing only fish purchased from a private fish hatchery, if the operator of the hatchery or pool furnishes each person catching fish a certificate prescribed by the commissioner. The certificate must state the number and species of the fish caught and other information as prescribed by the commissioner. A person without a fishing license may possess, ship, and transport within the state the fish caught in the same manner as fish taken by a resident with a fishing license.
Subd. 4. **License required to take sucker eggs.** A person may not take sucker eggs from public waters for a private fish hatchery without a license to do so.
Subd. 5. **Price of walleye fry.** The commissioner may not sell walleye fry for less than fair market value, defined as the average price charged by private walleye fry wholesalers located in Minnesota.

**97C.301 LICENSE REQUIRED TO TAKE FISH.**

Subdivision 1. **Requirement.** Unless exempted under section 97A.445, 97A.451, or 97A.465, subdivision 1, a person must have a license to take fish as provided in this section.
Subd. 5. **Aquatic farms.** An aquatic farm licensee may take aquatic life under the aquatic farm license and its endorsements as authorized without additional licenses under the game and fish laws.

**97C.501 MINNOW LICENSES REQUIRED.**

Subdivision 1. **Minnow retailers.** (a) A person may not be a minnow retailer without a minnow retailer license except as provided in subdivision 3.
(b) A minnow retailer must obtain a minnow retailer's vehicle license for each motor vehicle used by the minnow retailer to transport more than 12 dozen minnows to the minnow retailer's place of business, except as provided in subdivision 3. A minnow retailer is not required to obtain a minnow retailer's vehicle license if minnows are being transported by common carrier and information is provided that allows the commissioner to find out the location of the shipment in the state.
Subd. 2. **Minnow dealers.** (a) A person may not be a minnow dealer without a minnow dealer license except as provided in subdivision 3.
(b) A minnow dealer must obtain a minnow dealer's helper license for each person employed to take, buy, sell, or transport minnows by the minnow dealer. The minnow dealer may transfer a helper's license from a former helper to a new helper.
(c) A minnow dealer must obtain a minnow dealer's vehicle license for each motor vehicle used to transport minnows. The serial number, motor vehicle license number, make, and model must be on the license. The license must be conspicuously displayed in the vehicle.
(d) A minnow dealer may not transport minnows out of the state without an exporting minnow dealer license. A minnow dealer must obtain an exporting minnow dealer's vehicle license for each motor vehicle used to transport minnows out of the state. The serial number,

motor vehicle license number, make, and model must be on the license. The license must be conspicuously displayed in the vehicle.
Subd. 3. **License exemption for minors selling leeches.** A resident under age 18 may take leeches, sell leeches at retail, and transport leeches without a minnow retailer or dealer license.
Subd. 4. **Nonresident minnow haulers.** (a) A nonresident may not transport minnows in a motor vehicle without an exporting minnow hauler license.
(b) A nonresident must obtain an exporting minnow hauler's vehicle license for the motor vehicle used to transport minnows. The serial number, motor vehicle license number, make, and model must be on the license. The license must be conspicuously displayed in the vehicle.
(c) Only one nonresident motor vehicle license may be issued to an exporting minnow hauler.

**97C.505 MINNOWS.**
Subdivision 1. **Authority to take, possess, buy, and sell.** (a) Minnows may be taken, possessed, bought, and sold, subject to the restrictions in this chapter and in rules adopted by the commissioner under paragraph (b). A person may not take, possess, or sell minnows except for use as bait or for ornamental or aquacultural purposes.
(b) The commissioner may adopt rules for the taking, possession, purchase, sale, and transportation of minnows.
Subd. 2. **Continuous open season.** The open season for taking minnows is continuous, except as provided in subdivisions 3 and 4.
Subd. 3. **Closing waters.** The commissioner may close any state waters for commercially taking minnows if a survey is conducted and the commissioner determines it is necessary to close the waters to prevent depletion or extinction of the minnows.
Subd. 4. **Hours of taking.** A person may not take minnows from one hour after sunset to one hour before sunrise.
Subd. 5. **Restrictions on taking from trout waters.** A person may not take minnows from designated trout lakes or trout streams without a special permit issued by the commissioner.
Subd. 6. **Approved equipment required.** A person must use equipment approved by the commissioner to possess or transport minnows for sale. This subdivision does not apply to licensed aquatic farms.

**97C.511 MINNOW SEINES.**
Subdivision 1. **Size restrictions.** Except as provided in subdivision 2, a person may not take minnows with a seine longer than 25 feet, and deeper than:
(1) 148 meshes of 1/4 inch bar measure;
(2) 197 meshes of 3/16 inch bar measure; or
(3) four feet of material of less than 3/16 inch bar measure.
Subd. 2. **Licensed minnow dealers.** A minnow dealer may take minnows with a seine that is not longer than 50 feet, and not deeper than:
(1) 222 meshes of 1/4 inch bar measure;
(2) 296 meshes of 3/16 inch bar measure; or
(3) six feet of material of less than 3/16 inch bar measure.

**97C.515 IMPORTED MINNOWS.**
Subdivision 1. **General prohibition.** A person may not bring live minnows into the state except as provided in this section.
Subd. 2. **Permit for transportation.** A person may transport minnows through the state with a permit from the commissioner. The permit must state the name and address of the person, the number and species of minnows, the point of entry into the state, the destination, and the route through the state. The permit is not valid for more than 12 hours after it is issued.
Subd. 3. **Use in home aquariums allowed.** A person may bring live minnows into the state for home aquariums.
Subd. 4. **Private fish hatchery or aquatic farm.** A person with a private fish hatchery or aquatic farm license may transport minnows from contiguous states to the private fish hatchery or aquatic farm, provided the minnows are used for processing or feeding hatchery fish. The commissioner may require inspection of minnows transported from outside the state.
Subd. 5. **Special permits.** (a) The commissioner may issue a special permit, without a fee, to allow a person with a private fish hatchery license to import minnows from other states for export. A permit under this subdivision is not required for importation authorized under subdivision 4.
(b) An applicant for a permit under this subdivision shall submit to the commissioner sufficient information to identify potential threats to native plant and animal species and an evaluation of the feasibility of the proposal. The permit may include reasonable restrictions on importation, transportation, possession, containment, and disposal of minnows to ensure that native species are protected. The permit may have a term of up to two years and may be modified, suspended, or revoked by the commissioner for cause, including violation of a condition of the permit.

**97C.521 TRANSPORTATION OF CARP FINGERLINGS PROHIBITED.**
A person may not transport live carp fingerlings.

**97C.525 RESTRICTIONS ON TRANSPORTATION OF MINNOWS.**
Subdivision 1. **Applicability.** This section does not apply to the transportation of 24 dozen minnows, or less, or to transportation with a permit issued under section 97C.515, subdivision 2.
Subd. 2. **Transporting out of the state.** A person may not transport minnows out of the state, except as provided in this section.
Subd. 3. **Minnow dealers and haulers.** A resident minnow dealer or a nonresident exporting minnow hauler may transport minnows out of the state. A nonresident exporting minnow hauler must possess a bill of lading issued by a minnow dealer with an exporting minnow dealer's license. The bill of lading must be on a form furnished by the commissioner and must state the exporting minnow hauler's name and address, the route through the state, number and species of minnows, and the time it was issued.
Subd. 4. **Minnow retailers.** A minnow retailer transporting minnows from a place of wholesale purchase to the retailer's place of business must use the most reasonably direct route.
Subd. 5. **Out-of-state vehicles.** The exporting minnow hauler must transport the minnows out of the state within 24 hours of the time of issuance stated on the bill of lading. A person may not transport minnows in a motor vehicle licensed in another state without an exporting minnow hauler's vehicle license.
Subd. 6. **Common carrier.** An exporting minnow dealer may transport minnows by common carrier and must provide on request by the commissioner information pertaining to product, quantity, and destination.

**97C.871 CRAYFISH.**
The commissioner may adopt rules, including record keeping re-

quirements, for taking, importing, buying, selling, possessing, and transporting crayfish.

**103G.221 DRAINAGE OF PUBLIC WATERS WETLANDS.**

Subdivision 1. **Drainage of public waters wetlands generally prohibited without replacement.** Except as provided in subdivisions 2 and 3, public waters wetlands may not be drained, and a permit authorizing drainage of public waters wetlands may not be issued, unless the public waters wetlands to be drained are replaced by wetlands that will have equal or greater public value.

**103G.222 REPLACEMENT OF WETLANDS.**

(a) After the effective date of the rules adopted under section 103B.3355 or 103G.2242, whichever is later, wetlands must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetland areas of at least equal public value under either a replacement plan approved as provided in section 103G.2242 or, if a permit to mine is required under section 93.481, under a mining reclamation plan approved by the commissioner under the permit to mine. Mining reclamation plans shall apply the same principles and standards for replacing wetlands by restoration or creation of wetland areas that are applicable to mitigation plans approved as provided in section 103G.2242.

(b) Replacement must be guided by the following principles in descending order of priority:

(1) avoiding the direct or indirect impact of the activity that may destroy or diminish the wetland;

(2) minimizing the impact by limiting the degree or magnitude of the wetland activity and its implementation;

(3) rectifying the impact by repairing, rehabilitating, or restoring the affected wetland environment;

(4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the activity; and

(5) compensating for the impact by replacing or providing substitute wetland resources or environments.

(c) If a wetland is located in a cultivated field, then replacement must be accomplished through restoration only without regard to the priority order in paragraph (b), provided that a deed restriction is placed on the altered wetland prohibiting nonagricultural use for at least ten years.

(d) Restoration and replacement of wetlands must be accomplished in accordance with the ecology of the landscape area affected.

(e) Replacement shall be within the same watershed or county as the impacted wetlands, as based on the wetland evaluation in section 103G.2242, subdivision 2, except that counties or watersheds in which 80 percent or more of the presettlement wetland acreage is intact may accomplish replacement in counties or watersheds in which 50 percent or more of the presettlement wetland acreage has been filled, drained, or otherwise degraded. Wetlands impacted by public transportation projects may be replaced statewide, provided they are approved by the commissioner under an established wetland banking system, or under the rules for wetland banking as provided for under section 103G.2242.

(f) Except as provided in paragraph (g), for a wetland located on nonagricultural land, replacement must be in the ratio of two acres of replaced wetland for each acre of drained or filled wetland.

(g) For a wetland located on agricultural land or in counties or watersheds in which 80 percent or more of the presettlement wetland acreage exists, replacement must be in the ratio of one acre of replaced wetland for each acre of drained or filled wetland.

(h) Wetlands that are restored or created as a result of an approved replacement plan are subject to the provisions of this section for any subsequent drainage or filling.

(i) Except in counties or watersheds where 80 percent or more of the presettlement wetlands are intact, only wetlands that have been restored from previously drained or filled wetlands, wetlands created by excavation in nonwetlands, wetlands created by dikes or dams along public or private drainage ditches, or wetlands created by dikes or dams associated with the restoration of previously drained or filled wetlands may be used in a statewide banking program established in rules adopted under section 103G.2242, subdivision 1. Modification or conversion of nondegraded naturally occurring wetlands from one type to another are not eligible for enrollment in a statewide wetlands bank.

(j) The technical evaluation panel established under section 103G.2242, subdivision 2, shall ensure that sufficient time has occurred for the wetland to develop wetland characteristics of soils, vegetation, and hydrology before recommending that the wetland be deposited in the statewide wetland bank. If the technical evaluation panel has reason to believe that the wetland characteristics may change substantially, the panel shall postpone its recommendation until the wetland has stabilized.

**103G.2241 EXEMPTIONS.**

(a) Subject to the conditions in paragraph (b), a replacement plan for wetlands is not required for:

(20) aquaculture activities, including pond excavation and construction and maintenance of associated access roads and dikes authorized under, and conducted in accordance with, a permit issued by the United States Army Corps of Engineers under section 404 of the federal Clean Water Act, United States Code, title 33, section 1344, but not including construction or expansion of buildings;

**103G.271 APPROPRIATION AND USE OF WATERS.**

Subdivision 1. **Permit required.** (a) Except as provided in paragraph (b), the state, a person, partnership, or association, private or public corporation, county, municipality, or other political subdivision of the state may not appropriate or use waters of the state without a water use permit from the commissioner.

(b) This section does not apply to use for a water supply by less than 25 persons for domestic purposes.

Subd. 6. **Water use permit processing fee.** (a) Except as described in paragraphs (b) to (f), a water use permit processing fee must be prescribed by the commissioner in accordance with the following schedule of fees for each water use permit in force at any time during the year:

(1) 0.05 cents per 1,000 gallons for the first 50,000,000 gallons per year;

(2) 0.10 cents per 1,000 gallons for amounts greater than 50,000,000 gallons but less than 100,000,000 gallons per year;

(3) 0.15 cents per 1,000 gallons for amounts greater than 100,000,000 gallons but less than 150,000,000 gallons per year; and

(4) 0.20 cents per 1,000 gallons for amounts greater than 150,000,000 gallons but less than 200,000,000 gallons per year;

(5) 0.25 cents per 1,000 gallons for amounts greater than 200,000,000 gallons but less than 250,000,000 gallons per year;

(6) 0.30 cents per 1,000 gallons for amounts greater than 250,000,000 gallons but less than 300,000,000 gallons per year;

(7) 0.35 cents per 1,000 gallons for amounts greater than 300,000,000 gallons but less than 350,000,000 gallons per year;

(8) 0.40 cents per 1,000 gallons for amounts greater than 350,000,000 gallons but less than 400;000,000 gallons per year; and

(9) 0.45 cents per 1,000 gallons for amounts greater than 400,000,000 gallons per year.

**103G.281 WATER USE PROHIBITED WITHOUT MEASURING QUANTITIES.**

Subdivision 1. **Measuring and records required.** The state, a political subdivision of the state, a person, partnership, public or private corporation, or association may not appropriate or use waters of the state without measuring and keeping a record of the quantity of water used or appropriated as provided in section 103G.271 or 103G.275.

Subd. 2. **Measuring equipment required.** An installation for appropriating or using water must be equipped with a flow meter to measure the quantity of water appropriated within the degree of accuracy required by rule. The commissioner can determine other methods to be used for measuring water quantity based on the quantity of water appropriated or used, the source of water, the method of appropriating or using water, and any other facts supplied to the commissioner.

Subd. 3. **Report.** (a) Records of the amount of water appropriated or used must be kept for each installation. The readings and the total amount of water appropriated must be reported annually to the commissioner on or before February 15 of the following year on forms provided by the commissioner.

(b) The records must be submitted with the annual water use permit processing fee in section 103G.271.

**103G.285 SURFACE WATER APPROPRIATIONS.**

Subdivision 1. **Waiver.** The commissioner may waive a limitation or requirement in subdivisions 2 to 6 for just cause.

Subd. 2. **Natural and altered natural watercourses.** If data are available, permits to appropriate water from natural and altered natural watercourses must be limited so that consumptive appropriations are not made from the watercourses during periods of specified low flows. The purpose of the limit is to safeguard water availability for instream uses and for downstream higher priority users located reasonably near the site of appropriation.

Subd. 3. **Waterbasins.** (a) Permits to appropriate water from waterbasins must be limited so that the collective annual withdrawals do not exceed a total volume of water amounting to one-half acre-foot per acre of waterbasin based on Minnesota department of conservation bulletin No. 25, "An Inventory of Minnesota Lakes," published in 1968.

(b) As a condition to a surface water appropriation permit, the commissioner shall set a protective elevation for the waterbasin, below which an appropriation is not allowed. During the determination of the protective elevation, the commissioner shall consider:

(1) the elevation of important aquatic vegetation characteristics related to fish and wildlife habitat;

(2) existing uses of the waterbasin by the public and riparian landowners; and

(3) the total volume within the waterbasin and the slope of the littoral zone.

Subd. 4. **Waterbasins less than 500 acres.** As part of an application for appropriation of water from a waterbasin less than 500 acres in surface area, the applicant shall obtain a statement of support with as many signatures as the applicant can obtain from property owners with property riparian to the waterbasin. The statement of support must:

(1) state support for the proposed appropriation; and

(2) show the number of property owners whose signatures the applicant could not obtain.

Subd. 5. **Trout streams.** Permits issued after June 3, 1977, to appropriate water from streams designated trout streams by the commissioner's orders under section 97C.021 must be limited to temporary appropriations.

Subd. 6. **Contingency planning.** An application for use of surface waters of the state is not complete until the applicant submits, as part of the application, a contingency plan that describes the alternatives the applicant will use if further appropriation is restricted due to the flow of the stream or the level of a waterbasin. A surface water appropriation may not be allowed unless the contingency plan is feasible or the permittee agrees to withstand the results of not being able to appropriate water.

**297A.02 IMPOSITION OF TAX.**

Subdivision 1. **Generally.** Except as otherwise provided in this chapter, there is imposed an excise tax of six percent of the gross receipts from sales at retail made by any person in this state.

Subd. 2. **Machinery and equipment.** Notwithstanding the provisions of subdivision 1, the rate of the excise tax imposed upon sales of special tooling is four percent and upon sales of farm machinery and aquaculture production equipment is two percent.

Subd. 19. **Aquaculture production equipment.** "Aquaculture production equipment" means new or used machinery, equipment, implements, accessories, and contrivances used directly and principally in aquaculture production. Aquaculture production equipment includes: augers and blowers, automatic feed systems, manual feeding equipment, shockers, gill nets, trap nets, seines, box traps, round nets and traps, net pens, dip nets, net washers, floating net supports, floating access walkways, net supports and walkways, growing tanks, holding tanks, troughs, raceways, transport tanks, egg taking equipment, egg hatcheries, egg incubators, egg baskets and troughs, egg graders, egg counting equipment, fish counting equipment, fish graders, fish pumps and loaders, fish elevators, air blowers, air compressors, oxygen generators, oxygen regulators, diffusers and injectors, air supply equipment, oxygenation columns, water coolers and heaters, heat exchangers, water filter systems, water purification systems, waste collection equipment, feed mills, portable scales, feed grinders, feed mixers, feed carts and trucks, power feed wagons, fertilizer spreaders, fertilizer tanks, forage collection equipment, land levelers, loaders, post hole diggers, disc, harrow, plow, and water diversion devices. Repair or replacement parts for aquaculture production equipment shall not be included in the definition of aquaculture production equipment.

## Minnesota Rules Relating To Aquaculture Production

**6216.0100 DEFINITIONS.**

Subpart 1. **Scope.** The terms used in parts 6216.0100 to 6216.0700 have the meanings given to them in Minnesota Statutes, sections 84.967 and 97A.015, unless otherwise noted.

Subp. 2. **Applicant.** "Applicant" means any person who applies for a permit pursuant to parts 6216.0100 to 6216.0700.

Subp. 3. **Aquatic plant.** "Aquatic plant" means a plant, including any part or seed of a plant, that can grow in water or on a substrate that is at least periodically deficient in oxygen as a result of water content.

Subp. 4. **Commissioner.** "Commissioner" means the commissioner of natural resources or a designated employee.

Subp. 5. **Department.** "Department" means the Department of Natural Resources.
Subp. 6. **Escape.** "Escape" means an accidental introduction or escape of a species from the control of the owner or responsible party.
Subp. 7. **Exotic species.** "Exotic species" means a species that enters or is introduced into an ecosystem beyond its historic range, except through a natural range expansion, including any such organism transferred from another country into the state, unnaturally occurring hybrids, cultivars, non-Minnesota genetic lineage or subspecies, genetically engineered species or strains, or other genetically altered species.
Subp. 8. **Exotic species importation and release permit.** "Exotic species importation and release permit" means a permit issued by the commissioner to allow the importation and release of an exotic species in the state.
Subp. 9. **Infested waters.** "Infested waters" means bodies of water with populations of zebra mussels, Eurasian water milfoil, ruffe, spiny water flea, or white perch.
Subp. 10. **Limited infestation.** "Limited infestation" means an infestation of Eurasian water milfoil occupying less than 20 percent of the littoral area of a water body up to a maximum of 75 acres, excluding water bodies where mechanical harvesting is used to manage Eurasian water milfoil or where no Eurasian water milfoil control is planned.
Subp. 11. **Littoral area.** "Littoral area" means those areas of a water body 15 feet or less in depth.
Subp. 12. **Native species.** "Native species" means a species present in an ecosystem within its historic range, or naturally expanded from its historic range, in the state.
Subp. 13. **Naturalize.** "Naturalize" means to establish a self-sustaining population of exotic species in the wild.
Subp. 14. **Release.** "Release" means an intentional introduction or release of a species from the control of the owner or responsible party.
Subp. 15. **Transport.** "Transport" means causing or attempting to cause undesirable aquatic plants and wild animals to be carried or moved by a device and includes, but is not limited to, accepting or receiving undesirable aquatic plants or wild animals for transportation or shipment. Transport does not include the incidental movement of undesirable aquatic plants or wild animals within a contiguous water body.
Subp. 16. **Undesirable exotic aquatic plant.** "Undesirable exotic aquatic plant" means the following ecologically harmful exotic species:
A. Eurasian water milfoil *(Myriophyllum spicatum)*;
B. curly leaf pondweed *(Potamogeton crispus);*
C. flowering rush *(Butomus umbellatus)*;
D. any variety, hybrid, or cultivar of purple loosestrife *(Lythrum salicaria, Lythrum virgatum,* or combinations thereof);
E. water chestnut *(Trapa natans)*; and
F. hydrilla *(Hydrilla verticillata).*
Subp. 17. **Undesirable exotic aquatic plant or wild animal permit.** "Undesirable exotic aquatic plant or wild animal permit" means a permit issued by the department to transport, possess, sell, purchase, import, take, or propagate undesirable exotic aquatic plants or undesirable exotic wild animals.
Subp. 18. **Undesirable exotic wild animal.** "Undesirable exotic wild animal" means the following ecologically harmful exotic species:
A. white perch *(Morone americana)*;
B. ruffe *(Gymnocephalus cernua)*;
C. grass carp *(Ctenopharyngodon idella)*;
D. zander *(Stizostedion lucioperca)*;
E. any strain of nutria *(Mycocastor coypu)*;
F. European rabbit *(Oryctolagus cuniculus)*;
G. Asian raccoon dog, also known as finnraccoon *(Nyctereutes procyonoides)*;
H. Eurasian wild pigs and their hybrids *(Sus scrofa* subspecies and *Sus scrofa* hybrids) excluding domestic hogs *(S. scrofa domesticus)*;
I. rusty crayfish *(Orconectes rusticus)*;
J. zebra mussel species (all species of the genus *Dreissena)*;
K. spiny water flea *(Bythotrephes cederstroemi)*;
L. asiatic clam *(Corbicula fluminea)*;
M. mute swan *(Cygnus olor)*;
N. Sichuan pheasant *(Phasianus colchicus strauchi)*;
O. sea lamprey *(Petromyzon marinus)*;
P. common carp *(Cyprinus carpio)*;
Q. tilapia species (all species of the genus *Tilapia)*;
R. rudd *(Scardinius erythrophthalmas)*;
S. tubenose goby *(Protererorhinus marmoratus)*; and
T. round goby *(Neogobius melanostomus).*
Subp. 19. **Water transmitted harmful exotic species.** "Water transmitted harmful exotic species" means:
A. hydrilla *(Hydrilla verticillata)*;
B. curly leaf pondweed *(Potamogeton crispus)*;
C. flowering rush *(Butomus umbellatus)*;
D. any variety, hybrid, or cultivar of purple loosestrife *(Lythrum salicaria, Lythrum virgatum,* or combinations thereof);
E. water chestnut *(Trapa natans)*;
F. white perch *(Morone americana)*;
G. ruffe *(Gymnocephalus cernua)*;
H. grass carp *(Ctenopharyngodon idella)*;
I. zander *(Stizostedion lucioperca)*;
J. rusty crayfish *(Orconectes rusticus)*;
K. spiny water flea *(Bythotrephes cederstroemi)*;
L. asiatic clam *(Corbicula fluminea)*;
M. sea lamprey *(Petromyzon marinus)*;
N. common carp *(Cyprinus carpio)*;
O. tilapia species (all species of the genus *Tilapia)*;
P. rudd *(Scardinius erythrophthalmas)*;
Q. tubenose goby *(Protererorhinus marmoratus)*; and
R. round goby *(Neogobius melanostomus).*

**6216.0200 POSSESSION, TRANSPORTATION, PURCHASE, SALE, OR IMPORTATION OF UNDESIRABLE EXOTIC SPECIES.**
Subpart 1. **Prohibition.** A person may not transport, possess, sell, purchase, import, propagate, or release undesirable exotic plants or animals designated as ecologically harmful exotic species in this state except as provided in subparts 2 to 4, and part 6216.0300, subpart 5, or:
A. under an aquatic nuisance control permit;
B. under an undesirable exotic aquatic plant or wild animal permit;
C. under a transportation permit as provided in Minnesota Statutes, section 17.4985;
D. as provided by law; or
E. when these species are transported, in direct passage, through Minnesota according to appropriate state and federal regulations.
Subp. 2. **Control activities.** A person authorized by a permit issued by the commissioner may transport Eurasian water milfoil or other water transmitted harmful exotic species identified by the com-

missioner for disposal as part of a permitted harvest or control activity as specified in Minnesota Statutes, section 18.317, subdivision 2.

Subp. 3. **Possession and transportation of dead undesirable exotic species.** A person may possess and transport dead undesirable exotic species to the department to report their occurrence and for identification.

Subp. 4. **Common carp.** A person may possess, transport, buy, or sell common carp as provided by the game and fish laws.

**6216.0300 PERMIT REQUIREMENTS FOR UNDESIRABLE EXOTIC SPECIES.**

Subpart 1. **Permits.** Before a person may transport, possess, purchase, sell, import, take, or propagate an undesirable aquatic plant or animal specified in part 6216.0100 for scientific, research, education, control, or exhibition purposes, a permit must be obtained from the commissioner.

Subp. 2. **Revocation of permit.** Permits issued under this part may be revoked by the commissioner if the conditions of the permit are not met by the permittee or for any act or omission, including release or escape, that threatens native plant and animal populations in the state.

Subp. 3. **Expiration date.** All permits shall expire on December 31 of each year, except permits issued less than 90 days before December 31 shall expire on December 31 the following year.

Subp. 4. **Application period.** Persons possessing undesirable exotic wild animals on the effective date of parts 6216.0100 to 6126.0700 must apply for an undesirable exotic aquatic plant or wild animal permit under subpart 5 within 60 days of the effective date of parts 6216.0100 to 6216.0700.

Subp. 5. **Commercial purposes.** The following species may be possessed, sold, exported, taken, or transported live for commercial purposes under an undesirable exotic aquatic plant or wild animal permit, a game farm license, a commercial fishing license or permit, a commercial crayfish harvest permit, commercial crayfish importation permit, or an aquatic farm or private fish hatchery license issued by the commissioner:

A. rusty crayfish;
B. common carp;
C. wild pigs;
D. Sichuan pheasant; and
E. tilapia.

Subp. 6. **Inspection of permitted sites.** Facilities for holding undesirable exotic wild animals and aquatic plants for research, exhibition, education, or commercial purposes are subject to inspection at any reasonable time by the commissioner.

Subp. 7. **Contingency plans.** Permittees must prepare written contingency plans for eradication or recapture of released or escaped species as specified in their undesirable exotic aquatic plant or wild animal permit.

**6216.0400 NOTIFICATION, RECAPTURE, AND DESTRUCTION OF RELEASED UNDESIRABLE EXOTIC SPECIES.**

Subpart 1. **Notice; actions to recapture or destroy.** In the event of an escape or release of an undesirable exotic wild animal or aquatic plant species, the owner must immediately notify a conservation officer and is personally responsible for the recovery or destruction of the plants or animals. The owner of an escaped undesirable wild animal or accidentally introduced aquatic plant must immediately implement the actions specified in the contingency plan required by an undesirable exotic aquatic plant or wild animal permit. If the owner is unable to recapture or otherwise destroy the released or escaped plants or animals within ten days of the escape, the escaped plant or animal may be captured or destroyed by the department at the owner's expense.

Subp. 2. **Department action.** Released, escaped, or other unconfined undesirable exotic wild animals or accidentally introduced aquatic plants, that have not been reported to the department as provided in subpart 1, may be captured or destroyed at any time by the department to avoid potential establishment of naturalized populations.

**6216.0500 RESTRICTED ACTIVITIES ON INFESTED WATER BODIES.**

Subpart 1. **Prohibition on entry.** Entry by boaters, anglers, or other water users and their associated equipment into infestations of Eurasian water milfoil marked with yellow buoys according to part 6110.1500, on water bodies identified with limited infestations under part 6216.0600, is prohibited, except for emergencies.

Subp. 2. **Exceptions.** Enforcement, emergency, resource management, and other government personnel or contractors are exempt from this part when performing official duties or authorized work as prescribed in part 6110.1200, subpart 2, item D, subitem (3). Owners or leasees of land adjacent to the control area, that do not have an alternative route for their watercraft from their property to reach waters may use the shortest and most direct route through the limited infestation when traveling to and from their property. They shall also operate their watercraft in a manner that would least disturb the aquatic plants in the marked area.

Subp. 3. **Prohibition on taking bait from infested waters.** The taking of minnows for bait purposes from infested waters in Minnesota is prohibited.

Subp. 4. **Commercial fish nets used in infested waters.** Commercial fish nets that are used in infested waters in Minnesota may only be used in other infested bodies of water with the same species designation. In addition to the information required under Minnesota Statutes, section 97C.351, commercial fish nets used in infested waters must be marked with the species designation of the infested body of water.

Subp. 5. **Transporting water from infested waters.** Owners or operators of watercraft leaving waters of the Mississippi River downstream of St. Anthony Falls, Minnesota waters of Lake Superior including waters of the St. Louis River downstream of the Fond du Lac dam, waters of the Minnesota River downstream of Shakopee and Island Lake in St. Louis county, must drain livewells, bait containers, other boating-related equipment holding water, and bilges by removing the drain plug before transporting the watercraft on public roads. This subpart does not apply to ballast water utilized by documented commercial vessels engaged in interstate or international commerce.

Subp. 6. **Fish hatchery or aquatic farms in infested waters.** Infested waters will not be licensed for private fish hatcheries or aquatic farm use.

Subp. 7. **Designation of infested waters.** Infested waters shall be designated by the commissioner by publishing an official notice in the State Register and posting all public access points. Water bodies may be removed from designation by the commissioner by publishing an official notice in the State Register and removal of posting at public access points.

**6216.0600 IDENTIFICATION AND MARKING OF LIMITED INFESTATIONS OF EURASIAN WATER MILFOIL.**

Subpart 1. **Publication.** The commissioner shall identify bodies of water having limited infestations of Eurasian water milfoil by pub-

lishing the names of those bodies of water in the State Register and a local newspaper. At any time, the commissioner may amend the list as additional limited infestations are discovered or water bodies are determined to no longer have limited infestations.

Subp. 2. **Marking.** Infestations of Eurasian water milfoil on bodies of water determined to be limited infestations shall be marked by the department according to part 6110.1500, subpart 7. The commissioner will mark areas where Eurasian water milfoil control is planned. The markers will be removed after control actions are completed and Eurasian water milfoil plants are no longer a threat to fragment or transport by boaters, anglers, or other water users and their associated equipment.

**6216.0700 IMPORTATION AND RELEASE OF EXOTIC WILD ANIMALS AND AQUATIC PLANT SPECIES.**

Exotic species of wild animals or aquatic plants may not be imported for release or released unless they meet one or more of the following conditions:

A. it is authorized to be released from a licensed shooting preserve according to the conditions of the shooting preserve license;

B. it is a ringnecked pheasant, gray (Hungarian) partridge, or Chukar partridge, or quail;

C. it is an exotic bird permitted for falconry under a state falconry permit and registered by submitting a Federal Form 3-186A (Migratory Bird Acquisition/Disposition Report);

D. it is a biological control that has been thoroughly tested by the United States Department of Agriculture, and approved by the Minnesota Department of Agriculture, and the Department of Natural Resources;

E. it is released according to a plan approved by the commissioner;

F. it is imported and released according to Minnesota Statutes, section 17.4981 to 17.4997, and Commissioner's Order Number 2450, section 1, chapter 6250, or its successor;

G. it is a game fish already present in Minnesota and released according to a fish stocking permit issued by the department; or

H. for an exotic species that is not an undesirable exotic wild animal or aquatic plant, or not exempted in this part, all the following steps are completed to the satisfaction of the commissioner:

(1) the applicant applies for an exotic species importation and release permit;

(2) the applicant must submit health information and history for the animals to be imported;

(3) the applicant must prepare an environmental assessment worksheet including data verifying that the proposed introduction does not have the characteristics of an ecologically harmful exotic species and indicating for what reasons species native to the state are not an acceptable alternative to the proposed release;

(4) the commissioner determines it is in the best interest of the state to release the species from captivity; and

(5) the commissioner issues an importation and release permit to the applicant. REPEALER. Commissioner's Order Number 2450, section 1, chapter 6216, is repealed.

**6250.0100 DEFINITIONS.**

Subpart 1. **Scope.** The terms used in this chapter have the meanings given them in this part.

Subp. 2. **Approved laboratory methods.** "Approved laboratory methods" means methods described in the latest edition of the Procedures for the Detection and Identification of Certain Fish Pathogens published by the American Fisheries Society Fish Health Section, also known as the Fish Health Blue Book.

Subp. 3. **Aquatic life.** "Aquatic life" has the meaning given to "private aquatic life" as defined by Minnesota Statutes, section 17.47, and for purposes of commercial transactions, aquatic life is livestock.

Subp. 4. **Certifiable diseases.** "Certifiable diseases" include channel catfish virus, bacterial kidney disease, bacterial furunculosis, enteric redmouth disease, enteric septicemia of catfish, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, whirling disease, proliferative kidney disease, viral hemorrhagic septicemia virus, ceratomyxosis, epizootic epitheliotropic virus, and any emergency disease.

Subp. 5. **Containment facility.** "Containment facility" means a licensed facility for salmonids or catfish that complies with items A, C, and D, or B, C, and D:

A. disinfects its effluent to the standards provided by part 6250.0800 before the effluent is discharged to public waters;

B. does not discharge into public waters or into waters of the state directly connected to public waters;

C. raises aquatic life for food consumption only;

D. contains aquatic life requiring a fish health inspection prior to transportation.

Subp. 6. **Emergency fish disease.** "Emergency fish disease" means a designated disease not already present in this state that could impact populations of aquatic life if inadvertently released by infected aquatic life including, but not limited to, viral hemorrhagic septicemia virus, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, whirling disease, ceratomyxosis, proliferative kidney disease, channel catfish virus, epizootic epitheliotropic virus disease, or any other disease listed in a rule or published by the commissioner in the State Register on an emergency basis to be effective for not more than 240 days.

Subp. 7. **Enzootic.** "Enzootic" means a disease that is known to occur within well-defined geographic boundaries.

Subp. 8. **Fish health inspection.** "Fish health inspection" means an on-site statistically based sampling in accordance with procedures set forth in the Fish Health Blue Book for all lots of fish on the facility.

Subp. 9. **Fish health inspector.** "Fish health inspector" means an individual certified as a fish health inspector by the American Fisheries Society or a state, federal, or provincial resource management agency, except that a certification may not be made by an inspector who has a conflict of interest in connection with the outcome of the certification.

Subp. 10. **Game fish.** "Game fish" is defined by Minnesota Statutes, section 97A.015, except that green or orange spotted sunfish are not considered game fish for purposes of determining fish of significant public value.

Subp. 11. **Intensive culture.** "Intensive culture" means the rearing of fish at densities greater than can be supported in the natural environment.

Subp. 12. **Licensed facility.** "Licensed facility" means a licensed private fish hatchery including all licensed waters.

Subp. 13. **Lot.** "Lot" means a group of fish of the same species and age that originated from the same discrete spawning population and that always have shared a common water supply. Various age groups of adult brood stock of the same species may comprise the same lot if they have shared the same containers for one brood cycle.

Subp. 14. **Minnows.** "Minnows" is defined by Minnesota Statutes, section 97A.015, except the 12-inch restriction on sucker minnows does not apply.

Subp. 15. **Public waters.** "Public waters" is defined by Minnesota Statutes, section 103G.005.

Subp. 16. **Quarantine facility.** "Quarantine facility" means a cul-

ture system that is enclosed in a building and is separated from other fish culture facilities where fish can be isolated and maintained while preventing their introduction or pathogen introduction into the environment.

Subp. 17. **Standard facility.** "Standard facility" means a licensed facility with a continual or intermittent discharge of effluent to public waters.

Subp. 18. **Waters of the state.** "Waters of the state" is defined by Minnesota Statutes, section 103G.005.

STAT AUTH: MS s 97C.211

**6250.0200 FISH HATCHERY OPERATIONS.**

Subpart 1. **Acquisition and sale of private aquatic life.** Aquatic life legally possessed may be bought, acquired, and sold by licensed facilities as provided by this chapter.

Subp. 2. **Acquisition from state.** The commissioner may sell aquatic life to licensed facilities at fair market value. Fair market value must be determined by the average market price charged in this state and contiguous states and provinces for similar quantities.

Subp. 3. **Methods to harvest aquatic life.** Licensed facilities may use all reasonable methods to operate and harvest aquatic life from licensed facilities, including nets.

Subp. 4. **Discharge may require permit.** The discharge from a private fish hatchery must comply with discharge permits required by the Minnesota Pollution Control Agency.

Subp. 5. **Ownership of aquatic life.** The following provisions apply to the ownership of aquatic life:

A. Notwithstanding other provisions of law, aquatic life lawfully acquired and possessed by a licensed facility is private aquatic life and property of the owner of the licensed facility.

B. Private aquatic life in public waters may become property of the state if the waters are not part of a licensed facility. The commissioner will notify the licensee that the aquatic life in a facility that is no longer licensed will become property of the state if the aquatic life is not removed. If the licensee does not respond in writing within 30 days after receiving the notice and make alternative arrangements, or does not remove the aquatic life by 60 ice-free days after receiving the notice, the private aquatic life becomes property of the state.

C. Private aquatic life that is transferred to the state or released into public waters that are not part of a licensed facility is owned by the state and may be considered wildlife.

Subp. 6. **Control of licensed waters.** The following provisions apply to the use of licensed waters by the public:

A. If the public cannot legally access waters of the state that are part of a licensed private fish hatchery except by permission of the licensee, the use of the waters by the public is subject to restriction by the licensee.

B. Waters of the state may not be licensed for aquaculture use to more than one licensee.

Subp. 7. **Angling in licensed waters.** A person may not take fish by angling from waters subject to subpart 6, unless the person has written permission from the licensee and:

A. has an invoice when in possession of fish; or

B. takes fish under an angling license, subject to the limits and conditions in the game and fish laws.

STAT AUTH: MS s 97C.211

**6250.0300 FISH HATCHERY LICENSE.**

Subpart 1. **License required.** The following provisions apply to the licensing of a private fish hatchery:

A. A person or entity may not operate a private fish hatchery without first obtaining a private fish hatchery license from the commissioner.

B. An application for a private fish hatchery license must be made on a form provided by the commissioner.

C. A license issued by the commissioner is not a determination of private property rights, but is only based on a determination that the private fish hatchery does not have a significant detrimental impact on the public resource.

Subp. 2. **Listed waters.** The following provisions apply to the listing of waters for private fish hatcheries:

A. A private fish hatchery license must list:

(1) the specific waters of the state that may be used in connection with the licensed private fish hatchery and whether the hatchery is a standard, containment, or quarantine facility as defined by part 6250.0100;

(2) whether aeration requiring a permit is approved;

(3) whether piscicide use is approved; and

(4) those waters where nonindigenous species will be kept.

B. The right to use waters licensed for private fish hatchery or aquatic farm purposes may be transferred between licensees with prior approval by the commissioner if requirements for species to be raised are met. Waters that are continually connected by a permanent watercourse to other waters must not be approved for private fish hatchery use, except that connected waters that are isolated from other waters may be licensed as a single body of water. Waters that are intermittently connected or may become connected with other waters may be denied, or screening or other measures may be required to prevent passage of aquatic life. Listed waters may be changed on approval by the commissioner.

C. The commissioner will conduct an inspection of waters to be licensed prior to approving or denying initial licensing of the waters.

D. Waters containing game fish of significant public value may be denied licensing unless the applicant can demonstrate exclusive riparian control.

E. Waters containing game fish of significant public value may be denied licensing unless the game fish of significant public value are sold to the licensee, removed for other state use by the department, or disposed of as provided in writing by the commissioner.

F. Waters licensed under a private fish hatchery license may be aerated during open water periods without a separate aeration permit.

Subp. 3. **Listed species.** The following provisions apply to the listing of species for licensed waters:

A. A private fish hatchery license must list the species of aquatic life approved for each licensed water. Listed species of aquatic life may be changed on written request to and approval by the commissioner. Species of aquatic life regulated by Minnesota Statutes, chapters 97A, 97B, and 97C, may not be cultured unless listed on the license.

B. All waters licensed before July 1, 1992, under a private fish hatchery license must be approved for species listed under current licenses if other conditions for licensing are met.

C. If licensed waters are located within a 25-year floodplain and are not enclosed within a building, species of aquatic life may be licensed at the discretion of the commissioner.

D. Licensed waters located outside of a 25-year floodplain or enclosed within a building may be licensed for any species, except that the commissioner may deny licensing for species not present in the state.

Subp. 4. **Inspections and enforcement.** The premises, property, vehicles, private aquatic life, and equipment where private fish hatchery operations are being conducted are subject to inspection as pro-

vided by Minnesota Statutes, section 97A.215.
Subp. 5. **Records.** The following provisions apply to the maintenance and retention of records:
A. Licensees must keep complete, up-to-date records of the operation of the private fish hatchery. The records must be kept for at least three years.
B. The records must include the following information:
(1) for each species acquired, the number and pounds of fish or eggs acquired, the names and addresses of the sources from which acquired, and the dates of receipt;
(2) for each species sold or disposed of, the number and pounds of fish sold or disposed of, the names and addresses of the purchasers or persons to whom the conveyances are made, and the dates of sale; and
(3) for fish sperm or viable eggs, the amount acquired or sold, the names and addresses of the sources from which acquired, the purchasers to whom conveyed, and the dates of purchase or sale.
C. On or before March 1 of each year, the licensee must submit a complete annual report, on a form provided by the commissioner, covering the quantity of all species sold or purchased in the preceding license year.
D. Records are subject to inspection by the commissioner during reasonable hours.
STAT AUTH: MS s 97C.211

**6250.0400 TRANSPORTATION OF AQUATIC LIFE.**
Subpart 1. **Requirements for importation, transportation within the state, or stocking of fish.** Except as provided in subpart 3, an operator of a private fish hatchery may not import aquatic life into the state, transport aquatic life within the state, or stock waters of the state with aquatic life without first obtaining a bill of lading or transportation permit from the commissioner, with disease certification, if applicable.
Subp. 2. **Bill of lading.** The following provisions apply to the use of a bill of lading:
A. A person may transport aquatic life except salmonids or catfish with a completed bill of lading for:
(1) intrastate transportation of aquatic life between licensed private fish hatcheries, aquatic farms, or aquarium facilities licensed for the same species and of the proper classification for the aquatic life; and
(2) stocking of waters other than public waters.
B. When aquatic life is transported between licensed private fish hatcheries, aquatic farms, or aquarium facilities, a copy of the bill of lading must be submitted to the regional fisheries manager:
(1) at least 72 hours before the transportation, if species transported into a watershed are not found in it or have their original source outside this state and contiguous states; or
(2) within 30 days in cases not covered by subitem (1).
C. A bill of lading is also required at least 72 hours before any transportation between licensed waters of the same licensee, if species transported into a watershed are not found in it or have their original source outside this state and contiguous states.
D. For transportation and stocking of waters that are not public waters:
(1) a bill of lading must be submitted to the regional fisheries manager 72 hours before transporting fish for stocking;
(2) a bill of lading must be submitted to the regional fisheries manager within five days after stocking if the waters to be stocked are confirmed not to be public waters by telecopy or telephone prior to stocking by the regional fisheries office; or
(3) a completed bill of lading may be submitted to the regional fisheries office by telecopy prior to transporting fish for stocking. Confirmation that the waters to be stocked are not public waters may be made by returning the bill of lading by telecopy or in writing, in which cases additional copies need not be submitted to the department.
E. Bill of lading forms may only be issued by the Department of Natural Resources office located in St. Paul, and new bill of lading forms may not be issued until all previously issued forms have been returned.
Subp. 3. **Exemptions for transportation permits and bills of lading.** The following provisions apply to exemptions for transportation permits and bills of lading:
A. A bill of lading or transportation permit is not required by a private fish hatchery licensee for importation, transportation, or export for the following:
(1) minnows taken under a private fish hatchery license in this state and transported intrastate;
(2) aquarium or ornamental fish including tropical, subtropical, and saltwater species that cannot survive in the waters of the state, which may be imported or transported if accompanied by shipping documents;
(3) fish or fish eggs that have been processed for use as food, bait, or other purposes unrelated to fish propagation;
(4) live fish, except salmonids and catfish, from a licensed private fish hatchery, which are transported directly to an outlet for processing or for other food purposes if accompanied by shipping documents;
(5) fish being exported if accompanied by shipping documents;
(6) sucker eggs, sucker fry, or fathead minnows transported intrastate for bait propagation or feeding of cultured aquatic life;
(7) species of fish that are found within the state used in connection with public shows, exhibits, demonstrations, or fishing pools for periods not exceeding 14 days; or
(8) transfer of aquatic life between licensed waters of the same licensee, except when required in subpart 2.
B. Shipping documents required under this subpart must show the place of origin, owner or consignee, destination, number, and species.
Subp. 4. **Transportation permit requirements.** A transportation permit is required for all importation, transportation, or stocking of private aquatic life not covered by subpart 2 or exempted in subpart 3. A transportation permit may be used for multiple shipments within the 30-day term for the permit if the source and the destination remain the same. Transportation permits, which may authorize importation or stocking of public waters, may be issued through department regional offices or the St. Paul office, and must be obtained prior to shipment.
Subp. 5. **Permit application.** An application for a transportation permit must be made on forms provided by the commissioner. An application for a transportation permit for salmonids and catfish, their eggs, or sperm must be accompanied by certification that the source of the eggs or sperm are free of certifiable diseases, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported, transported, or stocked following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported, transported, or stocked into areas where the disease has been previously introduced. A copy of the transportation permit showing the date of certification inspection must accompany the shipment of fish while in transit and must be available for inspection by the commissioner. By 14 days after a completed application is received, the commissioner will approve or deny the importation permits as provided in this part.

Subp. 6. **Vehicle identification.** The following provisions apply to the identification of vehicles used in the operation of a private fish hatchery:
A. A vehicle used by a licensee for transporting aquatic life must be identified with the licensee's name and town of residence as it appears on the license and the license number.
B. A vehicle used by a licensee must have identification displayed so that it is readily visible from either side of the vehicle in letters and numbers not less than 2-1/2 inches high and with a three-eighths inch wide stroke. Identification may be permanently affixed to vehicles or displayed on removable plates or placards placed on opposite doors of the vehicle or on the tanks carried on the vehicle.
STAT AUTH: MS s 97C.211

**6250.0500 IMPORTATION OF AQUATIC LIFE.**
Subpart 1. **Licensed facilities.** The following provisions apply to the importation of aquatic life:
A. The commissioner may issue transportation permits to import:
(1) indigenous and naturalized species except trout, salmon, and catfish from any source to a standard facility;
(2) trout, salmon, and catfish from a nonemergency disease area to a containment facility if the fish are certified within the previous year to be free of certifiable diseases, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced; and
(3) trout, salmon, and catfish from a facility in a nonemergency disease area with a disease-free history of three years or more to a standard facility, except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced.
B. If a source facility in a nonemergency disease area cannot demonstrate a history free from disease, aquatic life may only be imported into a quarantine facility.
Subp. 2. **Enzootic disease area.** The following provisions apply to the importation of aquatic life in enzootic disease areas:
A. Except as otherwise provided and except that eggs with enteric redmouth, whirling disease, or furunculosis may be imported following treatment approved by the commissioner, and fish with bacterial kidney disease may be imported into areas where the disease has been previously introduced, fish may be imported from emergency disease enzootic areas only as fertilized eggs under the following conditions:
(1) to be imported into a standard facility, fertilized eggs must have a disease-free history for at least five years;
(2) to be imported into a containment facility, fertilized eggs must have a disease-free history for at least three years; or
(3) to be imported into a quarantine facility, fertilized eggs may have a disease-free history of less than three years.
B. A hatchery inspection must occur at least once a year and fish must have been tested for all certifiable diseases. The inspection must include at least viral testing of ovarian fluids at the 95 percent confidence level of detecting two percent incidence of disease (ovarian fluids must be sampled for certification of viral hemorrhagic septicemia and infectious hematopoietic necrosis). Bacterial diseases must be sampled at the 95 percent confidence level with a five percent incidence of disease. The inspection must be performed by a fish health inspector in cooperation with the producer with subsequent examination of the collected tissues and fluids for the detection of certifiable diseases.
STAT AUTH: MS s 97C.211

**6250.0600 STOCKING PRIVATE AQUATIC LIFE.**
A person may not release private aquatic life into public waters that are not licensed as part of a private fish hatchery without first obtaining a transportation permit from the commissioner. The commissioner may deny issuance of a permit if releasing the private aquatic life is not consistent with the management plan for the public waters.
STAT AUTH: MS s 97C.211

**6250.0700 LICENSE AND INSPECTION FEES.**
Subpart 1. **Private fish hatchery.** The private fish hatchery license must contain endorsements for the rights and privileges of the following licenses under the game and fish laws. The endorsements must be made upon payment of the license fee provided by Minnesota Statutes, section 97A.475, for the following licenses:
A. minnow dealer license;
B. minnow retailer license for sale of minnows as bait;
C. minnow exporting license;
D. minnow dealer helper license;
E. private fish hatchery vehicle endorsement, which includes a minnow dealer vehicle license, a minnow retailer vehicle license, an exporting minnow hauler vehicle license, and a fish vendor vehicle license;
F. sucker egg taking license; and
G. game fish packers license.
Subp. 2. **Inspection fees.** The fees for the following inspections are:
A. initial inspection of each water to be licensed, $50;
B. fish health inspection and certification, $20 plus $80 per lot thereafter; and
C. initial inspection for containment and quarantine facility inspections, $50.
STAT AUTH: MS s 97C.211

**6250.0800 DISEASE TRANSMISSION.**
Subpart 1. **Facility designation.** The following provisions apply to the designation of facilities to prevent disease transmission:
A. The licensee may apply to the commissioner for designation of all or a portion of a facility as a standard, containment, or quarantine facility on forms provided by the commissioner either as part of the license application or separately.
B. By 15 business days after an application is received, the commissioner must notify the applicant if there are any deficiencies in the application. By 30 business days after a complete application is received, the commissioner will approve or deny the designation requested.
Subp. 2. **Disinfection.** The following provisions apply to disinfection of effluent from containment facilities:
A. Containment facilities must disinfect effluent prior to discharge to public waters. The effluent required to be disinfected includes water used by a containment facility in the production of the aquatic life of concern, waste or mortalities from the aquatic life of concern, and live forage or commercial feed discarded from the containment facility. Runoff from precipitation and excess water from natural springs, wells, or other sources that is not used in the production of aquatic life is not effluent to be disinfected.
B. Disinfection treatment may include chlorination or other processes. If chlorine disinfection is utilized, a measurable residual

level of 1.0 part per million of active chlorine in the effluent must be maintained for one hour of retention time. The effluent must comply with chapter 7050.

C. A disinfection treatment process must ensure uninterrupted effluent treatment in the event of electrical power failure, a primary system failure, or other similar events that would cause treatment interruptions.

D. The effluent disinfection process must be sited, designed, and operated in a manner that allows inspection by the commissioner at all times to determine whether adequate effluent disinfection is maintained.

E. The commissioner may prescribe reasonable documentation of daily monitoring of treatment system performance to be included in the licensee's annual report. The records must be available for daily inspection by the commissioner during normal business hours and maintained for three years.

Subp. 3. **Fish health inspection.** The following provisions apply to fish health inspections:

A. A private fish hatchery propagating trout, salmon, or catfish and having an effluent discharge from the private fish hatchery into public waters must have an annual fish health inspection conducted by a certified fish health inspector. Testing must be conducted according to approved laboratory methods.

B. A fish health inspection fee must be charged based on each lot of fish sampled. The fee, by check or money order payable to the department, must be prepaid or paid at the time a bill or notice is received from the commissioner that the inspection and processing of samples is completed.

C. Upon receipt of payment and completion of inspection, the commissioner will notify the operator and issue a fish health certificate. The certification must be made according to the Fish Health Blue Book by a person certified as a fish health inspector.

D. All aquatic life in transit or held at transfer stations within the state may be inspected by the commissioner. This inspection may include the collection of stock for purposes of pathological analysis. Sample size necessary for analysis will follow guidelines listed in the Fish Health Blue Book.

Subp. 4. **Emergency disease determination.** If an emergency disease exists, the commissioner may order the fish in the facility to be impounded, confiscated, sold, or destroyed and the facility disinfected. The commissioner will make every effort to allow disposed fish to be sold for market if there is no imminent danger of a significant adverse impact on natural fish populations or human health or of escape of the pathogen to public waters.

STAT AUTH: MS s 97C.211

**6250.0900 GAME FISH.**

Subpart 1. **Acquisition and purchase.** Game fish sperm, viable game fish eggs, or live game fish may not be taken from public waters for aquaculture purposes but may be purchased from the state or acquired from licensed aquatic farms or private fish hatcheries.

Subp. 2. **Restriction on sale of game fish.** Species of the family salmonidae or ictaluridae, except bullheads, must be free of certifiable diseases if sold for stocking or transfer to another private fish hatchery or aquatic farm, except that eggs with enteric redmouth, whirling disease, or furunculosis may be transferred or stocked following treatment approved by the commissioner, and fish with bacterial kidney disease may be transferred or stocked to areas where the disease has been previously introduced.

Subp. 3. **Acquisition of fish for brood stock.** Game fish brood stock may be sold to private fish hatcheries by the state at fair market value. As a one-time purchase for brood stock development, up to 20 pairs of adults may be provided, if available, by the state through normal operations.

Subp. 4. **Sale of eggs by state.** The commissioner may offer for sale as eggs or fry up to two percent of the department's annual game fish egg harvest. Additional eggs or fry may be sold if they are surplus to this state's program needs.

Subp. 5. **Purchase of eggs dependent upon facility.** A licensee may purchase game fish eggs or fry from the state at a rate based on the capacity of the facility to hatch and rear fish. A licensee may purchase walleye at a rate of no more than one-half quart of eggs or 5,000 fry for each acre of licensed surface water. This limitation may be waived if a private fish hatchery is an intensive facility. The allowable purchase of trout or salmon eggs must be based on the capacity of rearing tanks and flow of water through the private fish hatchery.

Subp. 6. **Stocking walleye north of marked state Highway 210.** Walleye from outside of the area of the state north of marked state Highway 210 may not be stocked in waters of the state north of marked state Highway 210 without approval by the commissioner.

STAT AUTH: MS s 97C.211

**6250.1000 MINNOWS.**

Subpart 1. **Taking from public waters.** A licensee may take minnow sperm, minnow eggs, and live minnows from public waters for private fish hatchery purposes under a private fish hatchery license.

Subp. 2. **Importation of live minnows.** Minnows from outside of this state may not be imported live except as provided by Minnesota Statutes, section 97C.515.

STAT AUTH: MS s 97C.211

**6250.1100 SUCKER EGGS.**

Sucker eggs may be taken from public waters with a sucker egg license endorsement, which authorizes sucker eggs to be taken at a rate of one quart of eggs for each 1-1/2 acres of licensed surface waters, except that for intensive culture systems, sucker eggs may be taken at a rate of two quarts per 1,000 muskellunge fry being reared.

STAT AUTH: MS s 97C.211

**6250.1200 WHITE EARTH INDIAN RESERVATION.**

Until the commissioner reaches an agreement with the White Earth Indian Reservation regarding the acquisition and sale of aquatic life from public waters, a private fish hatchery licensee may acquire and transport rough fish, as defined by Minnesota Statutes, section 97A.015, and yellow perch lawfully acquired and possessed by a tribal member for sale under tribal laws and regulations on the White Earth Indian Reservation. Transportation of rough fish and yellow perch off the reservation must be accompanied by documentation showing the source and number of the yellow perch.

STAT AUTH: MS s 97C.211

**7050.0216 REQUIREMENTS FOR AQUACULTURE FACILITIES.**

Subpart 1. **Definitions.** For the purposes of this part, the terms in items A to J have the meanings given them.

A. "Aquaculture therapeutics" means drugs, medications, or disease control chemicals that are approved for concentrated aquatic animal production facility use by the United States Food and Drug Administration or the United States Environmental Protection Agency.

B. "Aquatic animal production" means harvest of unprocessed aquatic animals, including mortalities, where the animals are fed

fish food.

C. "Chemical additive" means an aquaculture therapeutic, growth-inducing compound, hormone, or algal control product that is added to a concentrated aquatic animal production facility.

D. "Cold water aquatic animals" means aquatic animals in the Salmonidae family of fish, such as trout and salmon.

E. "Concentrated aquatic animal production facility" means a hatchery, fish farm, or other facility that contains, grows, or holds aquatic animals as described in subitems (1) to (4).

(1) Cold water aquatic animal facilities that produce more that 9,090 harvest weight kilograms (approximately 20,000 pounds) of aquatic animals per year or feed more than 2,272 kilograms (approximately 5,000 pounds) of food during the calendar month of maximum feeding.

(2) Warm and cool water aquatic animal facilities that produce more than 45,454 harvest weight kilograms (approximately 100,000 pounds) of aquatic animals per year.

(3) Case-by-case designation of concentrated aquatic animal production facilities. The commissioner may designate any warm, cool, or cold water aquatic animal production facility as a concentrated aquatic animal facility upon determining that it may cause a violation of an applicable state or federal water quality rule or regulation. In making this designation, the commissioner shall consider the following factors:

(a) the location and quality of the receiving waters;

(b) the holding, feeding, and production capacities of the facility; and

(c) the quantity and nature of the pollutants reaching waters of the state.

A permit application is not required from a concentrated aquatic animal production facility designated under this item until the commissioner has conducted an on-site inspection of the facility and has determined that the facility is required to be regulated under the permit program. A permit will be required under this subitem only after the facility has been given notice of the commissioner's determination and an opportunity to request a hearing as provided in parts 7000.1000 and 7001.0130.

(4) Harvest weight is considered the weight of aquatic animal product which leaves a production facility, minus the weight of aquatic animal product which enters the same production facility.

F. "Continuous discharge" means a discharge that occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities.

G. "Existing beneficial uses" means the uses that have been made or may be reasonably anticipated to be made during the time of the proposed operations of waters of the state for domestic water supply, tourism and recreational industries, transportation, industrial consumption, wellhead protection, wildlife sustenance, wetland protection, fire protection, fire prevention, assimilation of municipal and industrial wastes and other wastes or other uses within this state, and, at the discretion of the agency, any uses in another state or interstate waters flowing through or originating in this state.

H. "Fish food" means materials including processed feeds, grains and seeds, plants, plant wastes, meat, and dead fish or other dead animal parts, but not including living aquatic animals, for the purposes of sustaining growth, repairing vital processes, or furnishing energy for aquatic animals present in the facility.

I. "Recirculating flow" means wastewater, within a concentrated aquatic animal production facility, which is collected from aquatic animal rearing units, treated, and then returned to aquatic animal rearing units for reuse.

J. "Warm and cool water aquatic animals" means all other aquatic animals not included in the Salmonidae family of fish.

Subp. 2. **Permit required.** No person may construct, operate, or maintain a concentrated aquatic animal production facility until the agency has issued a National Pollutant Discharge Elimination System and State Disposal System (NPDES/SDS) permit for the facility in accordance with chapter 7001 and parts 7023.9000 to 7023.9050. Production levels of multiple projects and multiple stages of a single project that are connected actions or phased actions will be considered in total under subpart 1, item E.

Subp. 3. **Treatment technology discharge requirements.**

A. Collection and treatment. All concentrated aquatic animal production facilities shall collect, remove, treat, and properly dispose of unconsumed fish food and fish wastes.

B. Discharge requirements. All concentrated aquatic animal production facilities that discharge industrial or other wastes to waters of the state shall comply with the requirements of part 7050.0212, subparts 1, 3, 4, 5, and 6.

C. Recirculating flow. The owner or operator of a recirculating flow facility may apply for a variance from the requirements of item B in accordance with parts 7000.0700 and 7050.0190. The variance application shall provide detailed information on the following:

(1) treatment, collection, removal, and disposal of wastes after wastewater flow leaves aquatic animal rearing units and before the wastewater is returned for reuse to rearing units;

(2) the rate of wastewater discharge flow compared to the volume of water in the aquatic animal rearing units;

(3) reduction in the mass discharge of pollutants due to the design, operation, and maintenance of the recirculating system; and

(4) reduction in water appropriation due to the design, operation, and maintenance of the recirculating system.

Subp. 4. **Additional requirements.** Except as expressly excluded in this part, the construction, operation, and maintenance of a concentrated aquatic animal production facility shall comply with the requirements of parts 7050.0110 to 7050.0214 and 7050.0217 to 7050.0220.

Subp. 5. **Interim reversible impacts.**

A. Variance. Upon application of the responsible person or persons and in accordance with parts 7000.0700 and 7050.0190, the agency shall grant a variance from subpart 3, item A or B, if the agency also finds that:

(1) the construction, operation, and maintenance of the facility will not impair the existing beneficial uses and the level of water quality necessary to protect the existing beneficial uses;

(2) the economic or social development of concern will not occur due to the standards in subpart 3;

(3) allowing lower water quality is necessary to accommodate important economic or social development in the area in which the receiving waters are located;

(4) the baseline quality of the receiving waters has been established in accordance with item C;

(5) a closure plan for the facility has been submitted in accordance with item E;

(6) financial assurance for the facility has been established and maintained in accordance with item F;

(7) the applicant has submitted a permit application for the facility for which the variance is sought in compliance with subpart 2;

(8) the applicant has submitted a completed variance application in accordance with item B; and

(9) the receiving waters will be restored to baseline quality within three years of initiation of closure.

However, no variances may be granted that would result in noncompliance with applicable federal rules, regulations, or standards for water quality.

B. Variance application. In addition to the requirements of part 7000.0700, subpart 2, the written application must contain:

(1) the baseline quality data of the receiving waters collected under commissioner-approved protocol in accordance with item C;

(2) the closure plan in accordance with item E; and

(3) an up-to-date closure cost estimate for the facility prepared under item E and evidence of the financial assurance required in item F.

C. Baseline quality. Baseline quality shall be established by no less than two consecutive years, or equivalent, of preoperational data on the receiving waters. The equivalent testing program shall require 12 sampling events for the parameters in item E collected during the months of May through October. Testing programs used to establish baseline quality shall be reviewed and approved by the commissioner before the start of testing. The commissioner shall supply the specific intra-year and inter-year variables.

D. Closure. If a variance is granted under item A, the permittee shall restore the receiving waters to baseline quality when:

(1) aquatic animal production from the facility ceases;

(2) any of the control pollutant limits in item G are exceeded;

(3) the permit for the facility expires, and reissuance of the permit is not applied for or is applied for and denied;

(4) the permit for the facility is revoked;

(5) an agency order to cease operation is issued; or

(6) the required financial assurance under item F for closure, postclosure monitoring, or corrective actions is not maintained with the proper payment or substitute instrument.

E. Closure plan. The applicant shall submit a closure plan with the variance application. The closure plan shall demonstrate financial assurance under item F for closure, postclosure monitoring, and corrective actions for restoration of the receiving waters to baseline quality, and shall describe the methods and processes that will be implemented to restore the receiving waters to baseline quality within three years of initiation of closure. The demonstration must show that no additional restoration is needed beyond three years. Restoration to baseline quality of the following parameters is required: dissolved oxygen, total phosphorus, and chlorophyll-a. Restoration to the baseline quality level means that the mean postclosure baseline quality levels shall not be significantly different as determined with the appropriate statistical test from the mean preoperational baseline quality level.

F. Financial assurance. The applicant shall submit to the commissioner for review and approval a closure, postclosure monitoring, and corrective action cost estimate, and evidence of financial assurance, prepared in accordance with parts 7035.2685 to 7035.2805.

G. Control pollutant limits. The following control pollutant limits are established to prevent irreversible pollution and to protect the existing beneficial uses, and apply to the receiving waters at all times:

| Substance or Characteristic | Limiting Concentration or Range |
|---|---|
| Total organic carbon | 5 milligrams per liter* |
| Nitrate nitrogen | 10 milligrams per liter** |
| Chlorophyll-a | 30 micrograms per liter*** |
| Dissolved oxygen | Not less than 3 milligrams per liter in the bottom half of the hypolimnion and 5 milligrams per liter in the upper half of the hypolimnion**** |

* *Annual mean.*

** *Instantaneous value. "Instantaneous value" means the concentration in one sample.*

*** *Monthly mean (May through September).*

**** *Instantaneous value. If the baseline monitoring shows that the preoperational oxygen concentration for the same time of the year is less than three milligrams per liter for the bottom half of the hypolimnion and five milligrams per liter for the upper half, there shall be no further reduction of the preoperational oxygen concentrations. If the baseline quality of a pollutant is greater than the control pollutant limit, or less in the case of dissolved oxygen, the baseline quality of the pollutant shall be used as the control pollutant limit.*

Subp. 6. **Special conditions.**

A. Monitoring, testing, and reporting.

(1) In addition to the requirements for monitoring, testing, and reporting under part 7001.0150, subpart 2, item B, the permittee shall report the aquatic animal production and amount of fish food used.

(2) The commissioner may require the permittee to monitor receiving waters to determine natural background levels and baseline quality and to determine compliance with state and federal antidegradation and water quality standard requirements. The monitoring shall consider natural seasonal and year-to-year variations in background levels and baseline quality.

B. Collection and disposal of aquatic animal mortalities and blood. The permittee shall transport aquatic animal mortalities for rendering or disposal at a land-based facility. Aquatic animal mortalities shall not be disposed of in waters of the state. The permittee shall prevent blood produced through harvest of aquatic animals from entering waters of the state untreated. The blood generated shall be transported to a land-based rendering or disposal facility approved by the commissioner, or discharged to a publicly owned treatment works in accordance with the applicable publicly owned treatment works NPDES/SDS permit.

C. Record keeping. The permittee shall maintain an operation record book of daily operations and other occurrences that may affect water quality including addition of fish food, composition of fish food, aquatic animal transfers and harvests, cleaning, mortalities, major weather events, and power failures. The operation record book shall be available at all times for inspection and copying by the commissioner.

D. Annual report. Each year, the permittee shall submit an annual report to the commissioner. The report shall include:

(1) a general description of the operations conducted for the past calendar year;

(2) a summary of the monitoring data;

(3) the mass of aquatic animals currently at the facility;

(4) aquatic animal production at the facility for the past calendar year;

(5) methods, amounts, and locations of the removal and disposal of waste fish food, filter backwash, sludges, sediments, mortalities, and other accumulated solids generated at the facility; and

(6) proposed changes in operation and/or production for the coming year.

E. Water treatment and chemical additives. The discharge of water treatment and chemical additives shall comply with parts 7050.0218 and 7050.0220.

STAT AUTH: MS s 17.498; 116.07