NATURAL RESOURCES

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Texas has a wide diversity of natural resources, and aquaculture production occurs to some degree in virtually every region of the state. However, most Texas aquaculture operations are small, family-owned farms which have difficulty competing with integrated operations (large grow-out facilities with associated processing plants, feed mills, and other infrastructure) being developed in other states. The issue that will be addressed in this chapter is whether suitable natural resources are available in Texas to support competitive integrated aquaculture developments, and, if so, which regions of the state are most appropriate for this purpose.

A variety of resources are required for aquacultural development. These can be categorized as water (quantity and quality), land (including soil type, elevation, and topography), climate (including temperature, evaporation, and precipitation) and infrastructure (access to roads, utilities, qualified labor, processing plant, feed mill, etc.). In most areas of Texas, The most crucial of the natural resources for aquaculture is the water supply.

WATER REQUIREMENTS

A multi-agency effort was recently implemented to identify locations with adequate water resources for integrated aquaculture operations in Texas. A review of the evaluation process and preliminary results will be presented here.

Hypothetical Farm Assumptions

The first step in this process was to estimate the quantity of water required for an integrated
aquaculture development. The following scenario was adopted based on catfish farming experience (pers. comm., Dr. Tom Wellborn):

The hypothetical farm was assumed to consist of 4000 surface acres of ponds producing 4000 lbs/acre/year. This would yield an annual production rate of 16 million pounds, which is sufficient to support a moderate sized processing plant (64,000 pounds/day assuming 250 operating days per year). Alternate farm sizes of 3,000 acres (sufficient to support a relatively small processing plant, 48,000 pounds/day) and 8,000 acres (sufficient to support a large processing plant and a small feed mill) were considered, but the 4,000-acre partially integrated scenario (with a processing plant, but without a feed mill) was used for calculations.

Water Requirement of Ponds

All ponds in the 4,000 acre hypothetical development were assumed to have a depth of 4 feet and to require an average of one fill and one change of water per year. Thus, 200% of the total volume would be required annually to operate the ponds. This would amount to 32,000 acre feet/year (4,000 surface acres x 4 foot depth x 2 volumes). Additional water would be needed if the facility were located in an area where evaporation exceeds precipitation.

Although the projected water requirement of 32,000 acre feet per year could be satisfied with a continuous year-round pumping rate of approximately 20,000 gallons per minute, higher flow rates would be needed for periodic management activities. For example, relatively high flow rates are needed if a large proportion of the ponds are being filled simultaneously. In order to avoid problems with aquatic vegetation, it is necessary to fill ponds in 10-15 days. Thus a flow rate of about 25 gallons per minute per acre is recommended for filling.

Water Requirement Of Processing Plant

Assuming that the processing activity requires 2 gallons of water per pound of fish, then about 100 acre feet of water would be required annually for the processing plant (16,000,000 pounds of fish x 2 gallons per pound + 325,851 gallons per acre foot).

Based on the above calculations, we assume that approximately 30,000 - 35,000 acre feet of water per year is required to support the hypothetical integrated catfish farm.

WATER AVAILABILITY

The calculated water requirement for an integrated freshwater farm represents a relatively large water use which is not readily available in most areas of Texas. However, some areas which apparently have insufficient surplus water for large-scale development will qualify through economic substitution. That is, water rights can be purchased from existing users to allow aquaculture development. It is anticipated that a combination of ground and surface water sources may be necessary for the development of large scale aquaculture operations in any region.

Experts from the Texas Water Development Board (TWDB) and the Texas Water Commission (TWC) have performed a preliminary review of areas in Texas generally having sufficient quantities of water supplies for aquaculture development. Water availability is discussed below under the headings of fresh groundwater, fresh surface water, saline groundwater, and saline surface water.

Fresh Groundwater Supplies

Texas has seven major and 17 minor aquifers (Figs. 1 and 2, respectively). Water quantity and quality vary significantly among aquifers and also among different regions within an aquifer.

In many parts of Texas, annual pumping of ground water exceeds recharge, and available ground water is expected to decline as this practice continues. This is especially true of the western irrigation areas of the state. Some aquifers that supply major portions of Texas with fresh water have saline aquifers associated with them which may either underlie or overlie the freshwater ones.

Depletion of freshwater aquifers is followed by encroachment of saline waters, thus reducing the usefulness of the remaining freshwater for many uses, in some cases including aquaculture. Therefore, when selecting potential areas for aquaculture, particular attention should be paid to areas where ground water is being utilized more rapidly than the natural recharge rate.

In areas of declining water supplies, pressures for uses other than aquaculture could affect the availability of ground water in the future. For example, the Harris-Galveston Coastal Subsidence District issues permits for withdrawal of groundwaters under its jurisdiction.

In addition, the Edwards Underground Water District was created under Section 59 of Article 16 of the Texas Constitution for the purpose of conserving, protecting and recharging the underground water-bearing formations within the District (Bexar, Comal, Hays, Medina and Uvalde Counties). The Edwards District does not issue permits, but it does have the right to purchase water and water rights and has powers of eminent domain for the erection of recharge dams and wells.
Figure 2. Minor Aquifers of Texas

EXPLANATION

MINOR AQUIFERS

Yields large quantities of water in small areas or relatively small quantities of water in large areas of the State.

- Woodbine
- Queen City
- Sparta
- Edwards-Trinity (High Plains)
- Santa Rosa
- Hurst Sandstone
- Ellenburger-San Saba
- Marble Falls Limestone

Note: Other Aquifers Undifferentiated (Not Shown)

STATE OF TEXAS
Texas Department of Water Resources
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Potential exists for aquaculture development in association with several major and minor aquifers (Figs 1 and 2). The following areas were identified by the TWDB:

- the Gulf Coast Aquifer originating above the Lower Rio Grande Valley, excluding the Counties of Harris, Galveston, Fort Bend, Brazoria, and Montgomery;
- the Carizzo-Wilcox Aquifer stretching from the Dimmi-La Salle County area up through East Texas;
- the upper northeast portion of the Trinity Aquifer in the Sulphur and Cypress River Basins; and
- the Ogallala Aquifer in West Texas.

**Fresh Surface Water Supplies**

Surface water is available in the form of springs, streams, and watershed runoff and in water from various sources provided by the numerous irrigation districts in the state. Each river basin has different amounts of authorized or claimed water (Table 1). The geographical locations of the river and coastal basins of Texas are presented in Figure 3.

### Table 1. Projections of surface water availability (in units of 1,000 acre feet) for aquaculture estimated by subtracting municipal and manufacturing water use from total water supply of each zone.

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Figure 3. Geographical locations of river and coastal basins of Texas
that may be available for purchase and conversion to aquaculture use. Table 2 lists irrigation water right holders that may have sufficient water for an aquaculture operation of this size.

According to the TWDB, fresh surface water supplies suitable for varying degrees of aquaculture development may be available in the following river basins:

- the lower reaches of the Sabine, Neches, and Trinity River Basins;
- the Cypress River Basin;
- the Lavaca River Basin;
- the Sulphur River Basin;

The following rice irrigation areas also have potential:

- the lower Colorado River Basin,
- the San Jacinto - Brazos Coastal Basin,
- the Colorado-Lavaca Coastal Basin,
- the Brazos-Colorado Coastal Basin, and
- the Lavaca-Gualalupe Coastal Basin.

Management of Existing Impoundments

At present, there are approximately 1.16 million ha (2.9 million acres) of freshwater in Texas. This figure includes natural rivers and lakes plus waters impounded by numerous U.S. Army Corps of Engineers projects, Bureau of Reclamation projects, P.L. 566 Flood Control projects and thousands of small, privately owned farm ponds.

Within Texas impoundments, there is great diversity of physical, chemical and biological characteristics. Both flowing and still waters are suitable for use in some form of aquaculture, although the probability for success will vary significantly from one region and water source to another. Most of the existing impoundments in Texas already yield a certain amount of aquatic animal production. However, the majority are not presently managed for aquaculture. Aquatic production could be increased in nearly all existing freshwater in Texas through the implementation of more intensive management. The potential for aquaculture production in farm ponds is great. The organisms produced in farm ponds could provide a significant amount of animal protein for the landowner at relatively little expense, and in some instances farm ponds can be adapted to commercial aquaculture. Pond design, water source and distance between ponds will be factors that determine whether farm ponds can be used for commercial production.

Saline Groundwater Supplies

The extensive saltwater aquifers of West Texas should not be overlooked in terms of aquaculture potential. Although there is considerable variation in total dissolved solids and ionic composition among ground water sources, preliminary trials with a variety of estuarine species indicate general acceptability of remarkably different water types. More definite research on saline groundwater quantity and quality is needed to fully evaluate the potential for inland mariculture in Texas. Permeability of soils is another factor which must be considered in selecting a pond site in West Texas.

Already, some West Texas areas which support little agriculture are being utilized on a small scale for brackish water aquaculture. If sufficient care is taken in the introduction of new stock into such areas, many problems of parasite and disease transmission, aquatic vegetation infestation and predation could be reduced relative to occurrence in the natural habitat of the culture organisms.

Figures 4, 5, and 6 are maps showing areas having varying degrees of total dissolved solids which could provide for marine species production.

Saline Surface Water Supplies

Approximately 607,000 ha (1.5 million acres) of bay and estuarine water exists within Texas with an additional 445,000 ha (1.1 million acres) of adjacent marshland and tidal flats. Such areas are important in the life cycles of the species of fish and shellfish which contribute a large percentage of the annual commercial and sport catches of the state.

Texas is unique in its salt-water aquaculture resources. Unlike other southern states, Texas has several large, relatively undeveloped bays surrounded by flat land with clay soils and sufficient elevation for pond construction. A great deal of aquaculture potential exists for species such as penaeid shrimp, red drum, and hybrid striped bass. Ample water is available for integrated developments. However, the aquaculture permitting process is more lengthy and complex for coastal than for inland sites.

A final saline resource that merits consideration is the Gulf of Mexico. It is not inconceivable that current offshore net pen technology used for salmon culture could be deployed in the Gulf for the culture of valuable warm water marine species such as red snapper, grouper, dolphin fish, etc.

FUTURE WATER PLANNING

Considering the crucial importance of water resources for aquaculture development in Texas, continued effort will be devoted to this issue. Obtaining more definitive water resource information will be a two-phase effort. The short-term effort will determine water surpluses in aquifers and watersheds. Following this, a ranking of surface and ground waters in reference to supply and
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<th>RIVER BASIN</th>
<th>ACRE FEET PER YEAR</th>
<th>ACRES IRRIGATED</th>
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Figure 4. Known Areal Extent of Ground Water Containing 1,500-5,000 Milligrams Per Liter Total Dissolved Solids in Texas
EXPLANATION

- Basin boundary
- Existing reservoir
- Reservoir for flood control only
- Area where total dissolved solids range from 20,000-35,000 mg/l
- 200-300 Depth to saline water in feet

Based on data obtained from agency files and reports

Figure 5. Known Areal Extent of Ground Water Containing 5,000-20,000 Milligrams Per Liter Total Dissolved Solids in Texas

Texas Aquaculture: Status of the Industry (draft)
Figure 6. Known Areal Extent of Ground Water Containing 20,000-35,000 Milligrams Per Liter Total Dissolved Solids in Texas
demand by location will be established. Maps displaying this information will be produced.

The long-term program will coordinate the Texas Aquaculture Plan and its associated water requirements with the 50-year planning cycle of the Texas Water Plan. Data, such as water costs and sustainable yields, will be the focus of this effort. In addition, economic feasibility studies comparing the aquaculture industry to other Texas water users will be initiated. An area of interest here would be comparing the profitability of aquaculture to that of irrigated crops. Other long-term interests are the projection of water surpluses over time and the availability of saline ground water.

Texas water allocation information is primarily the responsibility of the Texas Water Development Board (TWDB) and the Texas Water Commission (TWC). Contacts have been made with both agencies, and their staff have initiated procedures to develop both the short- and long-term water resource data needed for aquaculture planning.

TWDB is estimating groundwater by counties and determining pumping capacity in aquifers. It is probably too late for aquaculture water projections to be input into TWDB allocation modeling for the current water plan, however, the current water plan could include a discussion of aquaculture in the narrative section. For example, this might describe the emerging industry, estimate total water needs statewide, and list potential species. Aquaculture water requirements could then be used in allocation modeling the next water plan.

Although the initial stages of this important planning effort are proceeding without funds, ultimately, funds will be needed to support the economic analysis of aquaculture versus irrigated agriculture. Also, funding will be required for computer mapping of potential aquaculture sites in Texas.

CLIMATE

Climate has a substantial influence on both aquaculture management practices and productivity. In an attempt to characterize various regions of Texas in terms of their suitability for aquaculture as a function of climate, mean annual temperature and mean annual rainfall data have been examined (Figs. 7 and 8, respectively). In general, climate becomes more limiting as one proceeds from east to west and from south to north across the state.

Temperature plays an important role in the aquatic environment in that the metabolic rates of all aquaculture species are controlled by that parameter. Thus, growth rate and productivity are intimately linked with water temperature.

Temperature, in conjunction with humidity, also plays an important role in the extent of evaporation from a given aquaculture facility. In areas where the availability of water is marginal, evaporation may be the difference between success and failure.

Assuming that aquaculture in Texas will be largely restricted to what are generally accepted to be warmwater species, i.e., those which have temperature optima at or above about 25 C, (77 F) virtually all of the state can provide a suitable thermal regime in ponds during at least part of the year. However, since the growth of warmwater species is drastically reduced or ceases below about 20 C, (68 F), the duration of the nonproductive season is important. Areas having annual mean temperatures above 18 C are potentially suited for warmwater aquaculture, although certain species may still require special overwintering facilities to prevent cold death due to cold.

The major effect of rainfall relative to aquaculture development is in to compensate for loss of water through evaporation. Many pond managers allow pond water levels to drop considerably due to evaporation before resorting to pumping replacement water. Proper management can utilize precipitation to conserve water use.

Some farms rely on the use of surface water runoff. While the use of runoff water is not always desirable for freshwater culture, it is sometimes necessary to utilize this resource. In order to be useful to the aquaculturist, surface runoff volumes must exceed the water lost to evaporation and seepage. In addition, the runoff water must be available during the proper times of the year. Areas of high and predictable rainfall may be suitable for aquaculture systems which use only runoff, although well water and other sources of surface water (reservoirs, lakes, streams or springs) should be available as backups to surface runoff. Areas in Texas which receive 100 cm (40 inches) of rain annually may receive sufficient runoff to support aquaculture, while areas receiving between 40 and 100 cm (16-40 inches) require a source of backup water. Culturists in areas receiving less than 40 cm (16 inches) of rainfall per year should not depend upon runoff as a water source.

LAND

Proper land resources are important when ponds are to be constructed but are of less importance in tank, silo or cage culture. Land characteristics needed for pond construction include: suitable
Figure 7. Average Annual Temperature (°F)
1951 - 1980
Figure 8. Average Annual Precipitation in Inches, 1951 - 1980
elevation for drainage, absence of a high water table, and low permeability of soils. Of these factors, soil type poses the most frequent limitations.

Soil Resources
Texas has a wide variety of soil types, and it is not uncommon to find discontinuities in soils, such as areas with sufficient clay percentages for ponds occurring interspersed among highly porous, sandy soil. This is particularly the case in alluvial areas. Because it is not possible to predict the precise soil type on any specific piece of property by referring to a generalized soil map (Figure 9), it will be necessary for prospective aquaculturists to have an evaluation of the soil before construction begins. In general, soils with 25 percent or more clay are suitable for pond construction. Soil borings on prospective culture sites should be sufficiently deep to ensure that a surface layer of clay is not underlain by sand. In some instances sandy surface soil may be underlain by a thick clay layer beginning at a depth of only a few cm which can then be utilized to seal the pond basin.

While ponds have been built in areas with highly porous soils, the costs of lining ponds or other methods of sealing are often prohibitive. In areas of high water tables and sufficient hydrostatic pressure, seepage may be so great that water will rapidly enter ponds which are being drained.

SUMMARY
Water supply is thought to be the most crucial natural resource limiting freshwater aquaculture in Texas. Integrated aquaculture operations are estimated to require about 35,000 acre feet of water per year. This is a large water requirement that is unavailable as surplus in most areas of the state.

Some areas may have diversion rights available for sale or contract use. Information is presented about potential areas with available groundwater and surface water. Further evaluation of the location and extent of available water would be valuable to Texas aquaculture development.

Estuarine and oceanic water supplies are not limited by quantity considerations, but their use is associated with a greater engineering and permitting costs.

The large tracts of low-value property with access to brackish ground water in portions of West Texas may offer much presently unrecognized aquaculture potential.

Rainfall and temperature patterns in the eastern two-thirds of the state are generally suitable for aquacultural development.

Suitable soils for pond construction also are widely available, but on-site evaluations are recommended because of local variability.
Figure 9. Soils Suitable For Pond Construction in Texas
LEGAL, REGULATORY AND PERMITTING

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INTRODUCTION

A significant number of federal, state, and local government agencies may be involved in the regulation of an aquaculture operation. This involvement can include site selection and development, facility design and construction, species procurement, operations, processing, and marketing.

The regulatory environment is often a source of concern to individuals, investors, and corporations due to the possibility of unanticipated delays and increased capital and operating expenses, regardless of the endeavor. The source of this concern is frequently based on that small percentage of proposed projects which encounter regulatory difficulties.

In most cases, regulatory difficulties arise because of inadequate planning, lack of knowledge, and incomplete information concerning the agencies involved and their respective requirements. This is not to imply that improvements cannot be made in the regulatory environment, but rather to point out that information on government regulations is available and agency representatives are usually responsive to requests for assistance which fall within their agency's jurisdiction. It is not the responsibility of an agency representative, however, to be knowledgeable of the regulations of all other agencies which may have regulatory authority over some phase of a proposed

* The information contained in this chapter is excerpted from a manuscript entitled "Coastal Aquaculture Planning and Permitting Manual" which the authors expect to complete by the summer of 1990.
project. This responsibility remains with the project applicant.

In view of the need to provide prospective aquaculturists with information and sources of contact regarding applicable government agencies, the following lists each federal and state agency which has been determined to have authority over aquaculture operations. Under each agency heading are descriptions of the agency's role, responsibility, and regulatory or permitting requirements. In most cases, the following format is used for presentation of regulatory or permitting requirements:

- **Agency Role and Responsibility**
- **Regulatory Requirements** (permit, license, certification, etc.);
- **Procedures and Contacts**;
- **Review and Coordination**;
- **Processing Time Requirements**; and
- **Issuance, Fees, and Term**

Local government agencies also are presented and discussed in general terms.

**FEDERAL GOVERNMENT**

**U.S. Army Corps of Engineers**

**Agency Role and Responsibility**

The U.S. Army Corps of Engineers (COE) is responsible for preventing the alteration or obstruction of the navigable waters of the United States, protection of wetlands resources, and the maintenance and protection of the nation's water resources.

These responsibilities are carried out through the issuance, or denial, of permits authorizing certain activities involving wetlands, and navigable or other waters of the United States.

**Regulatory Requirements**

**Section 10 Permit.** A Section 10 Permit is required by Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) for any structure and work in or affecting navigable waters. Examples include piers, intake pipes, discharge pipes, dikes for ponds, open water grow-out or depuration facilities, or any other structure which is determined to be an alteration of navigable waters or a potential hazard to navigation.

**Section 404 Permit.** A Section 404 Permit is required by Section 301 of the Clean Water Act (33 U.S.C. 1344) for the discharge of dredged or fill material into waters of the United States or which may affect wetlands. Coastal submerged lands, wetlands, or marshes, may be publicly or privately owned and are generally characterized as lying between terrestrial uplands and the aquatic system. It must be emphasized that the COE does not make ownership determinations as their authority regulates a public resource, regardless of ownership. The elevation of these wetlands is usually less than three (3) feet above mean sea level. Freshwater wetlands may include natural lakes, playa lakes, man-made lakes, and marshes adjacent to rivers and streams. Some examples of activities requiring a 404 permit include bulkheads, road fills, dredging canals or channels, pumping basins, levees any fill operation, spoil disposal, etc.

**U.S. Environmental Protection Agency**

**Agency Role and Responsibility**

The U.S. Environmental Protection Agency (EPA) is responsible for the protection of the nation's air and water quality, including potential adverse impacts to public health and fish and wildlife resources. These responsibilities are carried out through regulatory, permitting, and enforcement programs.

**Regulatory Requirements**

**National Pollutant Discharge Elimination System Permit.** Of significance to aquaculture operations in Texas is EPA's regulation of pollutant discharges into U.S. waters under the Clean Water Act, as amended (33 U.S.C. 1251 et seq.). Section 402 of the Act requires that a National Pollutant Discharge Elimination System (NPDES) permit be issued by the EPA prior to the discharge of any pollutant into the waters of the United States.

A hatchery, fish farm, or other aquatic animal production facility is normally a point source of discharge and subject to the NPDES permit program (40 CFR, Part 122, Subpart B, 122.24(a) & (b)). EPA rules (40 CFR, Part 122, Appendix C), however, authorize the granting of exemptions from the NPDES permitting program if a production facility contains, grows, or holds aquatic animals which satisfy the following criteria:

Facilities raising cold water fish species or other cold water aquatic animals in ponds, raceways, or other similar structures which:

1. Produce less than 9,090 harvest weight kilograms (approx. 20,000 lbs) of aquatic animals per year; and
2. Feed less than 2,272 kilograms (approx. 5000 lbs) during the calendar months of maximum feeding.

Facilities raising warm water fish species or other warm water aquatic animals in ponds, raceways, or other similar structures which:
(1) Produce less than 45,454 harvest weight kilograms (approx, 100,000 lbs.) of aquatic animals per year; or
(2) Closed ponds which discharge only during periods of excess runoff.

Aquatic animal production facilities determined by EPA to be ineligible for an initial exemption, or a continued exemption, will be required to apply for a NPDES permit.

Aquaculture projects within a "defined managed area" of U.S. waters which discharge pollutants into that area for the maintenance or production of harvestable freshwater, estuarine, or marine plants or animals are subject to the NPDES permit program (Section 318; Clean Water Act, as amended, and in accordance with 40 CFR, Part 125, Subpart B).

Aquaculture facilities engaging in processing activities which result in wastewater discharges into U.S. waters are subject to NPDES permitting requirements. This means production facilities which are exempt from NPDES permitting requirements (above) would be required to obtain a permit if they undertake processing activities which result in wastewater discharges.

Discharges into publicly owned treatment works (local sewage treatment systems) are not subject to NPDES requirements. However, pretreatment standards of the treatment works will apply to the wastewater discharges. The applicant should consult with the publicly owned treatment facility for standards and authorization prior to any discharges into their system.

U.S. Fish and Wildlife Service

Agency Role and Responsibility

The U.S. Fish and Wildlife Service (FWS), U.S. Department of the Interior, is primarily responsible for the protection and management of fish, migratory birds, and wildlife. With the exception of migratory birds and endangered species, the FWS’s jurisdiction generally covers the inland, non-tidal, areas of Texas.

Programs administered by the FWS which could affect aquaculture development and operation include review and comment on proposed construction projects and the regulation of fish and wildlife imports and exports.

Regulatory Requirements

Construction Project Review. Federal agencies which issue permits, loans, loan guarantees, or grants for construction projects must coordinate with and consider FWS comments concerning impacts to fish and wildlife which may be associated with the project (Fish and Wildlife Coordination Act, 16 U.S.C. Section 661 et seq., as amended). This includes Section 404/10 permits issued by the U.S. Corps of Engineers and NPDES discharge permits issued by the U.S. Environmental Protection Agency. An objection raised by the FWS is usually a serious impediment to permit approval and may result in the need to modify the proposed project or offset damages to fish and wildlife species and/or their habitat. This especially is the case if endangered species are involved (Endangered Species Act, 16 U.S.C. Sections 703-712).

Fish and Wildlife Import/Export License. Any person who imports or exports live animals or fish with a value exceeding $25,000 per year for purposes of propagation or sale must first apply for and obtain a Fish and Wildlife Import/Export License from the FWS.

Designated Port Exemption Permit. There are nine (9) designated ports-of-entry for the import or export of fish and wildlife species and include: Dallas, New Orleans, Miami, Chicago, New York, Seattle, Los Angeles, San Francisco, and Honolulu. Ports-of-entry are usually at international airports or seaports. If a different city is preferred as the port-of-entry, a Designated Port Exemption Permit may be obtained.

National Marine Fisheries Service

Agency Role and Responsibility

The National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, U.S. Department of Commerce, is primarily responsible for the management and protection of marine fish, habitat, and certain marine animals (16 U.S.C. Section 1361 et seq., as amended). To some extent, the NMFS is the marine counterpart to the U.S. Fish and Wildlife Service in regard to fisheries management and protection.

Construction Project Review

As was the case with FWS, the Fish and Wildlife Coordination Act requires federal construction and permitting agencies to coordinate with and consider the comments of the NMFS prior to issuing permits, loans, loan guarantees, or grants for projects which may affect marine fish species (16 U.S.C., Section 661 et seq., as amended). Generally, the NMFS reviews the construction project application for any potential impacts to fish species and fisheries habitats located in tidal (salt) water.
United States Coast Guard

Agency Role and Responsibility

One of the U.S. Coast Guard's (CG), U.S. Department of Transportation, major roles is maintaining and regulating safe navigation in U.S. navigable waters. The marking of obstructions which may present a hazard to navigation is a specific regulatory program administered by the CG and was authorized by the Rivers and Harbors Act of 1899. Specific regulations concerning the marking of obstructions are described in 33 CFR, Part 66.

Regulatory Requirements

Regulation for the Marking of Structures and Floating Obstructions. Any structure, mooring, buoy, or dam in or over U.S. navigable waters, as determined by the CG, must be marked by lights and other signals for the protection of maritime navigation in the manner required by the CG. The prescribed lights and signals must be installed, maintained, and operated at the expense of the owner, or operator, of the obstruction (33 CFR, Part 66, Subpart 66.01). The required lights and signals are referred to as "Private Aids to Navigation". This could include piers, water intake pipes, discharge pipes, floating cages, and other similar obstructions which may be associated with an aquaculture operation.

Private Aids to Navigation. Where it is determined that proposed obstructions in U.S. navigable waters constitutes a potential hazard to navigation, the CG will notify the owner or operator of the obstruction that a private aid to navigation is required. Generally the CG becomes aware of proposed obstructions through the required coordination with the U.S. Army Corps of Engineers (COE) in the processing of Section 404 and Section 10 permits for construction in or near U.S. navigable waters. Where navigational aids are required, the requirement usually will be a condition of the COE permit.

The CG also investigates complaints from mariners regarding unmarked obstructions and may require either the removal or marking of the obstructions, if they constitute hazards.

Food and Drug Administration

Agency Role and Responsibility

One of the Food and Drug Administration's (FDA) responsibilities is the approval and regulation of drugs which may be used in aquaculture operations (Federal Food, Drug, and Cosmetic Act, 21, U.S.C. 301 et seq.).

Drug regulations include the use of drugs as additives to feed as well as drugs used for the treatment of diseases and parasite infestations in aquatic animals to be sold for human consumption. The Texas Department of Health also has authority over drug additives to feed (It is important to note that drugs do not include pesticides, which are regulated by the EPA).

Regulatory Requirements. Depending upon the drug and the drug concentration, commercial feed mills as well as individuals who desire to produce medicated feed, may be required to first submit an application and obtain approval from the FDA. Medicated feed mixtures which require a "waiting period" prior to marketing will usually require FDA approval. In most cases aquaculture operations who purchase commercially prepared feed will not be affected by these regulations. However, larger operations could fall under these regulatory requirements if they produce their own feed mixtures.

Drugs used for the treatment of diseases and parasite infections also require FDA approval. The process involves two steps. First, the drug must be approved; and second, the use of the drug for aquaculture applications, including dosage, must be approved. It is important that the aquaculturist use only FDA approved drugs and carefully follow the application instructions. In some cases a waiting period will be recommended between treatment and marketing. The waiting period should be carefully observed. Otherwise, the aquaculture products may be declared by the FDA, TDA, or local health authorities as being unfit for human consumption and confiscated from the market.

STATE GOVERNMENT

Texas General Land Office

Agency Role and Responsibility

The Texas General Land Office (GLO) is responsible for the management and use of state owned public lands. State owned public lands include:

- Public school lands;
- Emergent and submerged lands up to the mean high tide line in Texas bays; and
- Submerged lands extending from mean high tide out to three (3) marine leagues (10.35 miles) into the Gulf of Mexico.

A lease or easement must first be obtained from the GLO before any activity involving state lands may be undertaken (Texas Natural Resources Code, Chapters 33 and 51).
The majority of state-owned lands, which might be affected by aquaculture activities, are coastal submerged lands which begin at the mean high tide line and extend out into the bays and estuaries.

Regulatory Requirements

Lease/Easement. A lease or easement is required from the GLO for any activity which would involve the use of coastal submerged lands. Some examples include dredging of channels, levees, construction of piers or docks, bulkheading, road construction, and pipeline placement.

Texas Department of Agriculture

Agency Role and Responsibility

The Texas Department of Agriculture (TDA) is responsible for encouraging the raising of cultured fish, the development of the fish farming industry, and the marketing of fish farm products (Section 12.009(C), Texas Agriculture Code, as amended by the Fish Farming Act of 1989).

Effective September 1, 1989, the TDA also was made responsible for establishing a comprehensive fish-farm program which addresses fish farming on owned or leased lands and waters (Section 13.003 Agriculture Code). The objective of the fish-farm program is to develop and expand the fish-farm industry in order to expand the state's economy and offer alternative farming opportunities. At a minimum, the program must include:

- A plan for promoting fish-farm products;
- Licenses and regulations for fish-farming operations;
- Licenses and regulations for farm-raised fish and shellfish processing plants;
- Technical assistance to fish farmers;
- Coordinated support to fish farmers from colleges and universities and other governmental entities; and
- Solicitation of financial support from the federal government for the fish-farm industry.

The fish-farm program will be implemented and necessary rules adopted by the TDA by early 1990 (Section 12(b), Fishing Farming Act of 1989, Acts of the 71st Texas Legislature, Regular Session, 1989).

Regulatory Requirements

Fish Farmer's License. Any person engaged in the business of producing, propagating, transporting, possessing, and selling cultured fish or shellfish raised in private ponds for resale, consumption, or stocking purposes must first acquire a Fish Farmer's License from the TDA. Temporary licenses are currently being issued for a $10.00 fee. New rules for license issuance, fees, and terms are presently under consideration and should be completed by early 1990 (Sections 134.011, 134.014, 134.015(a) (b) (c), Agriculture Code).

Fish Farm Vehicle License. A vehicle used to transport fish from a fish farm for sale from the vehicle is required to have a Fish Farm Vehicle License. A vehicle owned and operated by a licensed fish farmer is exempt from this licensing requirement. New rules for license issuance, fees, and terms are presently under consideration and should be completed by early 1990 (Sections 134.012, 134.014, 134.015(a) (b) (c), Agriculture Code).

Cultured Fish Processing Plant License. Any person operating a cultured fish or cultured shellfish processing plant must first obtain a Cultured Fish Processing License from the TDA. The adoption of rules for the licensing of cultured fish processing plants are presently under consideration and should be completed by early 1990 (Subchapter C, Sections 134.031, 143.032, 143.033, 143.034, Agriculture Code).

In addition to this license, state law requires that a Certificate of Compliance (Shellfish), Crabmeat Plant License, or a Food Manufacturer (all other aquatic species) Registration also must be obtained from the Texas Department of Health. Both agencies have rule making and inspection authority.

Texas Parks and Wildlife Department

Agency Role and Responsibility

The Texas Parks and Wildlife Department (TPWD) is responsible for the conservation, management, and protection of the state's fish and wildlife resources.

These responsibilities are carried out through various planning, management, research, regulatory, and enforcement programs. Of significance to aquaculture operations are TPWD's programs which involve the regulation of imported fish, shellfish, and aquatic plants and the issuance of certain leases, licenses, and permits.

Regulatory Requirements

Sand, Gravel, Shell, and Marl Permit. This permit is required prior to disturbance or the removal of materials from state waters including streams, rivers, and bay bottoms (Texas Parks and Wildlife Code, Chapter 86.002).

Private Oyster Leases. Any Texas Citizen or U.S. corporation (composed of U.S. citizens) may lease up
to 100 acres of bay bottom for purposes of culturing oysters (Texas Parks and Wildlife Code, Chapter 76, Subchapter A).

Oyster Transplanting Permit. An Oyster Transplanting Permit must be obtained prior to taking oysters from public waters for the purposes of transplanting to a private oyster lease located in public waters (Texas Parks and Wildlife Code, Chapter 76, Subchapter B).

Oyster Harvest Permit. A permit is required to harvest oysters from private oyster leases (Texas Parks and Wildlife Code, Chapter 76, Subchapter B).

Commercial Oyster Boat License. A Commercial Oyster Boat License is required for each boat used in transporting or for the taking of oysters for pay, sale, barter, exchange, or for any other purpose from state public waters by the use of a dredge, tongs, or any other mechanical means (Texas Parks and Wildlife Code, Chapter 76, Subchapter C). The license includes the boat and crew for oysters only. A licensed fish farmer culturing oysters in state waters, including oyster lease holders, is also subject to the requirements of this license.

Shellfish Culture License. Each person engaged in the business of producing, propagating, transportation, selling, or processing for sale shellfish raised on private land must first acquire a Shellfish Culture License (Texas Parks and Wildlife Code, Chapter 51). Shellfish means aquatic species of crustaceans and mollusks, including oysters, clams, shrimp, prawns, and crabs of all varieties. A separate license is required for each tract of land on which shellfish are cultured.

General Exotic Shellfish Culture Permit. The holder of a Shellfish Culture License must obtain a General Exotic Shellfish Culture Permit prior to the importation, possession, propagation, or transport of exotic shellfish into or from the state (Texas Parks and Wildlife Code, Chapter 51.009). Exotic shellfish means non-native species of oysters, clams, shrimp, prawns, and crabs of all varieties.

Shellfish Sourcing Permit. The holder of a Shellfish Culture License may obtain shellfish broodstock during closed shellfish harvesting seasons, from public waters, by obtaining a Shellfish Sourcing Permit (Texas and Wildlife Code, Chapter 51.010). Note: This permit is not required when shellfish are taken during open season.

Red Drum and Speckled Sea Trout Sourcing Permit. This permit is required for the taking from public waters of a limited number of red drum (redfish) and/or spotted sea trout (speckled trout) of spawning size for broodstock purposes (Texas Parks and Wildlife Code, Chapter 48.0101 and Texas Administrative Code Title 31, Chapter 57.362). Only licensed fish farmers may obtain a permit.

Exotic Species Permit. An Exotic Species Permit must be obtained in order to possess, propagate, transport or sell certain exotic species which are considered harmful or potentially harmful to native species (Texas Parks and Wildlife Code 66.007 and 66.015, Agriculture Code 134.020). Species for which Exotic Species Permits may be obtained include:

- blue tilapia (Tilapia aurea);
- Mozambique tilapia (Tilapia mossambica);
- Hybrids between the above species;
- silver carp (Hypophthalmichthys molitrix);
- and black carp (Mylopharyngodon piceus), also known as the snail carp.

(Title 31, Texas Administrative Code, Chapter 57.113) Qualifications for obtaining an Exotic Species Permit to culture one or more of the above species in private ponds (pond, reservoir, vat or other structures) include:

- Applicant must be a licensed fish farmer;
- The fish farm must be designed to prevent discharges of water containing adult or juvenile exotic species or their eggs from the permittee's property;
- Fish farms which are within the 100 year floodplain must be enclosed within an earthen or concrete dike or levee constructed to exclude all flood waters and such that no section of the crest of the dike or levee is less than one foot above the 100 year flood elevation. Dike or levee design or construction must be approved before issuance of a permit; and the
- Applicant has not violated any provision of the exotic species rules during the previous year.

(Title 31, Texas Admin. Code, Chapter 57.116).

General Commercial Fisherman's License. Any person who catches fish, oysters, or other edible aquatic products from state waters for pay, sale, barter, or exchange must purchase a General Commercial Fisherman's License (Texas Parks and Wildlife Code, Chapter 47.001 and 47.002). This includes an individual harvesting oysters from a private oyster lease or any other species which was cultured in state waters. A licensed fish farmer who wishes to sell cultured aquatic products to wholesale fish dealers, retail fish dealers, shrimp house operators, or restaurants may be required to purchase one of the following licenses:

- Commercial Fisherman's License;
- Wholesale Fish Dealer's License; or
- Shrimp House Operator's License.
Fresh Water Commercial Fishing Boat License. This license is required when a boat equipped with a motor or sails is used in non-tidal state waters to catch fish, oysters or other edible aquatic products for pay or for the purpose of sale, barter, or exchange (Texas Parks and Wildlife Code, Chapter 47.005). This includes boats used to harvest aquatic species which were cultured in non-tidal state waters (freshwater).

Saltwater Commercial Fishing Boat License. A Saltwater Commercial Fishing Boat License is required when a boat is used for the catching or assisting in catching fish, oysters, or any other edible aquatic life (except for shrimp and menhaden) from tidal waters for pay or for the purpose of sale, barter, or exchange (Texas Parks and Wildlife Code, Chapter 47.007). This includes a boat used to harvest aquatic species which were cultured in tidal waters.

Bait Dealer's License. A person who catches or transports for sale, or who is engaged in the business of selling minnows, fish, shrimp, or other aquatic products for fish bait is required to purchase a Bait Dealers License (Texas Parks and Wildlife Code, Chapter 77.001(10), 77.043, and 77.044).

Wholesale Fish Dealer's License. A person who engages in the business of buying for the purpose of selling, canning, preserving, processing or handling for shipments or sale fish, oysters, shrimp, or other commercial edible aquatic products to retail fish dealers, hotels, restaurants, cafes, or consumers must purchase a Wholesale Fish Dealer's License (Texas Parks and Wildlife Code, Chapter 47.001(3) and 47.009). A licensed fish farmer who buys aquatic products for the above stated purposes is required to purchase this license. However, a licensed fish farmer who provides services to others (such as custom processing, packaging, labeling, shipping, etc.) for a fee is not required to purchase the license.

Wholesale Fish Truck Dealer's License. A person who engages in the business of selling edible aquatic products from a motor vehicle to retail fish dealers, hotels, restaurants, cafes, or consumers must have a Wholesale Truck Dealer's License. In most cases this license will not apply to a licensed fish farmer. However, if the fish farmer engages in the buying and selling of edible aquatic products the license may be required.

Retail Fish Dealer's License. A person engaged in the business of buying for the purpose of sale to a consumer, fresh or frozen edible aquatic products is required to purchase a Retail Fish Dealer's License (Texas Parks and Wildlife Code, Chapter 47.001(4) and 47.011). A licensed fish farmer who buys cultured or other fish products for sale at retail may be required to purchase this license.

Retail Fish Truck Dealer's License. A Retail Fish Truck Dealer's License is required to sell edible aquatic products from a motor vehicle to consumers (Texas Parks and Wildlife Code, Chapter 47.013). A licensed fish farmer who buys and sells from a motor vehicle at retail could fall under this licensing requirement.

Alligator Farmer's Permit. Any person who wishes to possess live alligators or propagate alligators for the purpose of selling the alligators, hides, meat, or other parts of an alligator must first obtain an Alligator Farmer's Permit (Texas Parks and Wildlife Code 65.003, 31 Texas Administrative Code 65.351-65.369).

Alligator Import Permit. An Alligator Import Permit is required to bring live alligators and alligator parts into the state (Texas Parks and Wildlife Code, Chapter 65.003 and Title 31, Texas Administrative Code, Chapter 65.351 and 65.369).

Alligator Hide Tag. Hides of all alligators harvested must be tagged (Texas Parks and Wildlife Code, Chapter 65.003 and Title 31 Texas Administrative Code, Chapter 65.351-65.369).

Alligator Broodstock Regulations (Texas Parks and Wildlife Code, Chapter 65.003 and 31 Texas Administrative Code 65.351-65.369)

Authorized Sources
- Live alligators and alligator eggs may be obtained by;
- Purchasing from licensed alligator farmers in other states;
- Purchasing from licensed alligator farmers in Texas;
- Purchasing nuisance alligators which are occasionally available through the department;
- Purchasing tagged hatchlings from a hatchling tag recipient (land owner), or a licensed alligator hunter; and
- Purchasing alligator eggs from an authorized egg collector, or an alligator nest stamp recipient (land owner).

Texas Water Commission

Agency Roles and Responsibilities

The Texas Water Commission (TWC) is responsible for the protection of the state's water resources. These responsibilities are carried out through planning, development of water quality standards, issuing discharge permits, enforcement of discharge limitations, regulating water use, and
issuing permits for construction activities affecting state waters.

**Regulatory Requirements**

**Section 401 Certification.** Any activity which requires a Section 404 permit from the U.S. Corps of Engineers COE also requires a Section 401 certification from the TWC prior to issuance of the COE permit (Section 404, Clean Water Act, as amended). The certification is a statement from the TWC that the proposed construction activity would not cause a violation of the state's water quality standards.

**Discharge Permit.** The Texas Water Code (Section 11.121) requires that a discharge permit be obtained prior to the discharge of wastes into or adjacent to the waters of the state. This includes the treatment, storage, or disposal of waste water by land treatment or evaporation. The federal Clean Water Act, as amended, also requires that a NPDES permit be obtained from the Environmental Protection Agency (EPA). (Refer to Federal Government for a description).

Certain discharges may be authorized by the TWC by rules or orders, instead of a permit. This includes certain aquaculture flow-through operations where discharge waters are high quality. Discharges of small and medium size shrimp packing operations are also regulated by rule.

**Reclamation Engineer Permit.** Construction within the 100 year flood plain of any stream, river, or other flood prone area which is an effort to control, regulate, or otherwise change the flood water of the stream is prohibited unless prior approval is obtained from the TWC or the appropriate city or county, if such city or county is participating in the National Flood Insurance Program (Texas Water Code 16.236).

Cities and counties participating in the Federal Flood Insurance Program, authorized by the National Flood Insurance Act of 1968, have jurisdiction over construction within the 100 year flood plain. This includes construction, maintenance, or improvements to levees, dams, or other improvements with the flood plain.

All coastal counties, and many other counties within the state, are currently participating in the federal program. In these counties, the local Flood Plain Administrator should be contacted for information on permitting requirements. The TWC has permitting authority in all other areas.

**Water Use Permit.** The TWC has regulatory authority over the diversion, impoundment, and/or use of all state waters. The use of brackish or marine waters for land based aquaculture operations is exempt from the Water Use Permit requirements (Texas Water Code 11.1421). However, a notice must be submitted to the TWC prior to taking such water for aquaculture purposes. The aquaculturist also must submit a report every year which states the amount of water that has been diverted during the past year. The TWC has the authority to limit or stop water use during droughts or other emergencies.

The use of state waters, other than brackish or marine, is prohibited without first obtaining a permit from the TWC. However, an individual property owner may, without obtaining a permit, construct a dam to impound up to 200 acre feet for domestic and livestock purposes. Aquaculture is considered an industrial use. Conversion of existing or creation of new impoundments for aquaculture would therefore require a Water Use Permit (Texas Water Code 11.1421 and 11.143).

In addition to the requirement for a Water Use Permit, unappropriated (surplus) water rights must be available in the water body from which the water is to be taken. In certain areas of the state where all water rights (to rivers and reservoirs) have been appropriated. In these limited situations it would be necessary to purchase water rights from an existing water rights holder. The purchase of water rights may require TWC approval.

**Texas Department of Health**

**Agency Role and Responsibility**

The Texas Department of Health (TDH) is responsible for the protection of the public health, including the regulation of food, drugs, and cosmetics which may ultimately affect consumers.

These responsibilities are carried out by various licensing, registration, labeling, certification, inspection and regulatory programs. Legal authority for carrying out these programs is provided by the Texas Food, Drug, and Cosmetic Act (Article 4476-5) and the Federal Food, Drug, and Cosmetic Act (Title 21 U.S.C. 301 et seq.).

The Food and Drug and the Shellfish Sanitation Control Divisions, within the TDH, are responsible for programs which affect aquaculture operations in Texas. These programs provide for the regulation of aquatic species which are raised in public and private waters and include water quality, production, harvesting, processing, transporting, storing, handling and packaging of cultured aquatic products to be sold for human consumption.
Regulatory Requirements

Transplant Permit. A Transplant Permit must be obtained from the Texas Parks and Wildlife Department.

TDH Notification. Information on the quantity of shellfish transplanted, origin of shellfish, where placed and the date the transplant permit expired must be provided to the TDH. Transplanting to a depuration facility has similar, but more detailed, reporting requirements. In addition, the waters from which shellfish may be gathered for delivery to a depuration facility are more stringently regulated and the gathering and transportation must be supervised.

Harvest Permit. A Harvest Permit must be obtained from the Texas Parks and Wildlife Department. No shellfish may be harvested for marketing in less than 15 days following the date of expiration or cancellation of the Transplant Permit. Marketing of shellfish from a depuration facility does not require a harvest permit. The TDH has specific regulations governing depuration facilities (Texas Molluscan Shellfish Rules, TDH, Sections 241.85 - 241-100).

Certificate of Compliance. Any person who processes or packages shellfish for sale as food after they have been harvested is classified as shellfish dealer or shipper and must first obtain a certificate of compliance from the TDH. During the harvest operation, shellfish are placed in bags or other approved containers. Any activity in which the shellfish are removed from the original containers and placed in other containers would fall under the definition of processing or packaging and thus would require a Certificate of Compliance.

Crabmeat Plant License. A Crabmeat Plant License is required of any person who engages in the processing and packing of crabmeat for sale for human consumption (Texas Crabmeat Rules, Section 241.01). The TDH rules also cover plant design, construction, and operations. Crabmeat plants are classified into two (2) major categories for licensing purposes:

- Picking and packing plants; and
- Picking, packing, and pasteurizing plants.

Food Manufacturer Registration. With the exceptions of shellfish (oysters, clams, mussels) and crabs, anyone wishing to process aquatic species for sale for human consumption must first be registered as food manufacturer with the TDH (Texas Food, Drug, and Cosmetic Act, Section 23a, Article 4476-5).

In addition, Section 431.222, Health and Safety Code, requires that a food manufacturer must register, annually on or before September 1, each establishment that the manufacturer operates within the state and pay a fee for each establishment.

Manufacture means the process of combining or purifying food and packaging food for sale to the consumer at wholesale or retail (Health and Safety Code, Section 431.221). All food manufacturers in Texas must comply with minimum standards of construction and operation in order to be eligible for registration. Minimum standards are contained in:

- Texas Food, Drug, and Cosmetic Act, Article 4476-5;
- Diseases Transmitted Through Food, Drink or Utensils Act, Article 4476-10; and
- Current Good Manufacturing Practice in Manufacturing, Processing, Packaging, or Holding Human Food, Code of Federal Regulations, Title 21, Part 110, Sections 110, 3-110.110.

Texas Animal Health Commission

Agency Role and Responsibilities

The Texas Animal Health Commission (TAHC) is responsible for the protection of the public and the states' domestic livestock industry from communicable diseases. This responsibility is carried out through inspection and certification of livestock within the state as well as animals which are imported into the state.

Regulatory requirements

Certification of Veterinary Inspection.

The TAHC requires that live animals shipped into the state be free of disease. The Texas Parks and Wildlife Department has primary responsibility for regulating the importation of aquatic animals, fish, and shellfish species. Consistent with TAHC regulations, the Texas Parks and Wildlife Department (TPWD) generally requires a "disease free" certification as a condition to a permit for the importation of aquatic species into the state.

The "disease free" determination is called a Certificate of Veterinary Inspection. The certificate is issued by a veterinarian or qualified testing laboratory. Usually the certificate is obtained prior to importation. However, in certain cases the animals may be brought into the state and held under controlled conditions while all, or a representative sample, of the aquatic animals are being tested for diseases.

Texas State Historic Preservation Officer and The Texas Antiquities Committee

Agency Role and Responsibility

The State Historic Preservation Officer (SHPO), acting on behalf of the Texas Historical Commission, and the Texas Antiquities Committee (TAC) are
jointly responsible for the protection and preservation of historical and archaeological resources within the state. (National Historic Preservation Act of 1966-SHPO, Texas National Resources Code, Section 191.131(b)-TAC). These responsibilities are carried out primarily through review of loans, grants, and construction permit applications which propose to undertake land disturbing activities, potentially impacting historical or archaeological resources. Both the SHPO and the TAC have the authority to issue or deny permits for the disturbance of known, or discovered, historic or archaeological resources. Scientific investigations may also be required as a condition of the permit, loan, grant, or in the event of discoveries during construction.

The SHPO has review authority over federal permits, loans, and grant applications for construction on public as well as private lands. The TAC's authority also covers lands owned by the state and political sub-divisions of the state.

Application Review Requirements

Applicants for federal or state construction permits are not required to submit separate applications to the SHPO or the TAC. However, the permitting agencies are required to provide an opportunity for review and comment on permit applications and must consider the comments received from the SHPO and the TAC. The National Historic Preservation Act of 1966 directs federal agencies to coordinate with the SHPO. State laws and agency rules require state agency coordination with both the SHPO and the TAC.

LOCAL GOVERNMENTS

The permit applications from most federal and state permitting agencies ask for information concerning the status of permits required by local political subdivisions. The aquaculture business's failure to identify and obtain necessary permits and approvals from appropriate local jurisdictions may result in project delay.

While federal and state agencies are aware of some of the local permitting requirements and will advise the permit applicant, the ultimate responsibility lies with the applicant. It is important, therefore, that the applicant, or his representative, meet with local officials to describe the project and identify local permitting requirements and regulations. Most of this coordination should be done during the site characterization and evaluation process and prior to development of detailed project design and construction plans.

The following are examples of the types of aquaculture project activities in which local government authorities could require a local permit, assess fees, or impose regulations on the project:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Local/Regional Authorities</th>
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<tbody>
<tr>
<td>Water Supply</td>
<td>City, Water District, River Authority, Underground water control districts</td>
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<tr>
<td>Wastewater and Solid Waste Disposal</td>
<td>Publicly owned water treatment facilities (cities or municipal utility districts), drainage districts, city or county land-fill regulations, county septic tank regulations</td>
</tr>
<tr>
<td>Land Use Construction</td>
<td>City zoning ordinances</td>
</tr>
<tr>
<td>Construction</td>
<td>City or county flood plain administrator, flood control or levee districts, city construction codes, county construction requirements as a condition of septic tank permits or use of county rights-of-way, city requirements within &quot;extra-territorial jurisdiction&quot;, local health authorities</td>
</tr>
<tr>
<td>Electrical Service</td>
<td>City, River authority, electric power company, rural electric cooperative, municipal utility district</td>
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