Trout Farm II
Final Report

Lafayette College
Technology Clinic
May 13 2013
"One Fish Two Fish
Trout are Due's Fish"

Executive Summary

Identify Objectives:

- Identify a base market for local farm raised rainbow trout
- Maintain trout quality and healthy pond ecosystem

Areas to Explore:

- Fabricating floating solar panels as alternate source of revenue
- Employing filtration to maintain pond quality
- Using the fish farm as a recreational fishing pond
- Partnering with local educational groups
- Identifying restaurants in our target market

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The Technology Clinic

Created at Lafayette College in Easton PA, the Technology Clinic is an interdisciplinary course which provides students with practical experience addressing novel challenges. Since its inception in 1986, Tech Clinic has provided opportunities for small groups of highly motivated students – usually five or six members – to work closely with professors and other professional mentors to solve real-world problems. These students and professionals bring a variety of experiences, skills and perspectives that contribute to the authentically interdisciplinary nature of the course.

Mission Statement

The goal of Tech Clinic AY 2012-13 is to provide recommendations to our client, the Due family, that enable Country Springs Farm to become a business that is socially desirable, economically feasible and environmentally viable. This is a continuation of a project from AY 2011-2012 with the Country Springs Farm but our focus has shifted and broadened from maintaining the trout population through extreme weather periods to finding a sustainable market for the rainbow trout.

The Team

Dan Bauer is a long-time resident of the Easton area, who has lived in highland Peru, Ethiopia, and southern Mexico. He began his education in engineering and, after completing a degree in Journalism and a stint in the Peace Corps, completed his PhD in Social Anthropology. The Lafayette College Technology Clinic, which he founded, combines these interests.

Ian Crawley is a sophomore from Doylestown, PA. As a Physics and Mathematics double major, Ian is heavily involved in the theater and arts community at Lafayette.

Ben Drake is a junior from Spring Lake Heights, NJ. He is currently pursuing a Bachelor of Science in Electrical and Computer Engineer. At Lafayette, he is involved with intramural sports and is on the board for the Lafayette Christian Fellowship and Club soccer. In his free time he enjoys playing soccer and longboarding.

Shehtaz Huq is a junior double major in English with Film and Media Studies and hails from Bangladesh but has lived in Texas for the last four years. She enjoys being a Resident Adviser, a student mentor for the College Writing Program, and working the Circulation Desk at Skillman Library. Shehtaz hopes to pursue graduate school for cultural studies.

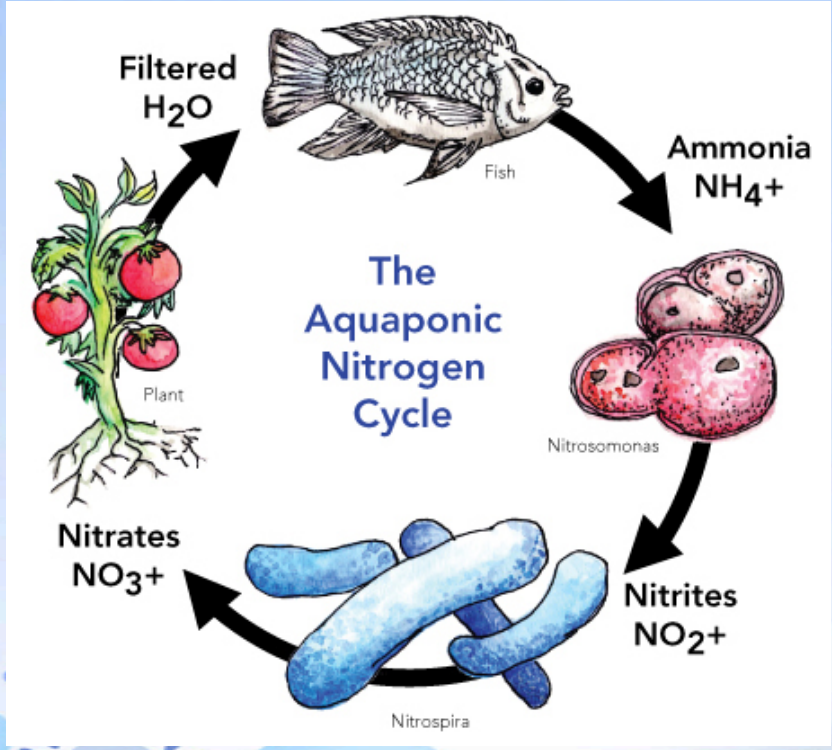
Brooke Kohler is a senior majoring in Anthropology & Sociology and minoring in Environmental Sciences. She is a pole vaulter on the Track & Field team, student-athlete peer mentor, President of the Emile Durkheim Society, Lafayette Leadership Education Committee member, and A&S Departmental Assistant. The past two years she has conducted student research in the US Virgin Islands on water conservation and invasive species.

Nancy McCreary Waters joined the Biology faculty in 1985. With expertise in freshwater biology and plant community ecology, Prof Waters worked with the Army Corps of Engineers and offers courses in the environmental science/studies programs. Though occasionally involved with TechClinic, she is gratified FINALLY to be a facilitator, even while serving as the Faculty Health Professions Advisor. Additionally, she once graced the Lafayette stage in *Evita*, *ThreePenny Opera*, and most recently in *Hear me Roar*, with hopes to return soon if she can convince her theatre colleagues to humor her.

Françeska Xhakaj is a sophomore from Vlore, Albania. She is pursuing a Bachelor of Science in Computer Science. Françeska is an active member of the Lafayette community and board member of ISA (International Student Association) along with the Women in Computing Club.

Yue 'Jim' Yin is a junior Chemical Engineering and Economics double major from Shanghai, China. At Lafayette, he conducts research in the Chemical Engineering Department on alternative energy and biofuels, and would like to continue his studies after graduation. In his free time, he enjoys playing saxophone at jazz combo and playing badminton.

Aquaponics
Aquaculture and Hydroponics



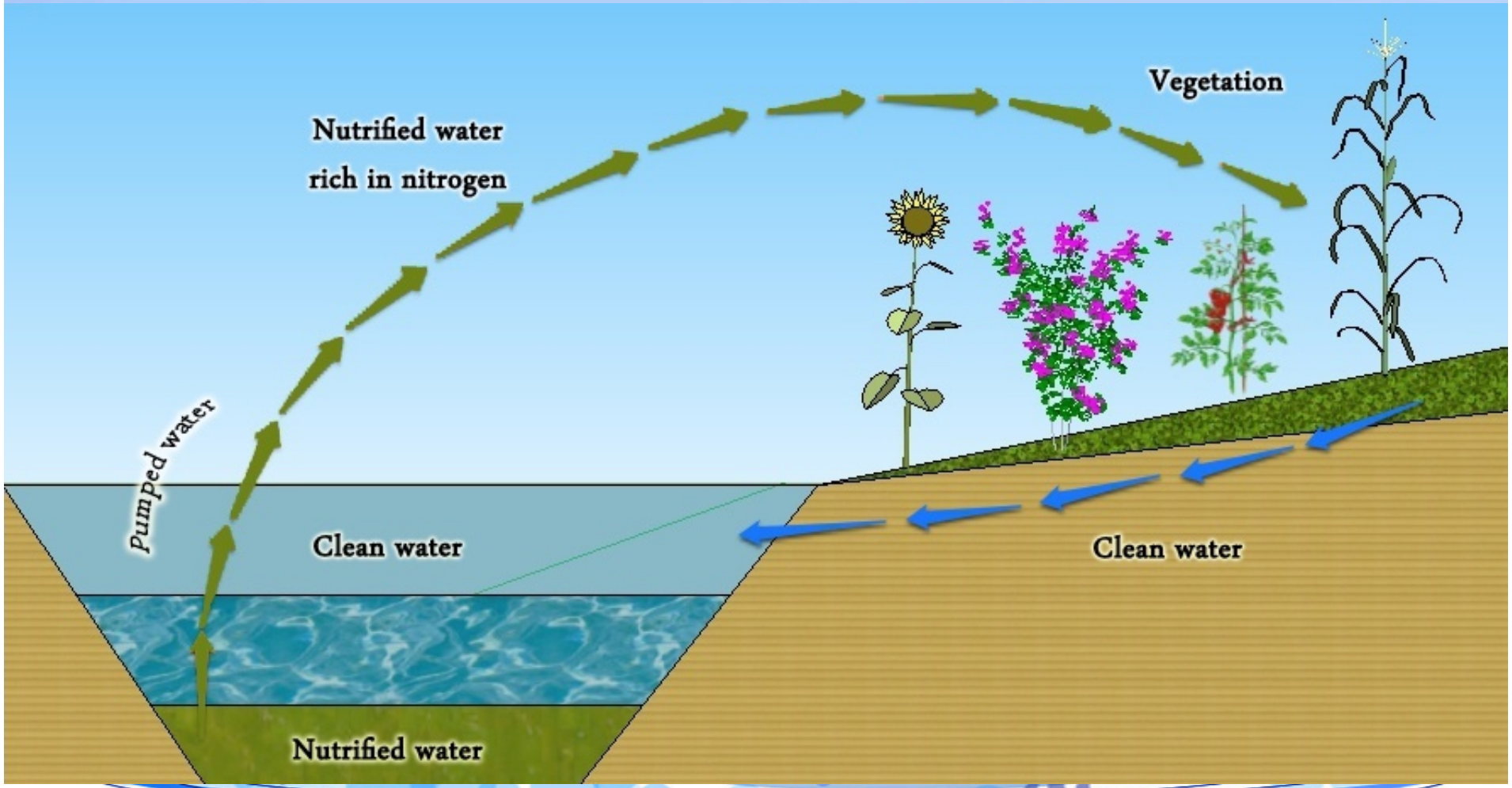
http://2.bp.blogspot.com/-nH3Dl6CceH4/UIdPmTTU6PI/AAAAAAAAAks/s55cuGxVVY4/s1600/AquaponicsNitrogenCycle.jpg

http://upload.wikimedia.org/wikipedia/commons/7/7f/CDC_South_Aquaponics_Raft_Tank_1_2010-07-17.jpg

Aquaponics: The Objective

Aquaponics integrates aquaculture with hydroponics into a soil-less growing system. Nutrient-rich fish waste is pumped from ponds into raised-bed gardens to feed vegetation. In turn, metabolizing plants gain nutrients by filtering impurities, thereby returning clean water to the pond.

Establishing aquaponics at Country Springs Farm



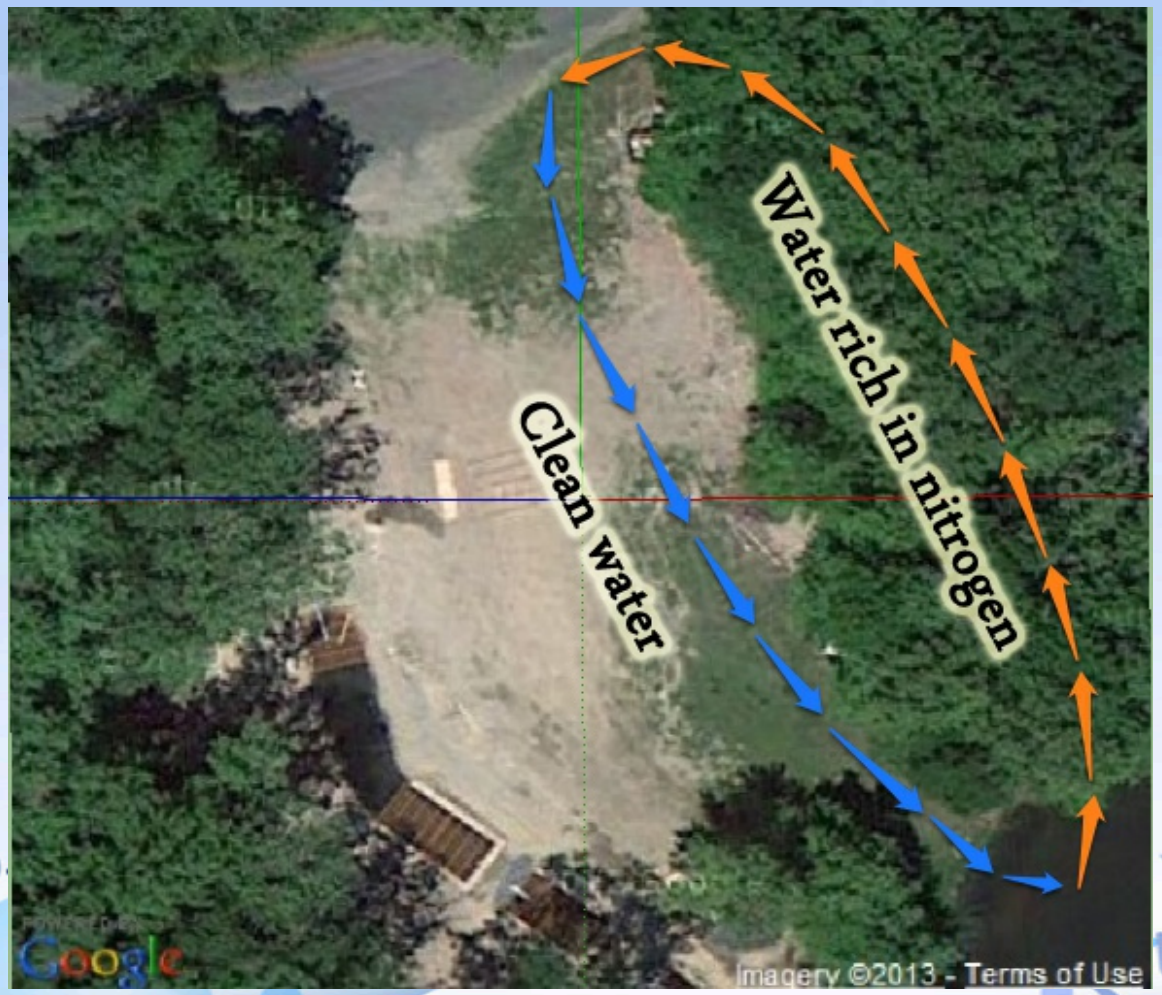
The Aquaponics Cycle:

- Fish produce waste that accumulates in sediments.
- Waste-rich water from just above the sediment surface at the bottom of the pond is pumped out.
- Removed water is a concentrated source of essential plant nutrients, particularly nitrogen.
- Water is transferred upgrade to vegetable beds.
- Naturally occurring microbes/bacteria degrade trout waste into plant fertilizer as water percolates.
- Plants absorb and metabolize compounds, thereby removing impurities and filtering water.
- Result? Ground flow returns clean water to pond.

Purpose of Aquaponics

- … instead of polluting the water by putting agriculture in water…
- … we want to put the water into the agriculture, to clean the water

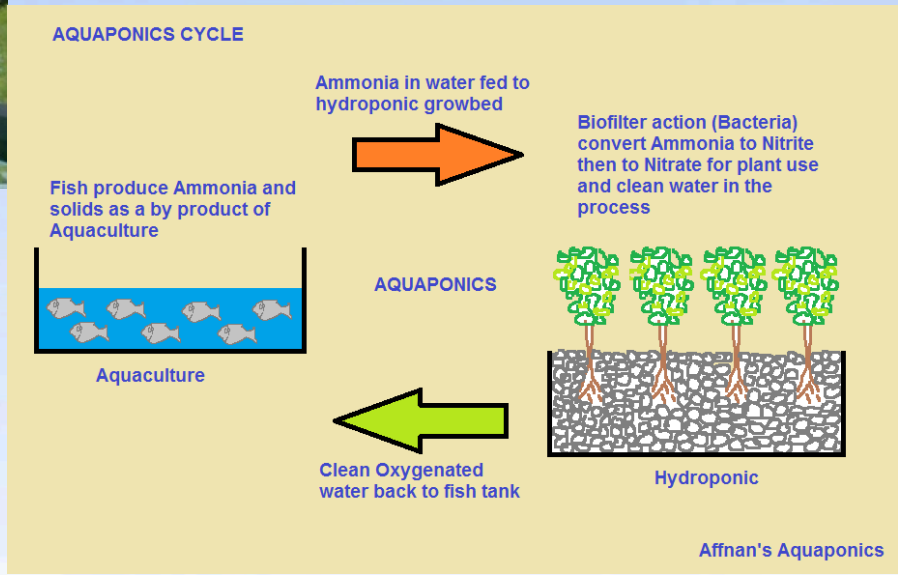
Proposed site for aquaponics system



Pump

- Tough, reliable ¼ hp submersible utility pump
- Rugged thermoplastic body resists corrosion, impact, stress, heat
- Pumping rate up to 1,260 gallons/hour

Using aquaponics in Pennsylvania generally requires a greenhouse to compensate for climate limitations on the growing season…



…But it remains a feasible way to filter fish waste and enhance plant growth; the picture above shows an aquaponic greenhouse located in Chester County, PA.

Pictures from left to right:
http://www.herbanfarms.com/Home.html
http://pinterest.com/zachmonroe/aquaponics/

Improving Soil

Healthy Soil>>>>Healthy Crops

- Analyze soil? Target deficiencies!
- Assess current nutrients (Sites A,B,C):
  - K_2O, P_2O_5 deficient; adequate MgO
  - pH 6.9-7.8; CEC<15meq; 2mg NH_4-N/kg
  - 7% OM; 57% sand, 31% silt, 12% clay
- Goals: enhance potassium, phosphate, cations, and organic matter with fish emulsion and compost applications
  - ***>Perfect for fish-based aquaponics!***

Implementing Aquaponics: Bangor High School

•***Transform an existing unused greenhouse at Bangor High School into an prototype aquaponics system!*** Advantages?

•Utilize an underused school facility
•Create a sustainable food production system
•Engage students in hands-on experiences
•Provide opportunities for community-based service-learning projects, both for Bangor High School students and for those at Lafayette College with interests in biology, environmental science, geology, civil engineering, as well as engineering studies, among others

http://coachesaid.com/school.aspx?school=13535

Aquaponics and the Slate Belt

- Leverage the current relationship between Lafayette College Tech Clinic and Bangor School Director Pam Colton to spearhead such educational initiatives as Trout in the Classroom
- Create projects aimed at enhancing economic development of the Slate Belt, such as commercial fish farming in a sustainable food production system

http://www.lehighvalleylive.com/slate-belt/index.ssf/2012/10/quarry_site_in_plainfield_wash.html

http://blog.discoverlehighvalley.com/2013/03/12/play/all-aboard-the-slate-belt-express-choo-choo/

Community-Based Learning Projects

Areas of Exploration:

- Enhance involvement of Country Springs Farm and the client with different stakeholders in the community.
- Engage in interdisciplinary collaboration with community members and improve community organization.
- Generate real-world application methods regarding aquaponics and solar panels through education.
- Develop systematic strategies solve real-world problems.
- Act as liaison to build educational connections among diverse community stakeholders.
- Investigate funding opportunities related to job creation.

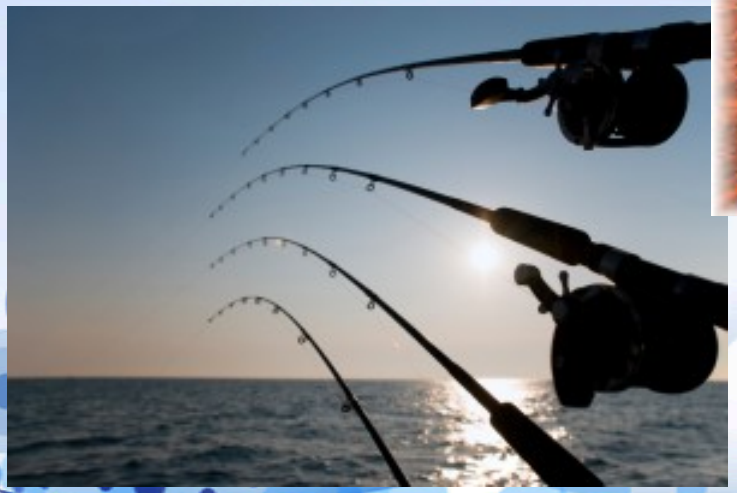
Collaboration and Learning

Career Institute Technology

•Interface with students from local schools like the CIT to learn about and share their experiences with aquaponics and more.

•Future Tech Clinic projects could partner with K-12 students to enhance community engagement and inclusion.

Alternative Markets



http://www.charliessmokehouse.com/, http://www.cropking.com/aqua.shtml, ,
http://threesheetsnw.com/blog/2011/12/get-fishing-and-crabbing-tips-from-the-best-at-seattle-boat-show/

Farm to Table Restaurants

Promoting farm-raised trout:

•Investigate interest level of local businesses/restaurants for farm-raised rainbow trout from Country Springs Farm.

• Local vendors can emphasize both the product (trout) and the source. Well-known farm-to-table restaurants in the Lehigh Valley, Hanover area and Western Pennsylvania enjoy close ties with their local suppliers. The aesthetic beauty of Country Springs Farm is a plus to leverage for the trout.

Pictures left to right: Jonathan Timmes' Fish in a Tray, Cape Ann SCF Boat-Day Fish, Mama's Fish House

Marketing Strategy

Priorities to assess a farm-to-table market: COST and EFFICIENCY

•If controlling costs is a concern, then the entrepreneur him/herself can assume the initiative. S/he can go into the local community, visiting businesses to gauge the area's clientele, and determine what similar establishments are doing. Is there a market for farm-to-table restaurants? Are there establishments willing to partner with a local farm as an ongoing supplier?

- This strategy is called Local Store Marketing (LSM).
- Requires direct involvement in the community: cater for local schools/ businesses, participate in chamber of commerce/non-profits/charity
- Connect with publicity sources, i.e., the food editor of the local paper
- Appeal to local businesses & corporations with sample menus, platters etc.

•For the sake of efficiency, the entrepreneur should engage a market researching firm to analyze the purchasing habits of potential clientele. While this may involve short-term upfront costs, it will reduce the time spent by the entrepreneur research market potential.

Collaboration and Learning

For Example: Easton Farmer's Market

- Suggestion 1 for Country Springs Farm:
  - Sell trout to current vendors at Easton Farmer's Market and/or nearby venues.
  - By selling to an established vendor, revenue is generated.
  - A plus is that personal vending licensure would not be necessary.
- Suggestion 2 for Country Springs Farm:
  - Appeal to Easton Farmer's Market community partners to become a direct vendor.
  - Direct engagement with the Easton community will aid in establishing a market for trout.

Recreational Fishing Pond

Advantages and Resources

- Rainbow Trout: Excellent Sport Fish

  - Handsome Fish
  - Stubborn Fighter
  - Good Table fare

- Beautiful Environment

- Flexibility and Versatility
  - Public Fishing
  - Group Parties
  - Stocking Fish

Preliminary Market Research

- **Market growth:**
  - License Sales Trends: +9.1% January – June 2012

- **Market Segmentation**

FAMILY

- Leisure and Relaxation
- Family cohesion
- Friendship development

Source: RBFF Fishing License Sales Index Produced for the Recreational Boating & Fishing Foundation.; Market Segmentation Profile Executive Summary, Strategic Marketing & Research, Inc.

Marketing Recommendations

- **Diversified Service**
- Recreational Fishing
- Birthday Parties
- Family/Class Reunions
- Corporate Outings
- Picnics

- **Scenery and water**

Public Fishing

- **Fish Stocking**

Fish	Suitable for Catch& Purchase	Suitable for Catch & Release
Trout	***Yes***	***No***
Large mouth bass	Yes	Yes
Hybrid striped bass	Yes	No
Catfish	Yes	Yes

- **Fees**

Items	Reference Prices ($)
2 hours of fishing	7.00
Each additional hour	3.50
Rod rentals	3.00
Caught trout- no release allowed	5.89/lb
Caught Catfish- optional release	5.89/lb
Fish cleaning	0.5/fish
Bait available	
Night crawlers/doz.	2.75
Mealworms/per 30	2.25

Source: http://www.centerpointpond.com/

Group Parties

- **Suggested Service**
- Fishing party for 10 anglers
- Fishing instruction
- Rods & bait rental
- Picnic site
- Charcoal grill
- Photography service

Additional Cost

- **Additional Constructions**
  - Landscape, Pavilions
- **Safety and Liability Concerns**
  - Staff & Insurance
- **Commercial Licenses and Permits**

Licenses and Permits

Pennsylvania Fish & Boat Commission

- ***Do I need a license to fish on my own land?***

  •**The law provides that no person 16 years of age or older shall fish in any of the waters of Pennsylvania or in any boundary waters without first procuring a license**. However, there is an exemption in the law. The exemption allows landowners who reside on their land throughout the year **and members of their families** residing thereon to fish on their land in waters wholly within said land without a license. This exemption does not apply to any person temporarily residing upon the land or any tenant who is not a member of the family of the owner. The exemption also does not apply to any servant or employee of the owner. A pond or lake that is wholly within land owned by a homeowners association or a private club does not exempt the individual homeowners or club members from having a fishing license.

- **Commercial License**

  •**For regulated fishing lake license application**

  •Class "A" :Less than 20 Acres ($100)

Class A Regulated Fishing Lake Application (PFBC-109)

Acknowledgements

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