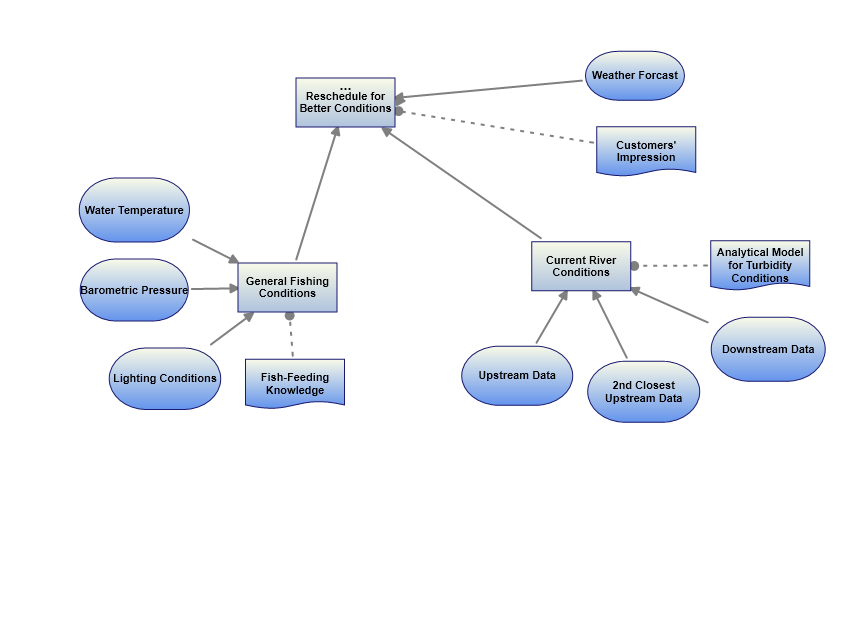
# Should we take clients fishing?

**Decision Requirements Diagram**

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| **Nodes** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |
| Decision | Reschedule for Better Conditions | This is the final decision. It is to decide whether to reschedule when to take a client, or take them out fishing. It takes in River Conditions, General Fishing Conditions, Weather Forecast and Customers' Impression Knowledge. These are two subsidiary decisions, one knowledge and one input. The two decisions lay on a spectrum from great to poor and obviously better the conditions means better fishing. The weather forecast is an unstructured, customer preference. If the weather forecast doesn't jive with their expectations it should be rescheduled. The Customers' Impression is like a marketing strategy component. We should not be providing anything less than our best effort in delivering the client a exciting experience. It is essentially begging the question, "even if the conditions are good now, should we wait until they are even better?" Of course, if we have unattainable standards then we won't bring any clients out, so there needs to be some discretion. |
| Data Source | Upstream Data | The data source is from a gage run by the United States Geological Survey, a government organization that studies natural resources in the US. In most cases, these gages only have the river height. Some have other information like water temperature and discharge (amount of water flowing per second). In any case, the closest upstream gage should be monitored to see what the conditions will be when you arrive there. The real purpose is to see the conditions/clarity of the river. The higher the more water that is in and flowing correlates to bad sport fishing. It is murky and turbulent. If the river is very high, it may become too dangerous to go out in a boat. In scenarios with low water, it may be impossible to navigate a boat in a river that is too shallow. If its low some spots may become impassable, preventing a boat from getting to prime fishing areas. For example, if there is a sudden increase in the river height upstream, this probably indicates that it rained in the river basin upstream and fishing conditions are likely going to be poor soon. If a river is decreasing in gage height, it indicates the river conditions are improving, but the rate of the decrease indicates how long ago the river peaked. The peak is considered the worst conditions. |
| Data Source | 2nd Closest Upstream Data | The next closest upstream gage should be monitored for the same purposes the other upstream gages are. It is an attempt to understand the conditions of the river and what the conditions are going to be. |
| Data Source | Barometric Pressure | Barometric Pressure, or atmospheric pressure, has been shown to influence the feeding activity of fish. Since fish have to regulate their buoyancy in the water, changes in pressure are felt more acutely than land-mammals. The analogy here is pressure changes to fish are similar to migraine headaches. The discomfort pushes fish to deeper water and loss of appetite, which spells bad for fishermen. Many sportfish that fisherman target hunt for food by rushing up from the bottom and striking their food near the surface. The quick change in pressure from this activity puts strain on their buoyancy organ. If buoyancy is already giving a fish discomfort, it is less likely for them to strike, creating even more discomfort for themselves. |
| Data Source | Downstream Data | Downstream data from USGS river gages is used to gather more context on the conditions. It shows what the conditions where in the targeted area you want to fish. From looking at the conditions above and the conditions below, one can infer what the conditions between are. This is where the analytical model helps us. |
| Data Source | Lighting Conditions | The Bass species tend to feed in less-intense light conditions. This would include dawn, dusk and cloudy weather. Bright light pushes fish to deeper water, creating more difficulty to catch them. |
| Data Source | Weather Forecast | This is the weather forecast for the time we would potentially have clients on the water. Some clients may be willing to put up with drizzling rain while others may want sunny weather. It's up to the customer. This is separate from river conditions because we would see changing river conditions in the upstream river gages. |
| Data Source | Water Temperature | Water temperature effects the activity level of fish. Since they are cold blooded, it is easier for fish to be active when water temperatures are higher. If the temperature is too high though, their feeding activity drops. Warm water temperatures are correlated to low oxygen levels in the water, which fish need for activity like humans. |
| Know How | Fish-Feeding Knowledge | This knowledge is connecting the water temperature, barometric pressure and lighting conditions data, and understanding of fish-feeding activity based on these exterior markers. In other words, being able to understand if the information correlates to good fishing. As an example, imagine if two input-data nodes are considered satisfactory, but the third is considered poor for fishing. Just how poor does it have to be to negate the other satisfactory input-data nodes? Expertise would be able to decide on these controversial cases. An expert would also know the ranges that are considered acceptable for each input-data node. For example, barometric may be able to stray 15% in either direction from its mean and be satisfactory, but temperature has a different acceptable range. Also, deviation from the mean in one direction may be worse than deviation in the other. For example, 5% below the median temperature may be worse than 5% above the median value. An expert would understand the interactions between the input data and how it all relates to determining the General Fishing Conditions decision. |
| Know How | Analytical Model for Turbidity Conditions | This model is meant to predict the clarity of the water at the area where you want to fish. The inputs to the model are the upstream and downstream data, and the outputs would be clarity of the water. To train this model, I would use a dataset where gage height and discharge are the independent features, and the dependent variable would be a turbidity value from a downstream gage. The turbidity value is a scientific measurement of how clear a liquid is, or how well someone can see through it. The higher the turbidity value, the less clear the liquid is. Particles floating in the water would make the water murky, raising the turbidity. When it rains, sediment is pulled into the river as water runs off the land. These particles remain suspended in the water if the river is flowing well. |
| Know How | Customers' Impression | This knowledge node is to determine what impression does the business want to leave on the clients. We may want to guarantee a particular customer perfect conditions. They may be well connected, and we hope to have them speak favorably of our services. They may live locally and we hope to have them book a guide with us again. This is part of marketing as well. To start a guide business and gain traction as a reputable guide, we probably want our first few clients to have great conditions so your reputation starts off in good standing. |

## General Fishing Conditions

**Operational Decision**

Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision.

### Question: What are the general fishing conditions?

|  |  |
| --- | --- |
| **Answer Type** | Value from explicit list |
| **Answers** |  |
| **Default Answer:** |  |
| **Supporting Information:** |  |

### Requirements Network

| **Requires** | | **Description** |
| --- | --- | --- |
| Input Data | Barometric Pressure | Barometric Pressure, or atmospheric pressure, has been shown to influence the feeding activity of fish. Since fish have to regulate their buoyancy in the water, changes in pressure are felt more acutely than land-mammals. The analogy here is pressure changes to fish are similar to migraine headaches. The discomfort pushes fish to deeper water and loss of appetite, which spells bad for fishermen. Many sportfish that fisherman target hunt for food by rushing up from the bottom and striking their food near the surface. The quick change in pressure from this activity puts strain on their buoyancy organ. If buoyancy is already giving a fish discomfort, it is less likely for them to strike, creating even more discomfort for themselves. |
| Input Data | Lighting Conditions | One is that fish are cold-blooded animals. The colder the water, the more difficult it is for them to make quick movements and strike prey. They want to conserve energy. Warm water also means there are low oxygen levels in the water. Fish need oxygen for activity just like humans, so the less there is the more strenuous it for them to exert themselves to chase prey. There is a preferable range where fishing is best. |
| Knowledge Source | Fish-Feeding Knowledge | This knowledge is connecting the water temperature, barometric pressure and lighting conditions data, and understanding of fish-feeding activity based on these exterior markers. In other words, being able to understand if the information correlates to good fishing. As an example, imagine if two input-data nodes are considered satisfactory, but the third is considered poor for fishing. Just how poor does it have to be to negate the other satisfactory input-data nodes? Expertise would be able to decide on these controversial cases. An expert would also know the ranges that are considered acceptable for each input-data node. For example, barometric may be able to stray 15% in either direction from its mean and be satisfactory, but temperature has a different acceptable range. Also, deviation from the mean in one direction may be worse than deviation in the other. For example, 5% below the median temperature may be worse than 5% above the median value. An expert would understand the interactions between the input data and how it all relates to determining the General Fishing Conditions decision. |
| Input Data | Water Temperature | Water temperature effects the activity level of fish. Since they are cold blooded, it is easier for fish to be active when water temperatures are higher. If the temperature is too high though, their feeding activity drops. Warm water temperatures are correlated to low oxygen levels in the water, which fish need for activity like humans. |

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Reschedule for Better Conditions | This is to decide whether to reschedule when to take a client. It takes in River Conditions, General Fishing Conditions, Weather Forecast and the Customers' Impression Knowledge node. |

### Properties

| **Name** | **Value** | **Description** |
| --- | --- | --- |
| Volume | Medium |  |
| Repeatability | Medium |  |
| Complexity | Medium |  |
| Variability | High |  |
| Measurability | Low |  |
| Time to outcome | Short |  |
| Decision Value Decay |  |  |

## Current River Conditions

**Operational Decision**

The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.).

### Question: What are the current river conditions?

|  |  |
| --- | --- |
| **Answer Type** | Value from explicit list |
| **Answers** |  |
| **Default Answer:** |  |
| **Supporting Information:** |  |

### Requirements Network

| **Requires** | | **Description** |
| --- | --- | --- |
| Input Data | Upstream Data | The data source is from a gage run by the United States Geological Survey, a government organization that studies natural resources in the US. In most cases, these gages only have the river height. Some have other information like water temperature and discharge (amount of water flowing per second). In any case, the closest upstream gage should be monitored to see what the conditions will be when you arrive there. The real purpose is to see the conditions/clarity of the river. The higher the more water that is in and flowing correlates to bad sport fishing. It is murky and turbulent. If the river is very high, it may become too dangerous to go out in a boat. In scenarios with low water, it may be impossible to navigate a boat in a river that is too shallow. If its low some spots may become impassable, preventing a boat from getting to prime fishing areas. For example, if there is a sudden increase in the river height upstream, this probably indicates that it rained in the river basin upstream and fishing conditions are likely going to be poor soon. If a river is decreasing in gage height, it indicates the river conditions are improving, but the rate of the decrease indicates how long ago the river peaked. The peak is considered the worst conditions. |
| Input Data | 2nd Closest Upstream Data | The next closest upstream gage should be monitored for the same purposes the other upstream gages are. It is an attempt to understand the conditions of the river and what the conditions are going to be. |
| Input Data | Downstream Data | Downstream data from USGS river gages is used to gather more context on the conditions. It show what the conditions where in the targeted area you want to fish. From looking at the conditions above and the conditions below, one can infer what the conditions between are. This is where the analytical model helps us. |
| Knowledge Source | Analytical Model for Turbidity Conditions | This model is meant to predict the clarity of the water at the area where you want to fish. The inputs to the model are the upstream and downstream data, and the outputs would be clarity of the water. To train this model, I would use a dataset where gage height and discharge are the independent features, and the dependent variable would be a turbidity value from a downstream gage. The turbidity value is a scientific measurement of how clear a liquid is, or how well someone can see through it. The higher the turbidity value, the less clear the liquid is. Particles floating in the water would make the water murky, raising the turbidity. When it rains, sediment is pulled into the river as water runs off the land. These particles remain suspended in the water if the river is flowing well. |

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Reschedule for Better Conditions | This is to decide whether to reschedule when to take a client. It takes in River Conditions, General Fishing Conditions, Weather Forecast and the Customers' Impression Knowledge node. |

### Properties

| **Name** | **Value** | **Description** |
| --- | --- | --- |
| Variability | High |  |
| Volume | Medium |  |
| Complexity | Medium |  |
| Repeatability | Medium |  |
| Measurability | High |  |
| Time to outcome | Short |  |
| Decision Value Decay |  |  |

## Reschedule for Better Conditions

**Operational Decision**

This is the final decision. It is to decide whether to reschedule when to take a client, or take them out fishing. It takes in River Conditions, General Fishing Conditions, Weather Forecast and Customers' Impression Knowledge. These are two subsidiary decisions, one knowledge and one input. The two decisions lay on a spectrum from great to poor and obviously better the conditions means better fishing. The weather forecast is an unstructured, customer preference. If the weather forecast doesn't jive with their expectations it should be rescheduled. The Customers' Impression is like a marketing strategy component. We should not be providing anything less than our best effort in delivering the client a exciting experience. It is essentially begging the question, "even if the conditions are good now, should we wait until they are even better?" Of course if we have unattainable standards then we won't bring any clients out, so there needs to be some discretion.

### Question: Should we reschedule or take the clients out?

|  |  |
| --- | --- |
| **Answer Type** | Yes/No |
| **Answers** |  |
| **Default Answer:** | No |
| **Supporting Information:** |  |

### Requirements Network

| **Requires** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |
| Knowledge Source | Customers' Impression | This knowledge node is to determine what impression does the business want to leave on the clients. We may want to guarantee a particular customer perfect conditions. They may be well connected, and we hope to have them speak favorably of our services. They may live locally and we hope to have them book a guide with us again. This is part of marketing as well. To start a guide business and gain traction as a reputable guide, we probably want our first few clients to have great conditions so your reputation starts off in good standing. |
| Input Data | Weather Forecast | This is the weather forcast for the time we would potentially have clients on the water. Some clients may be willing to put up with drizzling rain while others may want sunny weather. It's up to the customer. This is separate from river conditions because we would see changing river conditions in the upstream river gages. |

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Take clients to the river? - Y/N |  |

### Properties

| **Name** | **Value** | **Description** |
| --- | --- | --- |
| Complexity | High |  |
| Volume | High |  |
| Variability | High |  |
| Repeatability | Medium |  |
| Measurability | Low |  |
| Time to outcome | Short |  |
| Decision Value Decay |  |  |

### Objectives

| **Influences Objectives** | **Impact** | **Notes** |
| --- | --- | --- |
| KPI for taking clients out on guided trips |  |  |

## Upstream Data

**External, Structured Input Data**

The data source is from a gage run by the United States Geological Survey, a government organization that studies natural resources in the US. In most cases, these gages only have the river height. Some have other information like water temperature and discharge (amount of water flowing per second). In any case, the closest upstream gage should be monitored to see what the conditions will be when you arrive there. The real purpose is to see the conditions/clarity of the river. The higher the more water that is in and flowing correlates to bad sport fishing. It is murky and turbulent. If the river is very high, it may become too dangerous to go out in a boat. In scenarios with low water, it may be impossible to navigate a boat in a river that is too shallow. If its low some spots may become impassable, preventing a boat from getting to prime fishing areas. For example, if there is a sudden increase in the river height upstream, this probably indicates that it rained in the river basin upstream and fishing conditions are likely going to be poor soon. If a river is decreasing in gage height, it indicates the river conditions are improving, but the rate of the decrease indicates how long ago the river peaked. The peak is considered the worst conditions.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |

## 2nd Closest Upstream Data

**External, Structured Input Data**

The next closest upstream gage should be monitored for the same purposes the other upstream gages are. It is an attempt to understand the conditions of the river and what the conditions are going to be.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |

## Barometric Pressure

**External, Structured Input Data**

Barometric Pressure, or atmospheric pressure, has been shown to influence the feeding activity of fish. Since fish have to regulate their buoyancy in the water, changes in pressure are felt more acutely than land-mammals. The analogy here is pressure changes to fish are similar to migraine headaches. The discomfort pushes fish to deeper water and lose of appetite, which spells bad for fishermen. Many sportfish that fisherman target hunt for food by rushing up from the bottom and striking their food near the surface. The quick change in pressure from this activity puts strain on their buoyancy organ. If buoyancy is already giving a fish discomfort, it is less likely for them to strike, creating even more discomfort for themselves.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |

## Downstream Data

**External, Structured Input Data**

Downstream data from USGS river gages is used to gather more context on the conditions. It show what the conditions where in the targeted area you want to fish. From looking at the conditions above and the conditions below, one can infer what the conditions between are. This is where the analytical model helps us.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |

## Lighting Conditions

**External, Unstructured Input Data**

The Bass species tend to feed in less-intense light conditions. This would include dawn, dusk and cloudy weather. Bright light pushes fish to deeper water, creating more difficulty to catch them.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |

## Weather Forecast

**External, Unstructured Input Data**

This is the weather forecast for the time we would potentially have clients on the water. Some clients may be willing to put up with drizzling rain while others may want sunny weather. It's up to the customer. This is separate from river conditions because we would see changing river conditions in the upstream river gages.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Reschedule for Better Conditions | This is to decide whether to reschedule when to take a client. It takes in River Conditions, General Fishing Conditions, Weather Forecast and the Customers' Impression Knowledge node. |

## Water Temperature

**External, Structured Input Data**

Water temperature effects the activity level of fish. Since they are cold blooded, it is easier for fish to be active when water temperatures are higher. If the temperature is too high though, their feeding activity drops. Warm water temperatures are correlated to low oxygen levels in the water, which fish need for activity like humans.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |

## Fish-Feeding Knowledge

**Know how– Expertise**

This knowledge is connecting the water temperature, barometric pressure and lighting conditions data, and understanding of fish-feeding activity based on these exterior markers. In other words, being able to understand if the information correlates to good fishing. As an example, imagine if two input-data nodes are considered satisfactory, but the third is considered poor for fishing. Just how poor does it have to be to negate the other satisfactory input-data nodes? Expertise would be able to decide on these controversial cases. An expert would also know the ranges that are considered acceptable for each input-data node. For example, barometric may be able to stray 15% in either direction from its mean and be satisfactory, but temperature has a different acceptable range. Also, deviation from the mean in one direction may be worse than deviation in the other. For example, 5% below the median temperature may be worse than 5% above the median value. An expert would understand the interactions between the input data and how it all relates to determining the General Fishing Conditions decision.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | General Fishing Conditions | Conditions will lie on a spectrum. Some generalizations will have to be made. The expert with Fish-Feeding Knowledge should be making this decision. |

## Analytical Model for Turbidity Conditions

**Know how– Analytic Insight**

This model is meant to predict the clarity of the water at the area where you want to fish. The inputs to the model are the upstream and downstream data, and the outputs would be clarity of the water. To train this model, I would use a dataset where gage height and discharge are the independent features, and the dependent variable would be a turbidity value from a downstream gage. The turbidity value is a scientific measurement of how clear a liquid is, or how well someone can see through it. The higher the turbidity value, the less clear the liquid is. Particles floating in the water would make the water murky, raising the turbidity. When it rains, sediment is pulled into the river as water runs off the land. These particles remain suspended in the water if the river is flowing well.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Current River Conditions | The decision here is to make a determination on the current river conditions. It takes in raw data from river gages that have height, discharge and other information, and an analytical model that would help predict the clarity of the water. Again, this should be generalized. The raw data will have numerical values and the point of this decision is to convert them to a descriptive understanding (e.g good, bad, poor, etc.). |

## Customers' Impression

**Know how– Best Practice**

This knowledge node is to determine what impression does the business want to leave on the clients. We may want to guarantee a particular customer perfect conditions. They may be well connected, and we hope to have them speak favorably of our services. They may live locally and we hope to have them book a guide with us again. This is part of marketing as well. To start a guide business and gain traction as a reputable guide, we probably want our first few clients to have great conditions so your reputation starts off in good standing.

### Requirements Network

| **Required by** | | **Description** |
| --- | --- | --- |
| Decision | Reschedule for Better Conditions | This is to decide whether to reschedule when to take a client. It takes in River Conditions, General Fishing Conditions, Weather Forecast and the Customers' Impression Knowledge node. |