Summary of Habitat and Fish Monitoring Data from East Fork and
Upper Mainstem Lobster Creeks: 1988-2006

Prepared by Steve Johnson
Western Oregon Research & Monitoring Program
Oregon Department of Fish and Wildlife
For the Bureau of Land Management
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Since 1988, the Oregon Department of Fish and Wildlife (ODFW) has monitored juvenile salmonid summer abundance, smolt abundance, adult spawner abundance, and stream habitat parameters in East Fork and Upper Mainstem Lobster Creeks of the Alsea watershed (Figure 1). The primary purpose of this monitoring is to study the affects that stream habitat modification has on the freshwater survival and abundance of coho salmon (*Oncorhynchus kisutch*). This work has been partially funded by the Bureau of Land Management’s (BLM) Salem District Office since 1996. The purpose of this report is to provide BLM with an update of ODFW’s sampling in East Fork Lobster Creek (East Fork) and Upper Mainstem Lobster Creek (Upper Mainstem) during the 2005-06 sampling season and to put these data in context with past data collected by ODFW.

The watershed characteristics of the two study streams are shown in Table 1. In 1991, extensive in-stream habitat modification was conducted by the BLM in Upper Mainstem as part of a before-after-control-impact (BACI) study to determine the effect of habitat modification on survival rate and smolt abundance of juvenile salmonids. East Fork acted as the control stream during this study, which lasted from 1988 through 1995. A detailed description of this study is in Solazzi et al. (2000). During a February 1996 flood, a number of large debris torrents entered Upper Mainstem and significantly impacted the habitat structures, resulting in the loss of considerable overwinter habitat for juvenile coho salmon. Similar high streamflows in the winter of 1998-99 caused significant channel changes in East Fork. In the summer of 1999, the BLM used 65 pieces of large wood with a total volume of 265m$^3$ to create seven in-channel debris jams in East Fork.

Table 1. Watershed characteristics of East Fork and Upper Mainstem Lobster creeks.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Basin Area (km$^2$)</th>
<th>Stream Length (km)</th>
<th>Mean summer wetted width (m)</th>
<th>Average gradient (%)</th>
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<td>U.M. Lobster Cr.</td>
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</table>

Habitat Inventory

From 1988-2002 and in 2006, we completed physical habitat surveys during late summer (late August – early September) using the methods of Hankin and Reeves (1988) in East Fork (Table 2) and Upper Mainstem (Table 3). No physical habitat surveys were completed in the summers of 2003, 2004, or 2005. Physical habitat surveys were completed in the winter in both streams in the winters of 1990-91, 1991-92, 1995-96, 1996-97, and 2004-05. An additional winter habitat survey was also completed in Upper Mainstem Lobster in the winter of 1993-94 (Table 4). Additional details about sampling methods involved in the physical habitat surveys may be found in Solazzi et al. (2000) and Solazzi and Johnson (2002).
Figure 1. Locations of traps in East Fork and Upper Mainstem Lobster creeks in the Alsea Basin.
Table 2. Habitat survey results for East Fork Lobster Creek, 1988-2002 and 2006.

| Year | Glide (m²) | Cascade (m²) | Rapid (m²) | Riffle (m²) | Lateral Scour Pool (m²) | Plunge Pool (m²) | Alcove Pool (m²) | Dam Pool (m²) | Beaver Dam Pool (m²) | Trench Pool (m²) | Straight Scour Pool (m²) | Backwater Pool (m²) | Isolated Pool (m²) | % Clay | % Silt | % Sand | % Gravel | % Cobble | % Small Boulder | % Large Boulder | % Bedrock | No. Large Boulders | Wood Complexity | % Shade | Width (m) |
|------|------------|-------------|------------|------------|-------------------------|------------------|-----------------|--------------|----------------------|------------------|-----------------------|-------------------|-------------------|--------|-------|-------|--------|---------|----------------|--------------|----------|-----------|----------------|-------------|--------|---------|
|      | 1,252      | 2,108       | 2,737      | 1,474      | 1,252                   | 32               | 166             | 0            | 2,885                | 585              | 1,299                  | 0                 | 0                 | 0      | 5.1   | 2.2   | 37.5   | 32.6   | 15.2            | 0.6          | 6.8      | 0.8     | 1.7    | N/A     | 76.4  | 3.3    |
Table 3. Habitat survey results for Upper Mainstem Lobster Creek, 1988-2002 and 2006.

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<td>2,592</td>
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<td>1,552</td>
<td>1,814</td>
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<td>1,232</td>
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<td>5,553</td>
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<td>5,134</td>
<td>3,063</td>
<td>3,414</td>
<td>4,498</td>
<td>3,800</td>
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<td>8,574</td>
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<td>7,230</td>
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<td>4,020</td>
<td>3,891</td>
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<td>3,609</td>
<td>2,120</td>
<td>2,312</td>
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<td>891</td>
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<td>1,573</td>
<td>1,228</td>
<td>931</td>
<td>832</td>
<td>1,288</td>
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<td>657</td>
<td>343</td>
<td>281</td>
<td>405</td>
<td>646</td>
<td>852</td>
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<td>1,108</td>
<td>731</td>
<td>834</td>
<td>118</td>
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<td>131</td>
<td>245</td>
<td>222</td>
<td>108</td>
<td>204</td>
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<td>286</td>
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<td>1,792</td>
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<td>412</td>
<td>947</td>
<td>771</td>
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<td>0</td>
<td>0</td>
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<td>2,851</td>
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<td>2,655</td>
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<td>645</td>
<td>90</td>
<td>76</td>
<td>127</td>
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<td>63</td>
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<td>0.0</td>
<td>0.0</td>
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<tr>
<td>% Silt</td>
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<td>33.8</td>
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<tr>
<td>% Small Boulders</td>
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<td>N/A</td>
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<td>8.0</td>
<td>10.1</td>
<td>3.8</td>
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<tr>
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<td>0.4</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
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<td>0</td>
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<tr>
<td>% Bedrock</td>
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<td>1.7</td>
<td>2.1</td>
<td>2.3</td>
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<td>2.8</td>
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<td>3.2</td>
<td>3</td>
<td>4</td>
<td>2.7</td>
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<td>N/A</td>
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<td>0.5</td>
<td>0.9</td>
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<td>1.5</td>
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<td>2</td>
<td>1</td>
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<td>N/A</td>
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<td>2.0</td>
<td>1.8</td>
<td>1.8</td>
<td>N/A</td>
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Table 4. Winter habitat survey results for East Fork and Upper Mainstem Lobster creeks in select years between 1990-91 and 2004-05.

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<th>East Fork Lobster</th>
<th>Upper Mainstem Lobster</th>
</tr>
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<td>Glide (m²)</td>
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<tr>
<td>Cascade (m²)</td>
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<td>217</td>
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<tr>
<td>Rapid (m²)</td>
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<td>5,857</td>
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<td>Riffle (m²)</td>
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<td>7,392</td>
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<td>Plunge Pool (m²)</td>
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<td>Dam Pool (m²)</td>
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<td>Trench Pool (m²)</td>
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<tr>
<td>% Silt</td>
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<td>3.1</td>
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<tr>
<td>% Sand</td>
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<td>% Gravel</td>
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Juvenile Salmonid Summer Population Estimates

The estimated summer rearing populations of juvenile salmonids from 1988 through 2006 are shown in Table 5 for both streams. Each summer from 1988-2002, we estimated the number of young-of-the-year coho salmon, young-of-the-year trout (steelhead and cutthroat combined), age 1+ steelhead, and age 1+ cutthroat trout. To estimate the number of fish rearing in the pools, a diver counted the number of each species and age class in every third pool. These counts were adjusted for each species by a calibration factor derived from electrofishing population estimates in a subset of the snorkeled pools. Finally, the mean of the adjusted values was multiplied by the total number of pools in each stream (Hankin and Reeves 1988). Snorkel estimates were impractical in habitat with shallow depths, therefore we estimated the mean density of fish for a subset of glide, riffle, and rapid habitats by electrofishing, employing a removal population estimate with two or more passes (Serber and Lecren 1967). For each habitat type, we then multiplied the mean density by the surface area of the habitat type in the entire stream (Hankin 1984).

In the summers of 2003-2006, as in previous years, we completed dive counts in every third pool; however, we did not use electrofishing equipment to calibrate the diver counts or to estimate population size of juvenile salmonids in fast water habitat. In order to make comparable estimates to the number of juvenile salmonids rearing in each stream from past years, we applied the 2003-2006 uncalibrated diver estimates in pool habitat to the regression of total population estimate for all habitat units (derived from Hankin-Reeves survey methods) on uncalibrated diver counts in pool habitat (Table 6). Data collected from the summer of 1991-2002 on each stream were used to develop the regression equations. The relationship between uncalibrated diver counts in pool habitat and the Hankin-Reeves population estimate (all habitat types) was significant for coho salmon and age 0 trout for both streams. Thus, we used the regression equations in Table 6 to obtain the Hankin-Reeves population estimates given in Table 5 for coho salmon and age 0 trout in summers 2003-2006. We found a poor relationship between summer dive counts of steelhead and cutthroat trout (≥90mm) in pool habitat and the total population estimates for all habitat units derived from the Hankin-Reeves method (Table 5). Cutthroat (≥90mm) dive counts in pools were not significant and explained less than 10% of the variation in the Hankin-Reeves population estimates in both streams. The regression was also not significant for steelhead (≥90mm) for East Fork Lobster. While the regression was significant for steelhead (≥90mm) in Upper Mainstem Lobster (p=0.046), it explained only about 37% of the variation in the Hankin-Reeves population estimate. Therefore, no estimates of summer population size are provided for steelhead or cutthroat trout (≥90mm) in 2003-2006 (Table 5).

<table>
<thead>
<tr>
<th>Sample Year</th>
<th>E.F. Lobster Creek</th>
<th>U.M. Lobster Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coho &lt;90mm</td>
<td>Coho &lt;90mm</td>
</tr>
<tr>
<td>1988</td>
<td>11,462</td>
<td>5,098</td>
</tr>
<tr>
<td>1989</td>
<td>13,694</td>
<td>2,279</td>
</tr>
<tr>
<td>1990</td>
<td>19,278</td>
<td>2,837</td>
</tr>
<tr>
<td>1991</td>
<td>9,964</td>
<td>3,490</td>
</tr>
<tr>
<td>1992</td>
<td>7,716</td>
<td>3,096</td>
</tr>
<tr>
<td>1993</td>
<td>15,842</td>
<td>2,298</td>
</tr>
<tr>
<td>1994</td>
<td>6,432</td>
<td>2,278</td>
</tr>
<tr>
<td>1995</td>
<td>8,085</td>
<td>2,884</td>
</tr>
<tr>
<td>1996</td>
<td>3,767</td>
<td>2,355</td>
</tr>
<tr>
<td>1997</td>
<td>11,055</td>
<td>4,619</td>
</tr>
<tr>
<td>1998</td>
<td>4,863</td>
<td>3,516</td>
</tr>
<tr>
<td>1999</td>
<td>2,358</td>
<td>5,012</td>
</tr>
<tr>
<td>2000</td>
<td>8,001</td>
<td>5,478</td>
</tr>
<tr>
<td>2001</td>
<td>10,280</td>
<td>3,288</td>
</tr>
<tr>
<td>2002</td>
<td>10,954</td>
<td>4,121</td>
</tr>
<tr>
<td>2003</td>
<td>10,047</td>
<td>3,437</td>
</tr>
<tr>
<td>2004</td>
<td>10,937</td>
<td>3,686</td>
</tr>
<tr>
<td>2005</td>
<td>8,017</td>
<td>3,400</td>
</tr>
<tr>
<td>2006</td>
<td>11,456</td>
<td>2,100</td>
</tr>
<tr>
<td>Average</td>
<td>9,696</td>
<td>3,435</td>
</tr>
</tbody>
</table>

Table 6. Regression of Hankin-Reeves population estimate \(y\) on pool dive count \(x\) of juvenile salmonids in East Fork Lobster and Upper Mainstem Lobster creeks. Data collected from 1991-2002 were used for the regression analysis. Regression equations were used to determine the Hankin-Reeves population estimate for coho salmon and age 0 trout in each stream for the summer of 2003 through 2006.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Species</th>
<th>Regression Equation (y)</th>
<th>N</th>
<th>(R^2)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Fork</td>
<td>Coho</td>
<td>(y = 1.35356x + 614.296)</td>
<td>12</td>
<td>0.736</td>
<td>0.0004</td>
</tr>
<tr>
<td>East Fork</td>
<td>0+ trout</td>
<td>(y = 2.51135x + 1439.24)</td>
<td>12</td>
<td>0.424</td>
<td>0.022</td>
</tr>
<tr>
<td>East Fork</td>
<td>Steelhead ≥90mm</td>
<td>(y = 1.33392x + 311.81)</td>
<td>12</td>
<td>0.299</td>
<td>0.066</td>
</tr>
<tr>
<td>East Fork</td>
<td>Cutthroat ≥90mm</td>
<td>(y = 2.22139x + 670.77)</td>
<td>12</td>
<td>0.076</td>
<td>0.387</td>
</tr>
<tr>
<td>Upper Mainstem</td>
<td>Coho</td>
<td>(y = 1.63557x – 741.6)</td>
<td>11</td>
<td>0.942</td>
<td>0.0000007</td>
</tr>
<tr>
<td>Upper Mainstem</td>
<td>0+ trout</td>
<td>(y = 4.09322x – 49.081)</td>
<td>11</td>
<td>0.818</td>
<td>0.00013</td>
</tr>
<tr>
<td>Upper Mainstem</td>
<td>Steelhead ≥90mm</td>
<td>(y = 1.91800x + 29.61)</td>
<td>11</td>
<td>0.372</td>
<td>0.0462</td>
</tr>
<tr>
<td>Upper Mainstem</td>
<td>Cutthroat ≥90mm</td>
<td>(y = 1.23459x + 1075.26)</td>
<td>11</td>
<td>0.015</td>
<td>0.720</td>
</tr>
</tbody>
</table>
Downstream Migrant Juvenile Sampling

In the spring we operated a motor driven floating scoop trap in each study stream to estimate the number of juvenile fish emigrating downstream from each stream. A detailed description of the methods used to operate these traps may be found in Solazzi et al. (2000).

The estimated numbers of juvenile salmonids migrating downstream in East Fork in the spring of 2006 are shown in Table 7. The number of 1+ coho salmon migrants in East Fork in 2006 (2,552 fish) was similar to the 19-year average (Table 8). Age 1+ coho migration peaked during the week of April 24-30 and had a mean forklength of 89.0mm during that week. Fish size was similar to other years that had peak migration in late April (Table 9). The estimated number of coho salmon fry was lower than the past three years, but still well above the 19-year average. The estimate of cutthroat trout (≥90mm) migrants in East Fork (1,902 fish) was the highest observed since sampling began in 1988, while the number of steelhead (≥90mm) migrants was similar to the 19-year average (Table 8).

The estimated numbers of juvenile salmonids migrating downstream from Upper Mainstem Lobster Creek in the spring of 2006 are shown in Table 10. The number of age 1+ coho salmon migrants (4,187) was similar to recent years, and well above the 19-year average at this creek (Table 11). Emigration of age 1+ coho salmon was later than in other years, with the peak week of out-migration not occurring until the week of May 15-21. The mean fork length of age 1+ coho smolts during peak week (101.5mm) was larger than recent years (Table 12). This increase in size is presumably due to the later peak migration week, whereby smolts had additional time to grow. As in East Fork, the estimated number of coho salmon fry in Upper Mainstem was lower than the past three years, but still well above the 19-year average. Upper Mainstem had the second largest number of cutthroat (≥90mm) migrants in 2006 (1,556) since monitoring began in 1988, while the number of steelhead migrants (≥90mm) was below the long term average (Table 11).

Overwinter Survival

The 2005-06 overwinter survival of juvenile coho salmon was 31.8% in East Fork and 38.6% in Upper Mainstem, indicating that overwinter survival during the winter of 2005-06 was slightly higher than the long term average in both streams (Table 13). This above average overwinter survival occurred despite numerous high flow events during the winter of 2005-06.
### Table 7. Weekly estimates of the number of juvenile salmonids migrating downstream from East Fork Lobster Creek, spring 2006.

<table>
<thead>
<tr>
<th>Week</th>
<th>Coho 1+</th>
<th>Coho Fry</th>
<th>Trout Fry</th>
<th>Chinook Fry</th>
<th>Trout 60-89mm</th>
<th>Steelhead &gt;90mm</th>
<th>Cutthroat &gt;90mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEB 27-MAR 5</td>
<td>91</td>
<td>677</td>
<td>13</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>MAR 6-12</td>
<td>109</td>
<td>618</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAR 13-19</td>
<td>114</td>
<td>865</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAR 20-26</td>
<td>146</td>
<td>4,294</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>MAR 27-APR 2</td>
<td>12</td>
<td>1,660</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>APR 3-9</td>
<td>50</td>
<td>1,173</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>APR 10-6</td>
<td>69</td>
<td>1,080</td>
<td>0</td>
<td>0</td>
<td>48</td>
<td>97</td>
<td>33</td>
</tr>
<tr>
<td>APR 17-23</td>
<td>139</td>
<td>7,393</td>
<td>0</td>
<td>0</td>
<td>42</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>APR 24 -30</td>
<td>658</td>
<td>2,186</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>MAY 1-MAY 7</td>
<td>409</td>
<td>10,847</td>
<td>40</td>
<td>0</td>
<td>17</td>
<td>50</td>
<td>344</td>
</tr>
<tr>
<td>MAY 8-14</td>
<td>360</td>
<td>3,505</td>
<td>27</td>
<td>0</td>
<td>18</td>
<td>49</td>
<td>230</td>
</tr>
<tr>
<td>MAY 15-21</td>
<td>333</td>
<td>17,086</td>
<td>656</td>
<td>0</td>
<td>31</td>
<td>48</td>
<td>303</td>
</tr>
<tr>
<td>MAY 22-28</td>
<td>60</td>
<td>16,131</td>
<td>675</td>
<td>0</td>
<td>14</td>
<td>4</td>
<td>196</td>
</tr>
<tr>
<td>MAY 29-JUNE 4</td>
<td>2</td>
<td>12,773</td>
<td>1,492</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>306</td>
</tr>
<tr>
<td>JUNE 5-11</td>
<td>0</td>
<td>3,808</td>
<td>2,790</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>81</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,552</td>
<td>84,096</td>
<td>5,693</td>
<td>0</td>
<td>216</td>
<td>332</td>
<td>1,902</td>
</tr>
</tbody>
</table>

### Table 8. The estimated number of juvenile salmonids migrating downstream each spring in East Fork Lobster Creek 1988-2006.

<table>
<thead>
<tr>
<th>Trap Year</th>
<th>Trap Start Date</th>
<th>Coho 1+</th>
<th>Coho Fry</th>
<th>Trout Fry</th>
<th>Chinook Fry</th>
<th>Trout 60-89mm</th>
<th>Steelhead &gt;90mm</th>
<th>Cutthroat &gt;90mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9-Mar-88</td>
<td>1,178</td>
<td>19,044</td>
<td>3,204</td>
<td>2,130</td>
<td>14a</td>
<td>15a</td>
<td>15a</td>
</tr>
<tr>
<td>1989</td>
<td>1-Mar-89</td>
<td>2,691</td>
<td>48,133</td>
<td>3,594</td>
<td>264,733</td>
<td>43</td>
<td>1a</td>
<td>268</td>
</tr>
<tr>
<td>1990</td>
<td>5-Feb-90</td>
<td>3,549</td>
<td>22,736</td>
<td>4,381</td>
<td>0</td>
<td>99</td>
<td>32</td>
<td>110</td>
</tr>
<tr>
<td>1991</td>
<td>4-Feb-91</td>
<td>2,121</td>
<td>8,422</td>
<td>2,984</td>
<td>0</td>
<td>76</td>
<td>45</td>
<td>296</td>
</tr>
<tr>
<td>1992</td>
<td>4-Feb-92</td>
<td>2,627</td>
<td>6,992</td>
<td>1,486</td>
<td>0</td>
<td>123</td>
<td>49</td>
<td>251</td>
</tr>
<tr>
<td>1993</td>
<td>3-Feb-93</td>
<td>2,055</td>
<td>46,550</td>
<td>1,875</td>
<td>0</td>
<td>202</td>
<td>117</td>
<td>699</td>
</tr>
<tr>
<td>1994</td>
<td>1-Feb-94</td>
<td>3,641</td>
<td>4,266</td>
<td>5,529</td>
<td>0</td>
<td>102</td>
<td>26</td>
<td>738</td>
</tr>
<tr>
<td>1995</td>
<td>1-Feb-95</td>
<td>892</td>
<td>8,130</td>
<td>5,549</td>
<td>0</td>
<td>55</td>
<td>21</td>
<td>187</td>
</tr>
<tr>
<td>1996</td>
<td>12-Feb-96</td>
<td>985</td>
<td>6,302</td>
<td>33a</td>
<td>0</td>
<td>116</td>
<td>3a</td>
<td>7a</td>
</tr>
<tr>
<td>1997</td>
<td>3-Mar-97</td>
<td>1,055</td>
<td>42,715</td>
<td>13,609</td>
<td>0</td>
<td>25</td>
<td>14a</td>
<td>5a</td>
</tr>
<tr>
<td>1998</td>
<td>2-Mar-98</td>
<td>1,286</td>
<td>18,416</td>
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<td>455</td>
<td>523</td>
</tr>
<tr>
<td>1999</td>
<td>1-Mar-99</td>
<td>909</td>
<td>3,251</td>
<td>3,413</td>
<td>228</td>
<td>247</td>
<td>169</td>
<td>839</td>
</tr>
<tr>
<td>2000</td>
<td>28-Feb 00</td>
<td>1,189</td>
<td>17,108</td>
<td>8,025</td>
<td>0</td>
<td>737</td>
<td>714</td>
<td>691</td>
</tr>
<tr>
<td>2001</td>
<td>28-Feb 01</td>
<td>4,121</td>
<td>44,651</td>
<td>20a</td>
<td>0</td>
<td>1,131</td>
<td>1,371</td>
<td>999</td>
</tr>
<tr>
<td>2002</td>
<td>26-Feb 02</td>
<td>2,945</td>
<td>30,585</td>
<td>10,370</td>
<td>0</td>
<td>90</td>
<td>147</td>
<td>1,231</td>
</tr>
<tr>
<td>2003</td>
<td>28-Feb 03</td>
<td>2,054</td>
<td>329,809</td>
<td>10,523</td>
<td>5,951</td>
<td>426</td>
<td>76</td>
<td>842</td>
</tr>
<tr>
<td>2004</td>
<td>1-Mar-04</td>
<td>2,968</td>
<td>278,736</td>
<td>21,958</td>
<td>0</td>
<td>853</td>
<td>762</td>
<td>1,454</td>
</tr>
<tr>
<td>2005</td>
<td>27-Feb 05</td>
<td>4,580</td>
<td>115,706</td>
<td>94a</td>
<td>0</td>
<td>644</td>
<td>422</td>
<td>802</td>
</tr>
<tr>
<td>2006</td>
<td>26-Feb 06</td>
<td>2,552</td>
<td>84,096</td>
<td>5,693</td>
<td>0</td>
<td>216</td>
<td>332</td>
<td>1,902</td>
</tr>
</tbody>
</table>

| **Average** | 2,284 | 59,780 | 7,299b | 14,371 | 315b | 316b | 740b |

---

*a*Few marked fish recaptured, thus trap efficiency not available. Number shown is total fish captured, not an expanded estimate of total migrants using trap efficiency.  
*b*Average only includes years for which trap efficiency estimates are available.
Table 9. Number of coho salmon smolts (±95% CI), week of peak migration, and mean fork length of smolts during week of peak migration in East Fork Lobster Creek.

<table>
<thead>
<tr>
<th>Sample Year</th>
<th>Smolts ± CI</th>
<th>Peak Week</th>
<th>Mean FL (mm) ± CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>1,178 ± 144</td>
<td>3/21-3/27</td>
<td>79.1 ± 5.0</td>
</tr>
<tr>
<td>1989</td>
<td>2,691 ± 280</td>
<td>3/20-3/26</td>
<td>72.4 ± 3.5</td>
</tr>
<tr>
<td>1990</td>
<td>3,549 ± 266</td>
<td>3/23-3/29</td>
<td>76.2 ± 4.4</td>
</tr>
<tr>
<td>1991</td>
<td>2,121 ± 130</td>
<td>5/6-5/12</td>
<td>91.6 ± 4.4</td>
</tr>
<tr>
<td>1992</td>
<td>2,627 ± 166</td>
<td>4/6-4/12</td>
<td>na</td>
</tr>
<tr>
<td>1993</td>
<td>2,055 ± 219</td>
<td>4/19-4/25</td>
<td>89.9 ± 3.6</td>
</tr>
<tr>
<td>1994</td>
<td>3,641 ± 226</td>
<td>5/2-5/8</td>
<td>91.5 ± 2.8</td>
</tr>
<tr>
<td>1995</td>
<td>892 ± 153</td>
<td>5/1-5/7</td>
<td>95.0 ± 3.0</td>
</tr>
<tr>
<td>1996</td>
<td>985 ± 220</td>
<td>2/12-2/18</td>
<td>73.3 ± 6.4</td>
</tr>
<tr>
<td>1997</td>
<td>1,055 ± 205</td>
<td>4/21-4/27</td>
<td>84.8 ± 4.3</td>
</tr>
<tr>
<td>1998</td>
<td>1,286 ± 189</td>
<td>4/27-5/3</td>
<td>96.4 ± 3.8</td>
</tr>
<tr>
<td>1999</td>
<td>909 ± 103</td>
<td>3/15-3/21</td>
<td>74.9 ± 3.2</td>
</tr>
<tr>
<td>2000</td>
<td>1,189 ± 172</td>
<td>4/17-4/23</td>
<td>99.4 ± 2.9</td>
</tr>
<tr>
<td>2001</td>
<td>4,121 ± 256</td>
<td>4/23-4/29</td>
<td>93.1 ± 4.3</td>
</tr>
<tr>
<td>2002</td>
<td>2,945 ± 192</td>
<td>4/8-4/14</td>
<td>78.3 ± 3.7</td>
</tr>
<tr>
<td>2003</td>
<td>2,054 ± 221</td>
<td>4/14-4/20</td>
<td>84.7 ± 5.1</td>
</tr>
<tr>
<td>2004</td>
<td>2,968 ± 250</td>
<td>3/22-3/28</td>
<td>78.0 ± 5.3</td>
</tr>
<tr>
<td>2005</td>
<td>4,580 ± 363</td>
<td>3/21-3/27</td>
<td>77.9 ± 2.5</td>
</tr>
<tr>
<td>2006</td>
<td>2,552 ± 172</td>
<td>4/24-4/30</td>
<td>89.0 ± 3.7</td>
</tr>
</tbody>
</table>

Table 10. Weekly estimates of the number of juvenile salmonids migrating downstream from Upper Mainstem Lobster Creek, spring 2006.

<table>
<thead>
<tr>
<th>Week</th>
<th>Coho 1+</th>
<th>Coho Fry</th>
<th>Trout Fry</th>
<th>Chinook Fry</th>
<th>Trout 60-89mm</th>
<th>Steelhead &gt;90mm</th>
<th>Cutthroat &gt;90mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEB 27-MAR 5</td>
<td>165</td>
<td>47</td>
<td>0</td>
<td>0</td>
<td>32</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>MAR 6-12</td>
<td>158</td>
<td>98</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>MAR 13-19</td>
<td>109</td>
<td>693</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>MAR 20-26</td>
<td>262</td>
<td>1,015</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>57</td>
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<tr>
<td>MAR 27-APR 2</td>
<td>124</td>
<td>525</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>APR 3 – 9</td>
<td>49</td>
<td>180</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>117</td>
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<tr>
<td>APR 10-16</td>
<td>66</td>
<td>295</td>
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<td>0</td>
<td>7</td>
<td>4</td>
<td>78</td>
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<tr>
<td>APR 17-23</td>
<td>131</td>
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<td>6</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>93</td>
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<tr>
<td>APR 24 - 30</td>
<td>701</td>
<td>2,066</td>
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<td>0</td>
<td>6</td>
<td>6</td>
<td>353</td>
</tr>
<tr>
<td>MAY 1-MAY 7</td>
<td>678</td>
<td>2,805</td>
<td>31</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>228</td>
</tr>
<tr>
<td>MAY 8-14</td>
<td>606</td>
<td>571</td>
<td>37</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>208</td>
</tr>
<tr>
<td>MAY 15-21</td>
<td>840</td>
<td>10,220</td>
<td>295</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>77</td>
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<tr>
<td>MAY 22-28</td>
<td>233</td>
<td>11,964</td>
<td>45</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>98</td>
</tr>
<tr>
<td>MAY 29-JUNE 4</td>
<td>62</td>
<td>8,519</td>
<td>412</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>JUNE 5 - 11</td>
<td>3</td>
<td>3,062</td>
<td>217</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>4,187</td>
<td>43,583</td>
<td>1,043</td>
<td>0</td>
<td>70</td>
<td>20</td>
<td>1,556</td>
</tr>
</tbody>
</table>

*a Few marked fish recaptured, thus trap efficiency not available. Number shown is total fish captured, not an expanded estimate of total migrants using trap efficiency.
Table 11. The estimated number of juvenile salmonids migrating downstream each spring in Upper Mainstem Lobster Creek 1988-2006.

<table>
<thead>
<tr>
<th>Trap Year</th>
<th>Trap Start Date</th>
<th>Coho 1+</th>
<th>Coho Fry</th>
<th>Trout Fry</th>
<th>Chinook Fry</th>
<th>60-89mm</th>
<th>&gt;90mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9-Mar-88</td>
<td>1,337</td>
<td>4,311</td>
<td>4,100</td>
<td>4a</td>
<td>3a</td>
<td>2a</td>
</tr>
<tr>
<td>1989</td>
<td>1-Mar-89</td>
<td>832</td>
<td>1,570</td>
<td>1,370</td>
<td>1a</td>
<td>1a</td>
<td>0</td>
</tr>
<tr>
<td>1990</td>
<td>5-Feb-90</td>
<td>974</td>
<td>5,419</td>
<td>1,218</td>
<td>0</td>
<td>5a</td>
<td>14</td>
</tr>
<tr>
<td>1991</td>
<td>4-Feb-91</td>
<td>3,455</td>
<td>6,702</td>
<td>449</td>
<td>0</td>
<td>7a</td>
<td>36</td>
</tr>
<tr>
<td>1992</td>
<td>4-Feb-92</td>
<td>4,171</td>
<td>2,430</td>
<td>9a</td>
<td>0</td>
<td>15a</td>
<td>284</td>
</tr>
<tr>
<td>1993</td>
<td>3-Feb-93</td>
<td>2,666</td>
<td>21,077</td>
<td>1,138</td>
<td>0</td>
<td>21a</td>
<td>209</td>
</tr>
<tr>
<td>1994</td>
<td>1-Feb-94</td>
<td>8,909</td>
<td>8,628</td>
<td>21a</td>
<td>0</td>
<td>37a</td>
<td>101</td>
</tr>
<tr>
<td>1995</td>
<td>1-Feb-95</td>
<td>5,797</td>
<td>1,759</td>
<td>12a</td>
<td>0</td>
<td>0</td>
<td>10a</td>
</tr>
<tr>
<td>1996</td>
<td>12-Feb-96</td>
<td>428</td>
<td>0</td>
<td>0</td>
<td>1a</td>
<td>2a</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>3-Mar-97</td>
<td>214</td>
<td>1,266</td>
<td>6,561</td>
<td>0</td>
<td>0</td>
<td>6a</td>
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<tr>
<td>1998</td>
<td>2-Mar-98</td>
<td>2,913</td>
<td>3,915</td>
<td>1,406</td>
<td>0</td>
<td>584</td>
<td>484</td>
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<tr>
<td>1999</td>
<td>1-Mar-99</td>
<td>1,481</td>
<td>353</td>
<td>9,135</td>
<td>0</td>
<td>24a</td>
<td>147</td>
</tr>
<tr>
<td>2000</td>
<td>28-Feb-00</td>
<td>377</td>
<td>5,811</td>
<td>20,006</td>
<td>0</td>
<td>799</td>
<td>494</td>
</tr>
<tr>
<td>2001</td>
<td>28-Feb 01</td>
<td>4,173</td>
<td>18,238</td>
<td>1,947</td>
<td>0</td>
<td>665</td>
<td>347</td>
</tr>
<tr>
<td>2002</td>
<td>25-Feb-02</td>
<td>4,506</td>
<td>11,486</td>
<td>2,272</td>
<td>0</td>
<td>9a</td>
<td>196</td>
</tr>
<tr>
<td>2003</td>
<td>28-Feb-03</td>
<td>5,059</td>
<td>218,174</td>
<td>15,769</td>
<td>3,439</td>
<td>212</td>
<td>21a</td>
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<tr>
<td>2004</td>
<td>1-Mar-04</td>
<td>4,814</td>
<td>147,083</td>
<td>14,250</td>
<td>0</td>
<td>9a</td>
<td>23a</td>
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<tr>
<td>2005</td>
<td>27-Feb 05</td>
<td>4,924</td>
<td>69,203</td>
<td>618</td>
<td>0</td>
<td>4a</td>
<td>46</td>
</tr>
<tr>
<td>2006</td>
<td>26-Feb 06</td>
<td>4,187</td>
<td>43,583</td>
<td>1,043</td>
<td>0</td>
<td>70</td>
<td>20a</td>
</tr>
</tbody>
</table>

Average 3,222 30,053 5,080 b 202 b 314 b 197 b

aFew marked fish recaptured, thus trap efficiency not available. Number shown is total fish captured, not an expanded estimate of total migrants using trap efficiency.
bAverage only includes years for which trap efficiency estimates are available.

Table 12. Number of coho salmon smolts (±95% CI), week of peak migration, and mean fork length of smolts during week of peak migration in Upper Mainstem Lobster Creek.

<table>
<thead>
<tr>
<th>Sample Year</th>
<th>Smolts ± CI</th>
<th>Peak Week</th>
<th>Mean FL (mm) ± CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>1,337 ± 210</td>
<td>4/4-4/10</td>
<td>80.3 ± 3.4</td>
</tr>
<tr>
<td>1989</td>
<td>832 ± 240</td>
<td>3/6-3/12</td>
<td>67.8 ± 1.6</td>
</tr>
<tr>
<td>1990</td>
<td>974 ± 103</td>
<td>4/23-4/29</td>
<td>98 ± 4.1</td>
</tr>
<tr>
<td>1991</td>
<td>3,455 ± 153</td>
<td>4/1-4/7</td>
<td>75.4 ± 2.7</td>
</tr>
<tr>
<td>1992</td>
<td>4,171 ± 198</td>
<td>3/30-4/5</td>
<td>na</td>
</tr>
<tr>
<td>1993</td>
<td>2,666 ± 175</td>
<td>4/19-4/25</td>
<td>94.8 ± 3.6</td>
</tr>
<tr>
<td>1994</td>
<td>8,909 ± 351</td>
<td>3/29-4/3</td>
<td>74.3 ± 3.1</td>
</tr>
<tr>
<td>1995</td>
<td>5,797 ± 279</td>
<td>4/24-4/30</td>
<td>90.0 ± 5.0</td>
</tr>
<tr>
<td>1996</td>
<td>428 ± 235</td>
<td>4/29-5/5</td>
<td>109.0 ± 4.0</td>
</tr>
<tr>
<td>1997</td>
<td>214 ± 351</td>
<td>4/14-4/20</td>
<td>112.1 ± 4.0</td>
</tr>
<tr>
<td>1998</td>
<td>2,913 ± 333</td>
<td>4/20-4/26</td>
<td>92.4 ± 4.5</td>
</tr>
<tr>
<td>1999</td>
<td>1,481 ± 184</td>
<td>5/3-5/9</td>
<td>92.2 ± 3.8</td>
</tr>
<tr>
<td>2000</td>
<td>377 ± 151</td>
<td>5/8-5/14</td>
<td>98.3 ± 2.8</td>
</tr>
<tr>
<td>2001</td>
<td>4,173 ± 411</td>
<td>3/26-4/1</td>
<td>81.2 ± 2.6</td>
</tr>
<tr>
<td>2002</td>
<td>4,506 ± 316</td>
<td>4/8-4/14</td>
<td>79.6 ± 3.7</td>
</tr>
<tr>
<td>2003</td>
<td>5,059 ± 279</td>
<td>4/7-4/13</td>
<td>83.0 ± 3.8</td>
</tr>
<tr>
<td>2004</td>
<td>4,814 ± 349</td>
<td>4/5-4/11</td>
<td>82.5 ± 4.2</td>
</tr>
<tr>
<td>2005</td>
<td>4,924 ± 404</td>
<td>3/28-4/3</td>
<td>79.6 ± 3.3</td>
</tr>
<tr>
<td>2006</td>
<td>4,187 ± 230</td>
<td>5/15-5/21</td>
<td>101.5 ± 3.2</td>
</tr>
</tbody>
</table>
Spawning Adult Surveys

From October 26, 2005 through February 17, 2006, we conducted periodic surveys to count adult salmon and steelhead in each stream. A single observer walking the entire salmon-bearing length of each study stream counted the number of redds and the number of live and dead salmon and steelhead. Area-under-the-curve (AUC) extrapolation techniques (Biedler and Nickelson 1980; Neilson and Geen 1981; Solazzi 1984) were used to estimate the total number of spawning coho salmon from the survey data.

Counts of live adult coho spawners during the 2005-06 spawning season are shown in Table 14. Based on AUC adjusted estimates, a total of 492 and 487 adult coho salmon were estimated to have spawned in East Fork and Upper Mainstem Lobster creeks, respectively (Table 15).

Table 13. The overwinter survival of juvenile coho salmon in East Fork Lobster and Upper Mainstem Lobster Creek. Survival was calculated by dividing the number of downstream migrating 1+ coho salmon captured in brood year + 2 by the summer population of juvenile coho in brood year +1.
Table 14. Spawning ground counts for live adult coho salmon in East Fork Lobster and Upper Mainstem Lobster creeks during the winter of 2005-06.

<table>
<thead>
<tr>
<th>Date</th>
<th>E.F. Lobster Cr.</th>
<th>U.M Lobster Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/26/2005</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11/7/2005</td>
<td>42</td>
<td>35</td>
</tr>
<tr>
<td>11/15/2005</td>
<td>56</td>
<td>36</td>
</tr>
<tr>
<td>11/22/2005</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>11/28/2005</td>
<td>41</td>
<td>10</td>
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<tr>
<td>12/5/2005</td>
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</tr>
<tr>
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<td>4</td>
</tr>
<tr>
<td>1/3/2006</td>
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<td>133</td>
</tr>
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<tr>
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</tbody>
</table>

Table 15. Area-under-the-curve estimates of the number of adult coho salmon spawning in East Fork Lobster and Upper Mainstem Lobster creeks, 1986-2005 brood years.

<table>
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<tr>
<th>Brood Year</th>
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<th>U.M. Lobster Cr.</th>
</tr>
</thead>
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<td>31</td>
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<tr>
<td>1987</td>
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<td>32</td>
</tr>
<tr>
<td>1988</td>
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<td>1989</td>
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<tr>
<td>1992</td>
<td>272</td>
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<td>1993</td>
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<td>487</td>
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</table>

| Average    | 173              | 154             |
References


