Supplementary Figure 1. Global distribution of the sampling sites per ecosystem category. One dot is used per primary study and each dot may represent several studies and/or sites undergoing recovery.
Supplementary Figure 2. PRISMA flow chart of studies included in the meta-analysis. It does not include studies coming from studies refs. 1 and 2 that have been previously published. Structure and template for flow chart from ref. 3.
Supplementary Figure 3. Mean recovery debt values and 95% confidence intervals of the abundance of organisms across organism and ecosystem types. Only abundance was included because it was the only metric with enough data to perform the comparison.
**Supplementary Figure 4.** Mean recovery debt values and 95% confidence intervals of the abundance of organisms across organism types and degradation categories. Only abundance was included because it was the only metric with enough data to perform the comparison.
Supplementary Figure 5. Scenarios used to estimate the recovery debt. $X_s$, value of the outcome measure at the starting point; $X_e$, value at the end point in the recovery trajectory; and $X_r$, reference value at the reference system. $T$ is the time elapsed between the starting and the end point. Orange shading represents recovery debt estimated without transformation; yellow shading represents recovery debt estimated after transforming $X_s$ and $X_e$ into $Z_{s,e}$ (see Methods); and green shading represents areas under the curve used to estimate recovery debt. Note than in scenario $e$, $X_r = 0$. 
Supplementary Figure 6. Comparison between exponential and linear approaches to estimate the recovery debt. Only abundance means predicted by the model and confidence intervals by ecosystem categories are showed.
**Supplementary Figure 7.** Comparison between recovery debts calculated excluding outcome measures containing zero values and including transformed zero values. Only abundance means predicted by the model and confidence intervals by ecosystem categories are showed.
**Supplementary Table 1.** Distribution of outcome measures, primary studies, sites, and recovering area by ecosystem and disturbance categories. Studies may report outcome measures from multiple ecosystem categories or disturbance categories and thus the totals do not match the total amount of studies selected for the meta-analysis.

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>No. outcome measures</th>
<th>Average (min. – max.) no. outcome measures per study</th>
<th>No. studies</th>
<th>No. sites recovering</th>
<th>No. reference sites</th>
<th>Area recovering (km²)</th>
<th>Studies reporting restored area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>1,616</td>
<td>11.6 (1 – 72)</td>
<td>139</td>
<td>1,334</td>
<td>729</td>
<td>206,010</td>
<td>72</td>
</tr>
<tr>
<td>Grassland</td>
<td>254</td>
<td>9.8 (1 – 52)</td>
<td>26</td>
<td>151</td>
<td>53</td>
<td>1,051</td>
<td>59</td>
</tr>
<tr>
<td>Wetland</td>
<td>322</td>
<td>7.3 (1 – 32)</td>
<td>44</td>
<td>352</td>
<td>211</td>
<td>15,574</td>
<td>83</td>
</tr>
<tr>
<td>River</td>
<td>271</td>
<td>7.7 (1 – 38)</td>
<td>35</td>
<td>156</td>
<td>82</td>
<td>5,340</td>
<td>35</td>
</tr>
<tr>
<td>Lake</td>
<td>646</td>
<td>12.2 (1 – 75)</td>
<td>53</td>
<td>353</td>
<td>188</td>
<td>34,823</td>
<td>81</td>
</tr>
<tr>
<td>Marine system</td>
<td>707</td>
<td>10.6 (1 – 48)</td>
<td>67</td>
<td>689</td>
<td>349</td>
<td>287,888</td>
<td>65</td>
</tr>
<tr>
<td>Disturbance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>625</td>
<td>11.2 (1 – 56)</td>
<td>56</td>
<td>525</td>
<td>184</td>
<td>103,180</td>
<td>68</td>
</tr>
<tr>
<td>Logging</td>
<td>506</td>
<td>9.7 (1 – 52)</td>
<td>52</td>
<td>368</td>
<td>268</td>
<td>51,017</td>
<td>72</td>
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<tr>
<td>Mining</td>
<td>646</td>
<td>13.5 (1 – 48)</td>
<td>48</td>
<td>274</td>
<td>199</td>
<td>1,320</td>
<td>68</td>
</tr>
<tr>
<td>Invasive species</td>
<td>72</td>
<td>8.0 (1 – 9)</td>
<td>9</td>
<td>46</td>
<td>37</td>
<td>24,153</td>
<td>89</td>
</tr>
<tr>
<td>Hydrological disruption</td>
<td>123</td>
<td>5.3 (1 – 23)</td>
<td>23</td>
<td>227</td>
<td>93</td>
<td>5,556</td>
<td>64</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>811</td>
<td>12.9 (1 – 63)</td>
<td>63</td>
<td>406</td>
<td>214</td>
<td>9,690</td>
<td>78</td>
</tr>
<tr>
<td>Oil spill</td>
<td>307</td>
<td>8.3 (1 – 37)</td>
<td>37</td>
<td>148</td>
<td>80</td>
<td>35,244</td>
<td>40</td>
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<tr>
<td>Overfishing</td>
<td>84</td>
<td>6.5 (1 – 13)</td>
<td>13</td>
<td>193</td>
<td>34</td>
<td>325</td>
<td>85</td>
</tr>
<tr>
<td>Multiple</td>
<td>58</td>
<td>3.6 (1 – 16)</td>
<td>16</td>
<td>305</td>
<td>72</td>
<td>405,321</td>
<td>100</td>
</tr>
<tr>
<td>Hurricanes</td>
<td>584</td>
<td>14.2 (1 – 41)</td>
<td>41</td>
<td>543</td>
<td>414</td>
<td>15,986</td>
<td>67</td>
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Supplementary Table 2. Results of the test of moderator effects on the selected response metrics.

<table>
<thead>
<tr>
<th>Subset</th>
<th>Moderator</th>
<th>Q_M</th>
<th>df</th>
<th>Test of moderators p-value</th>
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<tbody>
<tr>
<td>Abundance</td>
<td>Habitat</td>
<td>189.11</td>
<td>5</td>
<td>&lt;0.0001</td>
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<tr>
<td>Abundance</td>
<td>Disturbance</td>
<td>42.83</td>
<td>9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diversity</td>
<td>Habitat</td>
<td>7.36</td>
<td>5</td>
<td>0.1951</td>
</tr>
<tr>
<td>Diversity</td>
<td>Disturbance</td>
<td>21.39</td>
<td>7</td>
<td>0.0032</td>
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<tr>
<td>Carbon</td>
<td>Habitat</td>
<td>5.85</td>
<td>5</td>
<td>0.3213</td>
</tr>
<tr>
<td>Carbon</td>
<td>Disturbance</td>
<td>59.35</td>
<td>4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Habitat</td>
<td>8.21</td>
<td>4</td>
<td>0.084</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Disturbance</td>
<td>9.77</td>
<td>5</td>
<td>0.0822</td>
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</tbody>
</table>
Supplementary Table 3. Results of the test to select the optimal amount to be added to outcome measures with zero values. We used Mann-Whitney rank sum tests to compare values of the $r$ parameter (see Methods) of the database excluding outcome measures that contain zero values and of the full database using nine different strategies. The first row shows the results for the database excluding outcome measures containing zero values. = OM, amount added of the same order of magnitude that $X_s$ and $X_g$. OM+1, amount added one order of magnitude larger than $X_s$ and $X_g$. X.1, amount added is the smallest value of the order of magnitude (e.g. 0.1, 1, 10). X.5, amount added is the median of the order of magnitude (e.g. 0.5, 5, 50).

<table>
<thead>
<tr>
<th>Amount added</th>
<th>n</th>
<th>Median</th>
<th>CI 25%</th>
<th>CI 75%</th>
<th>U</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>3,405</td>
<td>0.0336</td>
<td>0.00212</td>
<td>0.173</td>
<td>270,049</td>
<td>&lt;0.001</td>
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<tr>
<td>0.01</td>
<td>366</td>
<td>0.317</td>
<td>0.138</td>
<td>1.024</td>
<td>270,049</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>0.05</td>
<td>366</td>
<td>0.217</td>
<td>0.0956</td>
<td>0.665</td>
<td>320,288</td>
<td>&lt;0.001</td>
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<tr>
<td>0.1</td>
<td>366</td>
<td>0.176</td>
<td>0.0743</td>
<td>0.596</td>
<td>345,922</td>
<td>&lt;0.001</td>
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<tr>
<td>0.5</td>
<td>366</td>
<td>0.107</td>
<td>0.0294</td>
<td>0.421</td>
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<tr>
<td>1</td>
<td>366</td>
<td>0.0754</td>
<td>0.0174</td>
<td>0.339</td>
<td>477,439</td>
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<tr>
<td>= OM, X.1</td>
<td>366</td>
<td>0.077</td>
<td>0.0322</td>
<td>0.25</td>
<td>446,684</td>
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<td>366</td>
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<td>0.00733</td>
<td>0.0741</td>
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<tr>
<td>OM + 1, X.1</td>
<td>366</td>
<td>0.016</td>
<td>0.00567</td>
<td>0.0538</td>
<td>570,178</td>
<td>0.007</td>
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<tr>
<td>OM + 1, X.5</td>
<td>366</td>
<td>0.00358</td>
<td>0.00126</td>
<td>0.0118</td>
<td>417,130</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
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