Wetland Carbon Dynamics in the Eastern Qinghai-Tibet Plateau

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PROBLEMS
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• Wetland Loss
• Degradation
• Desertification (670 ha/year)
Importance of Wetlands in the Eastern Qinghai-Tibet Plateau

- Headwaters of Yangtze River and Yellow River basins
- Kidney of Plateau
- Ramsar Wetland (Rouergai Wetland)
- World Heritage (Jiuzhai Valley)
- Impact to Climate Change
OBJECTIVE

• To measure soil carbon, nitrogen and phosphorus for alpine natural and restored wetlands in the eastern Tibetan Plateau

• To investigate hydrologic dynamics from wetlands

• To understand if hydrology plays a key role for wetland carbon sink for restored area
Study Site

Qinghai-Tibet Plateau
Study Site
Natural Wetland
Natural Wetland
Natural Wetland
Restored Wetland
Restored Wetland
Restored Wetland
宽叶香蒲
Typha latifolia
香蒲科香蒲属
水景观赏植物。
九寨沟国家级自然保护区
METHODS

• Hydrological time series data (1988-2008) were analyzed and modelled.
• Above- Below- ground biomass from dominated plant communities with *Carex muniensis*, *Equisetum fluviatile*, *Caltha polulstris* and *Kabresia setchuenensis* were measured.
• Soil samples (0 ~ 30 cm) in natural and restored wetlands were collected.
• Total organic carbon (TOC), total nitrogen (TN) and total phosphorus (TP) in soil were estimated.
• SPSS was used for statistical analysis
PRELIMINARY RESULTS
Average monthly streamflow

Streamflow $Q/\text{m}^3\cdot\text{s}$

Month

1 2 3 4 5 6 7 8 9 10 11 12
<table>
<thead>
<tr>
<th>Wetland Plant Community</th>
<th>Biomass (g/m²)</th>
<th>Water level (cm)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Above –ground</td>
<td>Below-ground</td>
</tr>
<tr>
<td><em>Carex multiensis</em></td>
<td>653.36 ± 120</td>
<td>8125.62 ± 3920</td>
</tr>
<tr>
<td></td>
<td>8097.96 ± 2631</td>
<td>10265.80 ± 5891</td>
</tr>
<tr>
<td><em>Equisetum fluviatile</em></td>
<td>627.44 ± 120</td>
<td>8097.96 ± 2631</td>
</tr>
<tr>
<td></td>
<td>10265.80 ± 5891</td>
<td></td>
</tr>
<tr>
<td><em>Caltha palustris</em></td>
<td>413.48 ± 84</td>
<td>-</td>
</tr>
<tr>
<td><em>Kabresia setchuenensis</em></td>
<td>678.99 ± 81</td>
<td>-</td>
</tr>
</tbody>
</table>
TOC, TN, TP and TK in restored and natural wetlands
CONCLUSION

- significant decreasing trend since 1988 with annual runoffs of $20.0 \text{ m}^3 \text{s}^{-1}$ (1988-1994), $19.0 \text{ m}^3 \text{s}^{-1}$ (1995-2000), and $15.2 \text{ m}^3 \text{s}^{-1}$ (2001-2008).
- no significant difference in water level between natural and restored wetlands (20-55 cm)
- significant differences in TOC, TN and TP at soil depths (0-8 cm, 8-16 cm, 16-24 cm) between natural and restored wetlands.
- much higher TOC concentration in natural wetland ranging from 35% to 40%, while higher TP concentration for restored wetlands ranged from 1007 mg/kg to 720 mg/kg.
CONCLUSION

• ratio of TOC/TN (20.67±0.3) in natural wetland was higher than ratio of TOC/TN (14.65±0.5) in restored wetlands
• significant difference (p<0.05) between the two community sites in TOC, TN and TP
• increased trend for TOC concentration was found in soils (0-30 cm depth) from the *Equisetum fluviatile* plant community site ranging from 78 g/kg to 188 g/kg
• higher TOC, TN and TP concentrations were found in soils (0-30cm) from the *Equisetum fluviatile* plant community site (100.75±5.49 g/kg, 6.55±0.39 g/kg and 0.93±0.03 g/kg), than in soils from the *Carex muliensis* community site (55.36±2.69 g/kg, 3.66±0.17 g/kg and 0.58±0.03 g/kg)
REFERENCE


REFERENCE


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THANK YOU!