西北农林科技大学
NORTHWEST A&F UNIVERSITY

2026年推荐优秀应届本科毕业生
免试攻读研究生

# 佐
# 证
# 材
# 料

| | |
|---|---|
| 学院 | 风景园林艺术学院 |
| 专业 | 环境设计 |
| 姓名 | **梅琼元** |
| 学号 | 2022011555 |

西北农林科技大学
NORTHWEST A&F UNIVERSITY

# 本 科 生 成 绩 单
# Undergraduate Transcript

姓名：梅琼元　性别：女　学号：2022011555　入学时间：2022年09月01日
学院：风景园林艺术学院　专业：环境设计　班级：环设2201　学制：四年

| 课程号 | 课程名 | 性质 | 学分 | 成绩 | 绩点 | 附注 |
|---|---|---|---|---|---|---|
| | 2022-2023学年 秋 | | | | | |
| 1085002 | 工程训练（乙） | 必修 | 2.0 | 87 | 3.7 | |
| 1091006 | 大学信息技术（乙） | 必修 | 3.0 | 72 | 2.3 | |
| 1180008 | 改革开放史 | 任选 | 1.0 | 96 | -- | |
| 1180012 | 思想道德与法治 | 必修 | 2.5 | 87 | 3.7 | |
| 1191023 | 大学英语B1（环设） | 必修 | 3.0 | 86 | 3.7 | |
| 1200012 | 名园鉴赏 | 任选 | 1.0 | 89 | -- | |
| 1200302 | 设计学新生研讨课 | 任选 | 1.0 | 83 | -- | |
| 1201305 | 设计史 | 必修 | 2.0 | 87 | 3.7 | |
| 1202323 | 基础素描 | 必修 | 2.5 | 90 | 4.0 | |
| 1202324 | 基础色彩 | 必修 | 2.5 | 88 | 3.7 | |
| 1202325 | 平面构成 | 必修 | 2.0 | 83 | 3.3 | |
| 1241001 | 体育Ⅰ | 必修 | 1.0 | 89 | 3.7 | |
| 1301002 | 军事理论 | 必修 | 2.0 | 85 | 3.7 | |
| 1306001 | 大学生心理健康与发展 | 必修 | 1.0 | 86 | 3.7 | |
| | **已获学分：26.5　GPA：3.52** | | | | | |
| | 2022-2023学年 春 | | | | | |
| 1180005 | 西方哲学简史 | 任选 | 1.0 | 96 | -- | |
| 1181003 | 中国近现代史纲要 | 必修 | 2.5 | 91 | 4.0 | |
| 1191024 | 大学英语B2（环设） | 必修 | 3.0 | 90 | 4.0 | |
| 1200305 | 水彩画 | 必修 | 2.0 | 90 | 4.0 | |
| 1200306 | 中外美术史 | 必修 | 2.5 | 87 | 3.7 | |
| 1201101 | 计算机辅助设计I(CAD+3DMAX) | 必修 | 2.0 | 90 | 4.0 | |
| 1201102 | 计算机辅助设计II(PS+AI) | 必修 | 2.0 | 87 | 3.7 | |
| 1202326 | 色彩构成 | 必修 | 2.0 | 92 | 4.0 | |
| 1205302 | 风景写生Ⅰ（春季） | 必修 | 2.0 | 90 | 4.0 | |
| 1241002 | 体育Ⅱ | 必修 | 1.0 | 91 | 4.0 | |
| 1300001 | 创业基础 | 任选 | 1.0 | 97 | -- | |
| 1305202-1 | 劳动教育理论 | 任选 | 1.0 | 80 | 3.0 | |
| 1306005 | 生涯规划与职业发展 | 必修 | 1.0 | 85 | 3.7 | |
| 2201307 | 设计概论 | 必修 | 2.5 | 98 | 4.0 | |
| | **已获学分：25.5　GPA：3.89** | | | | | |
| | 2022-2023学年 夏 | | | | | |
| 1010031 | 生物育种进展 | 任选 | 1.0 | 81 | -- | |
| 1205304 | 设计素描 | 选修 | 2.0 | 87 | 3.7 | |
| 1205305 | 设计色彩 | 选修 | 2.0 | 95 | 4.0 | |
| 1300028 | 中国音乐地图 | 任选 | 1.0 | 89 | -- | |
| 1305103 | 军事训练 | 必修 | 2.0 | 92 | 4.0 | |
| ey191 | 当代大学生国家安全教育 | 任选 | 1.0 | 99 | -- | |
| | **已获学分：9.0　GPA：3.9** | | | | | |
| | 2023-2024学年 秋 | | | | | |
| 1200018 | 设计之美——基于构成艺术的设计鉴赏 | 任选 | 1.0 | 94 | -- | |
| 2181003 | 马克思主义基本原理 | 必修 | 2.5 | 86 | 3.7 | |
| 2191041 | 大学英语B3（环设） | 选修 | 1.5 | 94 | 4.0 | |
| 2201305 | 美学概论 | 必修 | 2.5 | 87 | 3.7 | |
| 2202328 | 立体构成 | 必修 | 2.0 | 84 | 3.3 | |
| 2203002 | 园林生态学 | 选修 | 1.5 | 88 | 3.7 | |
| 2203004 | 基础图案 | 选修 | 1.5 | 91 | 4.0 | |
| 2204001 | 人体工程学 | 选修 | 2.5 | 87 | 3.7 | |
| 2204007 | 设计表现技法 | 必修 | 3.0 | 96 | 4.0 | |
| 2205304 | 风景写生Ⅱ（秋季） | 必修 | 2.0 | 90 | 4.0 | |
| 2241001 | 体育Ⅲ | 必修 | 1.0 | 93 | 4.0 | |
| | **已获学分：21.0　GPA：3.8** | | | | | |
| | 2023-2024学年 春 | | | | | |
| 2191042 | 大学英语B4（环设） | 选修 | 1.5 | 85 | 3.7 | |
| 2203005 | 数字模型与动画 | 选修 | 2.0 | 85 | 3.7 | |
| 2203013 | 丝网印 | 选修 | 2.0 | 92 | 4.0 | |
| 2203015 | 设计初步 | 选修 | 2.0 | 90 | 4.0 | |
| 2204011 | 字体与编排设计 | 必修 | 2.0 | 89 | 3.7 | |
| 2204307 | 观赏植物学 | 必修 | 2.5 | 90 | 4.0 | |
| 2204309 | 文化遗产保护与应用 | 选修 | 2.5 | 92 | 4.0 | |
| 2205306 | 综合实习Ⅰ（材料、构造实习） | 必修 | 1.0 | 98 | 4.0 | |
| 2241002 | 体育Ⅳ | 必修 | 1.0 | 92 | 4.0 | |
| ZH197 | 景观设计 | 选修 | 1.0 | 74 | -- | |
| | **已获学分：17.5　GPA：3.9** | | | | | |
| | 2023-2024学年 夏 | | | | | |
| 1185008 | 思想政治理论课实践 | 必修 | 2.0 | 85 | 3.7 | |
| 2205305 | 中国书法 | 选修 | 2.0 | 87 | 3.7 | |
| 2205307 | 基础课综合实习（构成、植物、设计类型等综合实习 | 必修 | 2.0 | 91 | 4.0 | |
| | **已获学分：6.0　GPA：3.8** | | | | | |
| | 2024-2025学年 秋 | | | | | |
| 3181007 | 毛泽东思想和中国特色社会主义理论体系概论 | 必修 | 2.5 | 79 | 3.0 | |
| 3204314 | 家具设计 | 选修 | 2.5 | 92 | 4.0 | |
| 3204315 | 建筑设计原理 | 选修 | 2.5 | 89 | 3.7 | |
| 3204320 | 景观设计原理 | 选修 | 2.5 | 89 | 3.7 | |
| 3204321 | 室内灯光设计 | 选修 | 2.0 | 87 | 3.7 | |
| 3204322 | 室内设计原理 | 选修 | 2.5 | 92 | 4.0 | |
| 3204324 | 植物配置与造景 | 选修 | 2.0 | 82 | 3.3 | |
| 3205301 | 景观设计Ⅰ（公园绿地为主） | 选修 | 3.0 | 95 | 4.0 | |
| | **已获学分：19.5　GPA：3.69** | | | | | |
| | 2024-2025学年 春 | | | | | |
| 1204301 | 设计师道德与修养 | 选修 | 1.0 | 93 | 4.0 | |
| 3181008 | 习近平新时代中国特色社会主义思想概论 | 必修 | 3.0 | 85 | 3.7 | |
| 3203307 | 景观工程学 | 选修 | 2.0 | 90 | 4.0 | |
| 3204325 | 办公空间设计 | 选修 | 2.5 | 91 | 4.0 | |
| 3204326 | 工程材料与预算 | 选修 | 3.5 | 95 | 4.0 | |
| 3204327 | 公共建筑设计 | 选修 | 2.5 | 95 | 4.0 | |
| 3204329 | 环境心理学 | 选修 | 2.5 | 95 | 4.0 | |
| 3204330 | 景观建筑设计 | 选修 | 2.0 | 92 | 4.0 | |
| 3204331 | 景观设施设计 | 选修 | 2.0 | 94 | 4.0 | |
| | **已获学分：21.0　GPA：3.96** | | | | | |
| | 2024-2025学年 夏 | | | | | |
| 3205302 | 课程设计Ⅰ（居住空间内外环境设计） | 必修 | 2.0 | 90 | 4.0 | |
| 3205303 | 综合实习Ⅱ（建筑、室内、景观综合实习） | 必修 | 2.0 | 97 | 4.0 | |
| | **已获学分：4.0　GPA：4.0** | | | | | |
| | 以下空白 | | | | | |

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|---|---|---|---|---|---|
| 已获总学分 | 150.0 | 校内修读学分 | 150.0 | 校外认定学分 | 0.0 |
| 方案要求学分 | 171.0 | GPA | | 3.8 | |
| 备注 | | | | | |

西北农林科技大学 教务处



制表日期：2025年9月9日

# 风景园林艺术学院推荐免试研究生专家推荐信

学生姓名 梅琼元　出生年月 2004 年 11 月 07 日　政治面貌 预备党员

本科专业 环境设计 报考单位 ☑本校　☐外校

学生联系方式 19973670303　2025 年 9 月 9 日填写

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说明：为了便于评价考生的若干素质，请推荐人在同意的栏目上标记“√”，并请在表格中对学生的素质作进一步的说明。

| 项目\等级 | 优秀 | 良好 | 中等 | 较差 | 很差 | 不了解 |
|---|---|---|---|---|---|---|
| 专业知识 | √ | | | | | |
| 学习能力 | √ | | | | | |

**推荐人对学生素质的进一步说明：**

本人唐英，副教授，系西北农林科技大学风景园林艺术学院环境设计专业教师。担任梅琼元(学号为:2022011555，环境景观设计方向)《工程材料与预算》课程教学老师及毕业设计指导老师，我对其学术能力、专业素养及个人品质均有深入全面的了解。在此特别推荐梅琼元同学申请我校 2026 年学术特长生免试攻读研究生！

在学业成绩方面，该生学习认真刻苦、学习能力较强，一至三学年成绩优异，专业排名全年级第七名(7/90)，占比 7.77%，学分成绩 89.22，绩点 3.8；获得专业二等奖学金(2022)、专业一等奖学金(2023)、专业一等奖学金(2024)；获“优秀大学生”荣誉称号 2 次(2023、2024)，“优秀学生干部”荣誉称号 1 次（2024）。

在学科竞赛方面，梅琼元同学获得《西北农林科技大学学科竞赛名录》的 B 类竞赛国家级一等奖 8 项，二等奖 2 项，三等奖 1 项，共计 11 项。包括:“第九届米兰设计周——全国高校设计学科师生优秀作品展”国赛一等奖 2 项、“第八届米兰设计周——全国高校设计学科师生优秀作品展”国赛二等奖 1 项；“第十六届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖 3 项、“第十五届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖 1 项；“第十二届全国大学生数字媒体科技作品创意竞赛”国赛一等奖 1 项、三等奖 1 项；“第 18 届中国好创意暨全国数字艺术设计大赛”国赛一等奖 1 项、“第 13 届未来设计师·全国高校数字艺术设计大赛(NCDA)”(B 类)国赛二等奖 1 项；以及 B 类竞赛省级一等奖 7 项，二等奖 17 项，三等奖 4 项，优秀奖 1 项，等级奖共计 29 项。

在科研实践能力方面，梅琼元同学主持并参与创新创业项目 2 项，包括:国家级创新项目 1 项（主持，优秀结题）、国家级创新项目 1 项(参与，在研)。第四作者发表核心期刊（EI）科研论文 1 篇。此外，她曾在湖南省建筑设计院集团股份有限公司实习，深度参与多项实际项目，熟练运用 PS、GIS、AI、SU 等专业工具，其设计方案获得甲方与团队的高度认可，体现了优秀的实践应用能力与团队协作精神。

该生具有成为优秀研究者的潜质，其独特的设计视角、扎实的研究能力和深厚的人文素养，完全符合免试攻读硕士研究生的培养要求，期待她在学术道路上取得更大成就，特此推荐！

推荐人姓名 唐英 职称 副教授 单位 西北农林科技大学风景园林艺术学院

与学生的关系：导师 ☑ 班主任 ☐ 任课教师☐

☐其他（请说明）__________

熟悉程度：很了解 ☑ 比较了解 ☐ 一般了解 ☐ 不太了解 ☐

推荐人联系电话： 13474017022 推荐人工作单位：西北农林科技大学风景园林艺术学院

推荐人承诺：我保证表中推荐内容的真实性，若有失实本人将承担相关责任。

推荐人签名：唐英 2025年 9 月 10 日

（公章）

# 风景园林艺术学院推荐免试研究生专家推荐信

学生姓名 梅琼元　出生年月 2004 年 11 月 07 日　政治面貌 预备党员

本科专业 环境设计　报考单位 ☑本校　☐外校

学生联系方式 19973670303　2025 年 9 月 9 日填写

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| 项目\等级 | 优秀 | 良好 | 中等 | 较差 | 很差 | 不了解 |
|---|---|---|---|---|---|---|
| 专业知识 | √ | | | | | |
| 学习能力 | √ | | | | | |

**推荐人对学生素质的进一步说明：**

本人史承勇，教授，系西北农林科技大学风景园林艺术学院环境设计专业教师。担任梅琼元（学号为:2022011555，环境景观设计方向）《办公空间设计》课程教学老师，我对该生的专业能力和学术潜质有深入了解，在此推荐梅琼元同学申请我校 2026 年学术特长生免试攻读研究生。

在学业成绩方面，该生在我系表现持续优异，专业排名全年级第七名(7/90)，占比 7.77%，学分成绩 89.22，绩点 3.8；获得专业二等奖学金(2022)、专业一等奖学金(2023)、专业一等奖学金(2024)；获“优秀大学生”荣誉称号 2 次(2023、2024)，“优秀学生干部”荣誉称号 1 次（2024）

梅琼元同学获得《西北农林科技大学学科竞赛名录》的 B 类竞赛国家级一等奖 8 项，二等奖 2 项，三等奖 1 项，共计 11 项。包括:“第九届米兰设计周——全国高校设计学科师生优秀作品展”国赛一等奖 2 项、“第八届米兰设计周——全国高校设计学科师生优秀作品展”国赛二等奖 1 项；“第十六届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖 3 项、“第十五届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖 1 项；“第 18 届中国好创意暨全国数字艺术设计大赛”国赛一等奖 1 项、“第 13 届未来设计师·全国高校数字艺术设计大赛(NCDA)”(B 类)国赛二等奖 1 项；“第十二届全国大学生数字媒体科技作品创意竞赛”国赛一等奖 1 项、三等奖 1 项；以及 B 类竞赛省级一等奖 7 项，二等奖 17 项，三等奖 4 项，优秀奖 1 项，等级奖共计 29 项。

在科研方面，该生表现出极强的主动性和探索精神。梅琼元同学主持并参与创新创业项目 2 项，包括:国家级创新项目 1 项（主持，优秀结题）、国家级创新项目 1 项(参与，在研)。以第四作者身份发表核心期刊（EI）科研论文 1 篇。该生具备扎实的专业理论功底，并且能够将学校所

学知识与实际项目需求迅速结合，展现出极强的学习能力和领悟能力。在参与多个乡村规划与景观设计项目过程中，其表现可圈可点。

梅琼元同学对环境设计研究充满热情，兼具创新思维与严谨态度，其提出的设计解决方案往往既能体现人文关怀，又具有技术实现可能。我坚信其具备从事研究生阶段学习的各项素质，推荐其免试攻读硕士研究生。

推荐人姓名 史承勇 职称 教授 单位 西北农林科技大学风景园林艺术学院

与学生的关系：导师 ☐ 班主任 ☐ 任课教师☑

☐其他（请说明）

熟悉程度：很了解 ☑ 比较了解 ☐ 一般了解 ☐ 不太了解 ☐

推荐人联系电话： 13759885064 推荐人工作单位：西北农林科技大学风景园林艺术学院

推荐人承诺：我保证表中推荐内容的真实性，若有失实本人将承担相关责任。

推荐人签名：史承勇 2015年 9 月 10日

（公章）

# 风景园林艺术学院推荐免试研究生专家推荐信

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| 项目\等级 | 优秀 | 良好 | 中等 | 较差 | 很差 | 不了解 |
|---|---|---|---|---|---|---|
| 专业知识 | √ | | | | | |
| 学习能力 | √ | | | | | |

**推荐人对学生素质的进一步说明：**

本人田永刚，副教授，系西北农林科技大学风景园林艺术学院环境设计专业教师。担任梅琼元(学号为:2022011555，环境景观设计方向)《室内设计原理》课程教学老师，我对该生的专业能力和学术潜质有深入了解，在此推荐梅琼元同学申请我校2026年学术特长生免试攻读研究生。

在学业成绩方面，该生在我系表现持续优异，专业排名全年级第七名(7/90)，学分成绩89.22，绩点3.8；获得专业二等奖学金(2022)、专业一等奖学金(2023)、专业一等奖学金(2024)；获“优秀大学生”荣誉称号2次(2023、2024)，“优秀学生干部”荣誉称号1次（2024）。

在科研方面，该生表现出极强的主动性和探索精神。梅琼元同学主持并参与创新创业项目2项，包括:国家级创新项目1项（主持，优秀结题）、国家级创新项目1项(参与，在研)。以第四作者身份发表核心期刊（EI）科研论文1篇。

梅琼元同学获得《西北农林科技大学学科竞赛名录》的B类竞赛国家级一等奖8项，二等奖2项，三等奖1项，共计11项。包括:“第九届米兰设计周——全国高校设计学科师生优秀作品展”国赛一等奖2项、“第八届米兰设计周——全国高校设计学科师生优秀作品展”国赛二等奖1项；“第十六届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖3项、“第十五届蓝桥杯全国软件和信息技术专业人才大赛”国赛一等奖1项；“第18届中国好创意暨全国数字艺术设计大赛”国赛一等奖1项、“第13届未来设计师·全国高校数字艺术设计大赛(NCDA)”(B类)国赛二等奖1项；“第十二届全国大学生数字媒体科技作品创意竞赛”国赛一等奖1项、三等奖1项；以及B类竞赛省级一等奖7项，二等奖17项，三等奖4项，优秀奖1项，等级奖共计29项。

她具备敏锐的设计洞察力、严谨的逻辑思维和强烈的社会责任感。她善于批判性分析复杂环境问题，并能通过创意设计提出系统性解决方案。其坚韧的意志力、时间管理能力和持续学习热情令我印象深刻，这些品质使其完全具备攻读硕士研究生的潜力，我推荐其免试攻读硕士研究生！

推荐人姓名 田永刚 职称 副教授 单位 西北农林科技大学风景园林艺术学院

与学生的关系：导师 ☐ 班主任 ☐ 任课教师☑

☐其他（请说明）__________

熟悉程度：很了解 ☑ 比较了解 ☐ 一般了解 ☐ 不太了解 ☐

推荐人联系电话： 13571994234 推荐人工作单位：西北农林科技大学风景园林艺术学院

推荐人承诺：我保证表中推荐内容的真实性，若有失实本人将承担相关责任。

推荐人签名：田永刚 2025 年 9 月 10 日

（公章）

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
全国决赛

## 一等奖

作品编号：489660

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、齐馨悦、张倞瑄

作品名称：《解缚童年，愈行向阳》

指导老师：程焜

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年6月

投稿网站　微信公众号

证书编号：202500FM61010G010ML489660

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
全国决赛

## 一 等 奖

作品编号：513174

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、姚宇轩

作品名称：《域环共养：城乡健康》

指导老师：于瀚洋

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年6月

投稿网站　微信公众号

证书编号：202500FM61010G010ML513174

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：程焜

团队成员：梅琼元、齐馨悦、李梦瑶

其作品《心愈童梦》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题全国总决赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年7月9日

证书编号：1616080751

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：程焜

团队成员：梅琼元

其作品《龟途无忧》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题全国总决赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年7月9日

证书编号：1616080764

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：于瀚洋

团队成员：梅琼元、姚宇轩、谢国莹

其作品《童轨时代、无限童行》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题全国总决赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年7月9日

证书编号：1616080752

# 蓝桥杯大赛

## 获奖证书

西北农林科技大学梅琼元：

其作品《城市细胞单元-全健康视角下都市社区景观设计体系构建策略》荣获第十五届蓝桥杯全国软件和信息技术专业人才大赛-视觉艺术设计赛全国总决赛正式赛道（非命题）环境艺术设计一等奖。

特发此证，以资鼓励。

证书编号：161566013

证件号码：430722200411070189

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2024年6月2日

2024年第十二届

数字未来 · 创意无限 ITAL FUTURE UNLIMITED CREATIVITY

教育部中国高等教育学会学科竞赛排行榜赛项

# 全国大学生数字媒体科技作品及创意竞赛

www.cmit.cn

## 全国总决赛：一等奖

参赛学校：西北农林科技大学、武汉工程大学

参赛作品：和鸣乐土，悦生绿界——全健康视角下西安市紫薇田园都市景观规划方案

作品分类：人居环境设计

指导老师：于瀚洋、李厚华

团队成员：梅琼元、全典鹏、姚宇轩、刘佳、朱智坤

作品赛道：本科及以上学历

证书编号：20241599383

中国人工智能学会

全国大学生数字媒体科技作品及创意竞赛组委会

二〇二四年十一月

教育部高教学会学科竞赛排行榜赛项

中国好创意（第十八届）

暨全国数字艺术设计大赛

CHINA CREATIVE CHALLENGES CONTEST

简称“3C大赛”或“中国创意挑战大赛”

# 获奖证书

# CERTIFICATE

THIS CERTIFIES THAT

## 国赛普通高等院校赛道

空间设计类

一等奖

作品名称 和以睦邻、健以共赢

作者姓名 王坤、刘佳、姚宇轩、梅琼元、朱智坤

指导教师 于瀚洋

参赛院校 西北农林科技大学

中国电子视像行业协会　中国好创意暨全国数字艺术设计大赛组织委员会

2024 年 8 月 15 日

证书真伪查询

证书编号：ZCS-国赛 GX-20242315

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2024
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展

全国决赛

## 二 等 奖

作品编号：227764

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：王坤、梅琼元、朱智坤

作品名称：和以生，养以成——同一健康理念下陕西省西安紫薇田园都市社区设计

指导老师：于瀚洋

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科师生优秀作品展组委会

2024 年 6 月

投稿网站　微信公众号

证书编号：202400FM61010G020ML227764

# 未来设计师大赛组委会

## 2025第13届未来设计师·全国高校数字艺术设计大赛（NCDA）

## 获 奖 证 明

兹证明以下作品在2025第13届未来设计师·全国高校数字艺术设计大赛中获得以下奖项：

| | |
|---|---|
| 奖项等级： | 全国总决赛二等奖 |
| 作品名称： | 艺愈痕，梦愈长 |
| 作者姓名： | 梅琼元，齐馨悦，张倞瑄 |
| 参赛组别： | 本科生组 |
| 参赛类别： | D-人居环境规划与设计 |
| 指导老师： | 唐英，史承勇 |
| 参赛院校： | 西北农林科技大学 |

特此证明！本证明与最终颁发的获奖证书具有同等效力，获奖证书正在制作中，制作完成后将另行发放。

未来设计师·全国高校数字艺术设计大赛组委会
2025年8月28日

证明编号：NCDAGSHJZM20251082350
验证网址：https://www.ncda.org.cn

2024年第十二届

数字未来 · 创意无限 ITAL FUTURE UNLIMITED CREATIVITY

教育部中国高等教育学会学科竞赛排行榜赛项

# 全国大学生数字媒体科技作品及创意竞赛

www.cmit.cn

## 全国总决赛：三等奖

参赛学校：西北农林科技大学、西澳大学

参赛作品：奇趣童街——童趣无界，快乐无限

作品分类：人居环境设计

指导老师：于瀚洋

团队成员：梅琼元、姚宇轩、谢国莹、叶阳

作品赛道：本科及以上学历

证书编号：20241604542

中国人工智能学会

全国大学生数字媒体科技作品及创意竞赛组委会

二〇二四年十一月

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
陕西赛区

## 二 等 奖

作品编号：489660

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、齐馨悦、张倞瑄

作品名称：《解缚童年，愈行向阳》

指导老师：程焜

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年5月

投稿网站　微信公众号

证书编号：202500FM61010S020ML489660

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
陕西赛区

## 二 等 奖

作品编号：443356

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、张倞瑄、石凤婷

作品名称：《苗秀姐妹》

指导老师：丁砚强

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年5月

投稿网站　　微信公众号

证书编号：202500FM61010S020ML443356

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
陕西赛区

## 三 等 奖

作品编号：439208

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、姚宇轩、谢国莹

作品名称：《我的街道我做主》

指导老师：程焜

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年5月

投稿网站　微信公众号

证书编号：202500FM61010S030ML439208

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
陕西赛区

## 三 等 奖

作品编号：439195

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、齐馨悦、张倞瑄

作品名称：《艺启向阳》

指导老师：程焜

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年5月

投稿网站　微信公众号

证书编号：202500FM61010S030ML439195

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2025
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展
陕西赛区

## 二 等 奖

作品编号：513174

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：梅琼元、姚宇轩

作品名称：《域环共养：城乡健康》

指导老师：于瀚洋

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科
师生优秀作品展组委会

2025年5月

投稿网站　微信公众号

证书编号：202500FM61010S020ML513174

未来设计师大赛
FUTURE DESIGNER AWARDS

NCDA AWARDS 未/来/设/计/师
全国高校数字艺术设计大赛

2025 NCDA Awards

# 第13届未来设计师·全国高校数字艺术设计大赛

## 陕 西 赛 区

# 一 等 奖

作品名称：艺愈痕，梦愈长

作者姓名：梅琼元，齐馨悦，张倞瑄

参赛组别：本科生组

参赛类别：人居环境规划与设计

指导老师：唐英，史承勇

参赛院校：西北农林科技大学

证书编号：NCDA13S2N1361013G1D600401
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2025年8月

FUTURE DESIGNER · NCDA Awards

未来设计师大赛
FUTURE DESIGNER AWARDS

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

2025 NCDA Awards

# 第13届未来设计师·全国高校数字艺术设计大赛

## 陕 西 赛 区

# 一 等 奖

作品名称：艺抚伤，童绽放

作者姓名：梅琼元，齐馨悦，李梦瑶

参赛组别：本科生组

参赛类别：艺术疗愈

指导老师：唐英，史承勇

参赛院校：西北农林科技大学

证书编号：NCDA13S2N1361013G1I300101
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2025年8月

FUTURE DESIGNER · NCDA Awards

未来设计师大赛
FUTURE DESIGNER AWARDS

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

2025 NCDA Awards

# 第13届未来设计师·全国高校数字艺术设计大赛

## 陕 西 赛 区

# 二 等 奖

作品名称：言龟正传，笑看龟来

作者姓名：梅琼元，孙雪莹，王冉

参赛组别：本科生组

参赛类别：可持续设计

指导老师：程焜，张涛

参赛院校：西北农林科技大学

证书编号：NCDA13S2N1361013G1Q00201
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2025年8月

FUTURE DESIGNER · NCDA Awards

未来设计师大赛
FUTURE DESIGNER AWARDS

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

2025 NCDA Awards

# 第13届未来设计师·全国高校数字艺术设计大赛

## 陕 西 赛 区

# 三 等 奖

作品名称：冲呀！我们的无车游乐街

作者姓名：梅琼元，姚宇轩，谢国莹

参赛组别：本科生组

参赛类别：人居环境规划与设计

指导老师：程焜

参赛院校：西北农林科技大学

未来设计师·全国高校数字艺术设计大赛组委会

2025年8月

证书编号：NCDA13S2N1361013G1D300301

验证网址：https://www.ncda.org.cn

FUTURE DESIGNER · NCDA Awards

未来设计师大赛
FUTURE DESIGNER AWARDS

NCDA AWARDS 未来设计师
全国高校数字艺术设计大赛

2025 NCDA Awards

# 第13届未来设计师·全国高校数字艺术设计大赛

## 陕 西 赛 区

# 二 等 奖

作品名称：榆林市响水堡长城文化遗产社区景观规划设计

作者姓名：阎鹏跃，梅琼元

参赛组别：研究生组

参赛类别：乡村设计

指导老师：唐英，史承勇

参赛院校：西北农林科技大学

未来设计师·全国高校数字艺术设计大赛组委会

2025年8月

证书编号：NCDA13S3N1361013G1O300701

验证网址：https://www.ncda.org.cn

FUTURE DESIGNER · NCDA Awards

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

12th National College Digital Art&Design Awards

# 2024 NCDA Awards

## 第12届未来设计师·全国高校数字艺术设计大赛

## 陕西赛区

# 二等奖

作品名称：道“道”相传

作者姓名：梅琼元、王玺、顾雅雯

参赛组别：本科生组

作品类别：人居环境规划与设计

参赛院校：西北农林科技大学

指导老师：杨雪

证书编号：NCDA12S2N1261013G1D300601
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2024年8月

FUTURE DESIGNER · NCDA Awards

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

12th National College Digital Art&Design Awards

2024 NCDA Awards

# 第12届未来设计师·全国高校数字艺术设计大赛

## 陕西赛区

# 二等奖

作品名称：绿意秀韵

作者姓名：梅琼元、姚宇轩、张倞瑄

参赛组别：本科生组

作品类别：国潮·非遗设计

参赛院校：西北农林科技大学

指导老师：丁砚强

证书编号：NCDA12S2N1261013G1P100201
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2024年8月

FUTURE DESIGNER · NCDA Awards

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

12th National College Digital Art&Design Awards

# 2024 NCDA Awards

## 第12届未来设计师·全国高校数字艺术设计大赛

## 陕西赛区

# 二等奖

作品名称：苗绘秀彩

作者姓名：梅琼元、石凤婷、姚宇轩

参赛组别：本科生组

作品类别：虚拟IP及表情包设计

参赛院校：西北农林科技大学

指导老师：丁砚强

证书编号：NCDA12S2N1261013G1G100101
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2024年8月

FUTURE DESIGNER · NCDA Awards

NCDA AWARDS
未/来/设/计/师
全国高校数字艺术设计大赛

12th National College Digital Art&Design Awards

# 2024 NCDA Awards

## 第12届未来设计师·全国高校数字艺术设计大赛

## 陕西赛区

# 二等奖

作品名称：苗秀雅集

作者姓名：梅琼元、姚宇轩、石凤婷

参赛组别：本科生组

作品类别：虚拟IP及表情包设计

参赛院校：西北农林科技大学

指导老师：丁砚强

证书编号：NCDA12S2N1261013G1G200101
验证网址：https://www.ncda.org.cn

未来设计师·全国高校数字艺术设计大赛组委会
2024年8月

全国高校数字艺术设计大赛·未来设计师组委会

FUTURE DESIGNER · NCDA Awards

教育部高教学会学科竞赛排行榜赛项

# 中国好创意（第十九届）暨全国数字艺术设计大赛

CHINA CREATIVE CHALLENGES CONTEST

简称“3C大赛”或“中国创意挑战大赛”

## 陕西赛区（本科组）

# 获奖证书

# CERTIFICATE

THIS CERTIFIES THAT

社会创新类

二等奖

作品名称 涵与养韧性城市理念下的城市雨洪污染治理

作者姓名 周涯娟、梅琼元、胡彬彬、王洪祥、吴曼菲、李聪

指导教师 刘媛、唐英

参赛院校 西北农林科技大学

中国电子视像行业协会　　中国好创意暨全国数字艺术设计大赛组织委员会

2025 年 8 月 25 日

证书真伪查询

证书编号：ZCS-19thgxfsq-11627

教育部高教学会学科竞赛排行榜赛项

# 中国好创意（第十九届）暨全国数字艺术设计大赛

CHINA CREATIVE CHALLENGES CONTEST

简称“3C大赛”或“中国创意挑战大赛”

## 陕西赛区（本科组）

# 获奖证书

# CERTIFICATE

THIS CERTIFIES THAT

艺术疗愈类

二等奖

作品名称 艺染童心，光破阴霾

作者姓名 梅琼元、齐馨悦、张倞瑄、李梦瑶

指导教师 唐英、史承勇

参赛院校 西北农林科技大学

中国电子视像行业协会

中国好创意暨全国数字艺术设计大赛组织委员会

证书真伪查询

2025 年 8 月 25 日

证书编号：ZCS-19thgxfsq-11421

2024年第十二届

数字未来 · 创意无限 ITAL FUTURE UNLIMITED CREATIVITY

教育部中国高等教育学会学科竞赛排行榜赛项

# 全国大学生数字媒体科技作品及创意竞赛

www.cmit.cn

## 陕西省赛区： 一等奖

参赛学校：西北农林科技大学、武汉工程大学

参赛作品：和鸣乐土，悦生绿界——全健康视角下西安市紫薇田园都市景观规划方案

作品分类：人居环境设计

指导老师：于瀚洋、李厚华

团队成员：梅琼元、全典鹏、姚宇轩、刘佳、朱智坤

作品赛道：本科及以上学历

证书编号：20241599383

中国人工智能学会

全国大学生数字媒体科技作品及创意竞赛组委会

二〇二四年十一月

2024年第十二届

数字未来 · 创意无限 ITAL FUTURE UNLIMITED CREATIVITY

教育部中国高等教育学会学科竞赛排行榜赛项

# 全国大学生数字媒体科技作品及创意竞赛

www.cmit.cn

## 陕西省赛区： 二等奖

参赛学校：西北农林科技大学、西澳大学

参赛作品：奇趣童街——童趣无界，快乐无限

作品分类：人居环境设计

指导老师：于瀚洋

团队成员：梅琼元、姚宇轩、谢国莹、叶阳

作品赛道：本科及以上学历

证书编号：20241604542

中国人工智能学会

全国大学生数字媒体科技作品及创意竞赛组委会

二〇二四年十一月

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：程焜

团队成员：梅琼元

其作品《龟途无忧》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题省赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616009870

# 蓝桥杯大赛

## 获奖证书

西北农林科技大学梅琼元：

其作品《城市细胞单元-全健康视角下都市社区景观设计体系构建策略》荣获第十五届蓝桥杯全国软件和信息技术专业人才大赛-视觉艺术设计赛陕西赛区正式赛道（非命题）环境艺术设计一等奖。

特发此证，以资鼓励。

证书编号：161544720

证件号码：430722200411070189

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2024年5月21日

# 蓝桥杯大赛

# 获奖证书

学校名称：西北农林科技大学

指导老师：于瀚洋

团队成员：梅琼元,姚宇轩,谢国莹

其作品《童轨时代，无限童行》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题省赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008974

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：程焜

团队成员：梅琼元,齐馨悦,李梦瑶

其作品《心愈童梦》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题省赛一等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008969

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：于瀚洋,兰青

团队成员：梅琼元,齐馨悦

其作品《釉安安》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——文创设计-非命题省赛二等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008972

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：于瀚洋

团队成员：梅琼元

其作品《传承》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——海报设计（静态海报）-非命题省赛二等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008973

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：于瀚洋

团队成员：梅琼元,齐馨悦

其作品《曲阳有礼》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——文创设计-非命题省赛二等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008970

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：程焜

团队成员：梅琼元,齐馨悦

其作品《艺启向阳》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——海报设计（静态海报）-命题省赛二等奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616008971

# 蓝桥杯大赛

## 获奖证书

学校名称：西北农林科技大学

指导老师：刘媛

团队成员：周涯娟,梅琼元,胡彬彬

其作品《涵脉循韧》荣获第十六届蓝桥杯全国软件和信息技术专业人才大赛视觉艺术设计赛——环境艺术设计-非命题省赛优秀奖。

特发此证，以资鼓励。

工业和信息化部
人才交流中心

蓝桥杯大赛组委会

2025年6月17日

证书编号：1616014294

米兰设计周 CHINA COLLEGIATE DESIGN COMPETITION & EXHIBITION | 2024
中国高校设计学科师生优秀作品展

# 获奖证书

米兰设计周中国高校设计学科师生优秀作品展

陕西赛区

## 二 等 奖

作品编号：227764

参赛组别：本科研究生组

作品类别：非命题赛场（图片类）

作者姓名：王坤、梅琼元、朱智坤

作品名称：和以生，养以成——同一健康理念下陕西省西安紫薇田园都市社区设计

指导老师：于瀚洋

参赛单位：西北农林科技大学

米兰设计周-中国高校设计学科师生优秀作品展组委会

2024 年 5 月

投稿网站　微信公众号

证书编号：202400FM61010S020ML227764

# 荣誉证书

CERTIFICATE OF HONOR

证书编号
SHXHCJ0120240003

单位：西北农林科技大学 湖北大学

作者：梅琼元 姚宇轩 谢国莹 叶阳

指导老师：于瀚洋

作品名称：《“童绘”——儿童街道游乐体系构建》

在2024年第九届“两岸新锐设计竞赛·华灿奖”赛区赛中荣获

# 三等奖

特发此证，以资鼓励！

中国高等教育学会

中华中山文化交流协会

二〇二四年十一月

编号：**EI-C-20250908-01**

# 检索报告

**根据委托人梅琼元委托，通过网络检索，梅琼元发表的 1 篇论文被 EI Compendex Web 数据库（The Engineering Index《工程索引》数据库网络版）收录。数据库具体检索结果如下：**

标题：Research on Scientific Calculation Methods and Ecological Effects of Plant Configurations in Sango Landscape Designs

Accession number: 20243616997679

Authors: Wang, Jingwen[1]; Cao, Yuhan[1]; Jia, Weitian[1]; Mei, Qiongyuan[1]; Li, Shangyue[1]; Wang, Jiashu[1]

Author affiliation : 1. College of Landscape Architecture and Art, Northwest A&F University, Shaanxi, Xianyang; 712100, China

Corresponding author: Wang, Jiashu(wangjiashu1111@163.com)

Source title: Applied Mathematics and Nonlinear Sciences

Abbreviated source title: Appl. Math. Nonlinear Sci.

Volume: 9

Issue: 1

Issue date: January 1, 2024

Publication Year: 2024

Language: English

eISSN: 2444-8656

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Publisher: Sciendo

DOI: 10.2478/amns-2024-2595

Database: Compendex

第四作者梅琼元，署名单位西北农林科技大学风景园林艺术学院。

通讯作者王嘉舒，署名单位西北农林科技大学风景园林艺术学院。

查证检索：

西北农林科技大学图书馆

2025 年 9 月 8 日

## 1. Research on Scientific Calculation Methods and Ecological Effects of Plant Configurations in Sango Landscape Designs (*Open Access*)

**Accession number:** 20243616997679
**Authors:** Wang, Jingwen (1); Cao, Yuhan (1); Jia, Weitian (1); Mei, Qiongyuan (1); Li, Shangyue (1); Wang, Jiashu (1)
**Author affiliation:** (1) College of Landscape Architecture and Art, Northwest A&F University, Shaanxi, Xianyang; 712100, China
**Corresponding author:** Wang, Jiashu(wangjiashu1111@163.com)
**Source title:** Applied Mathematics and Nonlinear Sciences
**Abbreviated source title:** Appl. Math. Nonlinear Sci.
**Volume:** 9
**Issue:** 1
**Issue date:** January 1, 2024
**Publication year:** 2024
**Article number:** 20242595
**Language:** English
**E-ISSN:** 24448656
**Document type:** Journal article (JA)
**Publisher:** Sciendo
**Abstract:** The basic composition of plant communities is an important part of the landscape, and good plant community design can effectively enhance the ecological benefits of the landscape. The article selects four sites in Xining City and Gerga Village of Guide County, Qinghai Province, as research objects and designs the relevant image factors of plant landscape design based on the whole life cycle of plant landscape and carbon sequestration benefits. The evaluation and analysis of plant configuration in the study area were carried out using the beauty degree evaluation method and semantic difference method, and the measurement was carried out for the ecological benefits of plant configuration. The mean value of SBE of plant configuration in the study area was around 0.05 points, and the mean values of SD scores of 12 plant landscape image factors were distributed between [0.507,1.293] points. The maximum carbon sequestration benefit of Qinghai spruce could reach 178.35kg·a-1, which was 72.82% higher than the extreme value of scrub with the lowest carbon sequestration benefit. The mean value of carbon sequestration per unit leaf area of different types of sequestering plants was 14.09g·m-2·d-1, and the mean value of oxygen release was 7.99g·m-2·d-1, respectively, and the value of ecological benefit of purifying the atmosphere produced by landscape plants in 2033 was 2.21 times higher than that in 2023 The value of ecological benefit produced by landscape plants to purify the atmosphere in 2033 was 2.21 times of that in 2023. In the landscape design of Sanxiang in Qinghai Province, it is necessary to pay attention to the spatial location design of plant configuration, and it is also necessary to fully combine trees and shrubs in order to achieve optimal ecological benefits. © 2024 Jingwen Wang, Yuhan Cao, Weitian Jia, Qiongyuan Mei, Shangyue Li and Jiashu Wang, published by Sciendo.
**Number of references:** 20
**Main heading:** Carbon sequestration
**Controlled terms:** Carbon capture and utilization - Carbon cycle - Zero-carbon
**Uncontrolled terms:** Carbon sequestration - Ecological benefits - Landscape design - Landscape evaluation - Mean values - Plant communities - Plant configuration - Qinghai Province - Semantic differential methods - Study areas
**Classification code:** 1501.4 Net Zero - 1502.1.2 Climate Change - 1502.2 Ecology and Ecosystems
**Numerical data indexing:** Mass 1.7835E+02kg, Percentage 7.282E+01%, Surface density 1.409E-02kg/m2, Surface density 7.99E-03kg/m2
**DOI:** 10.2478/amns-2024-2595
**Compendex references:** YES
**Open Access type(s):** All Open Access, Gold
**Database:** Compendex
**Data Provider:** Engineering Village

# Research on Scientific Calculation Methods and Ecological Effects of Plant Configurations in Sango Landscape Designs

Jingwen Wang[1], Yuhan Cao[1], Weitian Jia[1], Qiongyuan Mei[1], Shangyue Li[1], Jiashu Wang[1*]

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Abstract: The basic composition of plant communities is an important part of the landscape, and good plant community design can effectively enhance the ecological benefits of the landscape. The article selects four sites in Xining City and Gerga Village of Guide County, Qinghai Province as research objects, and designs the relevant image factors of plant landscape design based on the whole life cycle of plant landscape and carbon sequestration benefits. The evaluation and analysis of plant configuration in the study area was carried out using the beauty degree evaluation method and semantic difference method, and the measurement was carried out for the ecological benefits of plant configuration. The mean value of SBE of plant configuration in the study area was around 0.05 points, and the mean values of SD scores of 12 plant landscape image factors were distributed between [0.507,1.293] points. The maximum carbon sequestration benefit of Qinghai spruce could reach 178.35kg·$a^{-1}$, which was 72.82% higher than the extreme value of scrub with the lowest carbon sequestration benefit. The mean value of carbon sequestration per unit leaf area of different types of sequestering plants was 14.09g·$m^{-2}$·$d^{-1}$, and the mean value of oxygen release was 7.99g·$m^{-2}$·$d^{-1}$, respectively, and the value of ecological benefit of purifying the atmosphere produced by landscape plants in 2033 was 2.21 times higher than that in 2023 The value of ecological benefit produced by landscape plants to purify the atmosphere in 2033 was 2.21 times of that in 2023. In the landscape design of Sanxiang in Qinghai Province, it is necessary to pay attention to the spatial location design of plant configuration, and it is also necessary to fully combine trees and shrubs in order to

achieve the optimal ecological benefits.

Keywords: carbon sequestration; landscape evaluation; semantic differential method; plant configuration

# 1. Introduction

As an important part of nature, the ecological function of plants cannot be ignored in urban environments [1]. Plants provide oxygen through photosynthesis, help soil retain water and prevent erosion through their root structure, and also improve the microclimate of cities [2]. In addition, the aesthetic value of plants is key to improving the quality of urban public spaces. The diversity, color, form, and texture of plants can greatly enrich the urban landscape, provide visual enjoyment, and promote mental health [3-4].

However, the application of plants in landscape design is not a simple placement and layout. Different plant characteristics, such as physiology, morphology and ecological habits, all have an impact on their role in landscape design. In landscape design, plant matching is an important link [5]. Plant collocation should be based on plant growth characteristics, combined with the needs of urban landscape design, skillfully presenting the primary and secondary structure, staggered mood, obscure pictures, etc., to create a natural mood and give people an aesthetic feeling. Correct understanding and application of these characteristics is the key to realize functional, aesthetic and sustainable landscape design. This calls for an in-depth study of the relationship between plant characteristics and landscape design, and an exploration of how these characteristics can be better utilized to beautify public spaces [6-8]. Through this study, it is expected to provide more scientific basis and practical guidance for the landscape design of urban public spaces in Sango, and to help designers better understand and utilize plant resources, so as to create public spaces that are both aesthetically pleasing and functional.

Before thinking about the application of plants in public space landscape design, it is crucial to understand the basic physiological characteristics of plants. Plant physiological characteristics are mainly related to plant growth mode, photosynthesis, respiration, water absorption and transportation, etc., and these characteristics directly affect the selection and layout of plants in landscape design [9]. Literature [10] explored the visual effect of vegetation landscape design in urban parks, pointed out that a matrix strategy was used to evaluate the visual effect of vegetation design, and suggested that landscape designers could consider combining formal aesthetics with Gestalt principles to optimize the visual effect of vegetation design. Literature [11] explored the factors affecting the recovery and density of vegetation in forest landscapes, combined with practical cases, and used stepwise regression and other analytical methods, pointing out that rainfall, land fertility all significantly affect the degree of recovery and plant density in forest landscapes. Literature [12] based on the students' preference for campus landscapes, the campus landscape was designed to include shade trees, colorful vegetation, and informal landscaping with the aim of providing a comfortable, scenic campus landscape. Literature [13] examined 42 landscape plant configurations in six parks in Yinchuan, as well as the correlation between plant configurations and changes in daily air temperature, providing important information and data for public green spaces to realize the cooling effect. Literature [14] reviewed the research literature related to plant communities and landscape connectivity, and pointed out that landscape connectivity can form complex and different impacts on plant community structure, and also lead to fragmentation among connected communities. Literature [15] examined how landscape green plays the role of spatial aesthetic quality enhancement, and the study pointed out that the distribution of single green vegetation landscape and red beginning landscape aesthetic quality is higher, which provides some theoretical basis and suggestions for the urban landscape planning decision-making of the landscape design related departments. Literature [16] discusses the issues related to the sustainable development of people and the environment, and combines the related research literature and publications involving landscape and land system, in order to try to combine the two scientifically and systematically, in order to realize the goal of sustainable development of people and the environment.

The key point to enhance the beauty of landscape design and the comprehensive ecological benefits of landscape lies in the effective combination of plantscape. In this paper, Qinghai Lake, Chaka Salt Lake, Rubber Mountain and Guide National Geopark in Xining City and Guide County, Qinghai Province were selected as the research objects, and the whole life cycle of the landscape and the carbon sequestration benefit of the plant landscape were used as the guidance to carry out the calculation of the plant configuration and the analysis of the ecological benefit. Based on the existing research on landscape design, we designed the image factor of plant landscape configuration, combined the beauty degree evaluation method and semantic difference analysis method to evaluate and analyze the effect of plant landscape configuration, and measured the carbon sequestration of landscape plants and the amount of carbon sequestration and oxygen release per unit of leaf area and land area. After obtaining the evaluation results and ecological benefits of plant configuration, the plant configuration strategy for landscape design in the three townships of Qinghai Province was proposed.

# 2. Landscaping study areas and vegetation eco-efficiency

Landscape design is a crucial part of landscape construction projects, including the design of roads, scenery, plants, furnishings and other aspects, and its aesthetic orientation directly affects the overall structure, ornamental effect and aesthetic value of the landscape. Under the guidance of the sustainable development strategy, the penetration of low-carbon concepts in landscape design is getting deeper and deeper, and more attention is paid to the low-carbon effect of plant configuration. This also helps to build a more comfortable and harmonious low-carbon living environment for people, and helps the city develop into a green ecological city.

## 2.1 Overview of the study area and vegetation characteristics

### 2.1.1 Overview of the study area

Starting from the local climate ecology and existing vegetation, the main goal of this survey is to design a landscape suitable for the local climate without destroying the local characteristics of the local vegetation. Under the protection of the local area, the local landscape should be moderately transformed, and the local ecology should be improved under the condition of improving the aesthetics of the local landscape, so as to provide impetus for the development of local agriculture and animal husbandry. The study area was Xining City and Gejia Village, Guide County, Qinghai Province.

The Sanjiangyuan area in Xining City, Qinghai Province, is the area with the most significant biodiversity characteristics in the world's high-altitude areas, and is known as the first natural germplasm resource bank of alpine organisms. The source of the three rivers is the birthplace of the Yangtze River, the Yellow River and the Lancang River, and is an important ecological security barrier and alpine biological germplasm resource bank in China. Guide County belongs to Hainan Tibetan Autonomous Prefecture of Qinghai Province, located in the east of Qinghai Province, southeast of Hainan Tibetan Autonomous Prefecture, with an administrative area of 3,600 square kilometers, as of the end of 2020, Guide County has jurisdiction over 4 towns and 3 townships, 122 administrative villages, and 11 neighborhood committees. There are 15 ethnic groups in the county, including Han, Tibetan, Hui, Tu and Sala, who live in harmony, multiply and make progress together. Guide County is known as the "Plateau Little Jiangnan", "the Hometown of the Pear Capital" and the "Back Garden" of Xining City, the provincial capital. In order to further understand the changes in rural landscape design in Guide County, Qinghai Province, it was decided to go to Gejia Village, a surrounding village of "Guide Qing of the Yellow River in the World", to carry out research. The surging Yellow River enters the territory of Guide County from Longyang Gorge, flows through the Laxiwa Gorge and the "Three Rivers" area of Guide, and finally exits from Songba Gorge. Because of the flat terrain here, in only 76.8 kilometers of mileage, it has left its clearest and most beautiful side for Guide, so it also has the reputation of "the Yellow River in the world". The Yellow River has nurtured many villages along the river, but also left behind many Yellow River crossings and Yellow River pontoon bridges, and with a history of more than 1,900 years, this ancient village with a beautiful environment with history is also the ideal village in our selection process.

2.1.2 Regional vegetation characteristics

Guide County is deep inland, belonging to the plateau continental climate, with long light hours and strong solar radiation. Spring is dry and windy, summer is short and cool, fall is cloudy and wet and rainy, winter is long and dry, and there is a big difference between daily temperatures. The average annual temperature is 7.2℃, the highest extreme temperature is 34℃, and the lowest extreme temperature is -23.8 ℃. The average annual precipitation is 251~559 millimeters, the annual frost-free period is 258 days, the growing period of crops is 223 days, and the annual sunshine hours are 2,928 hours. There are 12 major rivers flowing into the Yellow River within the territory of Guide County. On the north bank of the Yellow River, there are 8 rivers such as Dolong, Langmai, Yesterday, Dora, Qubuzang, Longchun, Gajean and Songba. On the south bank, there are 4 rivers such as Nuanquan River, Moqu Gou (West River), Gao Hongya River (East River) and Qingshui River, of which Qingshui River is an outbound river and flows to Tongren County. The Yellow River crosses the territory from west to east, with a length of 74.7 kilometers, and there are also rivers such as the Red Bank River, Moquigou River, Longchun River, and Langmai River, which join the Yellow River from the north and south, respectively.

Qinghai Lake is mainly dominated by windbreak and soil conservation plants such as taller trees and shrubs and a few perennial herbs. They mainly include Qinghai spruce, Qilian cypress, small-leaved poplar, mountain willow, sand artemisia, water onion and hyacinth. The main vegetation types are temperate coniferous forests, plateau valley scrub, alpine scrub, sandy scrub, temperate grassland, alpine meadow and so on. There is a lack of aquatic plants in the Chaka Salt Lake, and the area around it is sparsely wooded, mainly dominated by herbaceous plants exemplified by morning glory and artemisia. The Rubber Mountain is a type of alpine pasture dominated by alfalfa, sardonyx, and zoysia japonica, which are examples of herbaceous plants. The main geological relics of Qinghai Guide National Geopark are sandstone peak scrub geomorphology, Yellow River valley landscape, wind erosion geomorphology and Danxia geomorphology. These geomorphological features determine its unique plants, namely the black-fruited wolfberry and white willow.

Among them, black fruit wolfberry has the characteristics of light-loving, saline and alkali resistance, drought resistance, adaptability and strong vitality, and is often born in saline and alkaline land, saline and sandy land, river and lake shores, dry river beds or roadsides, while white willow has the characteristics of light-loving, barrenness resistance and wind resistance, and so on.

## 2.2 Full Landscape Life Cycle and Carbon Sequestration Benefits

### 2.2.1 Full landscape life cycle

The full life cycle theory originated from the life cycle analysis (LCA) method, which refers to the compilation and evaluation of inputs, outputs, and potential environmental impacts throughout the life cycle of a product system [17]. It was later derived as a system for evaluating products. To determine the environmental impacts of consumption and generation of the entire process of product production to use. The evaluation includes the cycle of material and energy in the whole process of raw material extraction, transportation, product manufacturing, product use, and product disposal. Figure 1 shows the change of carbon source and sink in the whole life cycle of the landscape. Carbon sink is an important ecosystem that can help us reduce greenhouse gases in the atmosphere and can be realized through landscape design and the carbon sequestration and oxygen release effect of green plants.

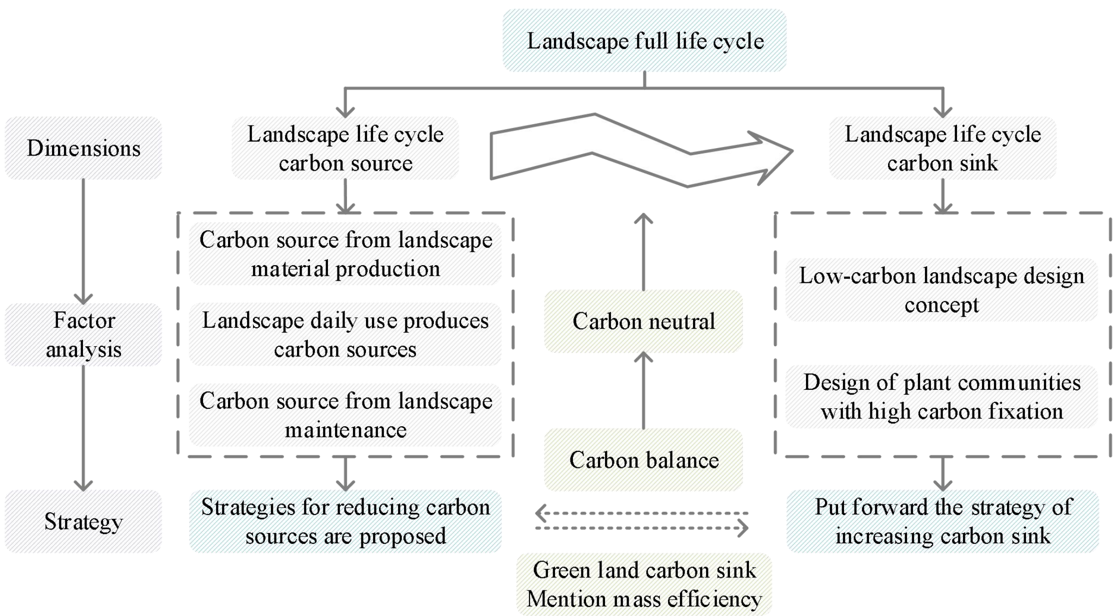


Figure 1 The whole life cycle process

The application of total life cycle analysis in landscape design can visualize and calculate the tracking of elements from the proposal stage to the completion and use of the whole process, and its application mainly focuses on the calculation of carbon emissions. According to the theory and methodology of total life cycle, the definition of total life cycle applied to landscape design is from the production stage of landscape materials, construction stage, daily use and maintenance stage, and disposal and demolition of four stages.

2.2.2 Carbon sequestration benefits of planted landscapes

Carbon sequestration and carbon reduction by plants means that plants not only absorb carbon dioxide from the air, but also consume carbon during their growth, maintenance and management. Low carbon means that plants can not only fix more carbon dioxide, but also reduce carbon emissions as much as possible. The carbon cycle process of the three major carbon pools is shown in Figure 2, which is the place where carbon can be stored in the ecosystem, and plants and soil are the major carbon pools in nature, of which the soil carbon pool is about 0.7-2.5 times of the vegetation carbon pool [18].

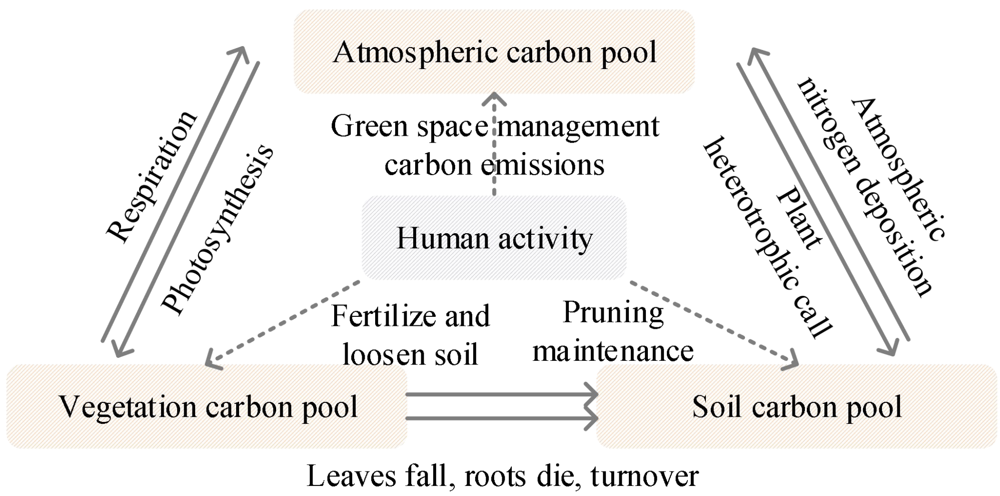



Figure 2 The carbon cycle of the three carbons

The benefits of plant carbon sequestration need to be considered comprehensively from the perspectives of both plant carbon sequestration capacity and carbon stock. The carbon sequestration capacity of green plants refers to the ability of plants to fix carbon dioxide through photosynthesis, and it is often expressed as the average annual carbon sequestration or the average daily carbon sequestration. In this study, due to the limitation of research time, the average daily carbon sequestration of plants was obtained by averaging multiple measurements. Plant carbon stock refers to the process of fixing carbon dioxide through photosynthesis during the growth stage of plants, in which a part of the carbon will be consumed with the transpiration and respiration of plants. A part of the carbon will be transferred to the soil through the root system of the plant, and the remaining part of the carbon fixed in the plant is the carbon stock of the plant.

## 3. Evaluation and eco-efficiency of plant landscape configurations

The rapid development of many economies has brought great changes to people's lifestyles and living environments, and likewise accelerated the rate of urbanization of the population, however, most of such development situations are at the expense of the ecological environment. Therefore, in the process of landscape design planning, began to focus on the integration of low-carbon concepts, through scientific and reasonable methods, the use of ecological and environmental protection concepts, advocating people to pay attention to the protection of the surrounding ecological environment, can alleviate the current waste of resources and environmental pollution and other issues, so that mankind into the era of low-carbon life.

### 3.1 Plant landscape configuration evaluation methods

#### 3.1.1 Landscape image factors

Synthesizing the adjective pairs commonly used in several studies on the impact of planted landscapes on people's psychology, as well as the public's general understanding and psychological feelings about landscape design, and then based on its own experience, this paper summarizes 12 landscape evaluation factor items, mainly including morphological beauty, color beauty, forest canopy line, topography, openness, spatial hierarchy, sense of comfort, harmony, dependence, species richness, plant configuration, and 12 indicators of naturalness, denoted by T1~T12.

Based on the 12 evaluation elements and with reference to the adjective pairs commonly used in the fields of forestry, gardening and architecture when applying the SD method, 12 adjective pairs applicable to this investigation were expanded, and the adjectives were generally set in pairs of positive and negative meanings. In order to facilitate quantitative statistical analysis, the evaluation scale was set based on the principle of "secondary nature", and the evaluation scale of adjective pairs was divided into seven grades, which were assigned scores ranging from -3 to +3, respectively, so as to quantitatively count the adjective pairs. Taking "beauty of form" as an example, the expanded adjective pairs are "bad" and "good", and the scoring options from most to least are from -3 to +3 points, and the respondents are evaluated according to their personal feelings. Respondents were asked to rate their personal feelings.

#### 3.1.2 Beauty assessment method

Scenic beauty evaluation method (SBE) is usually applied more in the landscape evaluation of the study of a large scale as well as a wide range of samples, which is easier to operate and the results are relatively more objective. It mainly adopts the method of photo taking and scoring, and relies on a certain number of people, using psychological methods as the reference basis for evaluation [19].

For the evaluation of plant configuration related to Gelga Village in Xining City and Guide County, Qinghai Province, the given Qinghai Lake, Chaka Salt Lake, Rubber Mountain and Guide National Geopark were selected as research objects, and the selected plant communities were uniformly photographed and recorded by one person with the same photographic tools from multiple angles. The photographs were mainly taken during the daytime from 12:00 to 16:00 in July 2023, when the weather was clear and the sunlight was good, and the uniform height of the photographs was 1.5 m. The selected plant communities were evaluated and ranked in terms of landscape effect by SBE. In order to ensure the scientific and random nature of the data, the evaluators were divided into two groups, namely, the picture evaluation group and the field evaluation group, and the two groups selected the same number of people, 20 people in each group, totaling 40 people for evaluation.

Although there are certain differences in the cognition and aesthetic preferences of different individuals on landscape aesthetics, there is no significant difference in the evaluation results, which have a high degree of consistency. However, in order to reduce the relative error, the data obtained from the evaluation method need to be standardized to eliminate the differences brought about by different groups of people as well as the influence of evaluation standards, and then re-ordered from high to low to obtain the final results. The standardized calculation formula is as follows:

$$Z_i = \frac{1}{N}\sum_{j=1}^{N}\left[\frac{R_{ij} - \min_i(R_{ij})}{\max_i(R_{ij}) - \min_i(R_{ij})}\right] \quad (1)$$

where $Z_i$ is the evaluation score value standardized for the *i*th community, *N* is the number of people evaluating the plant community, and $R_{ij}$ is the evaluation score value of the *j*th person for the *i*th plant community.

#### 3.1.3 Semantic Difference Analysis

Semantic Difference Evaluation (SD) is a psychometric method in which the evaluator usually compares the aspects of the current object of evaluation with the information stored in the brain when describing objective things in the past when evaluating the object according to his own experience [20].The evaluation process of the SD method is that the investigator first investigates and analyzes the object of evaluation, obtains the information related to the object of evaluation, and then presents the data and information obtained from these investigations to the evaluator verbally or textually to facilitate his evaluation of the object of study according to his own experience. Then, based on their own experience, the data and information obtained from these investigations are presented to the evaluator in verbal or written form, so that the evaluator can evaluate the subject of the study.

Considering that the SD method will produce certain errors due to the number of people participating in the evaluation, combining with the existing research, for the four different research areas of Qinghai Lake, Chaka Salt Lake, Rubber Mountain and Guide National Geopark, about 40 people were selected to take the questionnaire survey in an on-site one-on-one manner, and the questionnaire was based on the design of landscape factors.

After the offline questionnaire survey, the questionnaires were sorted out, omitted wrongly filled in questionnaires, and the remaining valid questionnaires were analyzed for reliability and scoring results were calculated by using SPSS software. The steps are as follows:

(1) The results of the SD questionnaire were entered into an Excel spreadsheet for statistical purposes, and the average score $W_j$ for each evaluation factor in each of the four study areas was calculated separately, as well as the total average score $V_j$ for each evaluation factor. ie:

$$V_j = \frac{1}{4}(W_{1j} + W_{2j} + W_{3j} + W_{4j}) \tag{2}$$

(2) Due to the fact that the SD method for evaluation assigns scores centered on 0, and the scores are distributed between -3 and 3, in order to make the evaluation results more in line with the general evaluation habits, and to compare the landscape quality between different regions more clearly, the scores can be percentile processed to arrive at the scores of each evaluation factor $T_j$, and the formula for percentile calculation is:

$$T_j = (W_j + 2) * 25 \tag{3}$$

(3) The scores of the 12 factors are weighted to arrive at a final score for the evaluation of the area's planted landscape. Then:

$$D_j = \sum_{j=1}^{N} T_j * V_j \tag{4}$$

## 3.2 Measurement of Ecological Benefits of Plant Configurations

### 3.2.1 Measurement of plant carbon sequestration

The method of calculating plant carbon sequestration in this study was the assimilation method, which is used to obtain the instantaneous photosynthetic and respiration rates per unit leaf area of a plant by determining the instantaneous $CO_2$ concentration and water entering and exiting the plant leaves. The method of multiplying the plant leaf area by the plant net photosynthesis per unit time to obtain the plant carbon sequestration is mainly applied in the calculation of carbon sequestration of shrubs and ground cover plants. In this study, the instantaneous photosynthesis rate was measured using a Li-540 portable photosynthesis meter, and the selected plants were subjected to photosynthesis rate measurements from July 2023 to November 2023 on sunny days with few clouds, while plant leaf area was measured using a Li-600C portable leaf area meter. Thereafter, the net assimilation of various plants on the day of measurement was calculated using the simple integration method. Assuming that the photosynthetically active radiation was calculated at 10 h per day, the net assimilation of the plants was:

$$P = \sum_{i=1}^{j} \left[ \frac{(p_{i+1} + p_i)}{2} \times (t_{i+1} - t_i) \times 3600 \div 1000 \right] \tag{5}$$

This was converted to daily carbon sequestration per unit leaf area by determining the total daily net photosynthesis as:

$$W_{CO_2} = P \times 44 / 1000 \tag{6}$$

The total daily carbon sequestration of a single plant was calculated as:

$$Q_{CO_2} = S \times W_{CO_2} \tag{7}$$

Where $P$ is the total assimilation of the plant, $p_i$ is the instantaneous photosynthesis rate at the initial measurement point, $p_{i+1}$ is the instantaneous photosynthesis rate at the $i+1$ moment, $t_i$ is the instantaneous time at the initial measurement point, $t_{i+1}$ is the time at the $i+1$ measurement point, and $j$ is the number of measurements. $W_{CO_2}$ is the amount of carbon sequestered per unit leaf area of the plant, 44 is the molar mass of $CO_2$, $Q_{CO_2}$ is the total daily carbon sequestration of a single plant, and $S$ is the total leaf area of the plant.

3.2.2 Oxygen sequestration by plants

(1) Leaf area index calculation

Leaf area index is used to calculate the amount of carbon dioxide absorbed per unit of leaf area per day. The leaf area index was measured once a month. The leaf area of each plant taken from this sample plot was measured using LI-3000C portable leaf area meter and the average value was taken as the average leaf area of each leaf of this plant in this sample plot. The leaf area index was calculated according to the following formula, viz:

$$LAI = (S \times N) / 4 \tag{8}$$

Where $S$ represents the average leaf area of each plant in the sample, $N$ represents the number of leaves of the plant in the sample, and 4 is the area of the community.

(2) Calculation of carbon sequestration and oxygen release by ground cover

According to the above indicators, the daily oxygen sequestration of each plant in the community and the daily oxygen sequestration per unit of the bottom area of the community were calculated. In the daily change curve of photosynthesis of plants, its assimilation amount is the area enclosed by the net photosynthetic rate curve and the time horizontal axis. On this basis, the net assimilation per unit leaf area of a plant on the day of measurement is calculated as:

$$P = \sum_{i=1}^{j} [(p_{i+1} + p_i) / 2 \times (t_{i+1} - t_i) \times 3600 / 1000] \tag{9}$$

Where $P$ is the total net assimilation on the day of measurement, $p_i$ is the instantaneous rate of photosynthesis at the initial point of measurement, $p_{i+1}$ is the instantaneous rate of photosynthesis at the next point of measurement, $t_i$ is the instantaneous time at the initial point of measurement, $t_{i+1}$ is the time at the next point of measurement, and $j$ is the number of tests, with 3600 referring to 3600s per hour, and 1000 referring to 1mmol for $1000\mu\text{mo1}$.

Then according to the reaction equation of photosynthesis, viz:

$$CO_2 + 4H_2O \rightarrow CH_2O + 3H_2O + O \tag{10}$$

It can be shown that the fixed $CO_2$ amount on the measurement day is:

$$W_{CO_2} = P \times 44/100 \tag{11}$$

Then the measured daily release $O_2$ amount is:

$$W_{O_2} = P \times 32/100 \tag{12}$$

Where $W_{CO_2}$ represents the mass fixed $CO_2$ per unit area of leaf, $W_{O_2}$ represents the mass released $O_2$ per unit area of leaf, 44 is the molar mass of $CO_2$, and 32 is the molar mass of $O_2$.

Then the daily carbon sequestration of ground cover community per unit land area is:

$$M_{CO_2} = \sum_{1}^{n} W(CO_2)_{2i} \times LAI_i \tag{13}$$

Then the daily oxygen release from the ground cover community per unit land area:

$$M_{O_2} = \sum_{1}^{n} W(O_2)_{2i} \times LAI_i \tag{14}$$

Where $M_{CO_2}$ represents the daily fixation of the community per unit land area, $n$ represents the number of plants measured in the sample site, $W(CO_2)_{2i}$ represents the mass of leaves fixed $CO_2$ per unit area of the $i$ rd plant, and $LAI_i$ represents the leaf area index of the $i$ th plant. $M_{O_2}$ denotes the daily oxygen release of the community per unit land area, *n* denotes the number of plants measured in the sample site, and $W(O_2)_{2i}$ denotes the mass per unit area of leaf release $O_2$ of the $i$th plant.

# 4. Evaluation and benefit analysis of plant configurations

Landscape can not only effectively beautify the environment and improve people's quality of life, but also reflect the humanistic flavor and ecological environment value of the city, improve the image of the city, and increase the soft power of the city. The combination of low carbon concept and into landscape design, effective plant landscape configuration can alleviate various ecological problems caused by excessive carbon emissions, and is conducive to environmental protection. This chapter mainly focuses on the evaluation of the plant configuration of Xining City and Gerga Village in Guide County, Qinghai Province, and proposes optimized configuration methods to illustrate the ecological benefits to the environment of Qinghai Province.

## 4.1 Evaluation and Analysis of Plant Configurations

### 4.1.1 Plant landscape evaluation based on the SBE method

Based on the SBE method of evaluating the botanical landscape given in the previous section, a total of 20 photographs were selected to be attached to the questionnaire. A total of 300 questionnaires were distributed for the SBE landscape evaluation of Xining City and Gerga Village in Guide County, Qinghai Province, and 300 questionnaires were validly collected, including 120 questionnaires from the professional group, 80 questionnaires from the non-professional group, and 100 questionnaires from the public group. Excel software was used to calculate the SBE values of the non-professional student group, the professional student group and the public group for the evaluation samples of different plant landscapes in Gelga Village, Xining and Guide Counties, Qinghai Province, respectively as shown in Figure 3.

The aesthetic evaluation of different groups has consistency, but the aesthetic results are different due to the differences in personal experience, economic status, cultural level and many other factors. Comparing the evaluation results of different evaluation groups, the results show that the lowest SBE results of the three evaluation groups belong to evaluation sample 18, respectively, the non-professional group (-0.335), the professional group (-0.323), and the public group (-0.319), the non-professional group has a different result from the professional group and the public group with the highest SBE, respectively, the non-professional group (0.583) belongs to sample 1, the professional group (0.482) belongs to sample 1, and the public group (0.583) belongs to sample 1. (0.482) and the public group (0.485) belonging to Sample 14. The trends of the differences in SBE values of the three evaluation groups for each evaluation sample are similar, and their aesthetic results are consistent. As a result, whether from the professional or non-professional point of view, the aesthetics of plant configurations in the village of Gerga, Xining City and Guide County, Qinghai Province, is better, but the mean value of the SBE is around 0.05, which needs to be optimized to improve the aesthetics of the plant landscapes in the village of Gerga, Xining City and Guide County, Qinghai Province.

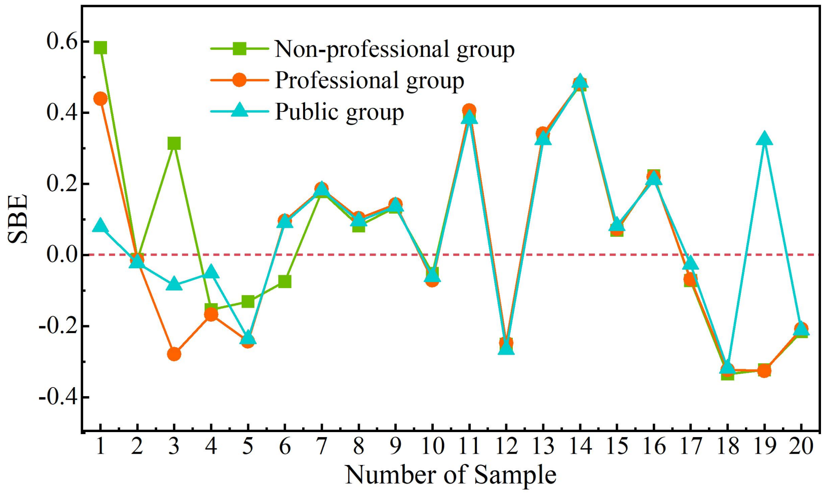



Figure 3 SBE values of evaluation samples from different evaluation groups

4.1.2 Evaluation of plant landscapes based on the SD method

A total of 200 questionnaires were distributed and 200 were effectively recovered to evaluate the landscape of plant configuration in Xining City and Guide County, GuiDe County, Qinghai Province by SD method. The landscape evaluation by SD method was carried out from Qinghai Lake (A), Chaka Salt Lake (B), Rubber Mountain (C), and Guide National Geopark (D), and the results of SD scores of different regions are shown in Figure 4. Where M represents the mean value of SD scores of the four study regions on different landscape factors, from blue to red represents the gradual increase of SD scores.

Based on the data in the figure, it can be seen that the mean values of the SD scores of Qinghai Lake, Chaka Salt Lake, Rubber Mountain and Guide National Geopark on the 12 plant landscape factors are centrally distributed in the range of 0.507 to 1.293, indicating that the evaluators are satisfied with the overall plant landscape configuration and quality in the four regions of Xining City and Guide

County, Guide County and Gelgazhong Village, Qinghai Province. Among them, the evaluators were most satisfied with the species richness (T10) of Guide National Geopark, whose SD score reached 1.416. Chaka Salt Lake had the lowest SD score of only 0.073 for its forest canopy line due to its overall more dispersed distribution, in which few plants were distributed. Overall, the evaluators showed high satisfaction with the plant configuration (T11) and naturalness (T12) of the four study areas in Qinghai Province, with SD scores of 1.035 and 1.095, respectively. Therefore, the results of the beauty of vegetation configuration in Xining City and Gerga Village, Guide County, Qinghai Province obtained based on the SD method are more consistent with the results of the SBE method.

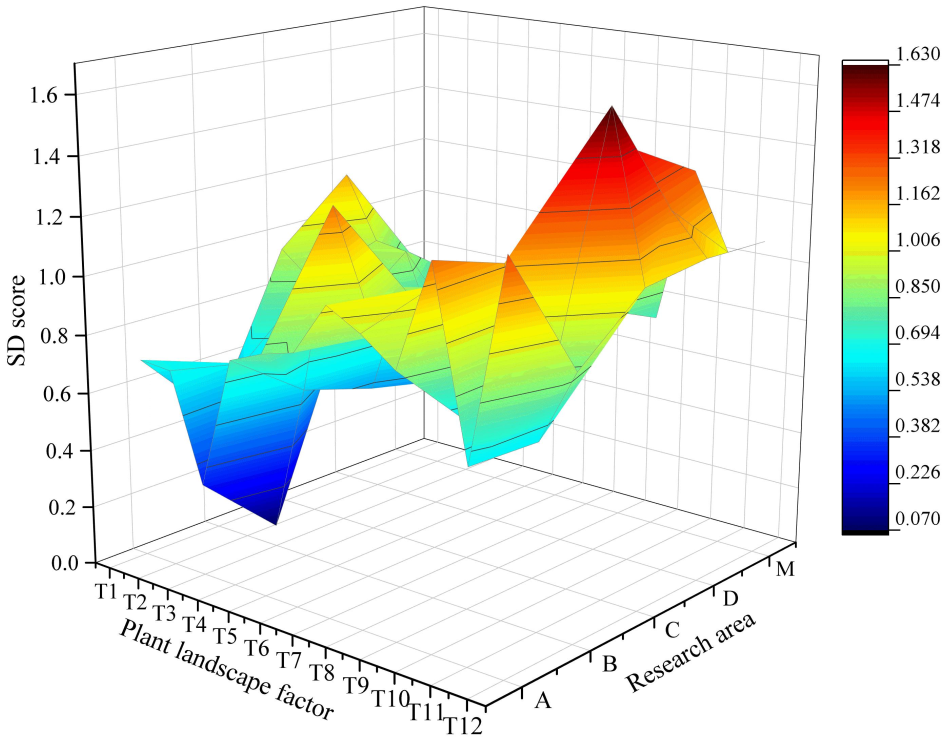



Figure 4 SD scores in different regions

4.1.3 Correlation of Landscape Factors with Degree of Beauty

(1) Normality test

The normality test is a prerequisite for many research analyses, and by analyzing quantitative data it is possible to know whether or not it contains the qualities of a normal distribution. Ideally, the normality test is to determine the significance first, when $p<0.05$ or $p<0.01$ presents significance, which means that the question item does not have normal distribution qualities, and vice versa $P>0.05$ is not significant, it has normal distribution characteristics. In this study, the mean scores of landscape factors in the study area were used for normality test. The normality test was conducted for T1~T12, and the results of the normality test analysis are shown in Table 1.

Specifically, three items of species richness (T10), plant configuration (T11) and naturalness (T12) showed significance ($p<0.01$), which indicated that ideally, vegetation species richness, plant configuration and naturalness did not have the quality of normality. However, by observing the absolute values of the kurtosis and skewness of the vegetation significance and landscape harmony, it can be seen that these two data can be basically regarded as conforming to the normal distribution. In addition, a total of 9 items from T1 to T9 did not show significance ($p>0.05$), which means that the T1 to T9 plant landscape factors have the quality of normality, and all of them can be accepted as normal distribution.

Table 1 Normality test analysis results

| Factor | Means | STD | Kurtosis | Skewness | Shapro-Wilk test | |
|---|---|---|---|---|---|---|
| | | | | | W value | p value |
| T1 | 0.801 | 0.205 | 0.235 | 1.705 | 0.835 | 0.316 |
| T2 | 0.773 | 0.217 | -0.166 | 0.963 | 0.924 | 0.052 |
| T3 | 0.507 | 0.235 | -0.099 | -0.992 | 0.873 | 0.408 |
| T4 | 0.626 | 0.353 | -0.083 | 2.058 | 0.901 | 0.337 |
| T5 | 0.868 | 0.374 | -0.072 | -1.043 | 0.889 | 0.329 |
| T6 | 0.862 | 0.338 | 0.129 | -0.556 | 0.916 | 0.157 |
| T7 | 0.968 | 0.352 | 0.245 | 0.689 | 0.927 | 0.124 |
| T8 | 0.924 | 0.267 | -0.165 | 0.623 | 0.892 | 0.228 |
| T9 | 0.754 | 0.335 | 0.232 | 2.034 | 0.937 | 0.305 |
| T10 | 1.293 | 0.249 | -1.891 | -0.121 | 0.941 | 0.001 |
| T11 | 1.035 | 0.278 | -0.835 | 0.938 | 0.859 | 0.005 |
| T12 | 1.095 | 0.201 | -1.342 | 1.179 | 0.924 | 0.009 |

(2) Correlation analysis between beauty degree and landscape features

In order to further analyze the correlation between plant beauty degree (Y) and landscape factors in Xining City, Guide County, and Gerga Village, Qinghai Province, the Pearson correlation index was used for verification. Figure 5 shows the results of correlation coefficients between the degree of beauty and each landscape factor, the darker the color means the stronger the correlation. All of the plant landscape factors from T1 to T9 showed significance, and the correlation coefficients were all greater than 0, which means that there is a positive correlation between the degree of aesthetics and the 12 items of beauty of form, color, canopy line, topography, openness, spatial hierarchy, sense of comfort, harmony, dependence, species richness, plant configuration and naturalness. The correlation coefficients of species richness, plant configuration, and naturalness with landscape beauty were 0.915, 0.872, and 0.884, respectively, at 1% level, which also confirmed the results of the evaluation of landscape beauty above. The remaining nine items showed correlation with plant configuration in landscape design at the 5% and 10% levels, respectively, which would reflect the key role of plant configuration in landscape design to some extent.

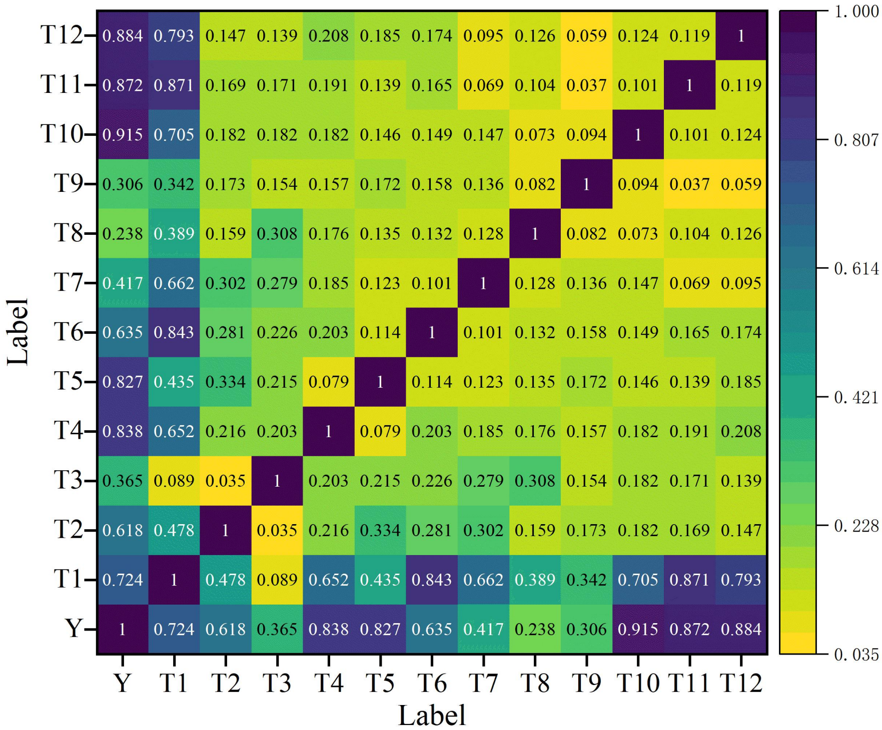


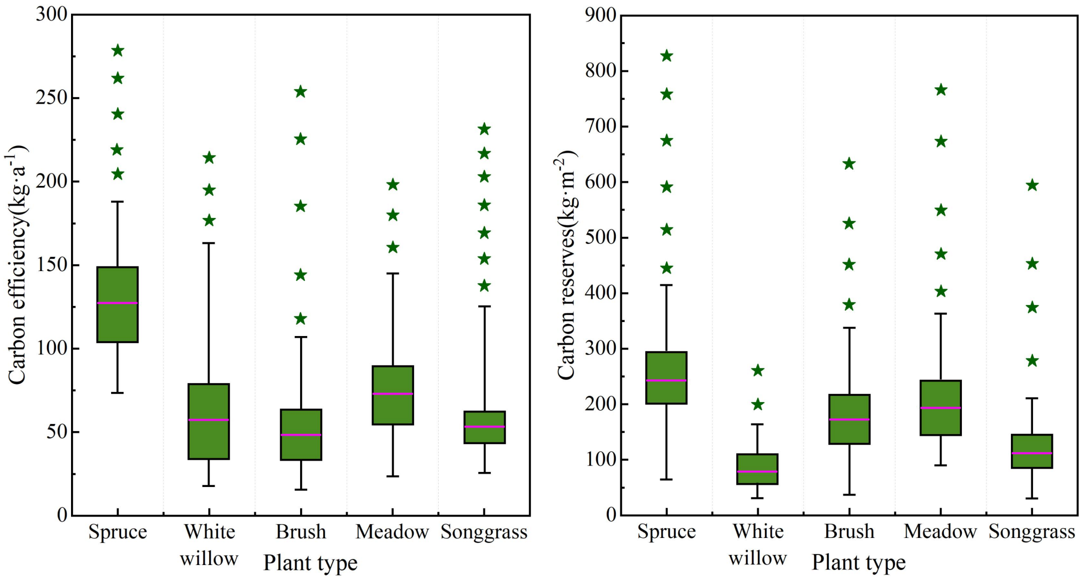

Figure 5 Coefficient of correlation coefficient

## 4.2 Ecological Benefits of Plant Configurations

### 4.2.1 Carbon sequestration capacity of different types of plants

Landscape plants can be categorized according to different characteristics, which can be divided into evergreen plants and deciduous plants according to seasonal characteristics, broadleaf plants and coniferous plants according to leaf types, etc. The plants researched in the four study areas of Xining City and Gerga Village, Guide County, Qinghai Province were categorized to compare the differences in carbon sequestration capacity of plants with different seasonal types and leaf types. Figure 6 shows the comparison of the differences between different plant types, where Figures 6(a) and (b) show the results of carbon sequestration efficiency and carbon storage, respectively.

For the researched plant landscapes in Xining City and Gerga Village, Guide County, Qinghai Province, the differences in carbon sequestration benefits of different plant types were spruce > white willow > meadow > tarragon grass > scrub, and the carbon sequestration benefit of Qinghai spruce could reach a maximum of 178.35kg·$a^{-1}$, which was 72.82% higher than that of the scrub, which had the lowest carbon sequestration benefit. The individual leaf area of Qinghai spruce was larger than that of meadow, willow or tarragon, with larger specific leaf surface area, higher leaf volume and relatively larger leaf area index, so the carbon sequestration benefit of spruce was higher than that of other types of plants. The differences in carbon storage among different plant types were spruce>meadow>scrub>tongue>white willow, of which spruce had the highest carbon storage of 417.24kg·$m^{-2}$. Spruce species had a higher biomass with a high growth rate in the growth equation of anisotropic biomass, so spruce species had a higher carbon storage. The above conclusions show that by combining spruce with different types of plants, such as meadow and scrub, the ecological benefits of spruce can be effectively enhanced on the basis of increasing the diversity of plant landscape configurations in Qinghai Province, which will help Qinghai Province to achieve carbon neutrality faster and better protect the ecological environment.




(a) Carbon efficiency (b) Carbon reserves

Figure 6 Differences in different plant types

4.2.2 Predictive analysis of ecological benefits

On the basis of investigating the ecological benefits of existing plant configurations in Qinghai Province, CITY green software was used to simulate plant growth in the four study areas, and simulate and predict the growth and ecological benefits of the study areas in the next 5, 10 and 20 years. Ozone, sulfur dioxide, nitrogen dioxide, respirable particles, carbon monoxide, carbon storage, carbon sequestration, and economic benefits were simulated. Table 2 shows the average annual ecological benefits of the growth simulation.

In 2028, the value of eco-efficiency of purifying the atmosphere produced by it increased by about 33.54%, the storage of carbon increased by 21,969.08 tons, an increase of about 0.57 times the value of 2023, and the absorption of carbon became 1,124.26 tons, an increase of 284.84 tons.The value of eco-efficiency of purifying the atmosphere produced by the landscape plants in 2033 was 2.21 times the value of 2023, and the value of carbon storage is about 81,661.94 tons, which is 2.12 times that of 2023, and carbon uptake has increased by 619.63 tons, which is 2.08 times that of ten years ago. This shows that as the number of plants in the study area continues to grow, the ecological benefits it produces are also increasing.

Table 2 The annual average ecological benefit of growth simulation

| Ecological benefit | 2023 | 2028 | 2033 | 2043 |
|---|---|---|---|---|
| Ozone | 30124.15kg | 52163.47kg | 73516.83kg | 91464.52kg |
| Sulfur dioxide | 12636.74kg | 17539.52kg | 20335.41kg | 24151.86kg |
| Nitrogen dioxide | 18574.46kg | 24337.85kg | 27954.76kg | 30958.27kg |
| Inhaled particles | 36241.79kg | 45241.74kg | 52493.62kg | 66567.43kg |
| Carbon monoxide | 4264.83kg | 5368.93kg | 6156.38kg | 7235.92kg |
| Carbon deposits | 38472.61t | 60441.69t | 81661.94t | 98426.74t |
| Carbon absorption | 839.42t/y | 1124.26t/y | 1743.89t/y | 1916.51t/y |
| Economic benefits | 1.37Million | 2.63Million | 3.51Million | 4.22Million |

### 4.2.3 Oxygen sequestration benefits of different plants

Oxygen sequestration per unit leaf area can reflect the carbon sequestration and oxygen release capacity of different plant leaves. The strength of daily oxygen sequestration per unit leaf area of different plants was determined by measuring the photosynthetic net photosynthesis assimilation of 14 plants, including Qinghai spruce, Qilian cypress, small-leaved poplar, mountain willow, Artemisia annua, water onion, water hyacinth, Splendentilla, morning glory, Artemisia annua, alfalfa, Sardinia, Zoysia japonica, black fruit Lycium barbarum and white willow, in Xining City and GuiDe County, Qinghai Province. Table 3 shows the daily carbon and oxygen sequestration values per unit leaf area and per unit land area of different plants, where 1~14 represents 14 plants, NPR represents net photosynthetic rate, NA represents net assimilation, RASP is daily carbon and oxygen sequestration per unit leaf area, RAULA is daily carbon and oxygen sequestration per unit land area, and CPD and SPD are daily carbon and oxygen sequestration.

The average carbon sequestration value per unit leaf area of the 14 species was $14.09g\cdot m^{-2}\cdot d^{-1}$ and the mean oxygen release value was $7.99g\cdot m^{-2}\cdot d^{-1}$. The highest carbon sequestration and oxygen release value per unit leaf area was $16.95g\cdot m^{-2}\cdot d^{-1}$ and the lowest was $9.36g\cdot m^{-2}\cdot d^{-1}$, and the carbon sequestration and oxygen release capacity of the former was 1.81 times that of the latter. The average daily carbon sequestration and oxygen release per unit land area of the 14 medicinal ornamental plants was $35.57g\cdot m^{-2}\cdot d^{-1}$, and the highest and lowest values were still Qinghai spruce and shallot, and the carbon sequestration and oxygen release capacity of the former was 8.17 times that of the latter. Further analysis showed that the mean daily carbon sequestration values per unit leaf area of trees and shrubs were 14.52g·m$^{-2}$·d$^{-1}$ and 14.69g·m$^{-2}$·d$^{-1}$, respectively, and the mean oxygen release values were 8.06g·m$^{-2}$·d$^{-1}$ and 7.95g·m$^{-2}$·d$^{-1}$, respectively. The observation data showed that the ability of trees and shrubs in carbon sequestration and oxygen release was similar, and there was little difference, and the daily carbon sequestration and oxygen release value per unit land area was greater than that of shrub types. Therefore, in the landscape design of Sanxiang, Xining City, Qinghai Province, the combination of Qinghai spruce and different types of shrubs can effectively improve the carbon sequestration and oxygen release capacity and help the protection of the ecological environment.

Table 3 Carbon release value of different plants

| No | NPR (μmol·m$^{-2}$·s$^{-1}$) | NA (mmol·m$^{-2}$·d$^{-1}$) | RASP (g·m$^{-2}$·d$^{-1}$) | | RAULA (g·m$^{-2}$·d$^{-1}$) | |
|---|---|---|---|---|---|---|
| | | | CPD | SPD | CPD | SPD |
| 1 | 9.14 | 327.36 | 16.95 | 12.34 | 86.85 | 63.47 |
| 2 | 3.26 | 233.51 | 14.24 | 10.21 | 58.24 | 41.46 |
| 3 | 5.38 | 207.43 | 13.28 | 7.35 | 38.47 | 27.89 |
| 4 | 4.72 | 236.34 | 15.24 | 13.06 | 23.82 | 24.14 |
| 5 | 5.53 | 244.27 | 14.49 | 7.57 | 42.26 | 30.95 |
| 6 | 5.34 | 177.51 | 9.36 | 7.32 | 10.63 | 29.63 |
| 7 | 4.02 | 166.36 | 14.15 | 5.56 | 18.31 | 13.71 |
| 8 | 3.78 | 202.54 | 14.28 | 5.24 | 15.24 | 11.52 |
| 9 | 5.13 | 269.42 | 14.42 | 7.16 | 20.33 | 15.85 |
| 10 | 5.42 | 251.54 | 14.03 | 8.61 | 30.28 | 22.39 |
| 11 | 3.36 | 143.52 | 14.29 | 8.09 | 38.37 | 26.72 |
| 12 | 5.47 | 246.53 | 14.38 | 4.63 | 13.52 | 10.52 |
| 13 | 4.15 | 202.37 | 14.11 | 7.82 | 47.76 | 33.79 |
| 14 | 6.34 | 275.48 | 13.97 | 6.85 | 23.91 | 21.24 |

## 4.3 Configuration strategies for landscape design

Through an in-depth analysis of the landscape design species and plant configurations in the landscape design of Xining City and Guide County's Gerga Village on Qinghai, this paper proposes a set of landscape plant selection and landscape design configuration strategies applicable to the Qinghai region, which can effectively construct and maintain planted landscapes under different environments and needs through spatial layout design, plant combinations and collocations, as well as maintenance and management strategies. These strategies not only consider the ecological and aesthetic values of plants, but also emphasize the harmonious symbiosis of culture and environment, providing sustainable and innovative solutions for landscape design in Qinghai Province.

### 4.3.1 Space layout design

In the design of the spatial layout of landscape plants in the village of Gerga, Xining and Guide County, Qinghai Province, it is crucial to consider the division of functional areas. In the recreational area, the designer favored the use of large trees and shrubs that provide shade and a comfortable environment to promote leisure activities. In contrast, ornamental areas are more likely to use plants with brightly colored flowers and different forms to increase visual appeal through clever layout. In addition, pathways and boundaries are designed to enhance the sense of space through the use of plants of different heights and textures to guide sightlines and walking routes.

### 4.3.2 Plant combinations and mixes

Plant combination and matching is also one of the important considerations in landscape design. An effective plant matching strategy should take into account the coordination of color, height, and growth habit in order to create a harmonious and layered landscape effect. In plant landscape design, combining yellowish flowers with dark green evergreens not only increases the color contrast, but also enhances the ornamental value of the seasons. Height matching was also a key consideration. By using tall trees as the background, medium height shrubs as the transition, and groundcover plants in the foreground, a rich sense of hierarchy was formed, while also meeting the viewing needs of different perspectives.

## 5. Conclusion

This paper evaluates the plant landscape configuration in Xining City and Gerga Village, Guide County, Qinghai Province using the beauty degree evaluation method and semantic difference analysis method, and analyzes the ecological benefits possessed by plant landscape configuration using plant carbon sequestration and oxygen release, aiming to improve the plant configuration and ecological protection ability of landscape design in Qinghai Province. The conclusions are as follows:

(1) The mean value of SBE of plant configuration in Xining City and Gerga Village, Guide County, Qinghai Province was around 0.05 points, and the mean value of SD scores of 12 plant landscape factors were centrally distributed between 0.507 and 1.293 points. Overall the evaluators were satisfied with the vegetation configuration of Qinghai Lake, Chaka Salt Lake, Rubber Mountain and Guide National Geopark, but there is still room for optimizing the configuration.

(2) Among the four selected study areas, the difference in carbon sequestration efficiency of different types of plants was spruce> white willow> meadow> > shrubs of Songcao, and the carbon sequestration benefit of Qinghai spruce was up to 178.35kg·a$^{-1}$. The mean carbon sequestration value per unit leaf area of the 14 species was 14.09g·m$^{-2}$·d$^{-1}$ and the mean oxygen release value was 7.99g·m$^{-2}$·d$^{-1}$, respectively. In landscape design, the combination of Qinghai spruce and various types of shrubs can effectively improve the carbon sequestration benefits, enhance the oxygen release, and contribute to the improvement of the ecological benefits of each study area.

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